No. 1

Basic Design Study Report
on
The Establishment Project
of
The Center for Development of Appropriate Agricultural Engineering Technology

December, 1985

Japan International Cooperation Agency

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PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a Basic Design Study on the Project for Construction of the Center for Development of Appropriate Agricultural Engineering Technology and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Indonesia a study team headed by Mr. Hideo ISHIKAWA, Director, Planning and Survey Department, Institute of Agricultural Machinery, from August 12 to September 1, 1985.

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

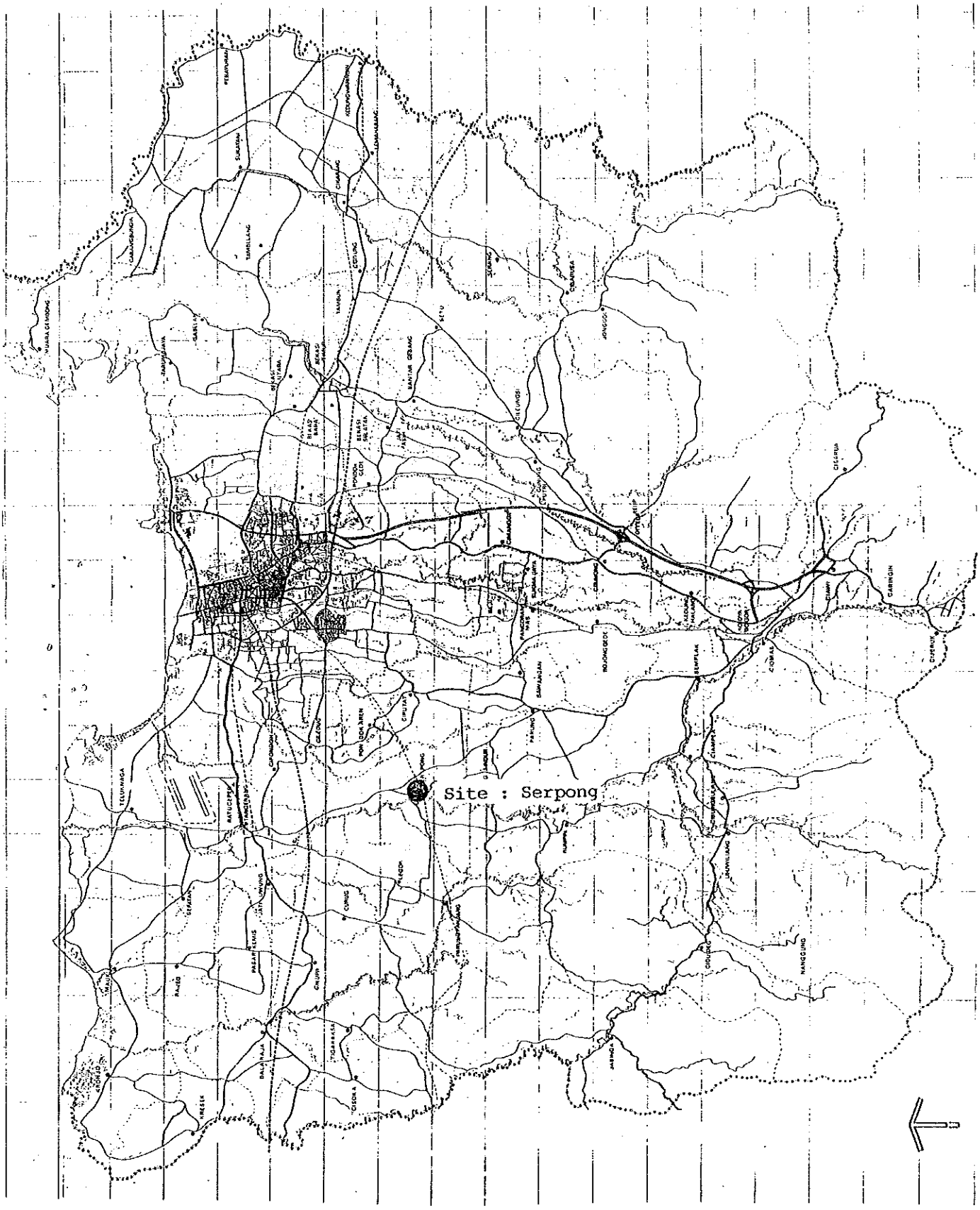
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between the two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the republic of Indonesia for their close cooperation extended to the team.

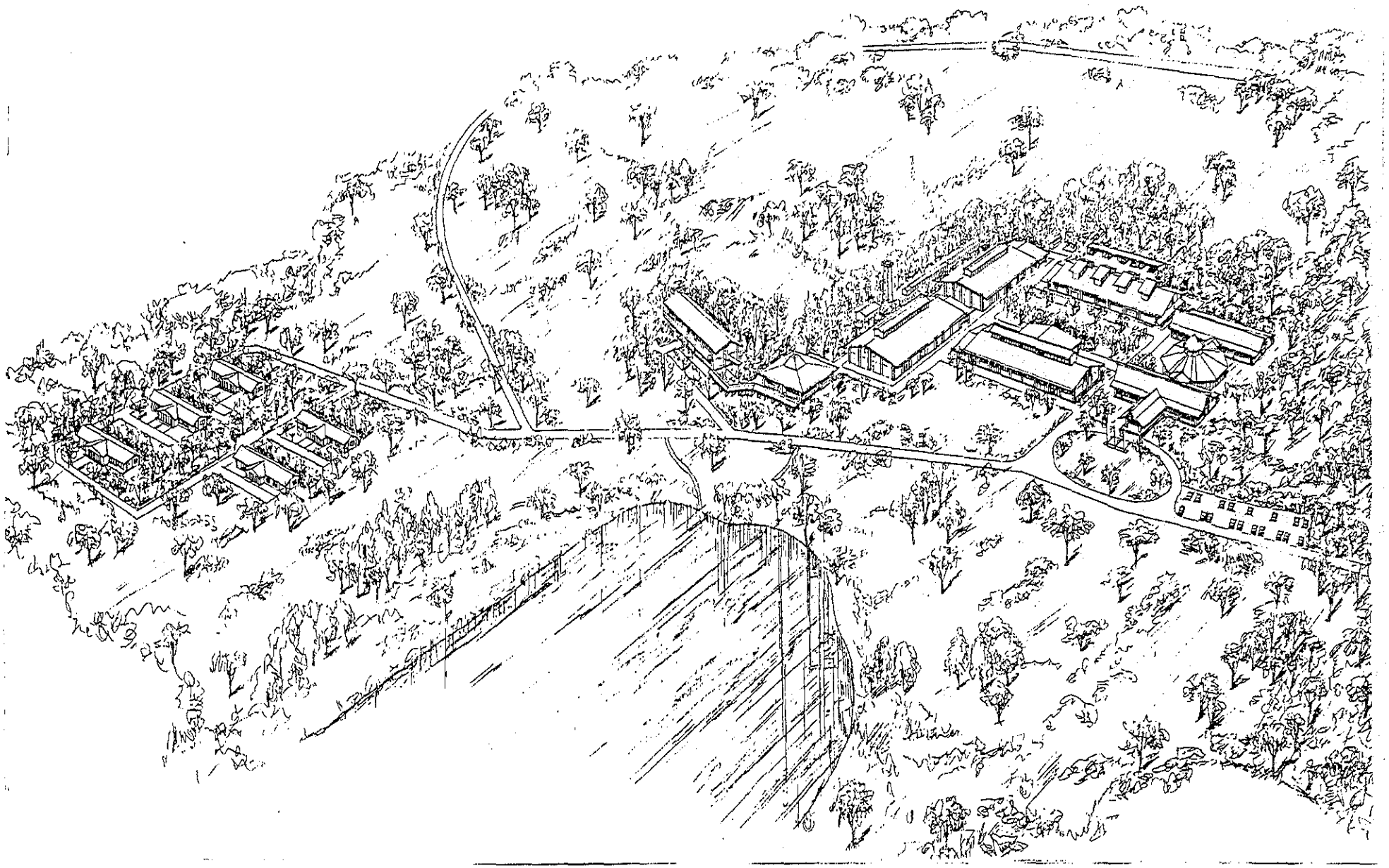
December, 1985

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency



Map of Jakarta



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SUMMARY

Summary

Circumstances surrounding the agriculture of the Republic of Indonesia have been changing through the decrease of its agricultural population, while the agricultural sector's proportion of the Gross Domestic Product (GDP) has been declining. In order to achieve the development of a sound economy, the achievement of increased food crop production has become one of the most significant tasks in implementing agricultural policies.

Mechanization in Indonesian agriculture has been promoted since around 1950. At the earliest stage, large-size tractors and pumps were introduced to examine the appropriateness of agricultural mechnization with the purpose of giving an assistance to small-scale farmers. But it turned out that these efforts had no noticeable effects on the expansion of food crop production. In accordance with the development of mechanization in agriculture, small-size machines with simpler structures started to draw public attention. Particularly, there was a drastic increase in the number of handy anti-insect machines. In spite of its substantial increase, the number of farm machines was still very small around 1980 compared with the total number of farmers.

Because of the increased imports of farm machines, a policy was implemented to consign the design and production of farm machines to domestic manufacturers in order to bring up domestic local companies. But this policy did not develop well enough, as the manufacturers failed to produce machines appropriate to meeting the farmers' needs.

For the above reasons, and in order to increase food crop production, it is necessary to achieve technological improvement including land policy readjustment as well as improvement of both cultivation techniques and plant breeding. As the development of farm machinery can contribute to the overall improvement of the agricultural technology, the appropriate promotion of agricultural mechanization is one of the most significant tasks.

In the light of the above-mentioned background, the establishment of the Center for the Development of Appropriate Agricultural Engineering Technology was planned. This center will be operated for the purpose of drawing the guidelines for machine introduction, and to develop and improve farm machines as well as to test and evaluate them. The center will contribute to the technological improvement of farm machine engineers, agricultural manufacturers and those concerned with the promotion of agricultural mechanization.

This center consists of a Main Building including Office Building and Training Center, Laboratory and Testing Zone

including Laboratory and Testing Building and Work Shop Building, and Residential Zone. The construction site is located at Serpong, West Java, about 50 km southwest from Jakarta. The site with 35 ha area is at a hilly area originally used as a national rubber tree plantation and was obtained by purchase. On the site, there is a plain area and an area with a slight slope. Gentle ups and downs can be observed on the site. There is no problem with drainage, as the site is located higher than the surrounding area by 2 to 3 m. For water supply, a deep well for drinking water is to be dug at the site.

In the light of the importance of this establishment project, The Indonesian Government requested Japan to provide Grant Aid for the procurement of the facilities and the necessary equipment. The Japanese Government responded to the request with an approval conduct a basic design study for this project. The Japan International Co-operation Agency sent a delegation for the basic design study to Indonesia in 1985 from Aug. 12 to Aug. 31.

The study team considers the adequate way of co-operation at the Japanese side as follows conserning the establishment of this center.

The facilities of the project consist of Main building (Office Building, Training Building, Exhibition Building), Laboratory and Testing Building, Machinery Training Building, Work Shop Building, Lodging Building, etc.. Major rooms and size of each building are as follows:

Office Building: Director Room, Japanese Experts Room, Reception Room, General Affairs & Public Relations Section, Office Room, Computer Room, Meeting Room, etc.

532.0 m2

Training Building: 4th Section Office Room, Drawing Room, Lecture Room, Lecturers Waiting Room, Library

588.0 m2

Exhibition Building: Exhibition Hall

381.0 m2

Laboratory and Testing Building: Workroom, Measurement Room, 1st and 2nd Section Office Room, Laboratory

1,289.0 m2

Machinery Training Building: Training Room, Exercise Room, Measurement Room, Staff Room

		810.0 m2
Machinery Testing Building:	Testing Room, Measurement Room, Warehouse	
		810.0 m2
Work Shop Building:	Laboratory, Woodwork Room, Metalwork Room, Workroom	
		1,152.0 m2
Farm House:	Workers Rest Room, Farm Machinery Warehouse	
		100.0 m2
Guest House (A):	Hall, Lodging Room, Maid Room, Kitchen	
		656.0 m2
Guest House (B):	Hall, Lodging Room, Maid Room, Kitchen	
		252.0 m2
Dormitory:	Lodging Room (16 rooms), Hall	
		504.0 m2
Canteen:	Canteen, Kitchen	
		256.0 m2
Electric Room, Pump Room, Garage:	Electric Transfer Room, Pump Room, Garage	
		412.0 m2
Total		7,742.0 m2
Equipment:	Experiment Machines, Testing Machines, Training Machines, etc.	
Test Road:	Test Road, Pilot Farm (whose cost is to be paid by technical aid program)	

With regards to the construction costs of the work to be done by Indonesian side, these costs will be estimated at approx. 744,400,000 RP.

Time required for the construction will be as follows: 3

months for detailed design, 2 months for tender and contract, 12 months for construction.

Director General of Food Crops, Ministry of Agriculture will assume the responsibility for the project.

The project for the establishment of the Center for Development of Appropriate Agricultural Engineering Technology aims to improve the technological level of farm machinery engineers, manufacturers, and those concerned with promotion. The project aims to draw up guidelines for the introduction of farm machinery and to promote the development and improvement of testing and evaluation works. For these purposes, the expansion of food crop production, including rice and realization of stable food self-supply systems are to be promoted.

In the light of the above factors, the earliest possible materialization of the project is desired. It is of great significance to implement the project with Grant Aid from Japan, and it is expected to bear wonderful fruit.

At the same time, the Indonesian Government requests Japan to provide project-type technical cooperation. They also ask us to dispatch experts and provide machines and equipment for the management of the center, preparation of the actual training plan and its introduction to the local people. In addition, the center is expected to play a more important role, if at the same time the project-type technical cooperation is to be implemented such as the Counterpart Exchange Training System in Japan.

CHAPTER 1 INTRODUCTION

Chapter 1 Introduction

Indonesian agriculture needs appropriate agricultural mechanization development aimed to increase food production in keeping the balance of natural and social conditions. According to this background, the Indonesian Government requested assistance from the Japanese Government regarding the "Center for Development of Appropriate Agricultural Engineering Technology", Establishment program in the form of Grant Aid and Japan's technical cooperation programs.

In response to this request, the Japanese Government dispatched a mission to discuss and confirm a basic policy of the technical cooperation on October 1984.

The details of the requested project include a center for Development of Appropriate Agricultural Engineering Technology established in Serpong situated approx. 50 km southwest of the central district of Jakarta. The center is to be used for the improvement of agricultural machinery suited to the regional natural conditions. Considerations include the customs used in the growing of crops and the technical ability standards involving the operation of agricultural machinery. Tests of agricultural machinery, both domestic and foreign, as well as technological guidance to domestic agricultural instructors and agricultural machinery manufacturers will be provided.

Following the mission, a long-term research staff and an antecedent research team was dispatched, the former in May 1985 and the latter in June 1985. They discussed the present local state of agricultural mechanization, concrete methods of development and improvement and the details for the request. They also conducted a survey to determine whether co-operation in this project would be appropriate.

Acting on the survey reports from these missions, a basic design research team was dispatched in August 1985 and they carried out the surveys necessary for the apprehension of the project details and the basic designs.

The surveys were conducted August 12 through August 31 1985, a period of 21 days; these concerned confirmation of the request details, the role of the center in the Ministry of Agriculture, the function, scale, composition and design policy of the facility and scrupulous discussions based on the field surveys.

On August 23, 1985, minutes were concluded between Mr. Shiombing, Directorate General of Food Crops Production and Mr. Ishikawa, leader of the Basic Design Study Team.

Data about the organization of the research teams, itineraries of the filed trips, minutes and other matters are appended at the end of of this report.

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Social and Economical State of Affairs in General

2-2 The State of Affairs Regarding Agriculture

2-3 Details of Agricultural Mechanization

2-4 Outline and Details of the Request

Chapter 2 Background of the Project

2-1 Social and Economical State of Affairs in General

The primary 5 year program achieved significant results such as an increase in rice production and an end to inflation; the actual GDP growth rate reached 7.7% with the economic and political conditions relatively stable.

The second 5 year program was put into practice in 1974, but even with the price of oil rising as a result of the first oil shock, the GDP growth rates were not satisfactory, faltering at 6.9%, 0.8% short of the targetted 7.7%. With worldwide depression and the PULTAMINA finance corruption in 1975, the Rupia underwent a 50% devaluation relatively stable on November, 1978.

The third 5 year program was put into practice in April 1979 with "Just Distribution of Development and its Accomplishments" as the major objective, and following that the fourth 5 year program has been under way since 1984.

The outline of the national policies regarding this fourth 5 year program is to lay emphasis on economic development of agriculture and industry, impartial development, stability, better national welfare, to build a foundation for the generations to come, to take flight toward a just and prosperous society based on "Panchashira" by the mid-term years of the sixth 5 year program (1944 - 1988).

Still the issues facing the Indonesian economy are not few in number, among them high population growth rates and potential unemployment, income and economy differences between social classes, urban and rural regions, races, etc. A long term endeavoring under harsher conditions is anticipated.

The objectives concerning agriculture of the fourth 5 year program are:

1) A production increase for supplying demand of the consumers and the industries

2) An increase in the export of agricultural products

3) An increase in the incomes of farming households

4) Employment exploitation

5) To promote business equally throughout the nation

6) To assist industrial development

In order to achieve these objectives, farmland cultivation, soil improvement, consolidation of irrigation systems, agricultural production technology improvement and a systematization of agricultural mechanization are urgently needed.

The following chart shows the food crops agricultural production targets of the fourth 5 year program.

Chart 1 Food Crops Agricultural Production Targets (1984 - 1985)

(x 1,000 t)

No.	ITEMS	1984	1985	1986	1987	1988
1.	Rice	24,701	25,781	26,867	27,736	28,624
2.	Corn	5,412	5,694	5,993	6,308	6,656
3.	Cassava	14,702	15,403	16,145	16,919	17,756
4.	Sweet-potatoes	2,257	2,331	2,401	2,482	2,564
5.	Peanut	536	580	621	672	724
6.	Soy-bean	918	1,015	1,174	1.250	1,370
7.	Mung-bean	204	231	261	298	340
8.	Vegetables	5,317	5,810	6,109	6,543	6,899
9.	Fruit	8,031	8,474	8,929	9,408	9,901

Source : Food Crops Agricultural Development Plan in REPELITA IV, January 1984

2-2 The State of Affairs Regarding Agriculture

The weight agriculture shares in Indonesia's actual GDP has declined from 44% in 1971 to 30% in 1982, due to the development in modern fields such as industry. Still it is the farming villages that support the huge population. it can be said that the importance of this field is growing politically and socially not to mention economically.

Looking at the population census of the year 1980, 114 million people, 77.6% of the total population, live in farming villages and 55% of the working population was employed in agriculture. Considering the fact that the percentage of those employed in agriculture in 1971 was 64.2%, the percentage is on the decrease, but the absolute scale was increased. Furthermore, 25% of those employed in these forming industry work less than 24 hours a week, thus the farming villages compose a huge pool of under-employed workers.

The population of Indonesia is concentrated in Java island and the nucleus of agricultural issues finds itself there as

well. Its major characteristic is overpopulation and tenant farmers. With petty farmers and agricultural laborers increasing as the population increased, Java island is in a saturated state as far as population is concerned.

Chart 2 The urban and rural farming village population in Indonesia (unit:1,000 pers., %)

REGION	URBAN REGION	RURAL REGION	PTG.IN URBAN REGIONS
JAVA	22,626	70,951	24.2
OUTER ISLANDS	10,220	42,980	19.2
SUMATRA	5,653	20,096	22.0
KALIMANTAN	1,288	5,003	20.5
SURAWESI	1,832	8,637	17.5
NATION TOTAL	32,846	113,931	22.4

* source: Statistic Indonesia, 1982

The Indonesian Government has regarded the agricultural field as its major concern and so far has shown substantial results in the increase of food production, mainly rice. still it can hardly be said that potential production abilities are being put to full use. The failure to meet increasing demands such as those for sugar call for future modernization of agriculture.

This chart shows the transition of the produce of major agricultural products up to 1982.

Chart 3 The yield of main agricultural products

(unit:1,000t)

	1939	1969	1973	1978	1980	1981	1982
Rice		12,249	14,607	17,525	20,163	22,287	28,191
Corn		2,392	3,690	4,029	8,091	4,648	4,194
Cassava		10,917	11,186	12,902	13,726	13,673	12,630
Sweet potato		3,360	2,387	2,083	2,079	2,034	2,303
Soy beans		389	541	617	653	687	698
Meat		309	379	475	571	596	629
Eggs		58	81	151	259	275	297
Milk (1million l)		29	35	62	78	86	117
Palm oil	244	189	289	532	701	748	873
Cobra	43	1,221	1,237	1,575	1,759	1,812	1,736
Coffee	58	175	150	223	285	295	266
Tea	83	62	67	91	106	109	92
Cloves		12	22	21	39	40	31
Pepper		17	29	46	37	39	31
Tobbacco		84	80	81	116	118	110
Sweet potato	1,576	922	1,010	1,516	1,831	1,913	1,550

Small scale farmers and large scale plantations co-exist in Indonesia and the former produces, after rice, secondary crops such as corn, cassava, sweet potatoes, soy beans, peanuts and peas as well as merchandise crops including long-term crops such as rubber and coconuts.

Plantations produce rubber, palm oil, tea and sugar cane on a large scale by employing agricultural labors. The majority are employed in state plantations.

According to the population census in 1983, of the total 322.2 million households, 19.5 million are classified as farming households. These households average 1.0 ha in land area. If we take a look at the distribution, we find that 48% manage less than 0.5 ha, 22%, 0.5 to 1.0 ha and 30% more than 1.0 ha. Thus, approximately half the farming households are extremely shall in scale.

Presently, the actual situation is that these small scale farms are being increasing due to the Islamic equal heritage custom dividing small lots in to even smaller lots. This makes it extremely difficult to realize an increase in the income of the farming households.

Still, the cultivated land area at present is 16.4 million ha (according to the agricultural census of 1973), amounting to a mere 8.5% of the country's total land area. There still is much room for further cultivation. An increase by 40 million ha is considered possible. Investments in agriculture lagged behind in the outer islands. Due to favorable climate conditions, substantial areas of land with potential remain uncultivated.

Agricultural mechanization, which has been unrealized expect in certain regions are due to the following: machinery being unsuited for each region, unemployment problems, the farmer's low incomes. With the introduction of better seeds and popularization of two term harvests by irrigation consolidation, a tremendous increase in agricultural production is possible.

Producing rice using traditional methods causes losses in harvest and post harvest. Deterioration in quality are great. Furthermore, since there is great movement of agricultural workers into other industries, due to hard labor required, agricultural mechanization is urgently called for.

The present agricultural policies of Indonesia are:

1) to increase the self sufficiency of foodstuffs,
2) to increase farmer's income,
3) to increase foreign currency income,
4) to develop new employment chances.

The yield increase of rice is the most important issue. If investments will be made in accordance with these policies, to increase self sufficiency of foodstuffs and the farmers income are deemed possible.

2-3 Details of Agricultural Mechanization in Indonesia

Introduction of agricultural machinery to indonesia began ground 1950. The Government founded the Agricultural

Mechanization Development Section in 1952. When the section was first established an experimental introduction of large tractors, water-hauling pumps, etc. was carried out. However, due to insufficient measures taken to train the users of these machines, there was not much of a yield increase.

During the sixties, an increase of certain machines was endeavored with the objective of introducing technologies concerning agricultural mechanization. The main items introduced in this period, as compared to the larger items introduced in the fifties, were small and handy anti-insect machines which had a rapid expansion. The machinery introduced at this time was completely foreign made.

Introduction progressed in the seventies owing much to the public relations activities conducted in the sixties.

The following chart shows the number of major agricultural machines introduced in the years 1974 and 1980.

Chart 4 Major Agricultural machines Introduced

Type of machine	Number		Rate of increase
	1974	1980	
Tractors	567	6,405	eleven fold
Pumps	867	3,479	four fold
Sprayers	64,078	181,684	three fold
Threshers	470	2,215	five fold
Rice pearling Machines	10,767	55,092	five fold

While the popularization of agricultural machines progressed, policies aimed at realizing the manufacturing of these machines by domestic manufacturers were conducted and as a part of that the I.R.R.I. workshop was established with Grant Aid funding by USAID in 1978.

Although the assembling of prototypes in this workshop has contributed much, these prototypes are nonetheless based on designs by I.R.R.I and not necessarily well suited to the soil, cultivation etc., of Indonesia, and therefore pose numerous problems.

With such matters forming the framework, future agricultural mechanization in Indonesia needs to be well suited to the natural conditions and crop growing techniques of each region.

The following charts show the number of agricultural machines and manufacturers and general statistics of three major manufacturers.

Chart 5 Domestic Production of Agricultural Machinery

Type of machine	Number of Manufacturers	Annual Production
Hand tractors (6 - 8 PS)	18	16,060
Rice pearling machines	9	24,300
Hand sprayers	13	304,000
Threshers (rice)	8	3,500
Threshers (corn)	2	3,000

As shown above there are 50 domestic manufacturers. The following chart shows the general statistics of three major manufacturers.

Chart 6 General Statistics of Three Major Domestic Manufacturers of Agricultural Machinery

Company Name	General Statistics
P.T. AGRINDO co.	Established 1942 An affiliate of a Japanese manufacturer of agricultural and forestry machinery. Rice sil 900 per month Rubber roll 40 thousand per month Manufactures threshers, dryers, generators, etc. Is recently considering going into the manufacturing and sales of hand tractors. Has its own iron casting factory in Indonesia.
P.T. YAMINDO	Established 1974 Indonesian-Japanese joint management Manufactures: hand tractors (8.10 PS) tractors (5 PS) threshers

	rice hullers rice pearling machines attachment such as when it first began operation, the parts were 100% foreign made but presently the domestic production rate has gone up and the threshers are composed entirely of domestic parts.
GOLDEN AGI Co.	Established 1974 Specialized in Hand Sprayers; 800-1000 per day

Since 1980 further promotion of agricultural mechanization policies has been conducted, aiming at modernization of agriculture and to increase food production.

The Government set up the National Farm Mechanization Committee for Agricultural Mechanization in 1981 to provide special advice concerning agricultural mechanization policies. This committee proposed the following:

Policies on a National Level

1) Research development and utilization of agricultural machinery
2) Testing and evaluation of agricultural machinery
3) Introduction of agricultural machinery
4) Utilization of agricultural machinery

On a Regional Level

1) That adaptability tests of agricultural machines be conducted.

2) Testing and evaluation of agricultural machinery

Policies Regarding Local Manufacturers

1) The manufacturing of agricultural machines, simple in design easy to use and maintain.

2) That such machines can be manufactured using materials available locally

3) That these machine be effective.

4) That these machines be inexpensive.

The number of agricultural machines in Indonesia has increased rapidly, but still the expansion rate, as shown in the following chart is still extremely low.

Chart 7 The Possible Expansion Rate of Major Agricultural Machines in Indonesia

	Number Introduced	Expansion Rate (Number per 100 farming households)	Reference
Tractors	10,000	0.06 (62)	The number of farming households in 1980 (1980 population census) 17,469,000
Sprayers	100,000	1.0 (82)	

ref. The number in brackets indicates the expansion rate in Japan.

If we take a look at the situations concerning the production of aquatic rice, the major crop, procedures such as plowing and tilling are mostly done by cattle like water oxen, whereas planting, harvesting and thrashing is done completely by manual labor.

Judging from this, agricultural mechanization, on a national basis, has only just begun.

For the present, manual labor forms the backbone of farming in Indonesia. Farming villages which have an abundance of agricultural laborers in addition to minimal average farmland area, can be considered as possessing enough manual labor, but we should not overlook the difficulties which result from manual labor.

This is especially true in the case of aquatic rice, which is reaped with a traditional tool called "ani-ani" 30 cm below the ears. It can be considered as the direct causes for the long time it takes for reaping the fields. There is 18% quality deterioration during the harvesting process and post-harvest losses.

In order to prevent these losses and quality deterioration, the spread of machines suited to each region is urgently called for.

Furthermore, cultivation of farmlands and irrigation consolidation will probably be promoted in the strive for a future agricultural production increase. On the other hand, the outflow of agricultural laborers into other industries and the hard labor that accompanies agriculture are also important matters that need of be looked into.

Since the Indonesian Government considers agricultural produce increase and development, improvement and propagation of appropriate agricultural machinery as major agricultural policies, problems need to be coped with quickly.

Ref.1 The Harvesting Method of Aquatic Rice

In Java, a reaping tool called "ani-ani" is used in the harvesting of aquatic rice. It is reaped 30 cm below the ears and bound into bundles of 3 - 5 kg (wet stalk paddys). During the harvesting process many neighbors go into the paddy fields to help, customarily taking home 10 - 20 percent of the rice each reaped, with children going into the fields along with adults and everyone obtaining the ripest, largest and easiest to reap ears, substantial crop losses result from this custom. Problems occur by tramping upon, unreaped ears dropping the ears reaped and leaving ears.

2-4 Outline and Details of the Request

Rice, in Indonesia, can be considered as one of the most important crops, being their stable food. At present, the rice is being grown using traditional farming tools and methods, and with low-wage agricultural laborers.

Since climatic conditions in Indonesia are favorable, an around-the-year growing of rice is possible with the consolidation of irrigation systems, but few regions actually employ two-term harvests.

It is now clear, through experimentation, that two-term harvests and introduction of existing large yielding seeds will improve rice production.

Still, it has been confirmed that the realization of the foresaid is difficult without utilizing agricultural machines and improving agricultural technology standards.

As you can see, agricultural mechanization will make year-round harvests possible and as a result of that, will lead to a yield increase. Therefore, the role of agricultural mechanization in increasing the yield of aquatic rice is extremely important.

Various agricultural machines have been imported up to now, but most of these, besides being too expensive for the farmers to afford, possess numerous problems. for example, special training was required to use the machines.

Thus, the developing and improving of original agricultural

machines well suited to the natural, social and economical conditions of each region in Indonesia is essential for an increase in agricultural produce. In order to carry it out effectively, the establishment of a center that will play a central role in the mechanization is urgent.

Such is the outline of how the Indonesian Government came to request the Japanese Government's Grant Aid in the project to construct this facility, and to supply equipment.

The details of the request confirmed by the basic design study mission are as follows:

1) Technological Analysis of Agricultural Mechanization:

To analyze and determine whether mechanization is, or otherwise has a potential of being "appropriate". For example, the collection of technological information which can be considered as determining the center's direction, with discussion about what types should be developed in the center. Also what functions the information should have, justifiable prices and economical evaluations of imported machines.

In regards to information already introduced, actual utilization situations will be looked into and ways of improvement be discussed.

2) The Testing and Examining of Agricultural Machines:

To conduct operating tests and various measurements while in the developmental process, and to make use of the results for improvement. In other words, to test the functions and operation conditions of the machines when manufacturers decide upon their production, and to provide them with necessary advice. Further still, to conduct tests of machines which domestic manufacturers developed on their own, and to provide the manufacturer with the data.

Regarding foreign machines, tests will be conducted to determine whether or not to import them.

These tests are to check operation, function and verification. Furthermore, regarding those machines which already have an established testing system, the tests will be conducted according to that established system. Those without an established method or system, will be taken care of also.

3) Conditions such as an appropriate price, power saving efficiency, etc. will be determined in the process of designing the required agricultural machinery. This is

needed to suit the manufacturing standards of Indonesian industry and for making these into practical machines through validating tests. From another point of view, these machines will be designed so as to be within a justifiable price and to possess required functions, by contemplating accessible materials and parts. The types of machines considered at present and details are as follows:

1-1 Development and Improvement of Tillers (Small, lightweight types and multiple attachment, the latter for multiple usage)

1-2 Soy threshers (Development of rice threshers which can be used as soy threshers as well, since such types will become useful when conducting three term harvests; rice first, rice again and then soy beans. This three term harvest results in a soy production increase, Soy beans grown in dry fields will also be considered.)

1-3 Corn Shellers (Power driven 1-ton per hour)

1-4 Underground Fertilizing Machines (To aim at a more efficient use of fertilizers, both in paddy fields and dry fields)

1-5 Power Driven Weeders (For paddy fields. To cope with the possible discontinuation of governmental subsided regarding agriculture)

1-6 Cassava Slicers (Both power driven and manual types. These slicers also have a cleaning function.)

1-7 Peanut Shellers (Power driven 500 kg per hour)

1-8 Dryers (mainly as a measure against the rainy season)

1-9 Grain Storage Tanks (5-tons)

1-10 The Improvement of the Hulling Devices of Rice Hullers

1-11 The Improvement of Mini-tractors to improve upon their adaptability

4) Those subject to receiving this training and education can be divided into manufacturers of agricultural machinery and instructors who will engage in instructional activities in local training institutions. The manufacturers will be instructed in processing technologies, designing and manufacturing

methods, and the manufacturing technologies concerning the manufacturing of machinery developed by the center. The instructors will be educated in adaptability testing methods, evaluation methods and technological analysis. Therefore the manufacturers curriculum will center around design, development and improvement while the instructors' curriculum will center around testing, evaluating and technological analysis.

CHAPTER 3 OUTLINE OF THE PROJECT AREA

Chapter 3 Outline of the Project Area

3-1 Outline of the Project Area

Location: Serpong

Pagadandan Village

Legok County

Tangerang Prefecture

State of West Jawa

Area : 34,9907 ha

The project site is located at an old rubber plantation situated approximately 50 km southwest of the central district of Jakarta.

The site is shaped like an inversed "S" and high voltage wires carrying 500 thousand volts run through the middle of it in a noutheast-southwest direction.

There are two access roads to the site, one on the east side and one on the south. These roads are 5.5 m wide, and unpaved. The site itself is presently unpopulated but neighboring farmers grow food crops such as cassava. The underground water level, at 3 m, is relatively high, but sand has been dug out on a large scale at a nearby location recently and the water level is declining.

3-2 Social Conditions and Climate

The site is 3 - 5 m higher than its surrounding area which consists of marshes and paddy fields. With the Cisauk river to the east and there being drainage waterways, the drainage conditions are favorable.

Taking a look at the living conditions of the area, there is a primary school, a junior high school and a high school but there is nothing which can be regarded as a hospital in the neighboring area and the only thing that comes close is the government managed clinic situated in Serpong.

The means of transportation from Jakarta city to the site are bus, railroad and car.

Both scheduled busses and unscheduled mini-buses between Serpong and the site is only covered by mini-busses, 30 minutes ride.

By train it takes 50 minutes from Jakarta to Serpong but these trains operate at three hour intervals starting 9 AM, with only four trains a day.

If we take a look at the time each major bus route takes, we see that the

JKT --- Kebayaran --- Ciputat --- Site takes approx. 3-3.5 hrs.

Kebayaran --- Ciputat --- Site takes approx. 3 hrs.

By car, we can use toll highways making the

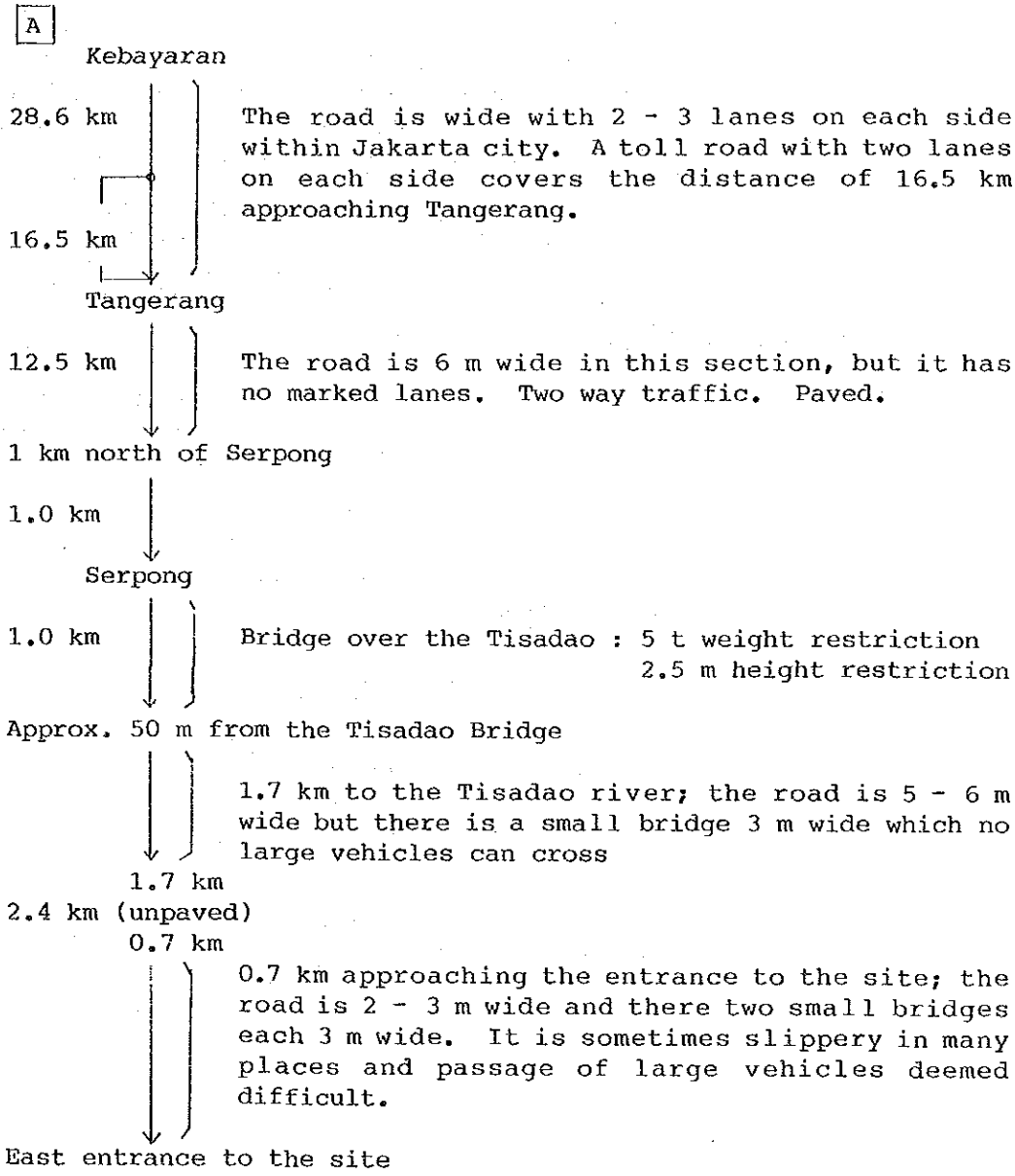
Kebayaran --- Tangerang --- Site in approx. 55 minutes, which is 1/3 the time it takes by bus.

Thus being the statistics of transportation, as for commutation, it would be inefficient to use the train considering the time period and the number of trains scheduled. Busses would not be adequate either, the substantial amount of time it takes. Therefore, commutation from and to Jakarta requires an exclusive commuting vehicle.

3-3 Infrastructure

a. Roads

At present, there are two accesses to the site and the general conditions of these two accesses, A and B, are shown below.



[B]

Pesar Minggu (Office of the Institute of Agricultural Machinery)

19.5 m — The road is 6 m wide, two way and no marked lanes. The traffic is heavy, Road leading to Keyabarang branches 14 km from the office.

Ciputat

10.9 m — The road is 4 m wide and has no marked lanes. The traffic is two way, but stopping is necessary when large vehicles pass each other.

Approaching the Science and Technology Research Center

5.1 km — Road is 6 m wide. No marked lanes.

1 km north of Serpong

0.3 km — The road is 6 m wide with two way traffic and no marked lanes. Bridge over the Tesadao river: 5t weight restriction, 2.5 m height restriction.

The Tisadane Bridge

2.6 km — The road is 6 m wide, with two way traffic and no marked lanes.

Junction of paved and unpaved roads

1.4 km — Road width 5 - 6 m. Unpaved pebble road. Road surface uneven. Bridge at one location transit of large vehicles possible.

Village

2.4 km — The road is 3 m wide and fairly smooth. Becomes muddy in the rain season making transit of large vehicles impossible.

Center of the Site (access from the south)

b. Electricity

At present, electricity reaches to a village 500 m from the site and extension work is being carried out at a fast pace, with electricity poles already put up within the site.

Jurisdiction P.L.N.

Voltage 220 volts

c. Water Supply

The water supply systems of the city do not reach the site. There is no plans for piping in water from the city. Water for drinking will be supplied by digging a well. Since there are marshes and paddy fields in the surrounding area, and a 2 - 3 m level difference. A sufficient water supply should be available, but simple filtering facilities will be needed for providing rough drinking water.

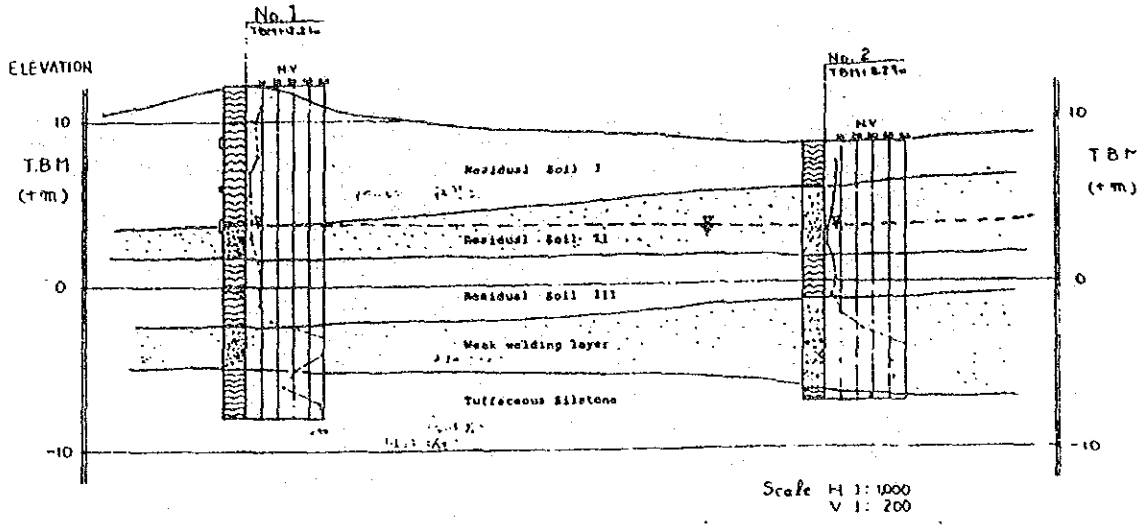
As for wells, inspection of a neighboring farmer's well revealed the following statistics: (1) Water level, G.L.-3 m (2) Transparency, -30 cm (3) odorless (4) tasteless. Attention must be paid to the fact that large scale sand collection has been conducted approximately 1 km from the site and the underground water level of these areas seems to be declining.

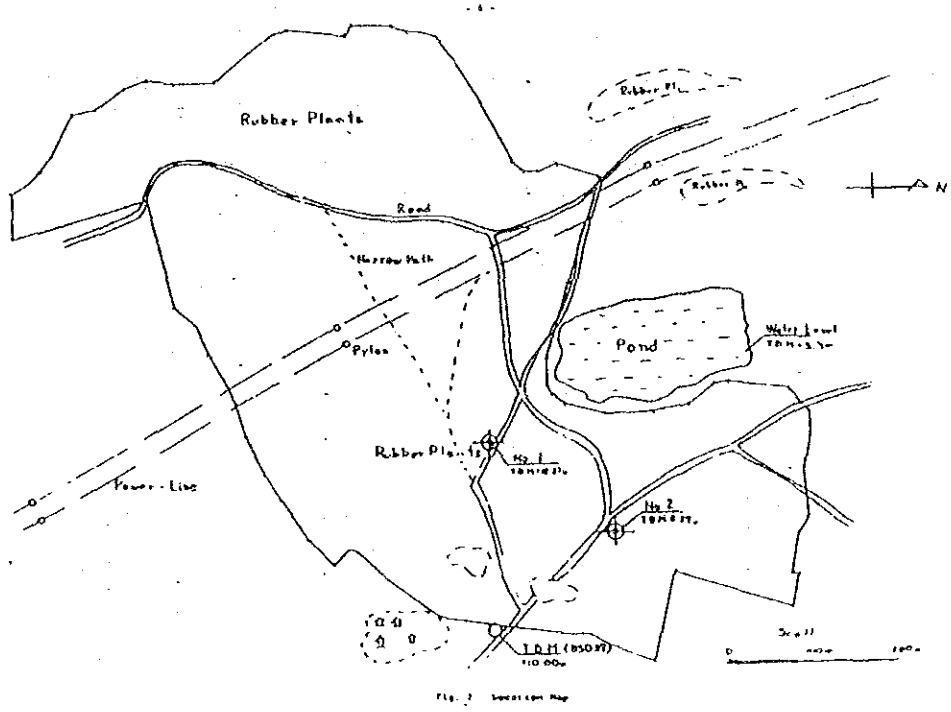
d. Drainage System

As previously mentioned, the level of the site is higher than the water level of the surrounding areas. Therefore drainage should be of no problem. There is a drainage waterway besides the site in addition to the Cisauk river running along the east side. But since this river is used to draw irrigation water to the neighboring farmfields, a primary treatment must be applied to household drainage if it is to be discharged there.

3-4 Ground and Soil Condition

The soil condition is a reddish brown heavy clay type. Surveys conducted at two locations within the site revealed the N-value = 50 depth points to be at 5 m and 8 m.





3-5 Construction Condition

a. The Construction Business

Private development is being conducted actively in Jakarta, and along major roads such as JI. Sudirman Avenue; a construction rush of high-rise buildings is going on. In spite of such activities, construction has not increased much since 1973, with building construction developments at a halt, reflecting the economy in general.

Cooperal construction firms has lagged behind in Indonesia, and although there are large scale enterprises around Jakarta and Bangdon, most are small scale firms.

At present, most if not all construction firms form some kind of fund and technology affiliation with foreign enterprises in order to make up for their weaknesses. Technological foreign investments concerning construction has witnessed a rapid increase though these ten years. The partners in joint management are mostly Japanese and American Companies.

b. Technological Standards

The present technological standard of local workers is relatively high and there should be no trouble concerning the construction of general buildings. Still, their volition toward work and their work efficiency are both 70% lower than that of Japanese workers, and supervisors must be positioned.

Reinforcement Bar Placer	300 - 400 kg per day (only beams and posts)
Reinforcement Bar Placer	100 kg per day (walls as well)
Framework Carpenter	2 m2 per day

C. Supplyment of Materials

As for materials, most are imported, with the exception of some aggregates, simple-form steel, and cement. Regarding equipment such as air conditioning, plumbing sanitary and electrical facilities, domestic supplying abilities do not meet the demands on matters of production, ability and amount. Therefore most of it is imported.

There are a number of ready-mixed concrete factories in Jakarta city but few of them can be relied upon. Since the traffic conditions are not favorable, it would be preferable

to build a concrete plant on site, conditions permitting.

A great portion of the reinforcing bars (6 - 25 ϕ) and deformed bars (D20 - D25) can be acquired locally.

The piles will, on the most part, be of steel reinforced concrete and made on site. They will be 23 m in length at the longest, and have square or octagonal sections.

Several types of steel frames such as lightweight angle steel and wide flange steel are manufactured locally. The qualities of these are good, but complex joint forms might cause trouble.

The building frame is generally of steel reinforced concrete or pre-stressed concrete. The use of concrete for walls is rare, the common material for this purpose being brick.

Ceiling materials, water proof materials, plaster boards, hardware, vinyl tiles, etc. are imported. Aluminium sash bars, wood paint, marble, etc. can be acquired locally.

3-6 Construction Cost

Regarding construction costs, the D.P.U. publishes the maximum cost per standard area unit of public buildings according to rank and the number of stories, the C.I.P.T.A. The unit costs of building materials and these should provide sufficient reference.

The Rupia was devaluated 50% in 1978, and this did bring about results, the inflation rate dropping from 15.8% in 1980 to 9.8% in 1981 and till 8.5% in 1982. Still due to the shift in world economy, with the price of oil dropping, the Rupia was devaluated once more, this time 28%, in 1983. Under these circumstances, construction cost have altered considerably. The price increase rates of major building materials are as follows:

	1975	1981	1982	1983
Wood	1.0	2.52	2.75	3.04
Cement	1.0	1.74	1.98	2.43
Steel products	1.0	1.74	1.79	2.00
Non-steel products	1.0	2.05	2.21	2.63
Machinery	1.0	1.70	1.84	2.73

Wages have risen accordingly. The wages for 1984 as published by the Public Enterprise Ministry are as follows:

Chief construction worker	:	3,000 - 3,500 Rupia per day
Skilled construction worker	:	3,500 - 5,000 Rupia per day
Unskilled construction worker	:	2,000 - 2,500 Rupia per day

CHAPTER 4 OUTLINE OF THE PROJECT

4-1 Objectives

4-2 Organization

4-3 Project Description

4-4 Technical Cooperation

Chapter 4 OUTLINE OF THE PROJECT

4-1 Objectives

The supply of the main rice crop, rice, is sufficient at present, owing to the various measures taken in recent years. But still, an increase in yield and its stabilizing the supply is desirable considering the rate of population increase. Mechanization for the types of agricultural labor which use manpower or cattle and for those processes where accuracy would lead to an yield increase is especially needed. Java is advanced in terms of intensive agriculture, therefore, mechanization there could result in depriving workers of their jobs. On the other hand, the outer islands lack sufficient population and consequently, require land cultivation and agricultural mechanization. A selective mechanization induction, with emphasis on regional conditions so as not to increase unemployment is mandatory. Improvements in appropriate agricultural machinery, drafting of guidelines for the introduction of agricultural machinery and further training of the engineers and salesmen of manufacturers of agricultural machinery are the main objectives for the facility.

4-2 Organization

This project will be carried out by the Directorate General of Food Crops Agriculture. The actual management of this project will be left to the Institute of Agricultural Machinery, the staff of which will be reinforced with personnel from other departments and new employees.

The chief of the Directorate General of Food Crops will serve as project leader, the chief of the Institute of Agricultural Machinery as assistant project leader and put the project liaison officers which are the equivalent of managers. This project is proposed as project type technical cooperation, in this case. The Japanese experts are set under the Directorate General of Food Crops Agriculture.

Recommendations and proposals by the National Farm Mechanization Committee for Agricultural Mechanization will be used in the fundamental management of this center. Since manufacturing and product control technologies are in the jurisdiction of the Ministry of Industry, the center will be a national institution specializing in agricultural research, and will involve itself in design developments, improvements, tests and examinations of agricultural machinery. However it will not conduct reseárch regarding the above.

The staff of the center is to be comprised of 64 personnel including the 31 engineers. Of these personnel 33 will be transferred from the Institute of Agricultural Machinery, and the

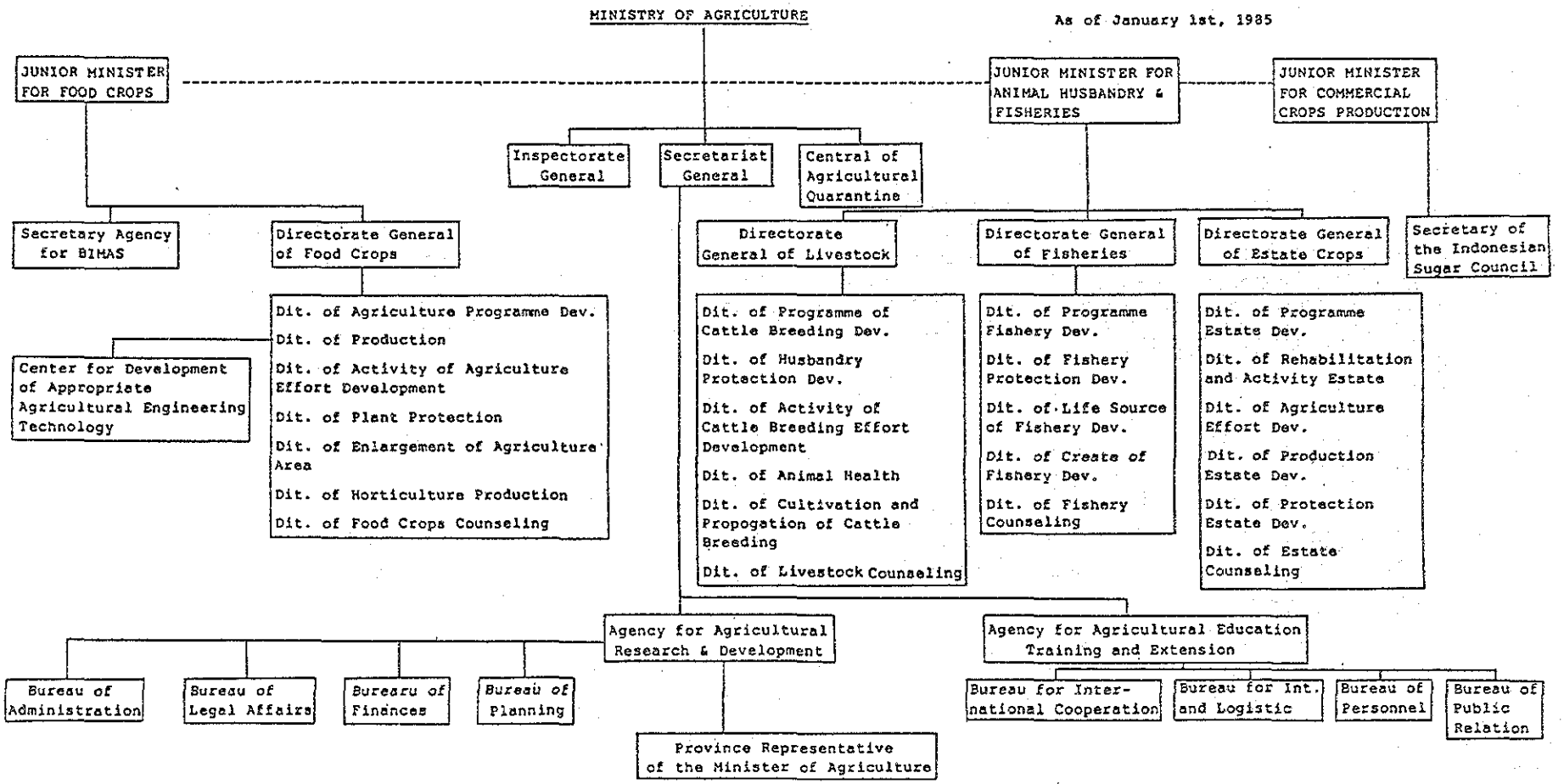
others newly employed.

The following two centers are considered to serve overlap functions and activities:

Agro-Economic Research Center
Food Crop Research Center

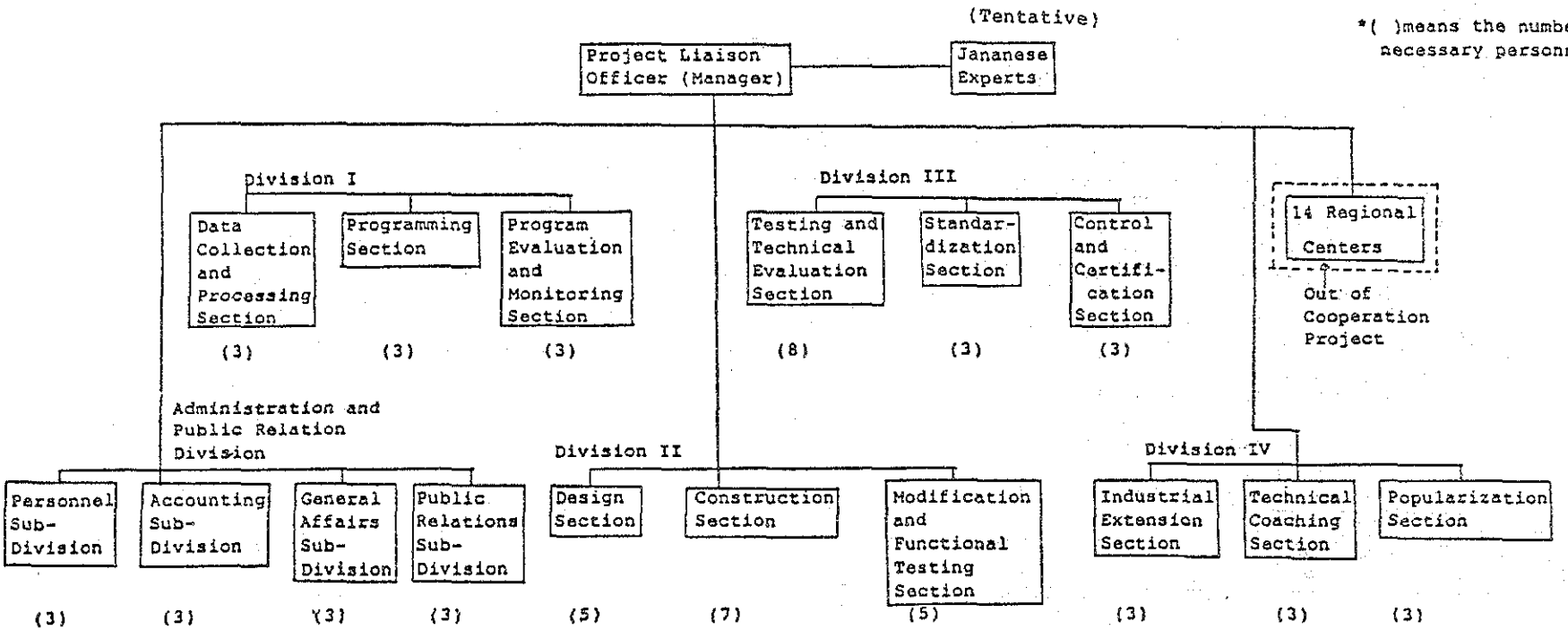
Neither center has an agricultural mechanization department.

Outside of the Ministry of Agriculture, the Department of Industry (Directorate General of Small Scale Industry) has several functions. The manufacturing of agricultural machinery by private manufacturers is in the jurisdiction of the Ministry of Industry. Also, the Center for Development of Appropriate Agricultural Engineering Technology will seek co-operation regarding manufacturing problems, while engaging in technological development.


MINISTRY OF AGRICULTURE
As of January 1st, 1985
JUNIOR MINISTER FOR FOOD CROPS
JUNIOR MINISTER FOR ANIMAL HUSBANDRY & FISHERIES
JUNIOR MINISTER FOR COMMERCIAL CROPS PRODUCTION
Inspectorate General
Secretariat General
Central of Agricultural Quarantine
Secretary Agency for BIMAS
Directorate General of Food Crops
Directorate General of Livestock
Directorate General of Fisheries
Directorate General of Estate Crops
Secretary of the Indonesian Sugar Council
Dit. of Agriculture Programme Dev.
Dit. of Production
Dit. of Activity of Agriculture Effort Development
Dit. of Plant Protection
Dit. of Enlargement of Agriculture Area
Dit. of Horticulture Production
Dit. of Food Crops Counseling
Center for Development of Appropriate Agricultural Engineering Technology
Dit. of Programme of Cattle Breeding Dev.
Dit. of Husbandry Protection Dev.
Dit. of Activity of Cattle Breeding Effort Development
Dit. of Animal Health
Dit. of Cultivation and Propogation of Cattle Breeding
Dit. of Livestock Counseling
Dit. of Programme Fishery Dev.
Dit. of Fishery Protection Dev.
Dit. of Life Source of Fishery Dev.
Dit. of Create of Fishery Dev.
Dit. of Fishery Counseling
Dit. of Programme Estate Dev.
Dit. of Rehabilitation and Activity Estate
Dit. of Agriculture Effort Dev.
Dit. of Production Estate Dev.
Dit. of Protection Estate Dev.
Dit. of Estate Counseling
Agency for Agricultural Research & Development
Agency for Agricultural Education Training and Extension
Bureau of Administration
Bureau of Legal Affairs
Bureau of Finances
Bureau of Planning
Province Representative of the Minister of Agriculture
Bureau for International Cooperation
Bureau for Int. and Logistic
Bureau of Personnel
Bureau of Public Relation

Proposed Organization of the Center for Development of Appropriate Agricultural Engineering Technology

(Not Authorized)



There will also be two car chauffers.

Manpower planning

STAFFING PERSONNEL FOR THE PROJECT

(NCAM/CDAET PROJECT)

DESIGNATION SPECIFICATION	POSITION	EXISTING	REQUIRED	TO BE SUPPLIED
Manager		0	1	1
Senior Agricultural Engineer	Head Division	4	8	4
Junior Agricultural Engineer (UNPAD/IPB/ GAMA)	Control & Actual field	5	10	5
Mechanical engineer (ITE)		0	3	3
Mechnic (Senior Technical School)		4	6	2
Machinist (STS)		2	4	2
Draftman (STS)		1	5	4
Operator (ST)		6	6	0
Skilled labor (SD)		4	4	0
Warehouse master		0	2	2
Typist (ASMI)		0	2	2
Driver		4	4	0
Laboratory instrument handler (STM)		0	4	4
Agronomist (IPE)		1	2	1
Translator (IKIP/ABA)		0	2	2
Librarian (IKIP)		0	1	1
	Total	31	64	33

4-3 Project Description

1) Executing Agency, Implementation Organization

Excecuting Agency for this center is Directorate of Production, Directorate General of Food Crops Agriculture.

2) Activity of the Center

This center will be organized by one Director General of the center, administration and Public Relations Section, and the No.1 through No.4 Section. Also, there will be Japanese national experts.

The purpose in promoting agricultural mechanization is to ;

(1)- emancipate farmers from hard labor,
(2)- lessen harvesting losses, etc.,
(3)- increase both yield and productivity while cutting back on the costs,
(4)- increase the income of farming households.

These promotions enable the realization of the main objective; agricultural productivity improvement.

Therefore, the development and improvement of agricultural machinery should primarily be directed towards adapting the machinery to the conditions of land and cultivation in Indonesia, the machinery also be ; (1) Simple structure-wise, (2) low-priced, (3) highly efficient, and (4) manufacturable locally.

Although the number of agricultural laborers has tended to decrease in recent years, attention must be paid so as not to create unemployment problems among agricultural laborers who comprise half the working population.

The activities this center will engage in concerning the promotion of agricultural mechanization can be classified into the following four categories:

A) Technological analysis of agricultural mechanization
B) Testing and examining agricultural machinery
C) Designing, developing, improving and making prototypes of agricultural machinery
D) Providing education and training for developing and manufacturing agricultural machinery

The following are the details of each activity:

A) Technological analysis of agricultural mechanization

To determine through analysis, the type of agricultural machinery whose mechanization would "appropriate" or have the potential of successfully being carried out, "appropriately".

a. Investigation and analysis for induction of mechanization prior to technical development.

b. Examination for result analysis and improvement points after induction of mechanization.

To gather and classify a substantial amount of technological information to study, contemplate and discuss. These include the type of machinery the center should develop and the functions required, reasonable prices, economical values for imported machinery, and also to conduct analytical researches concerning the actual utilization of agricultural machinery will be done, as well as discussion about making improvements. Guidelines for the center's future activities will be a result of all of this.

B) Testing and examining agricultural machinery

The center will conduct test runs, various other tests and functional examinations, the data of which are to be utilized in the development and improvement of agricultural machinery. Furthermore, if manufacturers decide to develop agricultural machinery improved upon by this center, the functions and operation conditions will be further tested and he necessary improvements and recommendations made. Machinery developed individually by local manufacturers will also be tested at this center, and the reports on these tests will be handed to the local manufacturers. Furthermore, foreign machinery will be tested so as to determine whether it should be imported.

Testing and inspection items are as follows;

a. Load measurement and axial load testing for agricultural machinery.

b. Structural examination and others for agricultural machinery.

c. Power testing and others for agricultural machinery.

d. Operational efficiency testing and others for agricultural machinery.

C) Design, development, improvement and making of prototypes of agricultural machinery

Considerations such as appropriate prices and labor-saving techniques will be determined by repeating tests on agricultural machinery designed to match the manufacturing standards of the Indonesian industry and making them fit for practical use. The machinery must be designed to conform to an appropriate price while retaining the require functions. This will be done by contemplating the accessible materials and parts.

The types of machinery requiring design development and improvement as of now are as follows:

1) Tillers (development of small lightweight types and attachment for multi-purpose usage)
2) Soy bean threshers (conversion of rice threshers)
3) Corn shellers (power-driven: 1 ton per hour)
4) Undergroung fertilizer (for a more effective use of fertilizers. For use in both paddy fields and dry fields)
5) Power-driven weeding machines (For paddy fields)
6) Cassava slicers (Power-driven and manual types. These slicers also have a cleaning function)
7) Peanut shellers (Power-driven: 500kg per hour)
8) Drying machines (Mainly as a counter measure against the rainy season)
9) Improvement of the rice hullers for rice pearling machines
10) Improvement of minitractors to make them more adaptable to land conditions
11) Improvement of increasing the adaptability of mini-tractor.

D) Providing education and training for developing and manufacturing agricultural machinery

Those to receive this education and training are manufacturers of agricultural machinery and instructors who are to engage in instructional activities in regional training institutes. The manufacturers will receive training concerning process technologies, design and manufacturing methods, in addition to the manufacturing techniques of agricultural machinery developed and improved upon by the center. The instructors will be instructed in matters such as methods used for evaluation, adaptability testing, and technological analysis methods. The curriculum will center around the above items.

The curriculum will be divided manufacturers course and extension workers course, and extension workers course will be divided technical course and administer course.

Indonesian Center for Development of Appropriate Agricultural Engineering Technology

Project Traning Scheme Chart

	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Reference
1. Manufacturer's Course						⟷ 32per.x2W					⟷ 32per.x2W		Will instruct advanced class persons in technological analysis, industrial profusion, examination, evaluation, repairs, maintenance, utilization design and the making of prototype.
2. Regional Promoter's Course													
Technical Course													
(1) Advanced PPS	⟷ 15per.x2W						⟷ 15per.x2W						These trainees will receive Training concerning, industrial profession (examination evaluation) repairs, maintenance, utilization, design, and the making of prototypes. Only the advanced class will be instructed in Technological Analysis.
(2) Middle Class PPM		⟷ 5per.x2W						⟷ 5per.x2W					
(3) Primary PPL			⟷ 30per.x2W						⟷ 30per.x2W				
Administrator's Course													
(4) Personnel of Regional Offices				⟷ 10per.x2W						⟷ 10per.x2W			To instruct the employees of regional offices in the adaptability test methods of machinery developed by the center.
Number of Trainees	15	5	30	10		32	15	5	30	10	32		Annual Total 184per. 64/120
Number of Instructors	3	1	5	1		5	3	1	5	1	5		Annual Total 30per.

* The number, the training period and frequency of trainees was taken from the reports of long-term survey team staff.
However the number of instructors was estimated from the foresaid report.

3) Necesarry Facilities and Equipments

The facilities and equipments necessary to obtain the objectives are as follows:

1. Rooms and facilities needed for the management and operation of the center will include;

   office space for the staff in charge (management, public relations), a computer room, the manager's office, offices for the senior chiefs of each section, a seminar room (a meeting room for the staff), a reception room and various facilities such as storage rooms, kettle rooms and toilets.

2. Rooms and facilities for conducting educational and training activities

   . Training center (Desk work)

   . Laboratory and testing building
   (actual practice)

   The necessary rooms include;

   a lecture hall (also serving as a screening room), a drafting room, a library, a filing room, office space for the staff in charge and an exhibition hall.

3. Rooms and facilities for executing tests and examinations

   The necessary rooms are:

   laboratory and testing building, office space for the staff in charge (section 1 and 3), a dark room, a measuring room, lavatories, changing rooms, kettle rooms, storage rooms and etc.

4. Rooms and facilities for executing development and improvement

   . Facilities centering around the workshop

   The necessary rooms contain;

   a space for assembling, bending, casting, forking welding and shearing work, a painting shop, storage rooms, office space for the staff in charge (2 sections), a designing room, toilets, changing rooms, kettle rooms and etc.

5. Rooms and facilities for conducting technological analysis

Technological analysis will be conducted in the facilities and rooms mentioned in the foregoing 1 thorough 5.

6. Various supplyment and disposal facilities required in operation of the center

Canteen for both employees and trainees

Elevated water tank to supply tap water to all the facilities

Receiving substation for the P.L.N.

Fuel station to store and supply fuel such as light oil for the machinery used in the center.

LPG tank to store LPG

Garage to accomodate vehicles

Sewage disposal facilities - Night soil treatment for sanitation purposes

Incinerator - Disposal facility for refuse

Shallow well to supply water to the fields

7. Accommodations for the staff invited from ASEAN countries and regional districts for instruction and Japanese short-term experts.

. Dormitory building, guest house

8. Equipment to achieve the objectives of the center

. Equipment for experiments, tests, educational training, and construction.

4-4 Technical Cooperation

It is desirable that Grant Aid will be proceeded with in connection with the technical cooperation as a project system in order to make the Aid more effective.

The period of the technical cooperation for this center is to be fixed at 5 years. The Japanese experts will be composed of 5 persons as the long-term experts (term of service : 5 years), and 4 persons as the short-term experts (term of service : 3 months/year x 5 years).

The competence and the term of service of the Japanese experts are as follows.

1. Long-term experts (team of 5 persons)

Title	No. of person	Contents of service	Term
a. Team Leader	1	Preparation and arrangement for an extra 1 month for each before and after the project	62 months per person x 1 person
b. Operational Analysis & System Engineer	1	Operational analysis andinstruction for appropriate introduction of agricultural machinery	60 months per person x 1 person
c. Design & Development Engineer	1	(1)Designand development and instruction of appropriate agricultural machinery and equipment. (2)Improvement and instruction concerning existing machinery	30 months per person x 2 person
d. Testing & Evaluation	1	(1) Inspection and instruction at the stage of developing and improving of agulicultural machinery	30 months per person x 2 person

Title	No. of person	Description	Term
		(2) Inspection and instruction of machinery imported and introduced	
e. Liaison Officer	1	Preparation and arrangement for an extra 1 month each before and after the project period	62 months per person x 1 person

2. Short-term experts after the period.

4 persons/3 months eaach/year x 5 years = 20 persons,
60 man-months

will be arranged for short-term experts and their field of specialization will be determined as required.

CHAPTER 5 BASIC DESIGN

Chapter 5 Basic Design

5-1 Design Policy

The following are the considerations concerning the construction and equipment scheme based on the foresaid conditions, field surveys and discussion sessions held with the local residents.

1. That it be a facility well suited to the land and climate of the Republic of Indonesia (Design contemplationsinclude material, construction methods, and shape)

2. The projected facilities will be divided into the following three categories; an office zone consisting of offices, training centers and such, a testing and experimentation zone to make prototypes and to conduct experiments and tests and a residential zone which will include housing for the staff and dormitories where the trainees will stay. Of these three, the Laboratory & testing building where tests and experiments are to be conducted will require special considerations, such as anti-polution, dust-proofing and vibration-proofing. Regarding the others there are many existing examples to be referred to and local building methods to be considered.

3. That the construction costs be lowered as much as possible in order to provide the functions required, and also to lay out the facilities so that a smooth connection between the facilities is possible, while staying within the budget of the gratuitous money fund. Furthermore, that the adoption of construction methods suited to the local conditions and utilization of domestic or locally available materials be used.

4. That it be a facility easy to maintain and that a reduction in running costs be pursued through considering natural conditions such as ventilation and light in addition to architectural and equipment-wise considerations.

5. To select types of testing and experimenting equipment that would be easy to maintain and enable, as possible, a local acquiring of parts.

5-2 Study of the Design Condition

The design considerations of each facility will be examined, based on the design principles. The design considerations based on the reports of field trips and discussions held with the agencies concerned are as follows:

1) Site evaluation

After making field trips and local surveys of the nominated sites, and considering the following points, decision was reached as to the appropriateness of choosing this site as the site for the center.

a. That it satisfies the conditions regarding its location as a test field required in the stage of technological co-operation.

b. That it is relatively easy to secure an access road to the site.

c. That the roads, electricity, water supply services and ground conditions be improved.

d. That there isn't an extreme level difference within the site area.

e. That the ground is solid enough to cause no problems in construction.

f. That the construction of the center will have no bad effect (noise, drainage) on the neighboring area.

g. That there are ponds with a high water level assuring a high and constant water supplying ability in the surrounding area. The scenic view deserves consideration as well.

h. That it is isolated from urban districts (Jakarta city, or the residential areas around Sact such as Pandok and Indah). This should not be much of a problem however.

2) Selection of access roads

Local surveys indicated that there are two ways of access, one from the east side and the other from the south. Decision was reached to utilize the latter owing to the following reasons:

a. The access road from the east passes through dense housing areas, making it difficult to secure the minimum road width of 6m needed to serve as a construction access road.

b. The only pre-requisite regarding the south access road is that it be paved.

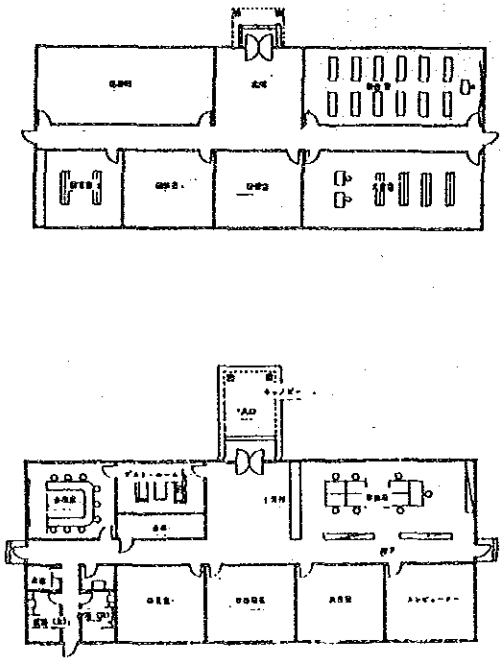
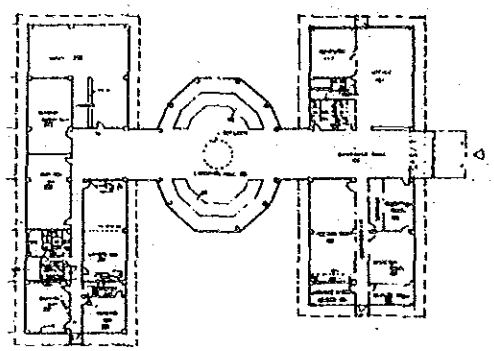
c. There three short concrete bridges along the east

access road which would impede the transit of heavy transportation vehicles during construction.

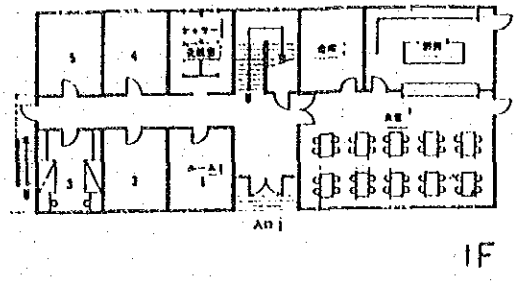
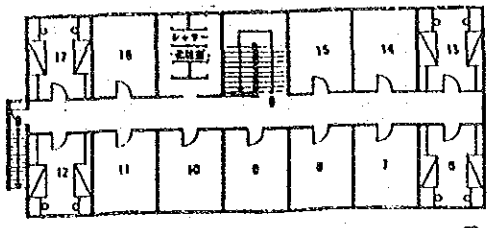
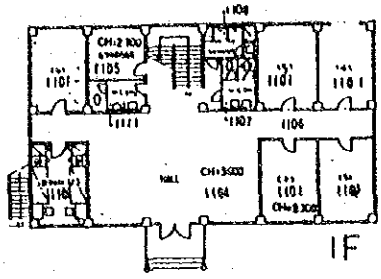
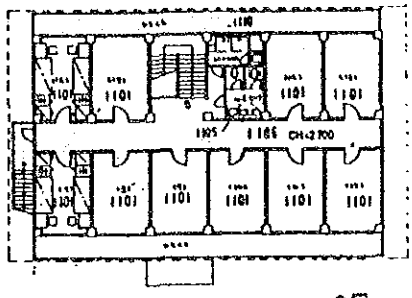
d. The east access road passes along side a pond situated 20m below road level and since the road is unpaved and the shoulders are graduallyeroding away, transit could be dangerous.

5-3 Comparison between Requested Plan & Proposed Plan

Difference between requested plan and proposed plan is as follows.

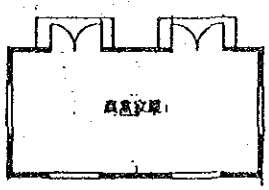
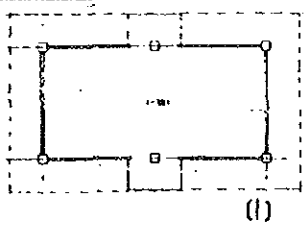
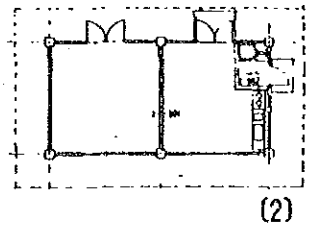
MAIN BUILDING	
Requested Plan	Proposed Plan
	
In proposed plan, Exibition Hall is designed indipendent in consideration of function of this center.	

DORMITORY

Requested Plan	Proposed Plan
 1F  2F	 1F  2F

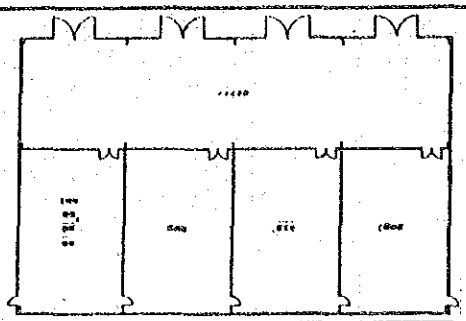
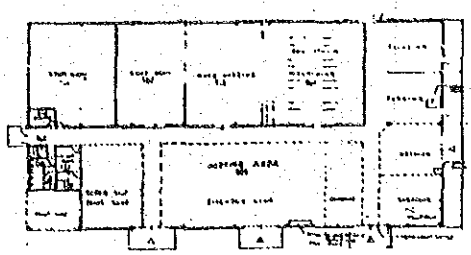
Proposed plan is same as requested plan, but 1 unit less.

FARM HOUSE

Requested Plan	Proposed Plan
	 (1)  (2)

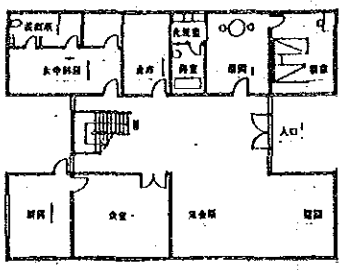
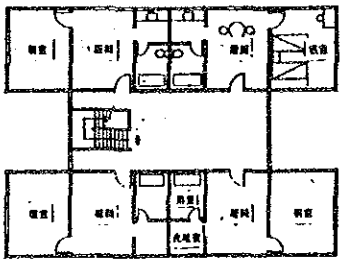
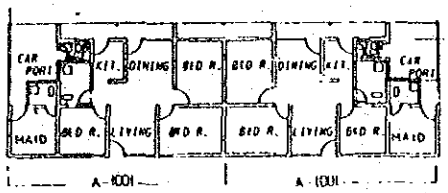
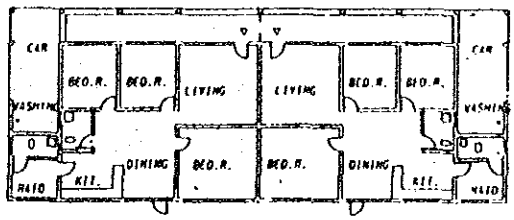
Requested plan shows 3 units, but in proposed plan is designed 1 unit at central zone and 1 unit at near the testing field. Central zone unit has rest function and testing field unit has storage function for agricultural machinery.

WORK SHOP

Requested Plan	Proposed Plan
	

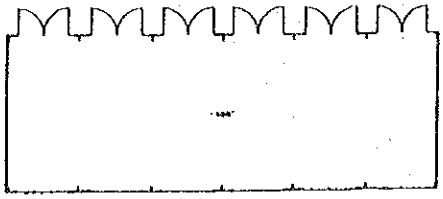
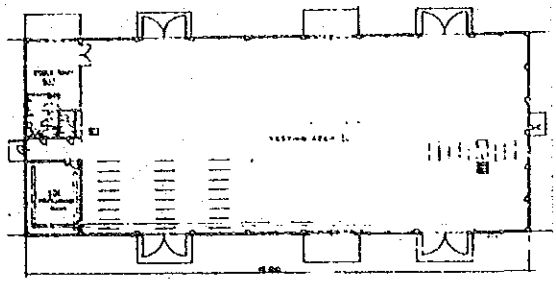
Proposed plan is same as requested plan

GUEST HOUSE

Requested Plan	Proposed Plan
 1F  2F	 A  B

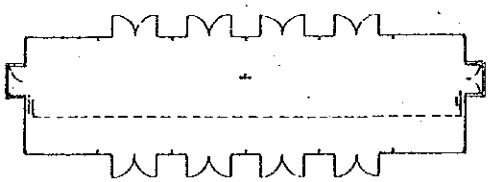
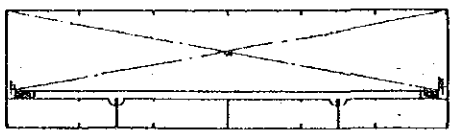
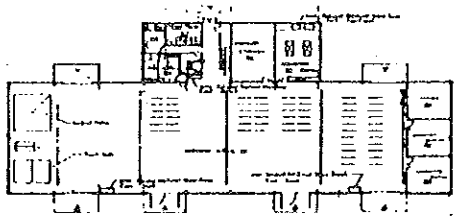
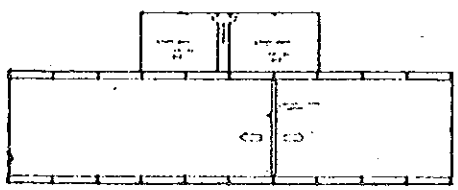
In requested plan, the house is two-story building and 5 units, but proposed plan is one story semidetached type and 10 units.

MACHINERY TESTING FACILITY

Requested Plan	Proposed Plan
	

Almost same as requested plan, but proposed plan has a measurement room.

LABORATORY & TESTING FACILITY

Requested Plan	Proposed Plan
 	 

Almost same as requested plan, but proposed plan is arranged measurement room at first floor and office room at 2nd floor so as to test and experiment.

5-4 Layout Plan

The site can be divided into two sections geologically, with the access road as the border, the east side being level and the west side a plateau 4-5m in height and sloping to the north.

High voltage wires run along the northwest-southeast axis of the site.

It was decided, after conducting local surveys, that the main access be from the south side, and the sub-access be from the east side. The access road will be 5.5m wide, and roads in the residential are will be 4m wide.

Two roads that the neighboring residents use runs through the site presently, and since this can not be removed, a bypass route for the use of these residents will be constructed along the western and eastern border of the site.

The layout plan can be divided into three zones which including the experimentation field zone, the main facilities zone, and the residential zone.

Since the site area is large, a compact layout will be planned so as to secure enough space for future expansion and to enable effective utilization of the facilities.

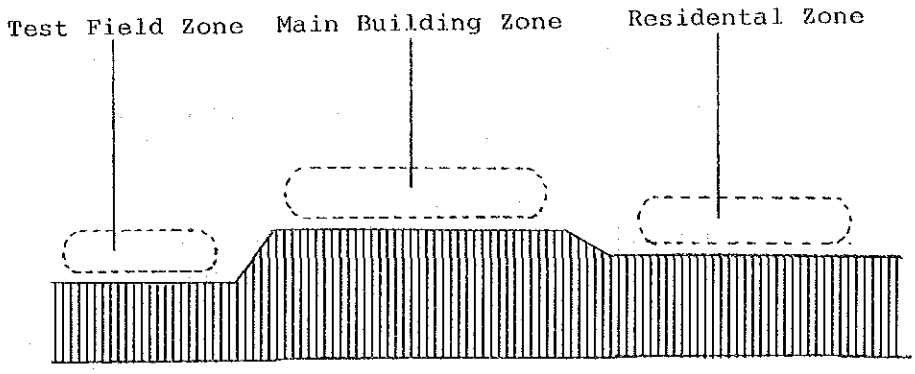
The test field will be located in the area west of the main access road, which is mostly level and convenient in terms of water supply and drainage. The test road will be located there as well.

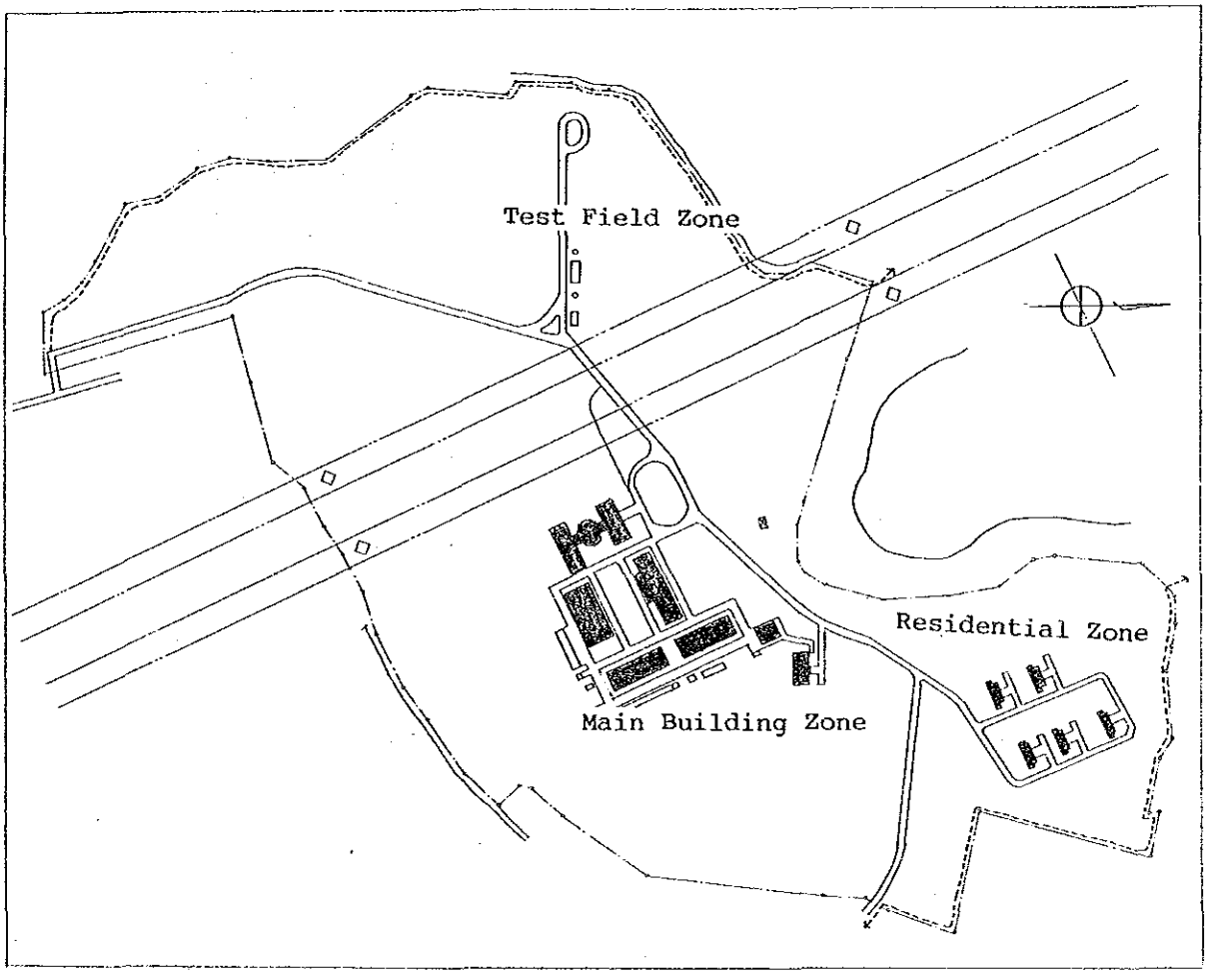
The main facilities such as the office building and test lab compose the nucleus of the center, and therefore these will be laid out on the plateau located approximately in the center of the site, an adequate location in terms of both fire prevention and scenic views.

Of the main facilities, those connected with the main building such as the offices, training center and the exhibition hall need to be clearly separated from the operation facilities such as the workshop and test lab. This is for consideration of noise and ease of service. They will be inter-connected by roads.

The canteen will be laid out to be used effectively from central facility zone and residential zone since the canteen is designed onoy one in the site.

The direction of the facilities will be decided upon after consideration of natural light and draft conditions in order to cut back on running costs.


Test Field Zone
Main Building Zone
Residental Zone


Test Field Zone
Residential Zone
Main Building Zone

5-5 Floor Plan

This center is composed of the following facilities and accessory facilities.

A. Facilities

Facility Name	Floor Area (m2)
Main buildings	
Office	532.0
Training center	588.0
Exhibition hall	381.0
Laboratory & testing building	1,289.4
Machinery testing facility	810.0
Machinery training facility	810.0
Workshop	1,152.0
Dormitory	504.0
Guest house A	656.0
B	252.0
Canteen	256.0
Farm house (1) & (2)	100.0
Transformer Station	154.0
Garage	240.0
Pump room	18.0

B. Accessory facilities

Facility Name
Test road
Shallow well & reservoir
Soil bin
Gasoline station
Septic tank
Incinerator
Deep well, electrical water tank
Drain ditch

(1) Planning of the buildings

1) Main building

The main building which constitutes the central facility of the center has the function to act as the administration division, technical and analysis division as well as the study and training division. The administration division is represented by the office building, consisting of the office of Director General, office of assistant Director General, office of Japanese national experts, general affairs and public relations section, conference rooms and a computer room.

The office of Japanese national experts will be located near the offices of Director General and of assistant Directrate General, while the general affairs and public relations section will be placed near the entrance. The computer room will process the information of the center as a whole. The test data of the center will be all inputted, and need to be taken good care of so will be positioned close to the general affairs and public relations section. Conference rooms being conceivably used not only for the purpose of consulation of various kinds by the personnel of the center and of liaison with sections, but further for the purpose of providing visitors to the center with orientation will be arranged in proximity to the entrance hall.

Offices including those of Director General and of assistant Director General will be planned with a 6 m x 7 m unit, by taking into consideration the building standards of the Japanese Government buildings.

The technical and analysis division as well as the study and training division will be located in the training center and in the display hall. The No.4 Section concerns the industrial extension and technical coaching sections. The office of Japanese national experts having long-term and short-term arrangements, as well as the training rooms where lectures will be held and the drafting room will connect to one another through the medium of the hall.

The library, and the archives and document room will have the function of housing the test data prepared by the center and of storing drawings. The No.4 Section and the office of Japanese national experts to have an easy access to it and the trainees at large will find it convenient.

The exhibition hall which will constitute a separate room in form, but will not be partitioned off to permit a free visit, will be arranged between the office building and the training builiding. There, machines either developed or improved by the center will be preferably shown. For a while, however, panels devoted to the promotion of mechanization of agriculture and models of agricultural machines whose introduction is desired to mechanize the local agriculture will be displayed for.

The display hall will be 12 sided and will be arranged in such a way that permits easy viewing. In arranging the hall lighting (south and ground) and ventilation (south-southeast direction) will be taken into account.

2) Lavoratory and Testing Building

This is the facility in which to take various kinds of measurements, records and experiments for the purpose of upgrading agricultural machines. Space is provided for determining and measuring the basic parts of agricultural machinery, overshauls, and if, measufing the weight of each part of the machinery. There is also space for accommodations measuring instruments and for No.1 and no.3 Sections.

The width and length of the facility will be determined, from the type of experimints and tests expected to be performed. Inside the facility, inspection rooms adjacent to each of the above mentioned floor spaces, will be arranged.

No.1 and No.3 Sections will be positioned on the 2nd floor in order to make it easy to control the experiment below. Disassembly of agricultural machines and experiments, if they are to be made easy to do, require the installation of fixtures onto the floor. For this purpose inlaid fixing rails will be installed. This will be done in the experiment and measurement rooms. Also hoist cranes will be set to make movement of the agricultural machines easier to do.

3) Mechanical training building

This is whose tests on agricultural machinery and technical study will be accomplished. The facility can be broadly separated into the office area and the test area. The former is located in the floor space secured for the No.3 Section for the experts with short-term arrangements to work in. Included there is a room

where practical agricultural techniques are instrucuted, a research and study room and a measurement room.

The test area is divided into a study and training area and a test zone dedicated to the testing of machines offered by manufacturers, the measurement room will be located near to the test zone.

4) Machine testing building

This is the space where fixed dynamometers for conducting various kinds of tests and inspections by moving the power drive of the agricultural machinery are to be done. This area will be designed to take into account dust from dry soil.

Width of this particular area is as shown in the following drawing with the fixed dynamometer and delivery space taken into account.

5) Workshop

The workshop in an area where agricultural machines to be submitted for the experiments, and determination in the test and experiment building.

The mechanical training and machine testing buildings will be prepared. The No.2 Section personnel room is dedicated to the development and improvement efforts. There is also a room for personnel.

The scale of the workshop will be set by taking into consideration the floor space occupied by the manufacturing machines and the flow of work.

6) Guest house

This is a lodging facility for instructors from ASEAN countries and other parts of the country and for Japanese short-term experts. They will stay here for a period of two weeks at the most.

The number of those accommodated will be a maximum of thirty instructors per year as stated in the projected training program plus short-term experts.

7) Dormitory

The dormitory is one of the facilities to support the training and study function of the center. It is a facility needed for the smooth operation of the training program. One room will be designed to

accommodate two people, and 16 rooms for a total of 32 people will be prepared in accordance with the training program. Of the 16 rooms, two are for the exclusive use of women.

The guest house as well as the dormitory will be designed with special attention to ventilation and will be positioned 15 degrees from the north-south axis.

(2) Various supply and disposal facilities

1) Canteen

The center has a total of 120 people working, including staff personnel, trainees, Japanese national experts, instructors and part-time workers. The canteen has a facility to provide them with breakfast, lunch, and dinner time services.

The canteen will be given a floor space for 60 people, the floor space allowing two turns. The canteen will not walled. A waist-high wall will be used to allow good ventilation and sufficient lighting.

2) Farmhouse

The rooms in the farmhouse to function as a 9 rest area for those staffs who work in each section, being provided at two places inside the center. One will be placed near the experiment farm, provided with a toilet, a water heater and designed to store agricultural machines. The other is located at the southern tip of the central facility with waist-high walls on all sides with a roof above them, and designed to be breezy. This building also has a gasoline stand, a parking lot.

3) Other supply and disposal facilities

Facilities like transformer station, elevated water tanks, garbage incinerators, pump houses and sewage disposal facilities will be provided.

5-6 Sectional Design

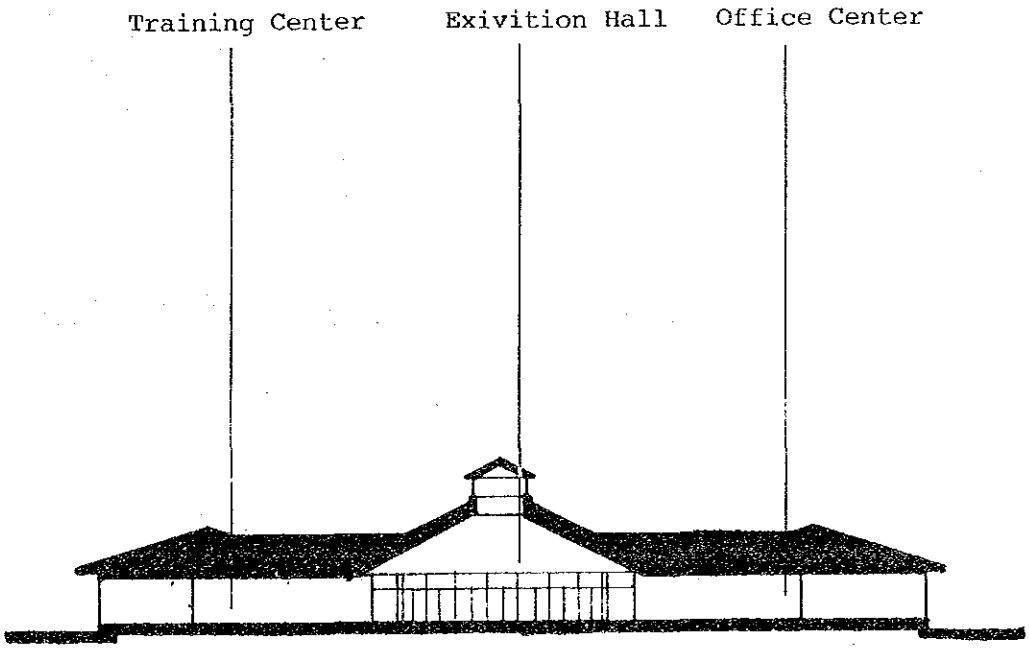
1) Main building

a) All rooms will have a ceiling height of more than 3m so as to assure satisfactory working conditions even without air-conditioning.

b) In order to avoid the strong sunlight, the eaves will protrude 1.5m and louvers will be installed where necessary.

c) The frame construction of the roof will be contemplated to achieve sufficient ventilation, especially in the exhibition hall which will have a monitor roof in the center.

d) Considering the local architectural styles, the columun and beams will be of reinforced concrete, the walls of brick, the roof truss of steel (in the exhibition hall where the span is wide). Or wood will be used in the office building and the training center.



2) The operations building

Regarding the workshop and the test lab

a) The work spaces will not have double ceilings, and the roof trusses will be exposed.

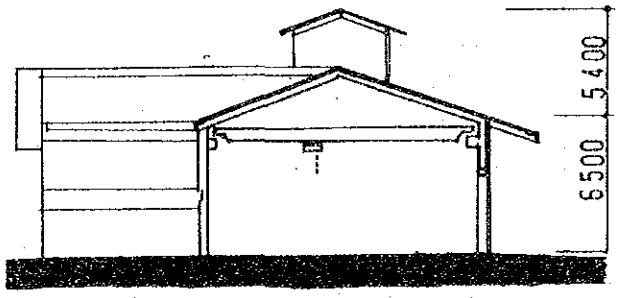
b) Separate rooms in the operations building, such as the measurement rooms, will have double ceilings, and the height will be 3m.

c) The outdoor exits of the work space will receive consideration for ventilation and the doors will be 4m high so that trucks loaded with equipment can transit.

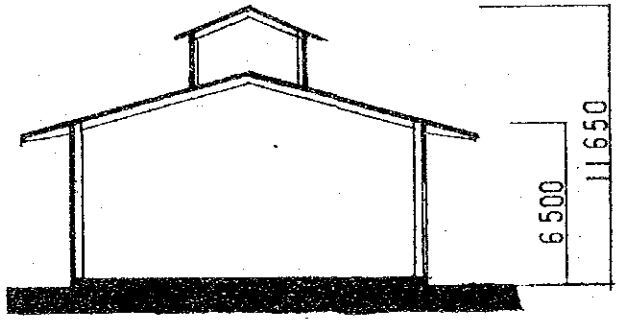
d) Since an electric hoist crane as well as a manual one will be installed in the work space, the height of the hall needs to be at least 5.5m from the bottom of the crane.

e) The work space will have a central monitor roof, which will provide both ventilation and natural light. This is known as top side lighting.

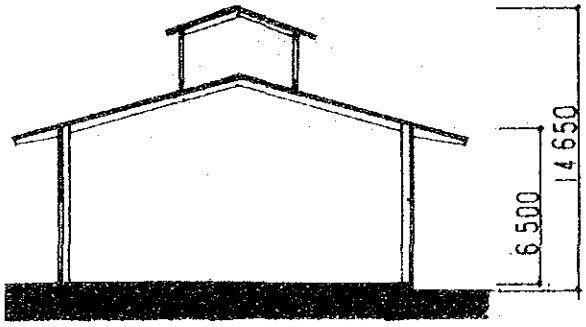
f) Metal sheets will be used in roofing.



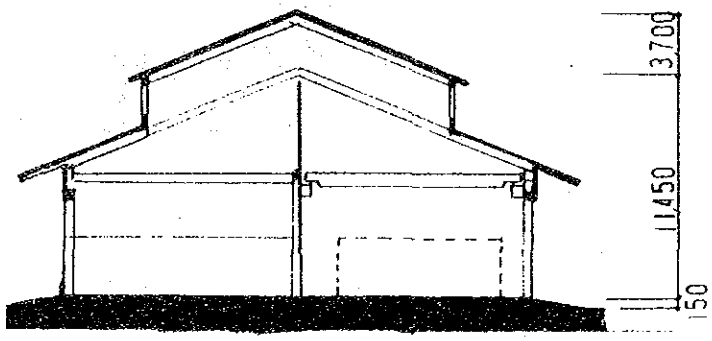
Laboratory Testing Building



Machinery Testing Facility



Machinery Training Facility



Work Shop

3) Housing

Dormitory and the guest house

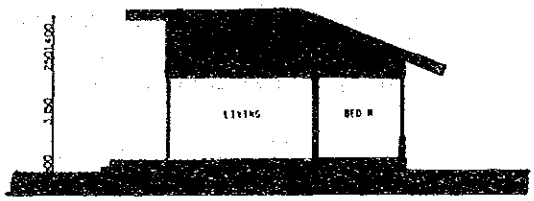
a) Wooden roof trusses will be placeda top a reinforced concrete frame structure. The double ceilings will be 2.7m-3m high.

b) To provide cover from the strong sunrays, 1.5m eaves will be installed. The best local residential lay out methods, in terms of draft flow will be used.

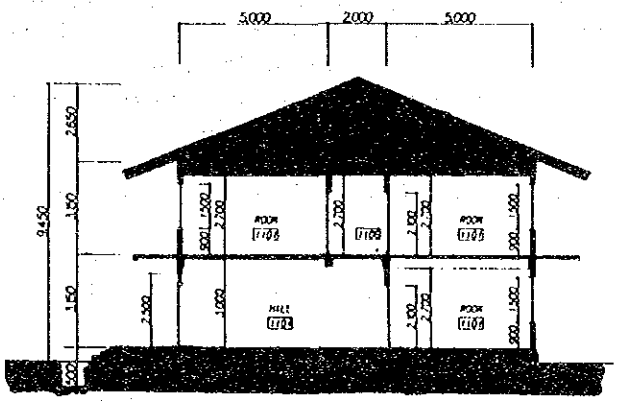
c) Guest house will be of masonry construction with reinforced concrete beams. The dormitory being two stories high, will be of reinforced concrete frame construction.

4) Other facilities

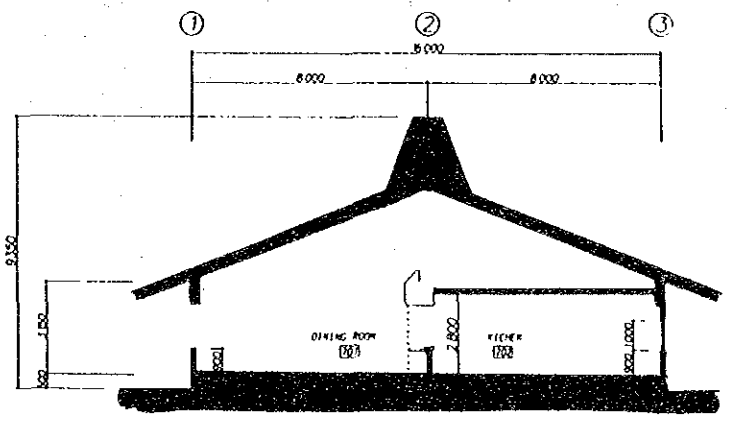
Giving consideration to ventilation, the dining area of the canteen will only be surrounded by low walls although the kitchen will be walled in. The eaves, extruding 1.5m, will shut out direct sunlight.



Guest House



Dormitory



Canteen

5-7. Exterior Plan

The costs of roads within the premises and test roads represent the largest portion of the total business of construction for exterior planning. The followings are other major works of exterior construction: open drainage ditch, berm, water proof testing tank, small reservoir for irrigation, soil bin, septic tank.

(1) Roads within Premises, Test Roads

Trunk roads and the roads connected with the central facilities shall have a 5.5 m width to assure two-way traffic, while roads in the residential zone shall have 2.54 km total length and 4.0 m width, which is the minimum width for one-way traffic. Asphalt pavement is specified.

Test roads are the roads where performance tests on tractors and other farm machines are conducted. The width will be 6 m and straight line distance 200 m. Concrete pavement will be stand up to heavy-car traffic.

(2) Open Drainage Ditch, Berm

Both are the outdoor drainage facilities. Rainwater gathered from roofs and peripheries of the building are drained or permeated through the berms. Open ditch drainage releases non-permeable surface water into the pond. Its width is 500 m and depth is 400 mm.

(3) Water Proof Testing Tank, Small Reservoir for Irrigation, Soil Bin, etc.

All of these facilities are subsidiary ones for experiments and tests.

(4) Septic Tank

Waste water should not be released into the nearby ponds. In the light of water usage and drainage pipe slope, 2 tanks will be installed. There will be 55 tanks in the residential zone, and 72 tanks in the central facilities. The water is to be pumped up and released into the river.

5-8 Material Plan

The selection of construction materials and methods will consider those used locally, nonetheless, a decision must be made from all points of view, considering supply stability, quality and price.

Construction	Material	Suplyment Conditions		Supply Source			Anticipated Quality		Remarks
		good	bad	Indonesia	Japan	Others	Evaluation	Comment	
Reinforced concrete	Cement	99		o			95	Quality uneven Standards of Japanese level	Has been produced in Indonesia since 1974.
	Reinforcing bars	100							Steel bars are government standard.
Foundation work	Gravel	100		o			80	Quality uneven Retains much mud	Washed gravel and shifted gravel are hard to obtain
Formwork	Formwork	100		o			75	Average freque-cy of diversion	For formwork, structural use, finishing carpentry and furniture.
Concrete blocks	Bricks	100		o			50-90	Quality and standards are uneven	Shoud be cheked after being obtained.
Waterproofing	Asphalt Water proofing		10		o	o	100	Imported (Super-visors necessary during installa-tion	Numerous importing dealers
Stone paneling	Marble		50				90	The local mate-rial is relati-vely soft	Imported materials are expensive
	Terrazo block	100					90		Common as flooring material in Indonesia.
Tile work	Glazed tiles	100		o			95	Can be divided into first class material and other classes. There are impor-ted ones as well	Inspection necessary when using large amounts.
	Vinyl chloride tiles		30		o	o	100		
Joinery	Ply wood	100		o	o	o	95	Peeling occurs occasionally due to the bad quality of the adhesives	
Steel frame	Wide flange bars		50	o	o	o	100		Insufficient market stock Should be acquired in advance.
	High tension bolts		15	o					

Construction	Material	Suplyment Conditions		Supply Source			Anticipated Quality		Remarks
		good	bad	Indonesia	Japan	Others	Evaluation	Comment	
Metal work	Backing for lightweight steel		None		o	o			Can be imported.
Hardware	Stainless steel hardware		None						
	Steel hardware		20	o				Hard to bend. Possibly for use in angle doors.	Flush doors can also be used but the quality is unsatisfactory.
	Aluminium hardware	75					90	Pofile limited. Hard to process and to install	Manufactured by a small firm. Instruction and supervision necessary from design to installation.
	Wooden hardware	100		o		o	98	The same as Japan	
	Metal fitting	100							Limited stock. Survey is necessary beforehand.
	Shutters	80		o		o			Wide spanning ones will be imported. Survey necessary beforehand.
Plastering	Mortar finish	99		o					
Glass Installation	Normal Glass	100		o	o	o	98		
	Figured Glass	60		o	o	o	90		
	Wired Sheet Glass		20				80		
Paint work	Rust-proofing	100		o			95	Mostly foreign capital firms	The specifications vary, according to each firm. Attention must be paid regarding construction supervision.
Interior work	Plaster		20		o	o	100	Improted	Used as fire proof in high-rises.
	Rock wood sound absorbing boards		50		o	o	100	Imported	
	Asbestos cement boards	90		o			95		
	Vinyl Cloth	90			o	o	100	Imported	Survey necessary beforehand
	Plastic tiles	60			o	o	90	Vinyl laminated tiles	Survey necessary beforehand
Micelaneous construction	Heat insulation materials		20		o	o	95	Imported	
	Sealants		50		o	o	90	Silicon,urethane and buthyl are imported	
	Furniture	100		o	o	o	98	To be made of domestic materials	There are imported ones as well, but are expensive
	Sink	80		o	o	o	80	Mostly of stainless steel or terrazo	
	Bath tubs	100		o	o	o	98		
	Blinds	60			o	o	98	Imported	Stock surveys necessary
Exterior construction	Asphalt	100		o		o	90	Has been produced domestically since 1984	For roads
	Fencing		50	o			90	wire nets will be zinc plated	To be manufactured for each project.
	U-shaped and L-shaped gutters		20	o			75	Has been in circulation recently. Lacks variation of standards	

5-9 Structural Design

1) Structural design standards

The structural design of the building will be executed according to the Indonesian National Building codes and the Indonesian Structural Calculation Standards.

The live load of each room will be calculated from the standards also. The equipment and machinery to be installed will be given consideration to suit the actual situation.

The earthquake load and the wind pressure load will be calculated according to the Building Standards and no special considerations given.

The selection of the foundation construction method will be conducted through analysis of the results of the ground survey of the construction site. However the allowable soil pressure will conform to the standards.

The allowable stress loads of the materials and the analysis and design methods of structure will follow the standards. The building standards of Japan and the structural design standards of the Architectural Institute of Japan will be referred to.

2) Foundation Structure

According to the data acquired, the ground site consists of a favorable soil similar to Loam to G.L. -5m. Therefore, considering the scale of the projected buildings, no pile foundations are possible.

Single story buildings will have continuous footing or independent foundations, and two story reinforced concrete buildings with mat foundations. These foundations will be deeper than G.L.-1.0m.

5-10 Building Facility Plan

(1) Electrical Installation

The Indonesian Government will be responsible for providing high-voltage electricity which is to be serviced in the designated location within the site. It will also supply low-voltage, using a substation to the various facilities.

1) Power Driven Equipment

Power lines will be run to the equipment of each facility and outlets for testing installed at necessary locations. The extent of the construction will be up to the point of installing shut off switches and connections in the switch board.

2) Lighting and Receptacle Facilities

Single-phase electricity will be used for lighting equipment and receptacles.

3) Lighting Equipment

The local illumination standards are 50% lower compared to those of Japan. However, considering working hours and management fees, in areas of dangerous or scrutinous work, Japanese standards will be used. Other areas, will be illuminated 40% lower than required by Japanese standards will be used.

4) Automatic Fire Alarm System

Minimum requirement systems will be installed for the safety and maintenance of the facilities.

5) Lightning Rods

Since lightning frequents the area, lightning rods will be installed to assure safety and good maintenance.

6) Interphone Equipment

The facilities are scattered around the site and the telephone facilities are insufficient. Therefore, interphones must be utilized for communication between facilities.

7) Telephone Equipment

Wiring and equipment within the site will be provided by the Indonesian Government.

8) T.V. Reception Equipment

T.V. antennas will be installed and signal wires minimally serviced to required locations.

9) P.A. Equipment

P.A. equipment and servicing for all buildings will be done. The main amplifier will be in the office. (a channel will be provided for outdoor use. It will be for calling chauffers etc.)

10) Emergency Electricity Supply Facilities

Since black-outs occur often in the area, a backup battery for computers and generators to supply electricity to the safety equipment are needed.

(2) Air Cooling and Ventilation Installation

1) Small sized coolers and packaged coolers which can be maintained locally will be used. The rooms to be cooled will be selected considering the nature of the work and employees health.

Main office building design

-drafting room, instructor's room, Japanese experts room and section 4

Training center

-chiefs office, senior section managers office, reception room, computer room

Test lab

-laboratory, section 1, section 4

Machinery testing office

-laboratory

Workshop

-laboratory

2) Ventilation

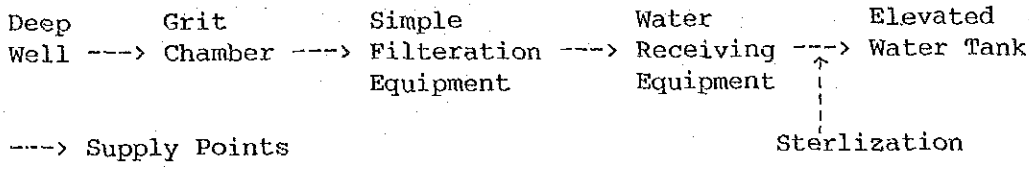
This will rely basically on natural ventilation, but mechanical ventilation will also be considered in areas where working conditions or structural conditions would require it, especially in the operation room.

(3) Plumbing Installation

1) Water supply systems

The water source will be from a deep well. However the water source for the fields will be from shallow wells.

Water supply flow chart



2) Water supply design

The water supply will consist of two systems, one for the facilities and one for the test field.

a. For the facilities, Water for drinking, washing, and testing.
A deep well will be dug within the site as the water source.

b. Calculation of the required water supply:

Daytime inhabitants

Employees of the Indonesian side	64 (Pers.)
Experts disptched by the Japanese Government	9
Part-time instructors	10 - 5
Trainees	32
Part-time employees, etc.	10
Families residing with the staff member	50
Short term visitors	39

Calculation of the required amount of water

supply:

64	(Pers.)	x	100	l/D.Pers.	= 6,400 l/D
9	"	x	100	"	= 900
10	"	x	100	"	= 1,000
32	"	x	100	"	= 3,200
40	"	x	100	"	= 4,000

Total 16,500 l/D

l/D.Pers = Liter per day per person

Testing Water 5,000 l/D

Total 21,500 l/D ≒ 22 M3/D

Reservoir -------- a day's amount of average water supply

Grit Chamber : 1 hour supply ≒ 3 M3

Primary Reservoir : 1 hour supply ≒ 3 M3

Secondary Reservoir: The remaining amount 19 M3

Elevated Water Tank ---- an hour's amount of the average water supply

22,000 l/D x 1/10 l = 2,200 l ≒ 3 M3

Water Hauling Pump --- Presuming it will fill the elevated Water Tank in 15 minutes

3,000 l ÷ 15 l = 200 l/M

Deep Well Pump --- Will pump a day's amount in three hours

22,000 l/D x 1/3 ≒ 73.0 l/M ≒ 100 l/M

Presuming the pump is installed at G.L. -100m

100 l/M x 120 M x 2.2 KW - 415 V

Filteration System -- Will filter an average day's amount of water supply in 7 hours.

Sand filtering, automatic reverse wash, pack adding device, hypochloride and control board

22,000 l/D x 1/7 ≒ 55.7 l/M

3) Drainage System

a. Sewage and general drainage

Will be collected from each facility through pipes and discharged into the pond after passing through the septic tank.

b. Rain Water

The rain falling on the facilities will be penetrated into the ground through the drainage trench, etc. Insite rain water will be carried to the pond through 3 open ditch (50cm wide, 40cm deep). These will travel underground where they cross with roads.

c. Sewage Disposal Planning

Number of persons to be considered (JIS A 3302)

. Guest House (residence)

(A) under 100 m2 --- 8 houses x 5 pers/house=40
(B) under 139 m2 --- 2 houses x 5 pers/house=12

. Dormitory

Capacity : 32 pers
Service Staff : 3 pers

. Center (Lab) (63 + 9 + 5 + 34 + 10) x 1/3
= 39.7 pers

Total : 126.7 pers ≒130 people

Sewage Outflow

6 pers x 200 L/D.pers = 1,200 L/D

40 pers x 200 L/D.pers = 8,000 L/D

12 pers x 200 L/D.pers = 2,400 L/D

32 pers x 200 L/D.pers = 6,400 L/D

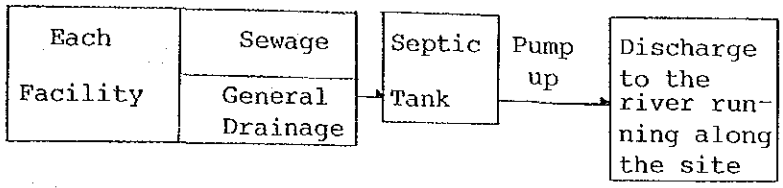
3 pers x 100 L/D.pers = 300 L/D

39.7 x (40+30) L/D.pers = 2,779 L/D

Total : 19,879 L/D ≒20 M3/D

Sewage Disposal Method

Contact Aeration Method BOD = 60 PPM



Septic Tanks will be installed at two location, giving consideration to the inclination pitch of drainage pipes.

Staff House + Guest House = 11.0 M3/D
(55 pers. tank)

Every other facility = 10.0 M3/D
(72 pers. tank)

3) Hot Water Supply Systems

These will basically be local systems using small boilers, but facilities which will use large amounts of hot water will have boilers.

4) LPG Facilities

Each building will have its own LPG tank and gas will be supplied to the necessary locations within the building.

a. Dormitory

LPG consumption

Water boiler	0.64 kg/H - 1H/D
Gas table	0.42 kg/H - 2H/D
	1.48 kg/D x 2 sets

Presuming that a two week supply will be installed:

1.48 kg/D x 6 D x 2 = 17.8 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

b. Main Building

LPG Consumption

Water boiler	0.64 kg/H - 1H/D
Gas table	0.42 kg/H - 2H/D

1.48 kg/D x 2 sets
= 2.96 kg/D

Presuming a two week supply is installed:

2.96 kg/D x 6 D x 2 = 35.52 kg

therefore 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

c. Laboratory and Testing

LPG Consumption

Water boiler	0.64 kg/H - 1H/D
Gas table	0.42 kg/H - 2H/D

1.48 kg/D

Presuming a two week supply is installed

1.48 kg/D x 6 D x 2 = 17.8 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

d. Machinery Testing Facility

LPG Consumption

Gas table 0.42 kg/H - 2H/D

1.48 kg/D

Presuming a two week supply is installed

1.48 kg/D x 6 D x 2 = 17.8 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

e. Farm House

LPG Consumption

Water boiler 0.64 kg/H - 1H/D

Gas table 0.42 kg/H - 2H/D

1.48 kg/D

Presuming a two week supply is installed

1.48 kg/D x 6 D x 2 = 17.8 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

f. Work Shop

LPG Consumption

Water boiler 0.64 kg/H - 1H/D

Gas table 0.42 kg/H - 2H/D

1.48 kg/D

Presuming a two week supply is installed

1.48 kg/D x 6 D x 2 = 17.8 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

g. Canteen

LPG Consumption

Water boiler	2.0	kg/H - 2H/D
Gas range	4.33	kg/H - 1H/D
Gas fryer	1.6	kg/H - 1H/D
Gas fly top table	0.84	kg/H - 1H/D
Gas low range	3.21	kg/H - 1H/D
Gas booster	1.14	kg/H - 1H/D
Gas booster	2.09	kg/H - 1H/D
Water boiler	3.76	kg/H - 1H/D

24.73 kg/D x 0.8
= 19.8 kg/D

Presuming a two week supply is installed

19.8 kg/D x 6 D x 2 = 237.6 kg

hence 50 kg LPG TANK x 5 ---> 5 + 5
(with automatic switching device)

h) Guest House

LPG Consumption

Water boiler	2.15	kg/H - 1H/D
Water boiler	0.64	kg/H - 1H/D
Gas Table	0.54	kg/H - 2H/D
	3.87	kg/D

Presuming a two week supply is installed

3.87 kg/D x 7 D x 2 = 54.18 kg

hence 50 kg LPG TANK x 1 ---> 1 + 1
(with automatic switching device)

5) Test Field Facilities

Paddy Fields	0.2 ha x 7 sections
Dry Fields	0.3 ha x 7 sections

Dry Fields 0.3 ha x 7 sections

a. Paddy field water supply

a-1 Water supply for : Wp = 150 mm/day
(only 1 day)

Since the water supply in the dry season will be limited to the shallow well in this project and water procurement limited accordingly the filling period will be considered as 3 days.

Presuming paddy field area is 0.2 ha and the irrigation effectivity 80 %:

$$q1 = \frac{150 \times 0.2 \times 10{,}000 \times 1{,}000}{1{,}000 \times 86{,}400 \times 0.8} = 4.34 \text{ L/S}$$

4.34 L/S = 260.4 L/M = 15.624 L/H
≒ 375 M3/D

Since this is a three day supply:

375/3 = 125 M3/D

a-2 Water procurement at peak development (presuming there are 3 sections)

(ETo x Kc) + Pc - Er = Q1

ETo : Amount of evaporation (Peak) 4.67mm/D

Uc : Crop co-efficient (Peak) 1.4

Pc : Persolation 2.0 mm/D

ER : Effective rainfall 0

4.67 x 1.4 x 2.0 = 8.398 ≒8.4 mm/D

$$q2 = \frac{8.4 \times 0.2 \times 3 \times 10{,}000 \times 1{,}000}{1{,}000 \times 86{,}400 \times 0.8} = 0.729 \text{ L/S}$$

0.729 L/S = 43.74 L/M = 2.624.4 L/H
2.624 L/H x (12 + 12 x 0.3) = 40.94 ≒ 41 M3/D

b. Water supply for dry field (presuming the irrigation effectibity to be 60%):

Q2 = ETo x Kc - ER (ER = 0)

0.3 ha x 4 sections = 1.2 ha

ETo : 4.15 mm/D
Kc : 1.08

4.15 x 1.08 = 4.48 mm/D

$$q3 = \frac{4.48 \times 1.2 \times 10{,}000 \times 1{,}000}{1{,}000 \times 86{,}400 \times 0.6} \fallingdotseq 1.037 \text{ L/S}$$

1.037 L/S = 63.22 L/M = 3,733.2 L/H
3.733.2 L/H x (12 + 12 x 0.3) = 58.238 L/D
$\fallingdotseq$ 58 M3/D

hence the total water procurement of the test field needs to be;

q1 + q2 + q3 = 125 M3/D + 41 M3/D + 58 M3/D
= 224 M3/D

c. Water reservoir for irrigation

It will hold a days supply of water:

224 M3/D $\fallingdotseq$ 230 M3

d. Water source for irrigation

The water source will be shallow wells which will be dug within the site.

Amount of water --- presuming it should fill the irrigation water reservoir in a single day

500 M3/D ÷60 = 347.2 L/M

Two shallow wells will be dug.

water hauling pump :

347.2 L/M/2 = 173.6 L/M $\fallingdotseq$ 200 L/M

200 L/M x 25 M x 2.2 KW - 415 V
(one for each well)

5-11 Equipment Plan

The facilities which will require equipment are as follows:

1) Testing and laboratory building

2) Machinery and laboratory building
3) Machinery training building
4) Workshop
5) Office building

The equipment will be selected with the following considerations in mind.

1. That it be durable, and easy to use and maintain.

2. That it be minimally required in testing and experimenting

3. That it be minimally required in testing imported machinery.

4. That the machine functions and performance will not tend to deteriorate, even considering maintenance system employed, the tests the equipment will be used for, and the availability of parts.

5. That the equipment be able to cope with increase in the number of imported agricultural machines, and at the same time, that it be able to cope with malfunctions of this imported machinery while improving upon the testing criterion.

The following are the details of the equipment especially necessary in testing agricultural machinery.

1. Laboratory and testing building

The equipment required here is mainly that associated with evaluation and testing of mobility. This equipment will be used to test basic performance, such as the center of gravity and overturning angle, and to examine the structure, of tractors and operational machinery, as well as equipment to be used in overhauling examinations and weighing of parts, equipment to test the power and load of toractor engines, and equipment to test the axis load of two-wheel tractors.

2. Machinery testing building

The facility will be utilized mainly as the training activities. Meanwhile, equipment to test the machinery developed individually byu domestic manufacturers will also be required.

This equipment will be utilized in the overhauling of a small sized machinery such as engines, maintenance training, the overhauling of weeders and manual

Furthermore, equipment to be utilized in training of overhauling, adjustment, and maintenance techniques of large-size machinery, is also required.

3. The equipment to be installed here will be used in testing and training with the agricultural machinery developed by the center, which will cause a considerable amount of dust to rise.

The required equipment;

- soy bean threshers
- Corn shellers
- Peanut Shellers
- Undergroung fertilizer
- Rice hullers
- Measuring equipment for the above

4. Equipment list

A. Laboratory and Testings

-Barometer
-Battery charger and tester
-DC Voltage/Current standard (PBS digital calibrator)
-Data ignition unit (Plycorder)
-Hardness tester
-Hourmeter
-Hydrometer
-Magnetic picup
-Manometer
-Micro computer
-Multi pen recorder
-Multimeter
-Sound-level meter (A weighted)
-Transducer strain indicator
-Watt meter/volt
-Testing dryer
-Testing winnower
-Tesing thresher
-Testing husker
-Testing mill
-Testing rice grader
-Sample divider
-Potary dry oven
-Whiteness meter
-Top analytical balance
-Platform scale (ELE)
-Deadweight pressure gauge tester
-Radio transceiver
-Tool sets and gauges
-Weld joint tester

-Grain rigidity (hardness) tester
-Grain crack inspector
-Statics balancer
-Surface and lapping plates
-Strain amplifier
-Thermometer
-Slip ring
-Measuring apparatus for ergonometrics pourposes
-Forklift
-Testing tractor
-Testing harvester
-Testing rice transplanter
-Testing raising seadlings machine
-Testing spraying machine
-Testing brash cutter
-Testing thresher
-Testing rice pearler
-Thermostat
-Four wheel tractor (four wheel drive)
-Power shovel

Machinery Testing Facility

-AC generater (Alternator)
-Anemometer (Combination for therm)
-Dynamometer complete with access services for fuel consumption
-Dynamometer load cell
-Moisture tester for grain
-Moisture meter for soil
-Prony brake
-Soil hardness tester (Penetrometer)
-Tachometer
-Sierometer for vibration measurement
-Current flow meter
-Gas detector (ELE)
-Dynamometer car
-Instrumentation vehicle
-Portable scale
-Hydraulic lift truck
-Strain gauges kit
-Various strain gauge
-Tillage model study unit (Soil bins)
-Refrigerator
-Work bench
-Development equipment and tools
-Table for laboratory
-Truck scale

Machinery Training Facility

-Mobil video unit
-Sound projection with tape

-Film projector
-Overhead projector
-Drafting machine table drawing
-Photo copy
-Camera
-Cut-in model at machinery
-Engine model
-Micro-bus
-Tool set for break-up and machine

Workshop

-Lathe machine
-Multipurpose power tools
-Spot welder
-Vives (Bench pipe)
-Work bench
-Tap and dies sets
-Table saw
-Band saw
-Drill press
-Electric furnaces and accessories for forging
-Anvil
-Electric cupola and accessories
-Tools set and impact tools
-Compressor
-Power grinder
-Dust collectors
-Hydraulic press hand operated cap
-Hydrawlic bender
-Shaper/Scraper
-All purpose bender
-Power grinder
-Welder ARC
-Oxy-Acetylene welder set complete
-Drilling machine
-Electric drill
-Power saw
-Electric plane (large)
-Steam cleaner
-Electric carpenter's tool
-Storage shell
-Sander
-Iron filings collector
-Surface plates
-Spray gun
-Shearing machine
-Bending roll mahcine