No. 05

BASIC DESIGN STUDY REPORT
ON
THE ESTABLISHMENT
OF
THE RICE MECHANIZATION CENTER
IN
THE ARAB REPUBLIC OF EGYPT

JAPAN INTERNATIONAL COOPERATION AGENCY

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MAY 1982

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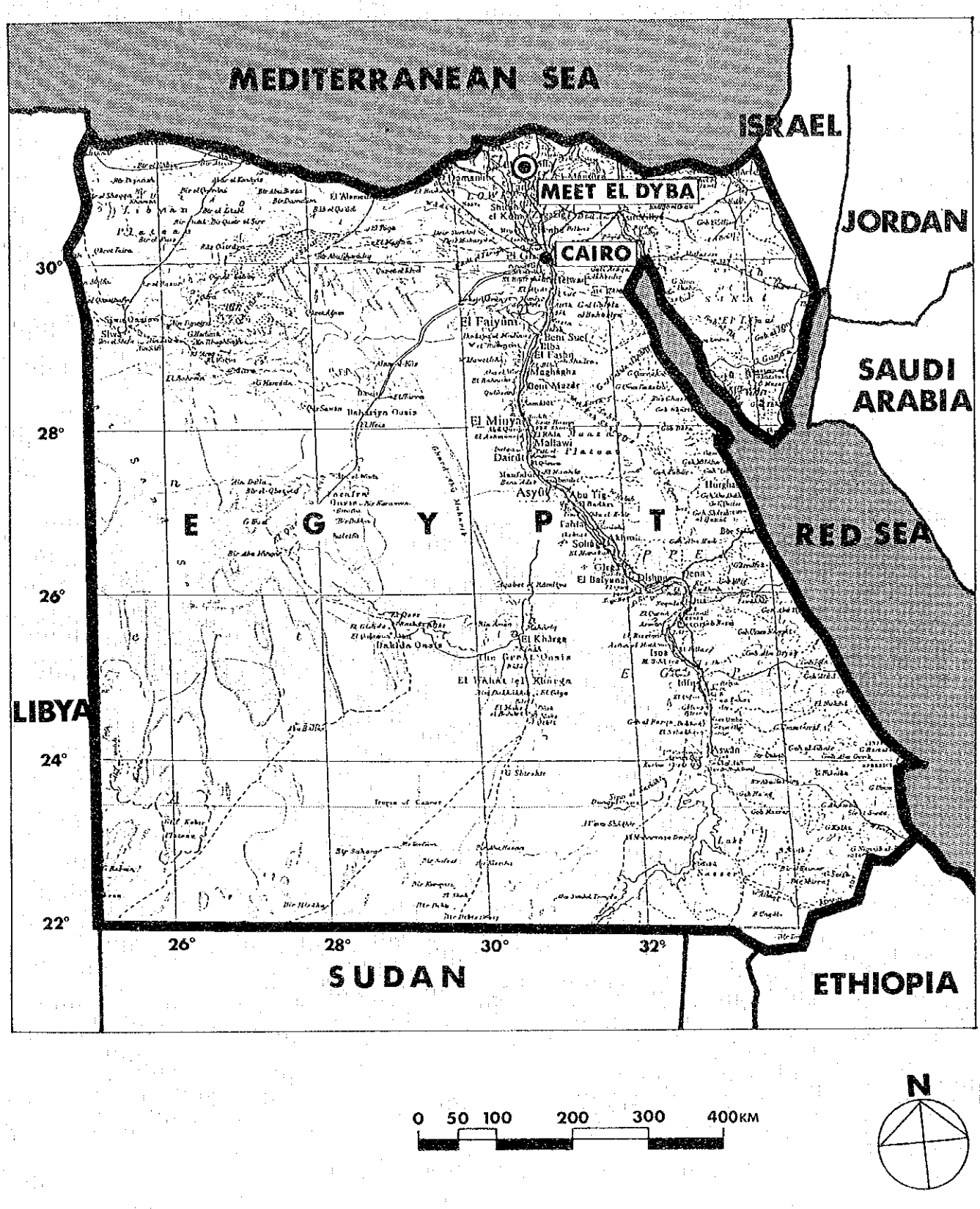
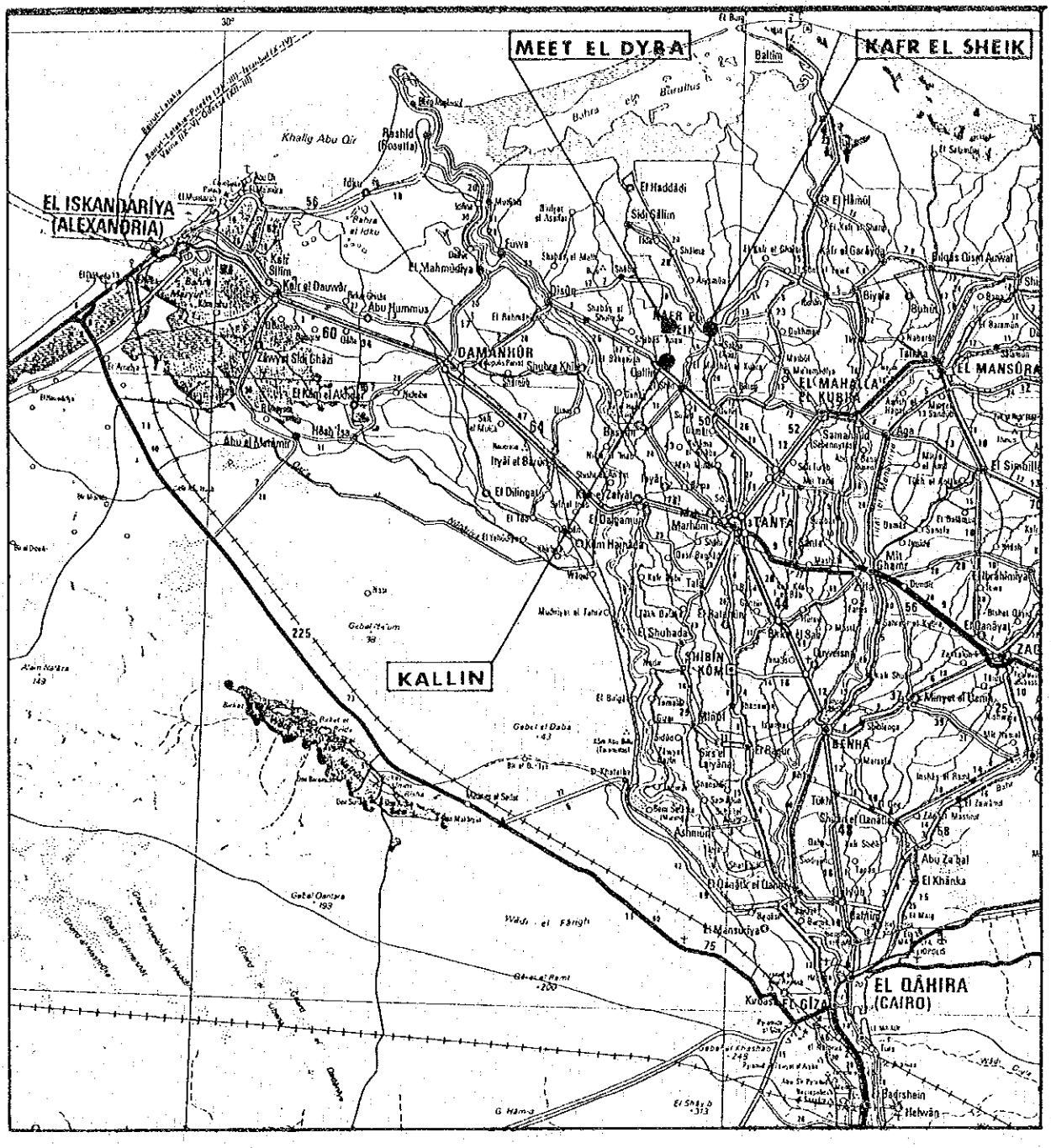


THE ARAB REPUBLIC OF EGYPT



LOCATION MAP

PREFACE

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In response to the request of the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a study on the Basic Design for the Establishment of the Rice Mechanization Centre and entrusted the survey to the International Cooperation Agency (J.I.C.A.). The J.I.C.A. sent to Egypt a Study team headed by Mr. Katsuhiko BIYAJIMA, Deputy Head, Technical Cooperation Division, Agricultural Development Cooperation Department, J.I.C.A. from January 24 to February 10, 1982.

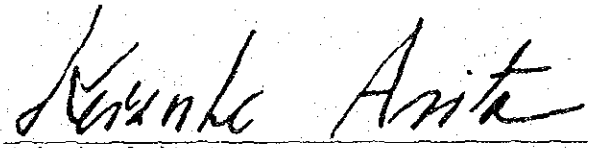
The team had discussions with the officials concerned of the Government of Egypt and conducted a field survey in Meet El Dyba.

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 our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the team.

May, 1982



Keisuke Arita
President
Japan International Cooperation Agency

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SUMMARY

SUMMARY

Agriculture is one of the key sectors of the Egyptian economy, accounting for 25% of the GDP and 41% of total employment in the late 1970s.

Most of the foreign currency earnings from cotton and rice exports are used to import wheat and wheat flour to feed the growing population. Despite the increasing food import bills, the average per capita calorie intake remains low at around 1.500 cal. An increase and improvement in food supplies is now considered one of the most urgent problems for Egypt to solve.

The continual out-migration of labor from villages to urban centers or to neighboring Arab countries has reduced the supply of agricultural labour considerably. With the resultant rise in rural wage rates, rice farming, which depends heavily on manual labor for transplanting, weeding, harvesting, etc. has been steadily losing profitability.

The current Five-year Plan declares that the long-term objectives for agricultural development are (i) increased food production, (ii) improvement in balance-of-payments deficits and (iii) re-absorption of the excess urban population into rural areas. The recently announced Food Security Plan stresses the need to raise the level of food self-sufficiency through (i) improved productivity in crop production, (ii) promotion of animal husbandry and (iii) promotion of fishery development. In the Food Security Plan, the need for mechanization of agriculture is stressed.

The present mechanization of Egyptian agriculture is largely limited to tilling with machinery obtained from other countries. Inadequate maintenance and the lack of spare parts, which is partly due to the diversity of models and suppliers in Egypt, keeps the utilization rate for agricultural machinery generally low. The shortage of operators and mechanics is another reason for inadequate maintenance. This situation presents various problems for the introduction of mechanization in agriculture.

In order to implement the following activities; (1) Verification experiments on the mechanized rice farming. (2) Economic study on the mechanized rice farming. (3) Establishment of the mechanized rice farming system. (4) Advice and guidance on training for operation and maintenance of agricultural machinery. (5) Advice and guidance for the demonstration of mechanized rice farming, the Government of Egypt has planned the establishment of the Rice Mechanization Center in Meet El Dyba national farm, Kafr El Sheik, and requested technical

cooperation and grant aid to the Government of Japan.

In respond to the request, Japanese Implementation Survey Teams has been dispatched to Egypt from August 5th to August 24th, 1981 to discuss with the Egyptian representative regarding the details of the project implementation and exchanged the Record of Discussion. The technical cooperation such as the dispatch of Japanese Experts and consolidation of the model farm, has already started.

The Basic Design Study Team and the Confirmation Team for grant aid have been dispatched to Egypt respectively in January, 1982 and April, 1982, to discuss with the representatives from the Ministry of Agriculture and study the site, the agricultural condition in Egypt, the current construction practice, the unit price for materials. The teams also had a discussion with the dispatched Japanese experts.

As a result of the studies, it is concluded that the project will contribute enormously to the agricultural development in Egypt and the implementation of the project is both timely and effective.
As a part of Food Security Plan , the project is expected to solve the problem or to improve the present condition in rice production sector in the followings;

(1) Shortage and rising wages of labor

(2) Increased production

(3) Improved quality of rice production

The total construction period is to be 15 months.
The Egyptian Government is taking necessary steps to ensure that the budgetary requirements (about 90.000 L.E./year) are available for research and operation personnel (1 director, 4 project managers, 7 researchers, 7 others, 7 general clerk and 30-40 part-timers as required) and operation after completion of the construction of the Center.

Chapter 1 : INTRODUCTION

Chapter 1 : INTRODUCTION

The Government of Egypt has devised this Rice Mechanization Pilot Project (R.M.P.) to establish rice mechanization systems for the purpose of increasing rice production, reducing the need for agricultural labor and improving the quality of rice, and has requested the Government of Japan to assist with technical cooperation.

In response to this request, the Government of Japan in October 1979 entrusted the Japan International Cooperation Agency (JICA) with the organization and dispatch of the Japanese Preliminary Survey Team. In addition, a Feasibility Study Mission was dispatched for two months from January 1981. Based on the findings by the previous teams, the Government of Japan, through JICA, dispatched the Japanese Implementation Survey Team for 20 days from August 5th to August 24th. The team and the representative from the Government of Egypt had meetings on the implementation of the Rice Mechanization Pilot Project. As a result, both parties reached agreement on the plan for the implementation of the R.M.P. and co-signed the Record of Discussion. In accordance with the Record of discussion, the Government of Japan, through JICA, started technical cooperation through the dispatch of Japanese experts, the acceptance of Egyptian counterpart personnel in Japan for training, the preparation of a model farm and the provision of machinery and equipment.

The Government of Egypt requested financing as a grant basis for the establishment of the Rice Mechanization Center in Meet El Dyba to meet the budget limitation. In response to this request made by the Egyptian Government, the Government of Japan entrusted the JICA with the organization of two basic design study teams, one of which visited Egypt in January 1982 and the other in April 1982, in order to conduct a technical feasibility study of the requested project.

The basic design study team had meetings with the Egyptian authorities to discuss the details of the agreement to be included in the Minutes. The team and the representatives from the Government of Egypt subsequently agreed upon the major objectives, functions and composition of the proposed Rice Mechanization Center, which were duly recorded in the Minutes. The team visited Kallin and Meet El Dyba to study the current agricultural conditions, construction industries the physical characteristics of the project site, the availability of utilities (electricity, public sewage systems, city water, telephones) etc. The project proposal prepared by the team was basically agreed to by the Egyptian authorities. The Minutes were then signed by the representatives of the two parties.

Chapter 2 : BACKGROUND

Chapter 2 : BACKGROUND

2-1 General socio-economic Conditions

Located in the northeastern corner of the African continent, the Arab Republic of Egypt has frontiers with Libya to the West and the Sudan to the south, and with Israel to the northeast on the Sinai Peninsula, and is bounded by the Mediterranean to the north and the Red Sea to the east. Its total land area of approximately one million km^2 is nearly three times that of Japan, and is mostly barren desert and highlands, with only 3.2% of the land (approx. the size of Switzerland) inhabited.

The growth of the gross domestic product in real terms was 4.4% in the 1950s and 5.0% in the 1960s, and shot up after 1974, recording 10.2% in 1975, 8.3% in 1976 and 9.0% in 1978. The growth of the agricultural sector was 2.6% during 1950s, 3.4% in the early half and 1.8% in the 1970s, showing a gradual decline since the Revolution.

The employment has steadily increased over the last two decades, and in 1977 recorded a 2.9% increase compared with the population growth of 2.4%. Agriculture has the largest share of employment, but as shown below, its share has been steadily declining from 54.0% in 1959/60 to 42.2% in 1977.

These trends reflect the expansion of employment in such sectors as service, construction, transportation and communications, and mining and manufacturing, which absorbed the outflow of labor from rural areas to urban centers. In addition, the out-migration to oil-producing Arab countries in search of better jobs is considerable and the 1977 population census estimates that over 1.5 million Egyptians are resident in these countries.

Table 2-1

Employment by Sector

(%)

	1959/60	1969/70	1975	1977
Agriculture	54.0	48.9	45.2	42.2
Mining & Manufacturing	10.0	11.1	12.8	12.8
Electricity	0.2	0.2	0.4	0.6
Construction	3.1	3.3	4.6	4.7
Transportation, Communications & the Suez Canal	3.6	4.2	4.5	4.6
Commerce & Finance	10.6	10.0	10.0	10.8
Housing	0.3	1.7	1.5	1.5
Public Utilities	0.4	0.4	0.5	0.6
Other services	17.8	19.3	20.6	22.3
Total (%)	100	100	100	100
Total (1,000 persons)	6.006	8.274	9.433	9.719

Sources: Federation of Egyptian Industries, Yearbook 1976, and Central Agency for Public Mobilization and Statistics, Statistical Yearbook 1979.

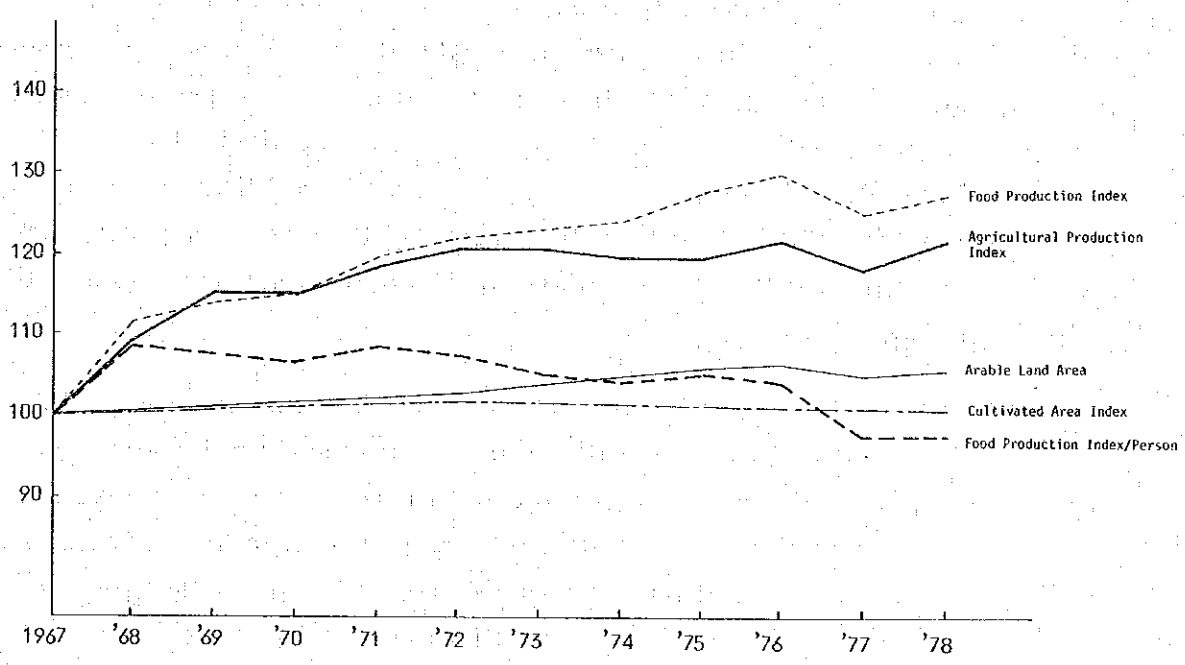
2-2 Agriculture in Egypt

2-2-1 General Agricultural Conditions

Agriculture, the mainstay of Egyptian economy, accounted for 25% of GDP and 41% of total employment in 1978. It is estimated that agricultural products, including manufactured products derived from them, made up over 50% of the total merchandise exports.

Agricultural production recorded a small annual increase of 2% during the period from 1967 to 1978. The area under cultivation increase very little, by about 38,000 ha, over the period. The slow expansion was mostly due to the continued conversion of arable land for urban and industrial use, on the one hand, and to the lagging development of farm land on the reclaimed areas, on the other.

The recent trend in food supply is toward increasing dependence on imported food. According to a report by ERA 2000 Inc.,* agricultural imports increased 3.3 times during the period from 1965 to 1977. Notably, wheat (grain) imports trebled over the same period to account for 34% of the total merchandise imports (47% when wheat flour is added). Self-sufficiency in major agricultural products in 1975 was less than 100% except for cotton, rice and a few others.



Source: FAO Production Yearbook 1978, 1979.

Fig. 2-1 Trends in Agricultural Production
(Index: 1967=100)

The Egyptian Government has announced the Food Security Plan, a positive approach to solving the problem of the shortage of food, of which a large proportion is being imported, and to catch up with the ever-growing population.

An increase in the production of rice is especially important since it is second to cotton in its export potential to obtain foreign currency which is needed in turn to import wheat, which is vital for securing food in Egypt.

* ERA 2000 Inc., Further Mechanization of Egyptian Agriculture, 1979.

(1) Production of Rice in Egypt

Rice farming in Egypt is largely found in the Nile delta. The five provinces of Dakahlia, Kafr El Sheik, Beheira, Sharkia and Gharbia account for 95% of the total area planted with paddy, with the remaining area found in the north of Beniseif and parts of the Fayyum basin and Dakhla and Kharga Oases.

The total area under cultivation in Egypt is estimated to be about 5.7 million feddans (approx. 2.39 million ha) in 1974. On the basis of this figure, one could estimate the increasing pressure of population on land since the beginning of the present century. The cultivated area per person was 0.48 feddans in 1907, 0.39 in 1927, 0.30 in 1940, 0.19 in 1967 and 0.15 in 1975. An estimate for the late 1970s gives the figure of 0.14 feddans per person. In other words, the availability of arable land per person declined by two thirds in 70 years.

The construction of the Aswan Dam and then the Aswan High Dam, made it possible to change the irrigation method from flooding irrigation to reservoir irrigation and then to perennial irrigation. As a result, summer cropping is now widely practice, with cropping intensity averaging two or three times per year. While the harvested area in the winter season increased by about 10% from 4.5 million to 5.0 million feddans during 1950-1975, that in the summer season increased by 70% over the same period. The harvested area under paddy approximately doubled during the period of 1954-1978.

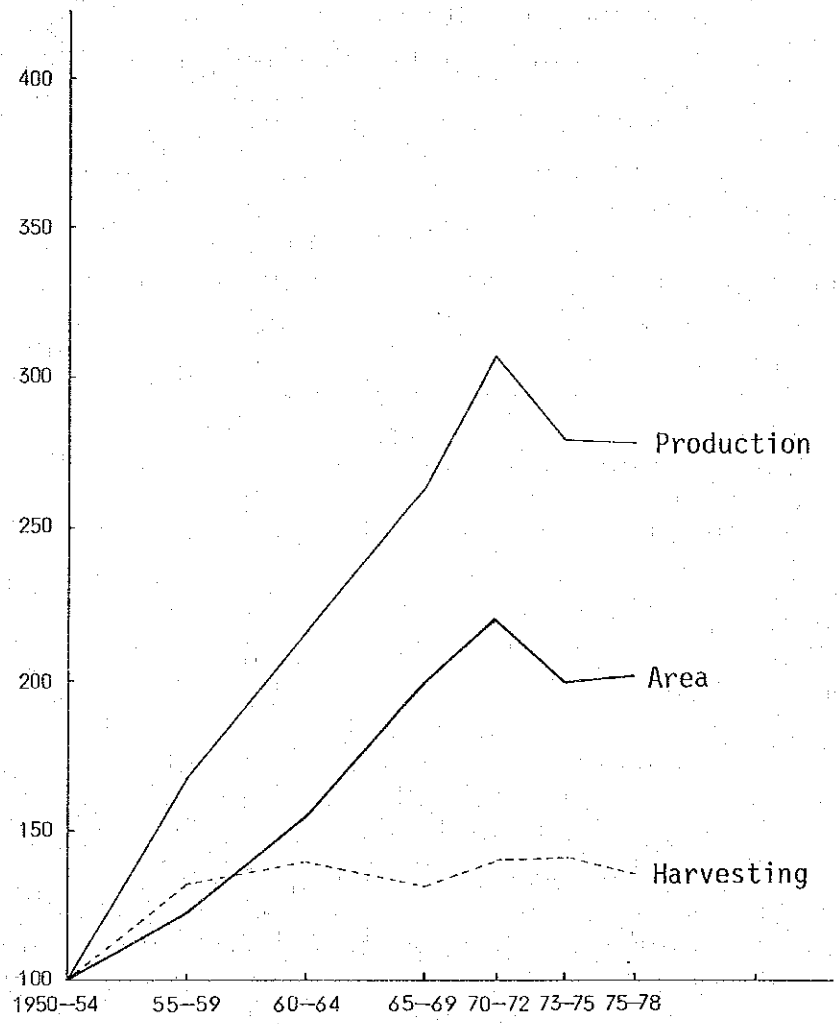
The change from flooding to perennial irrigation made possible by the dams brought with it some serious setbacks. In place of the fertile silt deposited by annual floods, crop production now requires the application of fertilizers.

The gradual rise in the water table and accompanying salination of soils calls for effective facilities for drainage and desalination, and consequently pushes up the costs of agricultural production. For example, the production of paddy steadily grew from 1950 to 1970, but showed a sudden decline afterward through the end of the 1970s. The yield per unit of area recorded remarkable growth from early 1950s to early 1960s, but showed little improvement since then.

The reason for the absence of significant growth in total paddy production are the crudeness of cultivation management in transplanting and fertilizing due to the shortage of seasonal labor, increases in the wage rates and stagnant rice prices.

The recent trend toward switching from the transplanting to the seed sowing method which requires less labor has caused crops to lodge and because damaged by saline substances in the soil. The Egyptian Government sees and hopes that application of mechanized transplanting method to save the input and increase production of rice will overcome the various problems mentioned in the near future.

Rice Production Trend (INDEX 1950-54 = 100)



Sources: Statistical Yearbook 1976, 1979.

Fig. 2-2

(2) Present Mechanization in Agriculture

The number of tractors in Egypt were estimated to be 24,600 in 1978. Out of the total, 4,000 tractors were used in National farms and 3,500 in the Agricultural Cooperatives. Agricultural tractors, in terms of horse power capacity for 36 PS dominated with 80% of the total, showing that mostly large tractors are used in present mechanization. These tractors are imported from Russia, East Germany, Czechoslovakia, Yugoslavia, Rumania and England.

Other agricultural machinery includes irrigation pumps, sprayers, threshers and separators.

Table 2-2
Farm Machinery Inventory by Type, 1978

Item	Estimated Total No.	Percent owned privately
	No.	Present
Tractors	24,680	83
Tractor Plows	19,900	86
Subsoiler	125	88
Harrows	8,820	86
Planters	6,430	95
Electric powered irrigation pumps	2,160	98
Diesel or gasoline powered irrigation pumps	24,830	98
Threshers and winnowers	3,580	89
Manual dusters	2,580	98
Motor operated dusters	960	8
Motor operated sprayers	160	38
Other sprayers	2,640	20
Spraying equipment:		
Motor operated & car carried	4,730	10
Motor operated & back carried	1,940	55
Manual and back carried	50,600	23

Sources: ERA 2000 Inc. Further Mechanization of Egyptian Agriculture, 1979.

2-2-2 Agricultural Development Plan

(1) Current Five-year Plan

The on-going Five-year Plan (1978-82) considers agriculture as one of the priority sectors for public-sector investment. The agricultural development is viewed as the foundation of the national prosperity and its long-term objectives are 1) increased food production, 2) improvement in balance-of-payments deficits, and 3) absorption of excess urban population in rural areas.

The guidelines indicated in the Five-year Plan for the purpose of improving productivity of the existing arable land are as follows;

a) Adoption of efficient irrigation and drainage systems and soil improvement

b) Mechanization of Agriculture

c) Seed multiplication and distribution of high-yielding varieties

d) Improvement of storage, packaging and transportation of agricultural produce

e) Modification of cropping systems (especially export crops, food crops and feed stuffs) and improvement of crop rotation

f) Protection of farm land from urbanization and industrialization

The over-all guidelines for agricultural development are defined as follows;

a) Expansion of agricultural exports

b) Strengthening of agricultural research and experiment

c) Promotion of the application of fertilizers and chemicals

d) Upgrading of extension workers and their training institutions

e) Expansion of agricultural credit

f) Reform of agricultural price policies

g) Integration of cropping (pooling of inputs)

h) Protection of soil fertility

(2) Food Security Plan

The Egyptian Government has recently made public its Food Security Plan, which emphasizes three objectives of 1) improvement of productivity in crop production, 2) promotion of animal husbandry and 3) promotion of fisheries.

With regard to crop production, major policy objectives are 1) introduction of early-maturing high-yielding varieties, 2) expansion of arable land, 3) land improvement, 4) development of irrigation and drainage systems, 5) development of crop protection technologies, 6) improvement of farming efficiency through mechanization, 7) establishment of Mechanization Fund, 8) diffusion of small agricultural machinery, 9) introduction of machinery rental systems and establishment of service stations, 10) establishment of workshops for maintenance and repair, 11) closer contact between agronomists and farmers through intensive extension services, 12) assistance to agricultural cooperatives, and 13) expansion and upgrading of facilities for storing machinery and harvested crops.

2-3 Present Mechanization of Rice Farming

To summarize present mechanization by type of machinery as follows;

1) A large tractor with a chisel plow is generally used for plowing. Also Italian heavy-duty machines are used for rotary plowing.

2) Land preparation and transplanting operations have not been mechanized at all. However, Japanese and Chinese rice transplanting machines have been recently demonstrated. Since there is only two weeks between the provision of irrigation water and transplanting rice in the field, mechanization of these operations is needed most.

3) Mechanization of irrigation water to the field accounts for about 58%, using diesel engine pumps, while there are still conventional way in which livestocks are used.

4) Weeding is generally done manually and insecticide is applied at the same time with other summer-harvested products such as cotton.

5) Reaping is generally done by manual labor using a sickle. After collection in the yard, crops are then threshed by large tractor or buffalo, leaving crop residues. This results in devaluing the crop as product. As mentioned previously, the mechanization of rice farming is not at a satisfactory level at present.

According to statistics,in terms of agricultural management, 94.5% of the totals is under 2.1 ha of farm and 2.4 ha is under 4.2%. The Government of Egypt therefore sees the necessity of developing and promotion of the rice mechanization systems appropriate to small-to medium-sized farmers.

However, there are major factors limiting mechanization:

1) A system of mechanized cultivation adapted to the climate and soil conditions of the region is lacking.

2) Considering the fact that most of the farms are too small and the cost of rice is relatively low to obtain expensive machineries, development of inexpensive machinery and organization of the cooperative use of such machinery is needed.

3) Because of the diversity of models and suppliers, the availability of spare parts is often limited. Therefore, systems for maintenance and repair and to secure the supplies are difficult.

4) Operators and mechanics are in short supply because the number of training institutions is very limited and the facilities and equipment of the existing ones are often inadequate.

2-4 Rice Mechanization Pilot Project

2-4-1 Outline

Based on the Food Security Plan, the Government of Egypt has devised the Rice Mechanization Pilot Project (R.M.P.) to establish rice mechanization systems appropriate for small-or medium-sized farms in Egypt. The Japanese Implementation Survey Team, dispatched through JICA by the Government of Japan, and the representatives from the Government of Egypt have decided on the basic plan for the Pilot Project.

The activities aim to cover the following subject matter.

(1) Verification experiments on the mechanized rice farming.

(2) Economic study on the mechanized rice farming.

(3) Establishment of the mechanized rice farming system.

(4) Advice and guidance on training for operation and maintenance of agricultural machinery.

(5) Advice and guidance for the demonstration of mechanized rice farming.

The Pilot Project is under the direct control of the Agricultural Mechanization Project. The administrative structure consists of the Egyptian experts and general affairs staff under the project manager who will receive advice and guidance from Japanese experts. It is planned that the Pilot Project will transfer the technology of Japanese rice mechanization systems appropriate for the conditions in Egypt.

The planned activities which consist of 2 phases will be attained in 5 years. The 1st phase (2 years) is planned to utilize the existing facilities in Kallin experimental field for temporary experiments and the 2nd phase (3 years) is planned to be implement the R.M.P. in the established Rice Mechanization Center with the experimental fields in Meet El Dyba.

The Kallin experimental farm consists of 3.78 ha of fields, 0.84 ha of building site, the site office, machinery storage and general storage with a staff of 70 people.

In addition, water, soil and transportation conditions are good enough to perform the preliminary tests as soon as possible. However, the facilities at Kallin experimental farm are getting to be old and expansion of the experimental field is not possible. Therefore, as a result of the investigation, Meet El Dyba national farm has been selected for the new experimental farm.

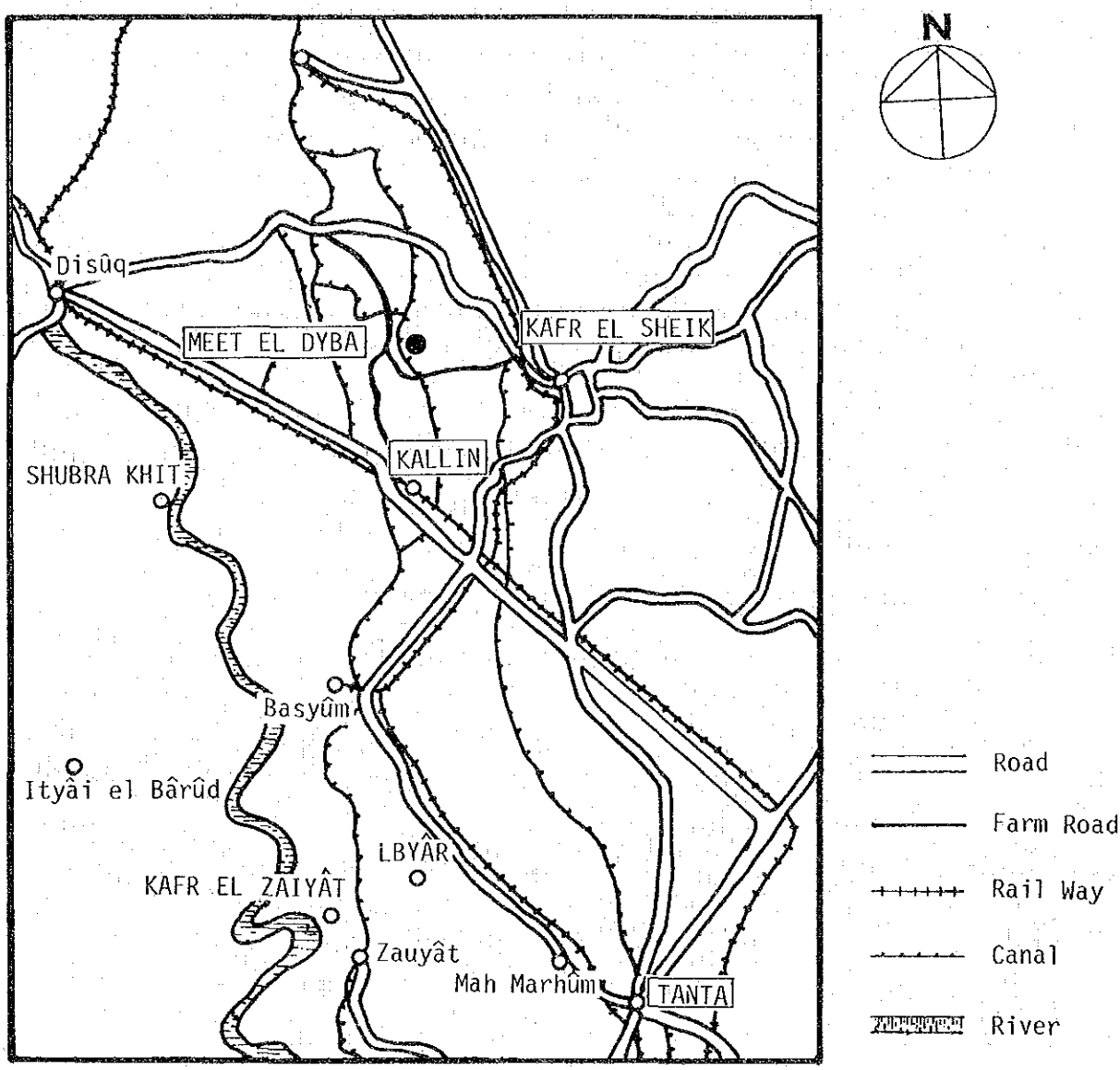
The reasons for the selection of the national farm are the following;

(1) Convenient location from Kallin experimental field and the Agricultural Department in Kafr El Sheik.

(2) Possibility of providing 40 ha of experimental fields with good water conditions.

(3) Ability to secure enough land area for the new facilities and building site. The maintenance of the experimental fields appropriate for rice mechanization tests has already started as a result of Japanese technical cooperation.

After completion of the period of the Japanese technical cooperation, continued efforts in research and the improvement of rice mechanization management systems will be made and appropriate training for the new instructors will be given.



LOCATION OF MEET EL DYBA

2-4-2 Contents of Programs

(1) Research Program

Feasibility tests for mechanization (first to fifth years):

Research efforts will be directed to trials with agricultural machinery appropriate to medium-and small-scale farmers and the comparative studies of the mechanized and conventional rice farming systems. The program will also evaluate the rice mechanization system in Egypt and indicate the appropriate direction it should take in the future.

(2) Training Programs

Training courses on the operation and maintenance of agricultural machinery (third to fifth years):

In order to promote the mechanization of rice farming in Egypt, the program will train management instructors and organize courses and workshops to teach operation and maintenance of various machinery for rice farming.

(3) Demonstration of mechanized rice farming (fourth to fifth years):

The mechanized rice farming system identified through the trials at the experimental farms will be demonstrated on the village level on scale practicable for ordinary rice farmers. The demonstration will be comprehensive, including selection of seeds and seeding, rearing of seedlings, management practices at various periods of growth, methods of tilling, soil management, operation and maintenance of various machines, and management of mechanized farming.

2-4-3 Administrative Structure

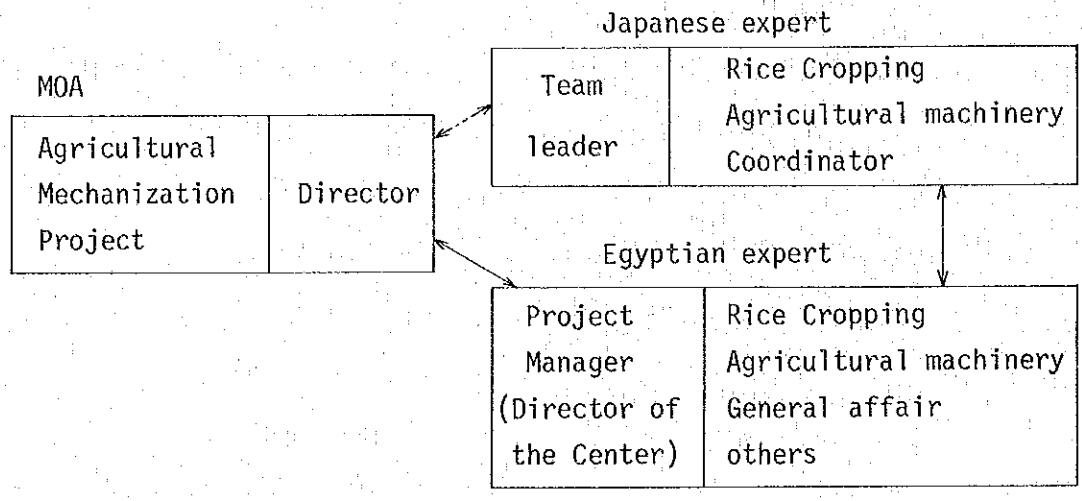
The Director of the Agricultural Mechanization projects, MOA will be responsible for management of the R.M.P. and the project manager (director of the Rice Mechanization Center) who will be appointed by the Minister of the MOA, will be responsible for the operation of the Center.

Egyptian rice cultivation experts and agricultural mechanization experts will be assigned under the Project Manager.

The members of the long-term expert team from Japan are as follows, under leadership of the team leader. Short-term experts will also be dispatched as required.

(1) Team leader (2) Rice-cropping expert
(3) Agricultural machinery expert (4) Coordinator

Table 2-3 Rice Mechanization Pilot Project Organization Chart



Various problems concerning implementation of the R.M.P. will be investigated by the Joint Committees, made up of members from both countries. After three years since the start of the R.M.P., the committee will re-examine progress and outcome and set up a frame for future.

The Japanese experts have been already dispatched as required under long-term appointments. The Japanese experts include of the following members (1) Team leader, (2) Rice crop experts, (3) Agricultural mechanization experts and (4) Team coordinator.

2-4-4 Facilities and Equipment

(1) Location, buildings and facilities:

1) Location: 11 feddans at Kallin and 95 feddans at Meet El Dyba
2) Garages (Kallin and Meet El Dyba)
3) Workshops (Kallin and Meet El Dyba)
4) Storage (Kallin and Meet El Dyba)
5) Seedling nurseries (Kallin and Meet El Dyba)
6) Conference room (Meet El Dyba)
7) Laboratory (Meet El Dyba)
8) Guest house (Meet El Dyba)
9) Lecture rooms (Meet El Dyba)
10) Auditorium (Meet El Dyba)
11) Water reservoir (Meet El Dyba)
12) Area reserved for other facilities (Meet El Dyba)

(2) Equipment and Supplies:

1) Irrigation and drainage pumps and spare parts
2) Agricultural machinery, equipment, measuring instruments, and tools with their spare parts
3) Instruments and materials necessary for research and experimentation
4) Vehicles and spare parts
5) Audio-visual teaching apparatus
6) Fertilizers, seeds and agricultural chemicals

Chapter 3 : OUTLINE OF THE RICE MECHANIZATION CENTER PROJECT

Chapter 3 : OUTLINE OF THE RICE MECHANIZATION CENTER PROJECT

3-1 Objective of Establishing the Center

The objective of establishing the Rice Mechanization Center (the Center) is to provide the required facilities for implementation of the research, experimentation and training activities. The facilities include buildings and machinery as listed in Chapter 2, 2-4-4.
The Center will continue to be used after completion of the implementation of the technical cooperation from Japan.

The Center will be a pilot model for establishing similar centers by the Government of Egypt for spreading innovation in research and development on mechanization and management.

3-2 Research, Training and Demonstration at the Center

(1) Research on rice mechanization

1) Verification experiments on paddy cultivation in experimental field

Based on the outcome of the experiments in the Kallin experimental field, preparatory plans for experimental field and cultivation plans will be reviewed after 2 years. A report on the feasibility study of cultivation will be made after 3 years.

2) Verification experiments on mechanization

Based on the outcome of research on the introduction of agricultural machinery at Kallin experimental field, experiments on machinery for tillage, transplanting, fertilizing, spraying, harvesting and processing of unhulled rice will be done at the center.

3) Evaluation of the feasibility test

Evaluation of experiments, analysis of research and evaluation of the results of experiments will be done.

The final report on the subject will be made in the fourth year.

4) Economic study on mechanized rice farming

Farm management analysis on data collected at the Center will be finalized. A final report on the subject will be made.

5) Establishment of rice mechanization system

In order to establish rice mechanization systems. The result of the experiment at Kallin and following research and experiment at the Center will be analyzed, compared with the conventional mechanization system and evaluated. As the final outcome, rice mechanization systems appropriate for small-to medium-sized farms will be established.

(2) Training on the rice mechanization

Egyptian rice farmers will receive the advice and guidance obtained from all the testing on rice mechanization systems and receive information on what is learned. The result will be finalized in the form of a report. For the utilization and promotion of the developed "rice mechanization systems", advanced, basic and short training courses will be arranged.

The advanced and basic courses call for training and teaching on the theory and application of rice mechanization for intermediate agricultural engineers and agronomists.

Anybody who completes the course will receive a certificate as an instructor for promotion of the system and is given special consideration. The 300 students (core farmers) for the short courses to promote the system will participate in courses given 12 times a year in the off-seasons. Various public facilities in Kafr El Sheik will be utilized to accommodate these 300 people.

Table 3-1

Contents of Training at the Center; As indicated in the following table;

Category	Purpose	Objective	Subject	Duration (week/seccion)	Number of Trainee
I, Advanced Course in Mechanized Rice Cultivation	To bring up instructors both in Rice-Machinery & Rice-agronomy	Senior agri. engineers & agronomists, or experienced stuff	Principles in mechanized rice cultivation and its applications	3 in winter & midsummer	20/session
II. Basic Course in Mechanized Rice Cultivation	To educate those who assist instructors in machinery & agronomy	Junior agri. engineers & agronomists, or extension workers	Practice in Nuroing, Machinery operation, Taking care of rice plants etc.	2 several times during season	20
III. Brief Course in Mechanized Rice Cultivation	To let key-farmers see How to work in Mechanized Rice Cultivation	Leading key-farmers nominated by governors	Demonstration of mechanized rice cultivation and social program for village organization	1 week or 5 days 12/year	300

(3) Demonstration of rice mechanization

The established rice mechanization management will be demonstrated in the experimental field, based on the experiences and the outcome at Kallin experimental farm and the Center.

3-3 Administrative structure

Based on the management planning of RMP, after the completion of the Center, the administrative structures at Kallin will be transfered to the Center to establish rice mechanization systems.

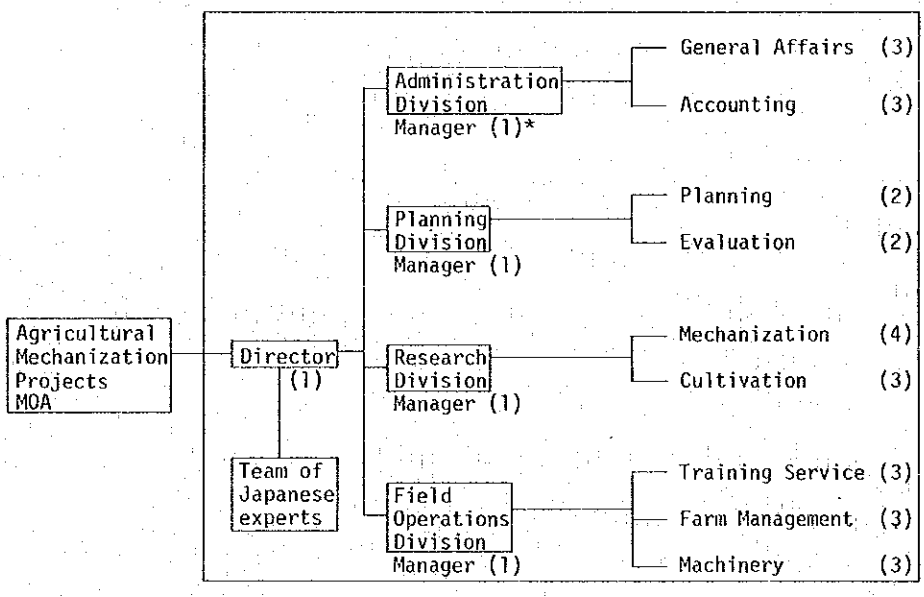


Fig. 3-2 Rice Mechanization Center Organization Chart

* Number in ( ) shows number of persons.

In addition to the regular staff, 30-40 part-timers will be employed as janitors, drivers, etc.

3-4 Facilities, Machinery and Equipment

As listed in 2-4-4 in Chapter 2, the required facilities, machinery and equipment for the RMP were further examined for financing on a grant basis and for the Basic Design Study. Consequently the following list has been drawn up.

1) Main building
2) Training Dormitory
3) Workshop
4) Net house
5) Tractor shed
6) Garage + Substation
7) Elevated water tank
8) Toilet
9) Guard box
10) Fuel storage
11) Pond
12) Water reservoir
13) Incinerator
14) Gas storage
15) Flag poles
16) Concrete paving
17) Asphalt pavement
18) Agricultural maintenance machinery
19) Audio-Visual training equipment

Chapter 4 : OUTLINE OF PROJECT SITE

Chapter 4 : OUTLINE OF PROJECT SITE

4-1 General

(1) Selection of the Project Site

The proposed project site for construction of center buildings and facilities has been selected in part of 40 ha experimental field of Meet El Dyba National Farm as a result of discussions by the Japanese Implementation Team and Egyptian representatives. The exact location of the project site is decided the 2.85 ha in the center of the experimental field after investigation of project site done by the Implementation farm management team and the representatives from the Government of Egypt.

The reasons for the selection of the site for the Center are the followings:

1) Being national land

2) Being able to secure enough experimental field

3) Provision of required condition for rice mechanization experiment such as irrigation water

4) Being in close proximity to Kallin experimental field.
It is also convenient location in terms of communication with the MOA in Kafr El Sheik and the office of governorate.
Meet El Dyba is located in the center of rice farming country of five provinces in the Nile delta. The transportation condition is relatively fair.

(2) Project Site Location

It is about 60 km to Tanta, a Center of Nile delta region, 180 km to Cairo and 140 km to Alexandria, adjoining the Mediterranean Sea.

Site elevation being 70 cm higher than the neighboring field to the North and relatively higher than the surrounding farms, make good conditions for water drainage. The main road is 5 m in width, requiring minor renovations for utilization.
The neighboring area around the site is all farm land. Meet El Dyba village is 600 m to the West and located between Kafr El Sheik and Kallin, a distance of some 7 km from both. There is no convenient transportation available, exception of private cars and taxi-cabs. The road connecting Meet El Dyba, Kafr El Sheik and Kallin is about 6 m in width and unpaved, making muddy conditions when it rains. However, there is no problem passing through in good weather.

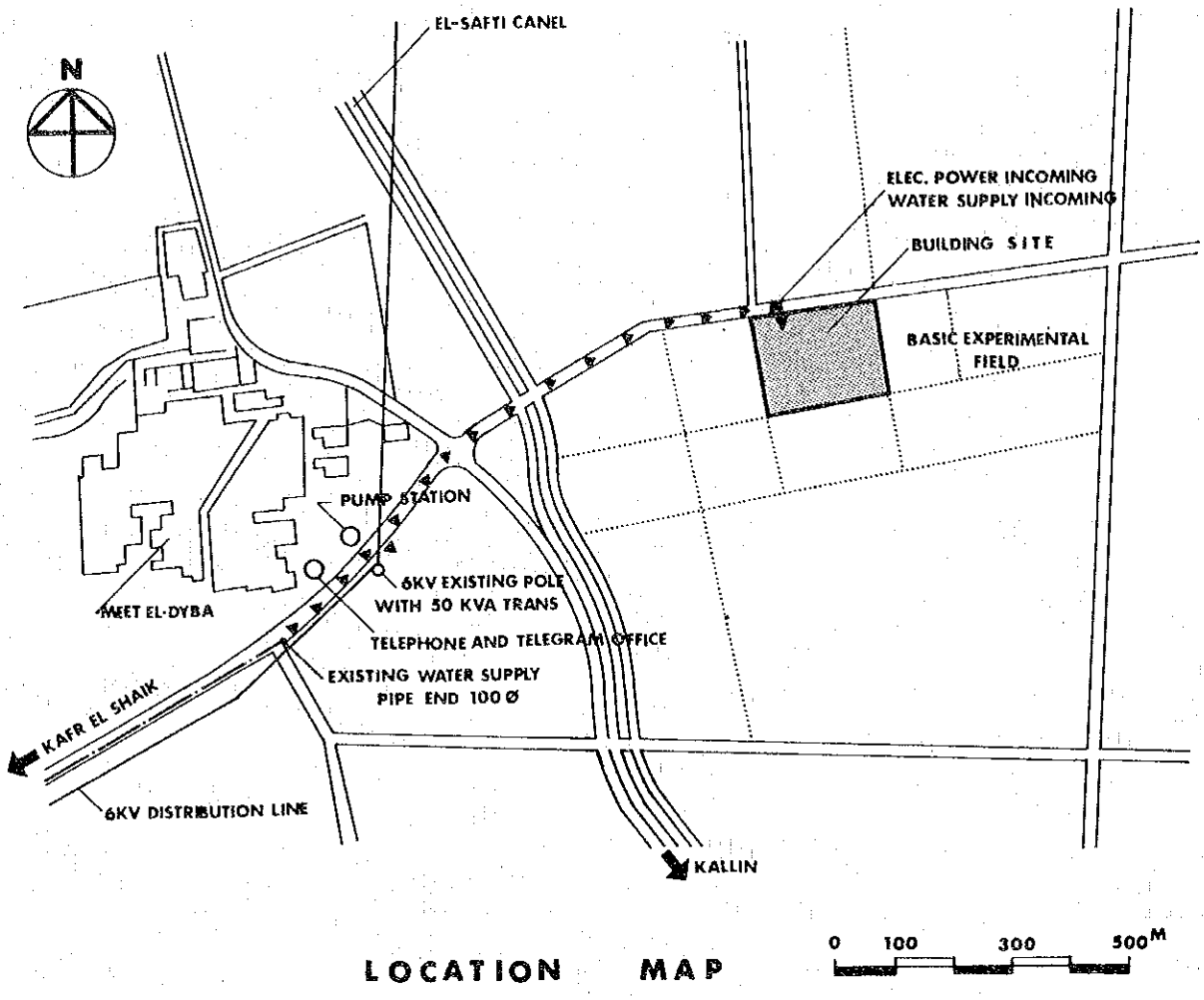
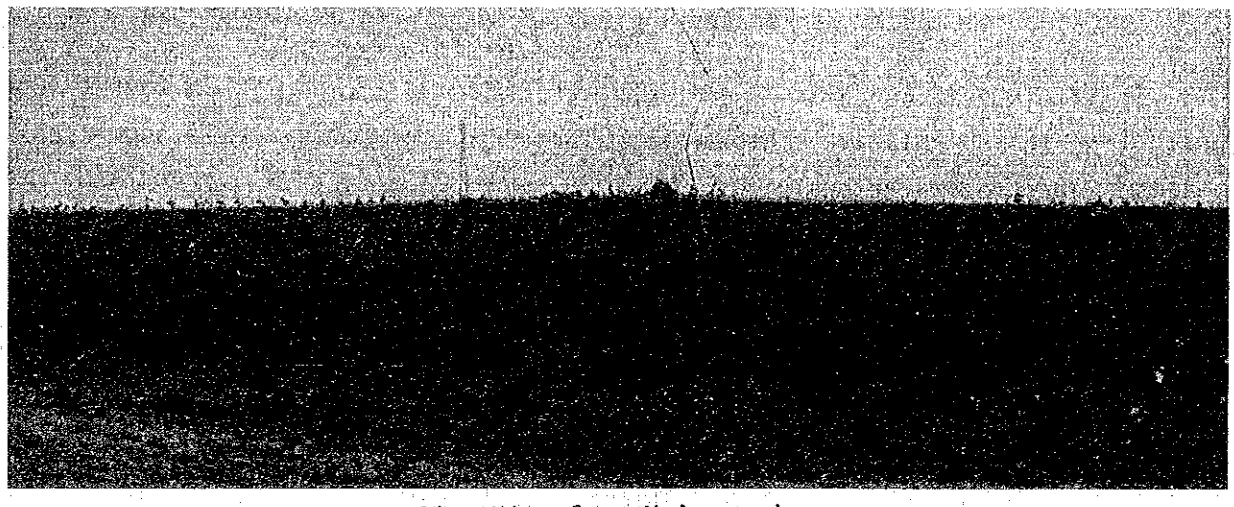


Fig. 4-1 Project Site



Site View from Main road

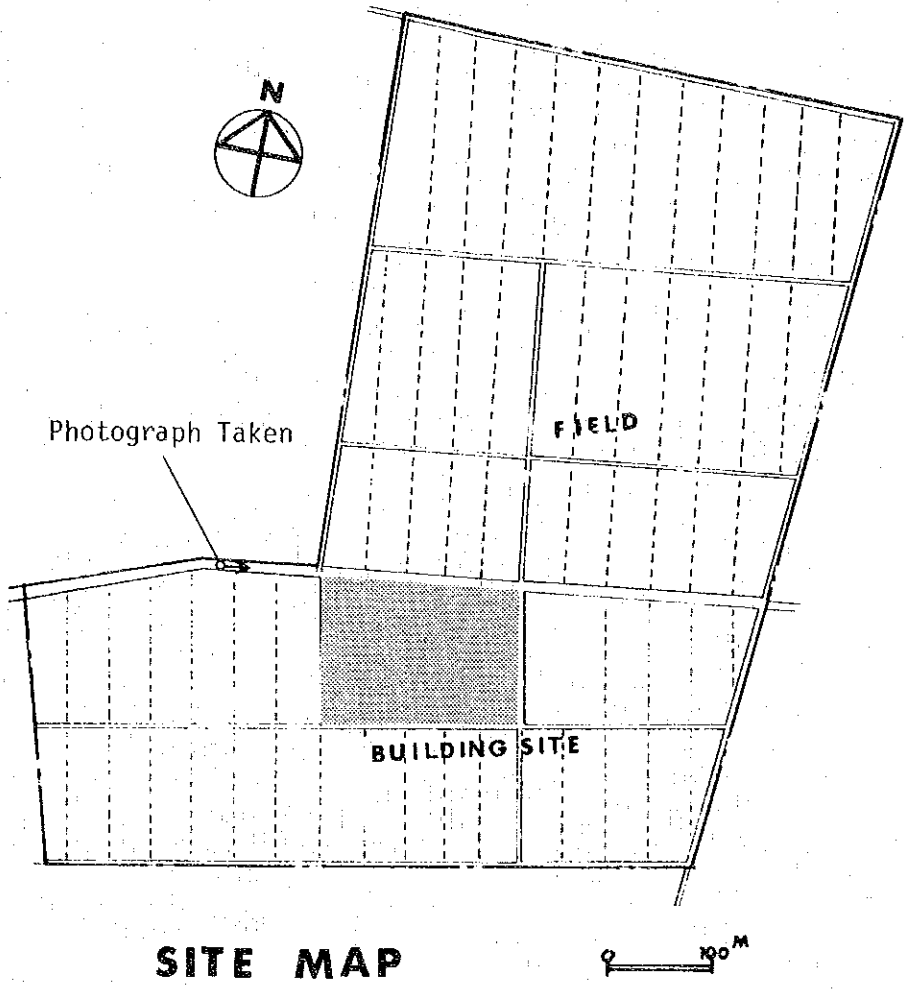
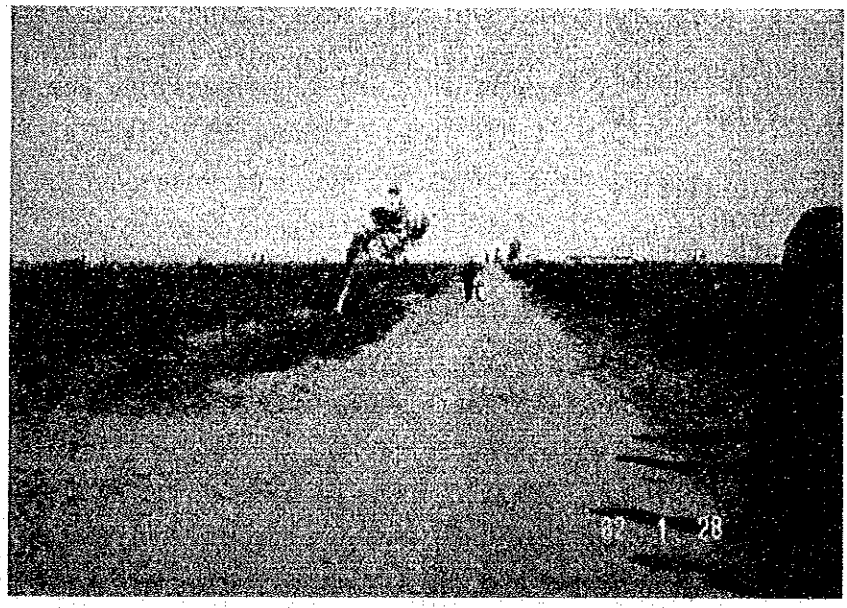


Fig. 4-2 Site map



Photograph view of the site and the road to Meet El Dyba

4-2 Natural Conditions

(1) General Climate

Meet El Dyba (31°06' North Latitude, 30°51' East Longitude) is located in the Nile delta region.

The climate around the site is dry throughout the year and the annual precipitation of about 90 mm occurs during the winter (November through March).

The mean temperature during the summer ranges from 35°C to 40°C but, due to low humidity, it feels relatively cool under shade in the daytime and the temperature drops considerably after nightfall. One can stand the heat of summer better than in humid Japan by staying indoors in well-shuttered houses.

During the winter season, the weather is poor and relatively cold (lowest temperature is 6° - 7°C and highest is 15°C).

The wind generally blows from the North Mediterranean Sea, and at the end of the winter season the Khamsin comes, a seasonal wind from a desert region in the South-west, making poor weather conditions.

(2) Soil Conditions

The predominant soils are dark brown heavy clay characteristic of the Nile delta. The bearing capacity of the soil is approximately 35 kg as measured vertical on a rectangular plate. The value for cone penetration is estimated to be about 1.5 kg/cm^2.

The Government of Egypt will take the necessary steps to collect boring data for the site (see Appendix III-3) before the detail design begins.

4-3 Available Utilities

(1) Water Supply

Egypt has a long history of water supply development and the community of Meet El Dyba is serviced by the public water supply system. However, there are no sewage facilities, relying solely on seepage and evapo-transpiration.

The water purification plant is located in the town.

Approximately 45 km downstream from the project site and the pipeline is laid down to the pump station at Kallin where the water is boosted up to reach the site (the distance from Kallin to the site is about 7 km).

The provincial office of the Housing and Reconstruction Authority gives the following requirements for drawing water to the project.

Material of pipe	:	asbestos-cement
Pipe size	:	a pipe of 100 mm in diameter is to be used, due to the low pressure
Water charge	:	2.5 pt/m^3

(2) Sewage

There is no sewage facility available. The usual practice in the region is seepage and evaporation.

(3) Gas

There is no municipal gas supply system, but butane gas is easily available in cylinders. It will be necessary to take into account that the calorific value of butane gas varies from 7.000 kcal/kg to 10.000 kcal/kg. The price of butane gas for household use is 65 pt. a cylinder of 8 kg with a guarantee of 30 LE for the initial purchase.

(4) Electricity

The Nile delta region is covered by the distribution network connected to both of the hydro-electric power stations at Aswan and the thermo-electric power stations on the Mediterranean coast. The Egypt Electricity Distribution Company constructs distribution lines and supplies power at 6 KV, 3 Ø, 3 W and 50 HZ. The transmitted voltage is sufficient, as the power capacity necessary for the project is 300 KVA. However, interruption of the power supply is rather frequent in Egypt and it will be necessary to install a generator in order to provide electricity to laboratory equipment such as incubators which require an uninterrupted power supply. The required distribution line to the site is about 700 m in length.

(5) Telephone

A telegraph and telephone company at Kafr El Sheik has some circuits available and it is possible to secure a telephone line, about 700 m to the project site. However, the telephone connection is generally poor in Egypt due to the inadequate maintenance as well as shortfalls in available circuits. In certain parts of the country, shortwave radio is used as a supplementary means of communication.

Chapter 5 : BASIC DESIGN

Chapter 5 : BASIC DESIGN

5-1 Basic Guidelines

Consideration will be given to the design of appropriate in facilities, based on the climatic conditions and current building construction practice. Local materials and construction techniques will be used as far as possible to reduce unnecessary costs and at the same time, the facilities will be planned for ease of maintenance and operation after the completion of the Center.

5-2 Basic Planning

5-2-1 Site Plan

(1) Land use planning

1) Site

The access to the site is from the main road connecting to Meet El Dyba village

2) Site form

The site is almost flat and gently sloping downward to the South and East. The periphery of the site is 200 m East-West and 135-150 m North-South. A 5 m wide road to the North is used as the main road and the road to the village. The North-South farm road to the east is expected to be built and the opposite side of the road is to become the basic experimental field in the near future.

3) Utilities

a) Water supply
A water line will be brought to the site by the Government of Egypt. A water reservoir will be facilitated at the site.

b) Sewage, disposal facilities
Sewage facilities appropriate for the Center will be installed by the Government of Egypt (about 40 m^3/day).

c) Electricity supply
An electricity supply line will be brought to the site by the Government of Egypt, directly branched from the

existing high voltage line and received at a substation which includes a transformer.

d) Telephone line

The lines will be brought to the site and connected to MDF from the telex and telephone company in the village by the Government of Egypt.

e) Gas

Butane gas is delivered in gas cylinders by the gas company.

4) Site Preparation

Adjustment and banking of the site to 30 cm higher than the existing grade will be carried out by the Government of Egypt.

(2) Site Planning

Two entrances to the site are provided. The main entrance is mainly for the staff, trainees and visitors, and is provided on the main road to the North.

The other entrance is provided on the side of the farm road to the East between the basic experimental field and the site. The main building is placed in the main area near the main entrance. The working area will be located close to the experimental field to the East for practical reasons.

The residential area will be placed at the West side of the site, separated from the working area for better residential environment and the convenience of being close to the villages. Surrounded by the residential area, the main building and the working area, the multi-purpose area (training area) is for test driving agricultural machinery, and future extension of the facilities.

Most of the buildings are placed on an East-West axis so that the minimum sun radiation will be received. The rooms in the training dormitory face North, to avoid strong sun radiation in summer. This also helps to catch the wind blowing from Mediterranean Sea to the North for fresh air and ventilation.

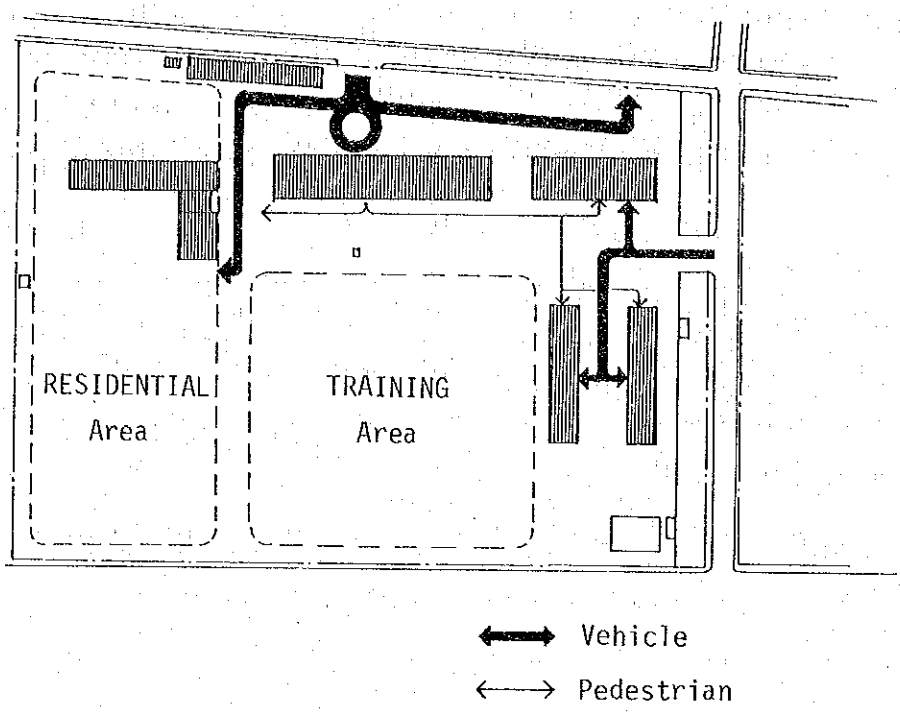


Fig. 5-1 CIRCULATION DIAGRAM

5-2-2 Architectural Plan

Based on the site plan, five major buildings are to be constructed as in Table 5-1.

Table 5-1

BUILDING	FUNCTION
1) Main Building	Administration of the Center, Operations and maintenance, research and experiments, lecture room
2) Training Dormitory	Instructors and trainees, dormitory and dining room, and kitchen
3) Workshop	Repair and maintenance for agricultural, machinery, storage for equipment, general storage
4) Net House	Housing seedlings. Storage for small machinery
5) Tractor Shed	Storage for large agricultural machinery, farm management

(1) Spatial Plan

The plan for the required rooms and their floor area has been decided by the basic design study and based on the Record of Discussions by the Japanese Implementation Survey Team.

Table 5-2

Room name	Number of staff
Director's room	1
Administration	7
Planning & Evaluation	5
Cultivation & Mechanization	8
Farm Management & Service training	10
Lecture and Laboratory	20
Auditorium	300
Part-time workers	30-40
Grand total	381-391

Main Building:

The main building comprises offices for administration and private rooms for senior staff, a room for medical care, lecture rooms, conference and meeting rooms, a library, a dark room, a seed storage room, a printing office and so forth.

Training dormitory & Dining hall:

The dormitory accommodates 20 trainees and 6 instructors.
The number of students for the advanced and basic courses is 20 each. Since the dormitory accommodates only 20 students, care should be taken to avoid overlapping of both at the same time.
The rooms for instructors are separated by a partition from the rooms for trainees, and each is provided with a toilet and a shower. The rooms for trainees each accommodate 4 persons and toilet and shower facilities are provided for common use.
In addition, a laundry room, a lounge, a storage room and a janitor's room are provided.

The dining hall accommodates 100 persons in two shifts, allowing for use by commuting staff. The hall is partitioned into two sections, one for the staff and the other for the trainees and temporary workers. A lunch service will be provided to those who are trainees on short courses.

Workshop:

The central portion of the building is used as a workshop for repairing agricultural machinery with a north to south through passage and a rail in the ceiling for the 2-ton hoist.

The workshop is flanked on the west by an office, a store room for tools, spare parts and various measuring instruments, a locker room and a toilet, and on the east by separate store rooms for fertilizers, agricultural chemicals and nursery boxes and general storage.

Net House

The net house is used for storing the harvest and rearing seedlings and has a passage way for vehicles through the center and a store room for small agricultural machinery at one end of the building.

Tractor Shed:

The shed houses tractors and other large agricultural machinery and provides access from both sides of the building. The shed has a room for research and another for field administration.

Guard House, Garage and Power House:

The building consists of guard room, a parking space for 8 vehicles, and separate rooms for a pump, a stand-by generator and power distribution.

2) Sectional Planning

Main building: Ceiling height to be more than 2.8 m for good ventilation.
Lecture room's ceiling is to be 6.5 m in height.

Training Dormitory :
Ceiling height to be more than 2.8 m. Optimum use of natural lighting and ventilation for a comfortable environment.

(2) Architectural Materials

1) Main building, Training Dormitory and Workshop are to be reinforced concrete structure with locally manufactured bricks for exterior walls and interior partitions.

Exterior finish	to be mortar with paint coating
Roof	to be locally manufactured asphalt water proofing and foam concrete with mortar tiles.
Interior floor	to be locally manufactured terrazzo tiles or terrazzo finish.
Interior walls	to be cement-mortar with paint, except the interior wall for the lecture room to be veneered plywood finish.
Ceiling	to be cement-mortar with paint where no suspended ceiling required. Ceiling for toilet and shower room to be asbestos board with paint. Ceiling for office rooms, classrooms library to be acoustical ceiling tiles.
Aluminum sash	to be Japanese made if it is impossible to get in Egypt.

Steel sash and wood sash to be Egyptian made.

Wooden furniture	to be all Egyptian.
Miscellaneous (metal,etc.)	items to be local as far as possible. Japanese products are to be used if it is not possible to get them locally.

2) Net house, Tractor shed and Service utility, Parking, Guard House

Net house and Tractor shed to be reinforced concrete structure.

Service utility to be steel structure made in Japan and assembled at the site.

Roof to be steel purlin with locally manufactured corrugated slate.

Exterior wall and interior partition to be locally manufactured bricks.

Exterior wall for net house and tractor shed to be locally manufactured bricks.

Interior floor to be trowel levelled concrete

Interior walls to be cement-mortar with paint for office room and experiment room.

Interior wall for storage room is to be locally manufactured bricks.

Ceilings to be same as 1).

3) Finishing materials

Exterior finish Table 5 - 3

	Roof	Exterior wall	Sash	Eave
Main building Training dormitory Workshop	asphalt water, proofing and foam conc. mortar tiles	local bricks and cement-mortar with paint	aluminum steel clear-glass	mortar coated with paint asbestos coated with paint
Tractor shed Service utility garage, guard house	corrugated slate	local bricks local bricks and cement-mortar with paint	steel clear glass	corrugated slate exposed

Interior finish Table 5 - 4

	Floor	Base	Interior wall	Sash	Ceiling
Main building Training dormitory Workshop	terrazzo tiles cast-in-place terrazzo concrete and cement-mortar	terrazzo tiles	cement-mortar with paint, veneered plywood, clear finish	wood, clear finish, clear glass	acoustical ceiling tiles, rough-mortar with paint, asbestos with paint.
Tractor shed Service utility, garage, guard house	trowel-levelled concrete	mortar	cement-mortar with paint, local brick	steel, clear glass	corrugated slate exposed, asbestos with paint.

(3) Structural Plan

Main structures:

* Main building : reinforced concrete with local 250 mm brick
* Dormitory : reinforced concrete with local 250 mm brick
* Workshop : reinforced concrete with local 250 mm brick
* Net house : reinforced concrete with roof to be steel purlin and slate
* Tractor shed : reinforced concrete with roof to be steel purlin and slate
* Guard house, garage & power house: steel frame with roof to be steel purlin and slate

1) Design standards:

* Stress analysis : elasticity design
* Section design : allowable stress
* Material standards : JIS for Japanese goods and BS for local goods
* Load factor

	floor slab & beam	girder,footing(kg/m^2)
Office, lounge projector room, conference	300	180
Classroom, lecture room, experiment	230	210
Dormitory room, toilet	180	130
Storage	400	300
R.C. roof	100	100
St. roof	0	0

Seismic force: not considered

Wind force : $W = cqA$ $g = 60\sqrt{h}$

h=height from grade level q=pressure/area
c=wind power index W=wind pressure A=area

2) Material to be used:

a) Reinforced steel bars - BS 4449-78 class 250 460/425

b) Steel - JISG 3101 class SS41

c) Bolt - JISG B1186 class F10T

d) Concrete

Cement - Portland cement BS 12

Design standard (28 days stress analysis)

Main structure - 210 kg/cm^2

others - 175 kg/cm^2

All other materials not specified here, will be British Standard.

B.S. = British Standard

JIS = Japanese Industrial Standards

Foundation

The bearing stratum is 1.0 m below the ground surface and directly serves as foundation.

The design bearing capacity of the soil is tentatively estimated to be 8.0 tons/m^2, but the final estimate will have to be based on the findings of the anticipated soil survey in the project site.

(4) Mechanical Works Design

Required equipment is in principle selected according to the Japanese Industrial Standards (JIS) and the Heating Air Conditioning and Sanitary Standard in Japan (HASS), but some modifications are made by taking due note of the special circumstances in Egypt.

1) Design criteria

Users	:	staff	31 (persons)
		manual workers	40
		resident trainees	20
		visitors	300
Water requirements	:	staff and trainees 250 l/day(max.)	
		manual workers and visitors 50 l/day	

2) Water supply

At the expense of the Egyptian Government, asbestos pipes of 100 mm in diameter will be laid to supply water to the reservoir on the premises. Water in the reservoir will be pumped up to the elevated tank from which it will be distributed by the gravity method to various points.

Water consumption:

(51 persons x 250 l/day) + (340 persons x 50 l/day)
+ 10 m^3/day(for various operations) = 40 m^3/day (max.)

3) Hot water supply

Gas heaters will be installed at selected points in the main building. A central hot water supply system will be provided in the dormitory as a safety precaution.

4) Sewage

The separate sewage system will be employed indoors. Discharged sewage will be collected in the outdoor catch-basin and led to the treatment system to be constructed entirely at the expense of the Egyptian Government. The construction work of the discharge channel to the main irrigation canal will be also done by the Egyptian Government.

5) Sanitary ware

Sanitary fixtures such as toilets, washing basins and showers will be installed at designated places.

6) Gas supply

Butane gas is centrally stored and distributed to the selected places in the main building and the dormitory.

7) Air conditioning

The combined air conditioners for cooling and heating will be installed as required.

8) Ventilation

Mechanical ventilation will be installed in the kitchen and other places where required.

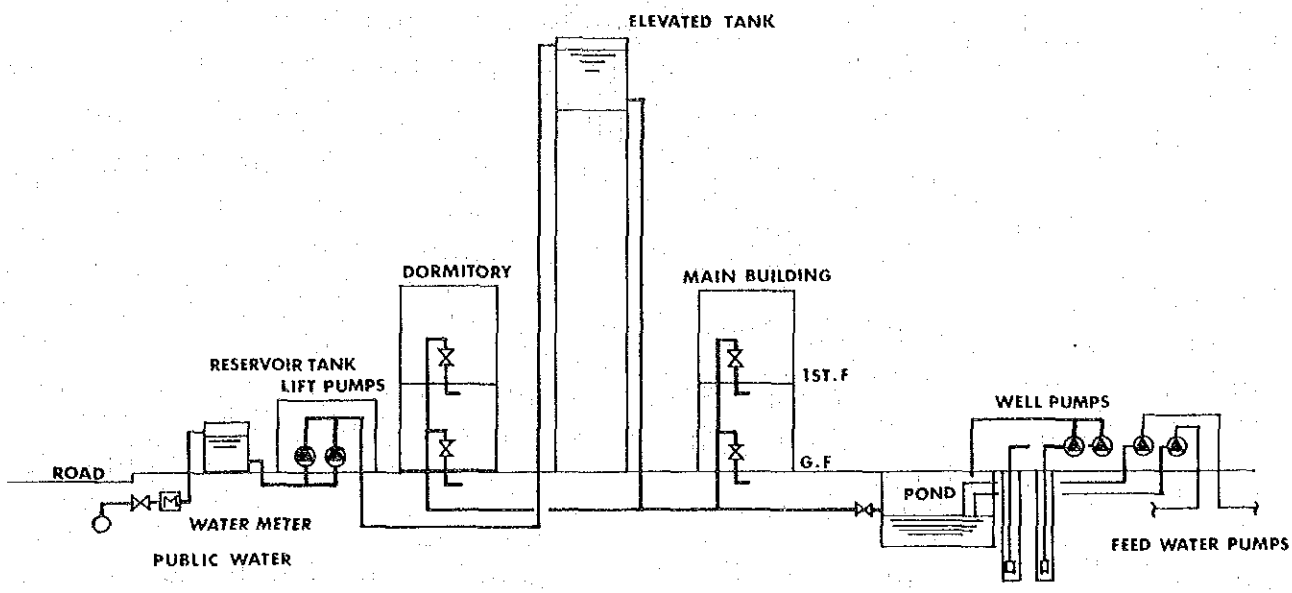


Fig. 5-2 WATER SUPPLY

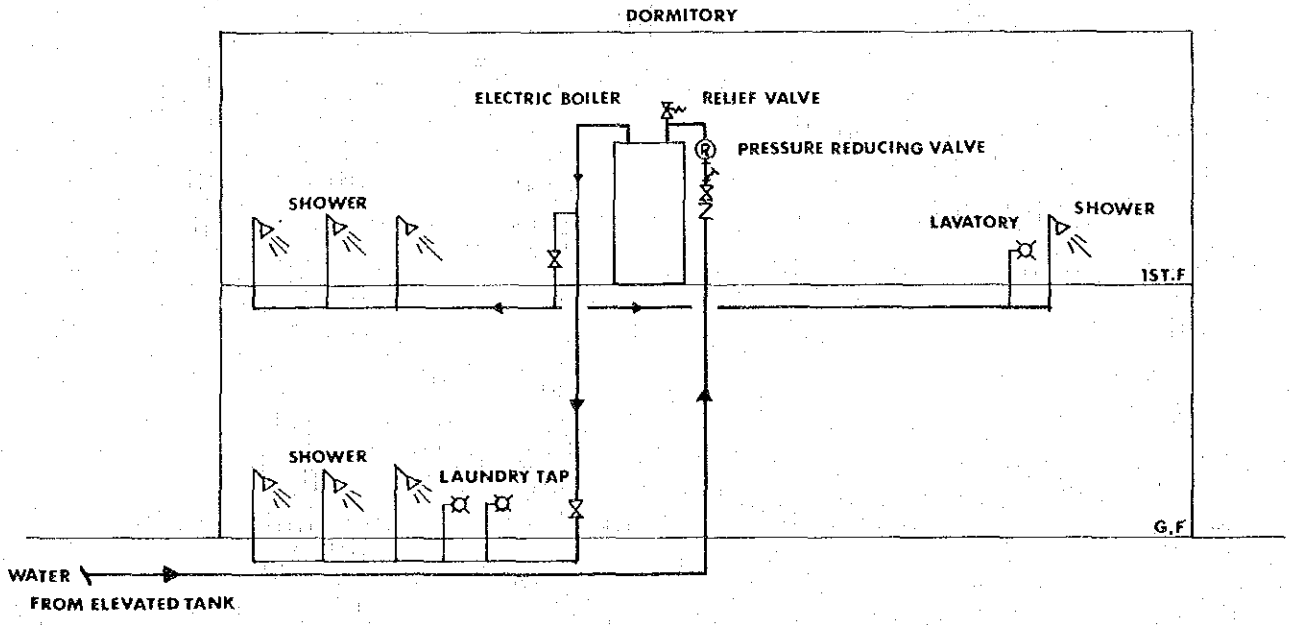


Fig. 5-3 HOTWATER SUPPLY

(5) Electrical Works Design

Required installations are in principle selected according to the Japanese Industrial Standards (JIS) and the Standards of the Japanese Electrotechnical Committee (JEC), Standards of the Japan Electrical Manufacturer's Association (JEM) but some modifications are made taking due note of the special circumstances in Egypt.

1) Design criteria

a) Lighting requirements for major rooms

* Auditorium	500 lx
* Manager's room	300 lx
* Conference room	300 lx
* Library	300 lx
* Laboratory	300 lx
* Director's room	300 lx
* Meeting room	300 lx
* Lecture rooms	300 lx
* Entrance lobby	100 lx
* Toilets	100 lx
* Corridors, store rooms	50-75 lx

b) Allowances for voltage drop

* Low-voltage feeder lines 3% and less
* Low-voltage branch lines 2% and less

2) Power source

Power to be supplied to the project is as follows;

High voltage line	: 3 Ø 3 W, 6.6 KV
Frequency	: 50 HZ
Installations Capacity	: 250 KVA

3) Substation Facilities

Substations are covered with a protective structure as a safety precaution and designed to allow easy maintenance.

Distribution Transformer	: 150 KVA x2
Standard voltage	; 6.6 KV - 380/220 V 3 Ø 4 W

4) Lighting System

Fluorescent lamps will be mostly used in accordance with the illumination requirements. The auditorium will be illuminated with high pressure mercury vapour lamps intermixed with some incandescent lamps. Variable incandescent lamps will be used so that they can be dimmed while audiovisual apparatus is being in use.

5) Feeder Lines and Electrical Power Facilities

Feeder lines will be wired from the main panel to the respective control panels and lighting panels. The motor power distribution system will be fully automated, but the air conditioners and ventilation fans will be manually controlled.

6) Telephone Pipings and Interphone

Each room of the dormitory will be provided with an interphone, with parent intercom installed in the janitor's room.

For Telephone Equipments in the main building and dormitory, it will be install piping system to several administrative rooms.

7) Public Address System

The amplifier and associated apparatus will be installed in the room for the administration office and speakers will be installed at several places in the corridors and at the water tower. The auditorium will be provided with a separate broadcasting apparatus for audio-visual presentation.

8) TV Master Antenna System

TV System antenna are installed on the roof top of the dormitory, and received at selected places in the building. Transmitted signals will have to be strong enough for color television.

9) Alarm

Switches for alarm bells will be provided in the corridors and selected rooms.

10) Stand-by Generator

An air-cooled diesel generator (100 KVA) will be installed to provide electricity to selected places in the main building and the dormitory, and to power parts of water supply and sewage systems and laboratory equipment. The generator will be designed to start automatically but to the stopped manually. The fuel tank will have the capacity to supply power for the duration of three days.

11) Lightning Equipment

A lightning conductor will be installed on the top of the water tower.

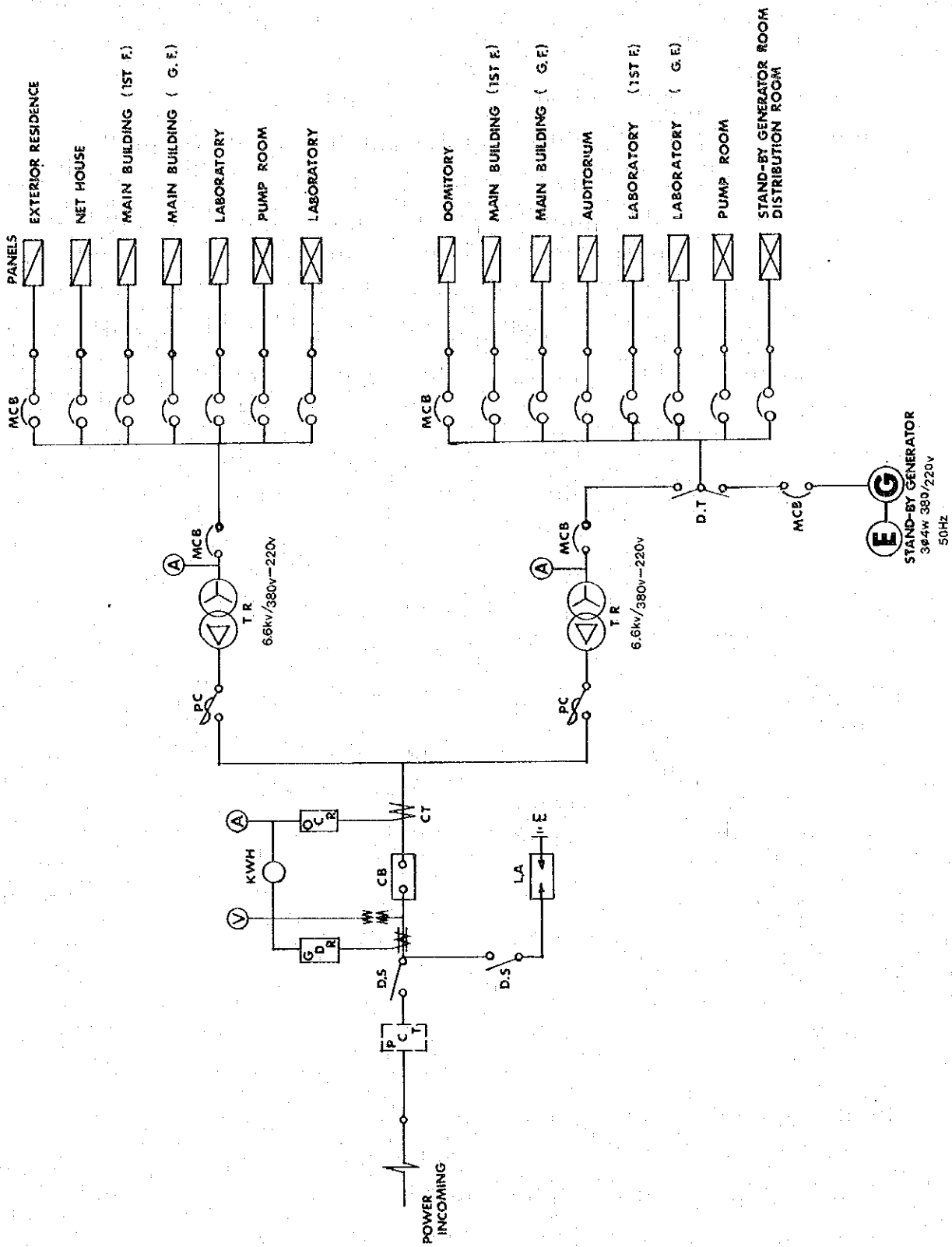


Fig. 5-4 POWER DISTRIBUTION SYSTEM

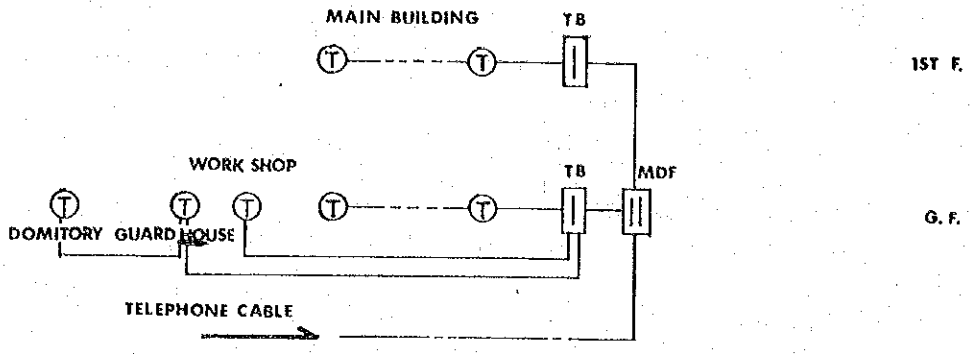


Fig. 5-5 TELEPHONE SYSTEM

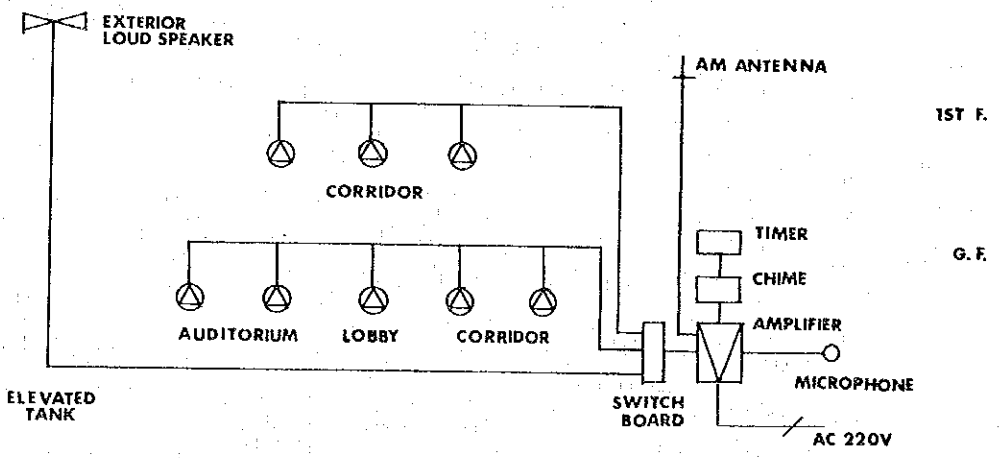


Fig. 5-6 PUBLIC ADDRESS SYSTEM

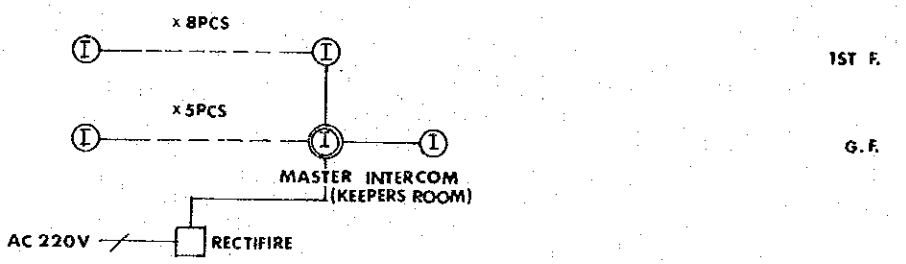


Fig. 5-7 INTERCOM SYSTEM

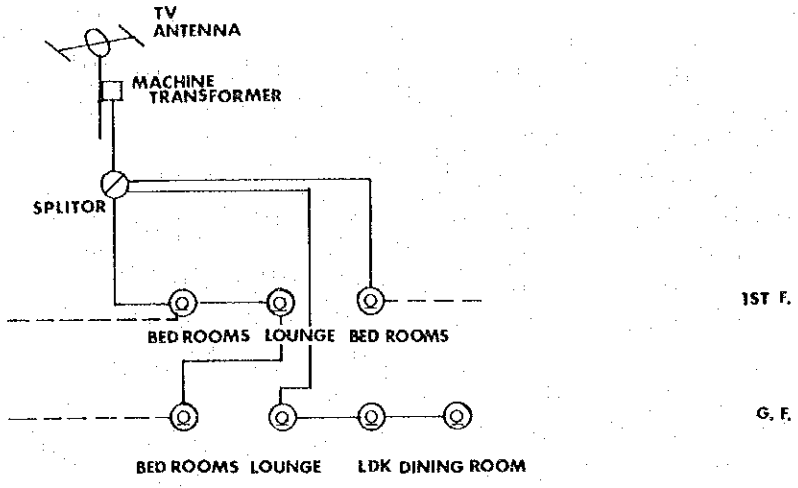


Fig. 5-8 T.V. ANTENNA SYSTEM

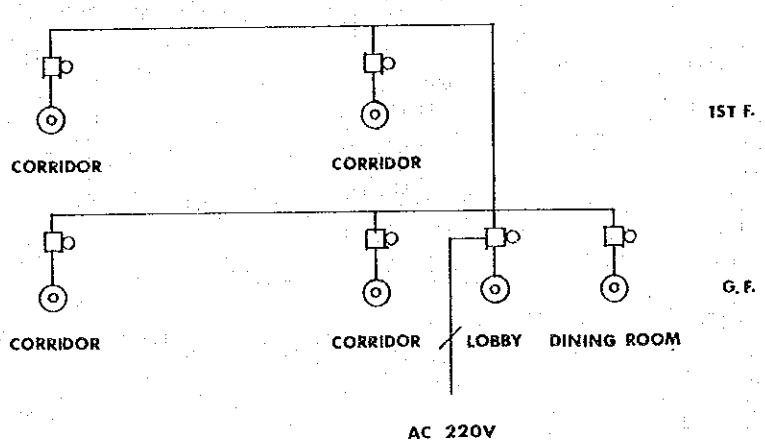


Fig. 5-9 ALARM SYSTEM

5-2-3 Other facilities on site

(1) Facilities

1) Outside Toilet

2) Guard box

3) Fuel storage

4) Pond

5) Pump shed

6) Water reservoir

7) Elevated tank

8) Incinerator

9) Gas cylinder storage

10) Concrete paved working area

(2) Pavement

1) Asphalt pavement

5-2-4 Planning of Machinery and Equipment

(1) Outlines of planning

The required machinery and equipment for the project are

1) Agricultural machinery

2) Research testing equipment

3) Maintenance equipment for agricultural machinery

4) Audio-visual training equipment

5) Fertilizer, seedling and agricultural chemicals

Out of the above five items 1), 2) and 5) will be provided under technical cooperation. Based on the results of testing and research at Kallin experimental field, the most suitable machinery and equipment will be selected for the center. For grant basis, 3) maintenance equipment for agricultural machinery. 4), audio-visual training equipment have been selected for the research, training and demonstration programs.

(2) List of machinery and equipment

1) WORKSHOP EQUIPMENTS

Item	Description
	(A) LIFTING EQUIPMENT
A-1	Hydraulic Garage Jack, 5 ton
A-2	Portable Hydraulic Jack, 2 ton
A-3	Portable Hydraulic Jack, 3 ton
A-4	Chain Block, 1 ton
A-5	Chain Block, 3 ton
	(B) WASHING & LUBRICATING EQUIPMENT
B-1	Parts Cleaner, 970x690x1,270 14 l/min.
B-2	Oil Lubricator, 18 liter
B-3	Chassis Lubricator, 450 g/min.
B-4	High Pressure Grease Gun, 500 cc
B-5	Oil Measure, 2 liter
B-6	Pistol Oiler, 250 cc
B-7	Gasoline Can, 20 liter
B-8	Drum Pump, 1 l/stroke
B-9	Drum Can Opener Spanner, 590 mm
B-10	Oil Filter Wrench, 2 pcs/set
B-11	High Pressure Car Washer, 25 l/min.
	(C) TIRE SERVICE EQUIPMENT
C-1	Tire Gauge, 8 kg/cm^2
C-2	Tube Heating Pressure, 10 kg/cm^2
C-3	Hot Patch, 43x33 100 pcs/set
C-4	Hot Patch Clamp

Item	Description
C-5	Tire Service Tool Set 830x650 mm
C-6	Brake Adjust Wrench Set, BAW - 1.2.3.4
	(D) AIR OPERATING EQUIPMENT
D-1	Air Compressor, 7.5 KW
D-2	Air Transformer, 0-14 kg/cm^2
D-3	Wider Spray Gun, 2.0 mmø
D-4	Wider Spray Gun, 1.3 mmø
D-5	Air Disc Sander, 100 mmø
	(E) BUMPING AND WELDING EQUIPMENT
E-1	Tinner's Shear, 240 mm
E-2	Tinner's Shear, 240 mm
E-3	Tinner's Shear, 240 mm
E-4	Hacksaw Blade, 250 mm
E-5	Hacksaw Frame, 250 mm
E-6	Gasoline Torch Lamp, 1 liter
E-7	C-Clamp, 0-100 mm
E-8	C-Clamp, 0-150 mm
E-9	Vice Grip Plier, 1,500 kg
E-10	AC Arc Welder, 200A
E-11	Welding Accessories
E-12	Gas Cutting Torch, 450 mm
E-13	Gas Cutting Torch, 530 mm
E-14	Combination Torch Set
E-15	Gas Welding & Cutting Accessories
E-16	Anvil, 30 kgs
E-17	Anvil, 70 kgs
E-18	Swage Block, 55 kgs

Item	Description
	(F) ELECTRIC EQUIPMENT
F-1	Armature Tester
F-2	Battery Charger, 75V 20A
F-3	Battery Hydrometer
F-4	Battery Cable, 200A
F-5	Hold Plug Wrench Set
F-6	Portable Electric Drill, 13 mm
F-7	Portable Electric Drill, 20 mm
F-8	Drill Set, 25 pcs/set
F-9	Portable Electric Grinder, 125x19x12.7 mm
F-10	Electric Bench Grinder, 305x32x25.4 mm
F-11	Accessories for Grinder
F-12	High Speed Cut Off Machine, 115 mm
F-13	Portable Electric Disc Grinder, 100 mm
F-14	Portable Electric Disc Grinder, 180 mm
F-15	Accessories for Disc Sander
	(G) MACHINE
G-1	Precision High Speed Lathe with Standard Accessories
G-2	Upright Drilling Machine with Standard Accessories
G-3	Universal Milling Machine with Standard Accessories
	(H) MEASURING EQUIPMENT
H-1	Vernier Caliper, 150 mm
H-2	Vernier Caliper, 300 mm
H-3	Outside Micrometer Set
H-4	Inside Micrometer Set, 50-150 mm
H-5	Outside Caliper, 0-150 mm

Item	Description
H-6	Outside Caliper, 0-200 mm
H-7	Outside Caliper, 0-300 mm
H-8	Inside Caliper, 0-150 mm
H-9	Inside Caliper, 0-200 mm
H-10	Inside Caliper, 0-300 mm
H-11	Steel Compass, 0-150 mm
H-12	Steel Compass, 0-200 mm
H-13	Stainless Steel Rule, 300 mm
H-14	Stainless Steel Rule, 1,000 mm
H-15	Surface Plate, 900x900x150 mm
H-16	Steel Square, 200x130 mm
H-17	Steel Square, 300x200 mm
H-18	V-Block, 100x55x38 mm
H-19	Surface Gauge, 250 mm
H-20	Surface Gauge, 400 mm
H-21	Thermometer (Alcohol) 0-150°C

2) EDUCATIONAL TRAINING EQUIPMENT

Items	
	(J) AUDIO-VISUAL EQUIPMENT
J-1	16 mm Movie Camera
J-2	16 mm Projector
J-3	Screen
J-4	Color Film Processor
J-5	Slide Projector
J-6	Over-head Projector
J-7	Camera
J-8	Interchangeable lens
J-9	Developing equipment
J-10	Tape Recorder
J-11	Wireless Speaker
J-12	Enlarging Equipment
J-13	Rotary Mimeograph
J-14	Drawings of Disassembled Agricultural Machinery