THE ARAB REPUBLIC OF EGYPT

RICE MECHANIZATION PILOT PROJECT
DETAIL DESIGN REPORT
ON
PILOT INFRASTRUCTURE IMPROVEMENT WORKS

DECEMBER, 1988

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

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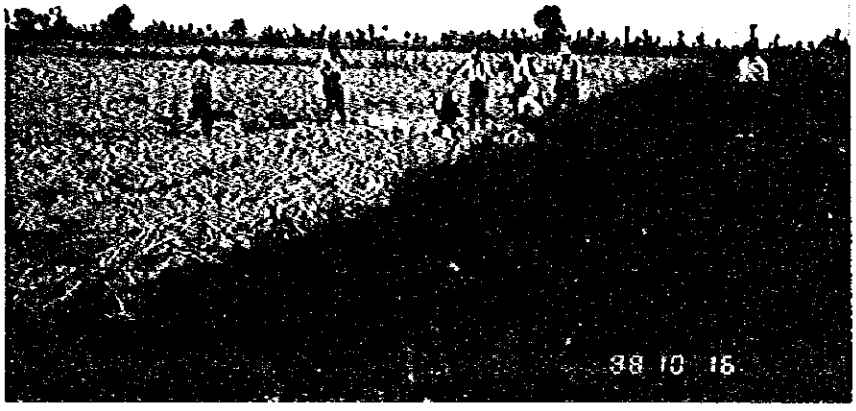
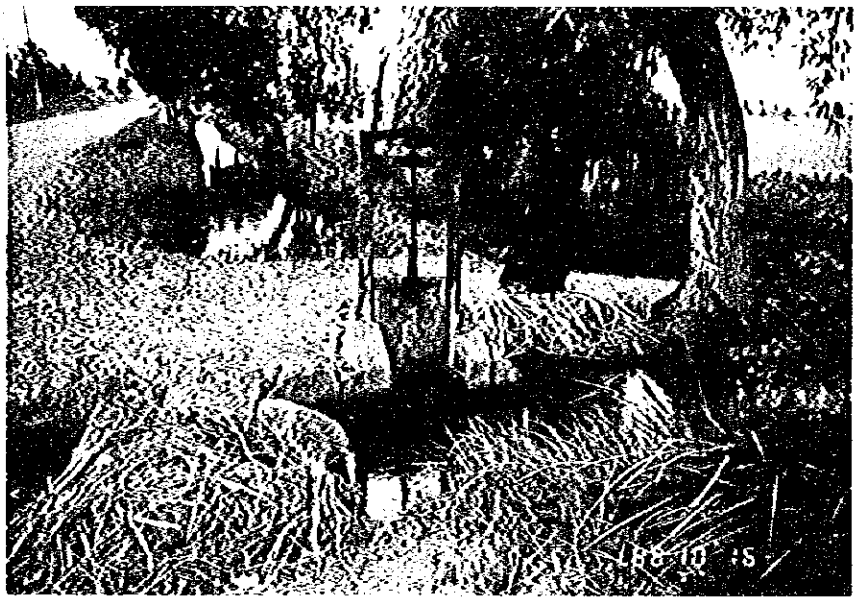


CAIMMEZA FARM

EXISTING FARMROAD
& DRAIN CANAL



CAIMMEZA FARM

INTAKE
& IRRIGATION
CANAL

MESSER FARM

PUMP STATION

MESSER FARM

DRAIN CANAL
& ROAD CROSSING
CULVERT

SAFT KHALED FARM

FARM ROAD
& IRRIGATION
CANAL

SAFT KHALED FARM

INTAKE PLACE

SERRM FARM

PADDY FIELD AFTER HARVESTING

SERRM FARM

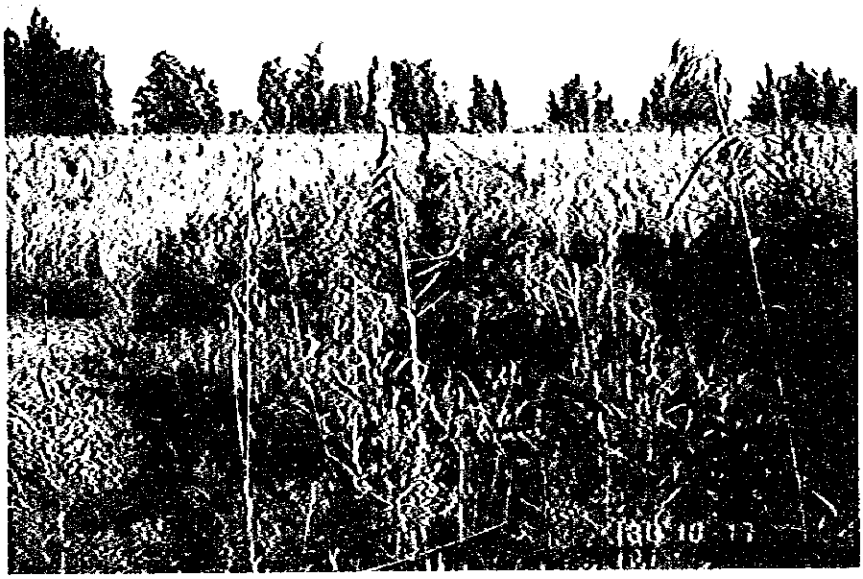
INTAKE PLACE

SERRM FARM

MAIN IRRIGATION CANAL

EDFINA FARM

IRRIGATION CANAL



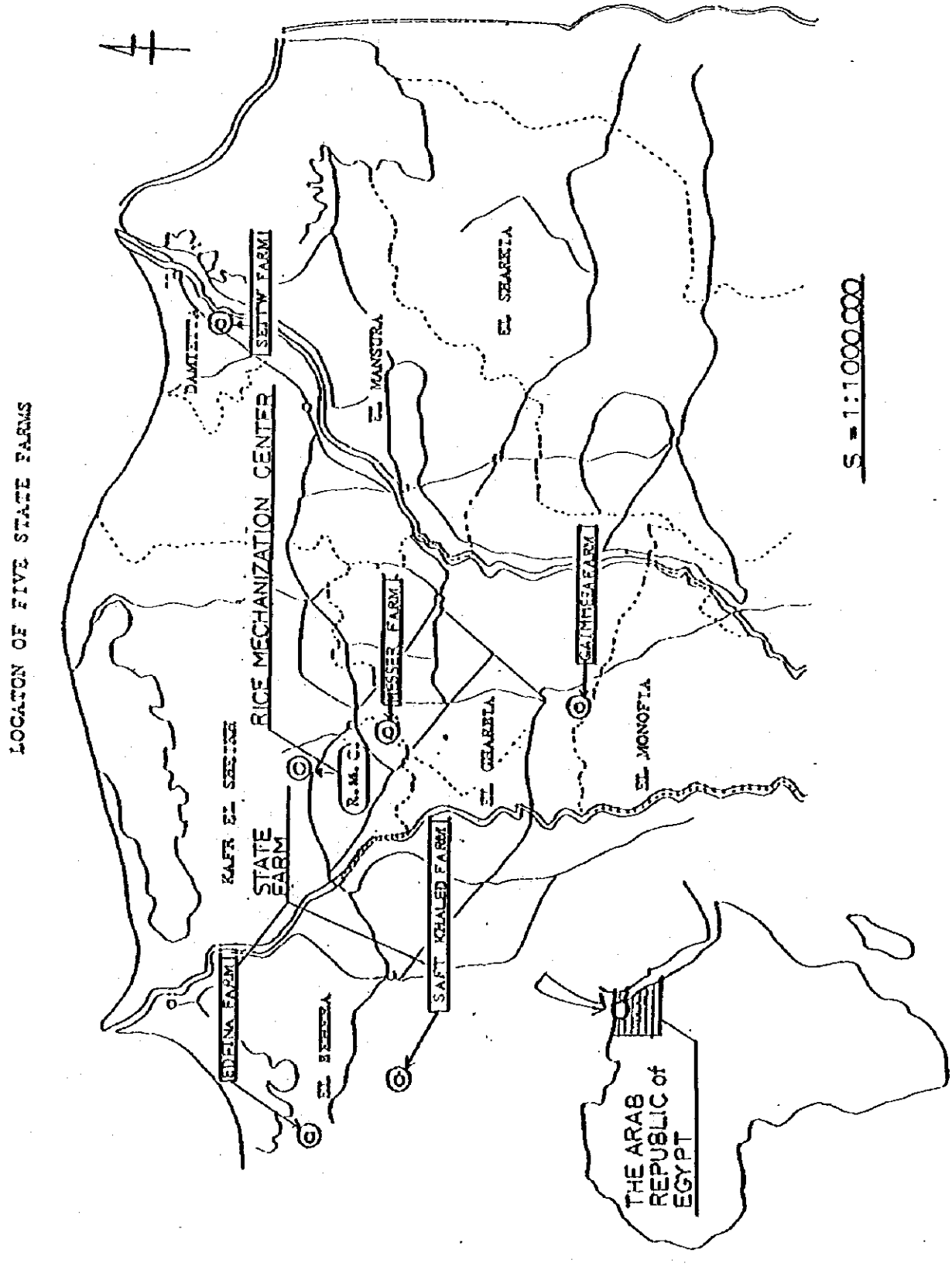
EDFINA FARM

DRAIN CANAL

EDFINA FARM

ADJACENT VILLAGE

LOCATION MAP OF THE RROJECT SITE



Abbreviation

JICA	: Japan International Cooperation Agency
MOA	: Ministry of Agriculture
MOI	: Ministry of Irrigation
IAM	: Institute of Agricultural Mechanization
RMC	: Rice Mechanization Center
RMP	: Rice Mechanization Project
LE	: Egyptian Pound
Feddan	: 0.42 hectare
ha	: Hectare
P.S.	: Pump Station

CONTENTS

APPENDIX

Chapter 1. Basic Principles of Design

In this project, a mechanized rice farming system that has been introduced by the past technical cooperation is being demonstrated and promoted at five satellite farms in the Nile Delta. Nevertheless, the progress of the project is seriously hindered by the fact that these five farms are not adequately equipped with the roads, farming machine entrances to the rice paddy fields, irrigation and drain canals etc. Since the principle of this pilot infra establishment project aims at extension of the system to farmers, the system must conform with the reality of the surroundings. Therefore, the following basic principles are closely followed:

1. Farm roads and farming machine entrances.

Since the Egyptian farms are generally made of large plots (Ex. 500 m x 420 m = 50 feddan.), to increase the effectiveness of a mechanized farming system, it is necessary to facilitate farm roads for transporting farming machines, seedling boxes, manure, etc. Also, farming machine entrances to the field block are necessary. Though these items are the necessities of the project, they have to be consistent with the reality of the surrounding area (one lane, dirt surface, etc.). Each farm is equipped with farm roads which were built as a temporal procedure in the spring of 1988. This basic layout is to be accepted and the necessary rehabilitation is to be given. Additional roads are to be built whereever needed.

2. Irrigation and drain facilities

This project solely aims at improved labor effectiveness and economic efficiency by the mechanization of the rice farming system. It is, therefore, out of the scope to introduce any sophisticated system such as drain facilities for desalination, etc. ; and the aimed level of the establishment is equivalent to the ones in the surrounding area.

CHAPTER 2. On-site Investigation

2-1 Soils

The soils of the five satellite pilot farms are predominantly clay though some differences were observed among them. The soils at the Serrw Farm and the Edfina Farm consist of saline clay with high salt content and hence, yield less amount of harvest in comparison to other satellite farms. At three other farms, silty clay is predominant and relatively high yields of the crops are commonly observed.

Table 2.1 Comparison of Soils of Satellite farms

Farm	Soil	Average Yield	Other Products
Gaimmeza	Clay Loam	3 t/fed.	maize, cotton, barley, bean wheat, potato, onion
Messer	Clay Loam	1.9 t/fed.	cotton, maize, wheat
Saft Khaled	Silty Clay	3 t/fed.	cotton, maize, wheat, soy bean
Serrw	Saline Clay	1.5 t/fed.	alfalfa, wheat, barley
Edfina	Saline Clay	1.5-2.0 t/fed.	wheat, barley

2-2 Quality of Water

The analysis of the water from these farms exhibits high pH alkaline content, typical for the water in the Nile Delta. As for the salt content, Serrw and Edfina exhibit high values. It is believed that the high salt content is responsible for the low yields of rice at these two farms.

Table 2.2 Comparison of Salt Contents in Water

Farm	Analysis in April, 1987				Analysis in Oct. 1988
	Irrigation		Drain		EC (ms/cm)
	pH	EC(ms/cm)	pH	EC	
Gaimmeza	7.8	.26	8.1	.54	.37 (Oct. the 30th)
Messer	8.0	.20	8.5	.78	.32 (Oct. the 26th)
Saft Khaled	7.8	.30	8.3	1.40	.40 (Oct. the 27th)
Serrw	8.1	1.80	8.2	2.70	.75 (Oct. the 29th)
Edfina	7.4	1.80	8.4	2.60	2.3 (Oct. the 31st)
Note	"Salt Injuries for Rice Plants", Sep. 1988, JICA				By present analysis

2-3 Load Bearing Capacity of Soil and Water Requirement in Depth

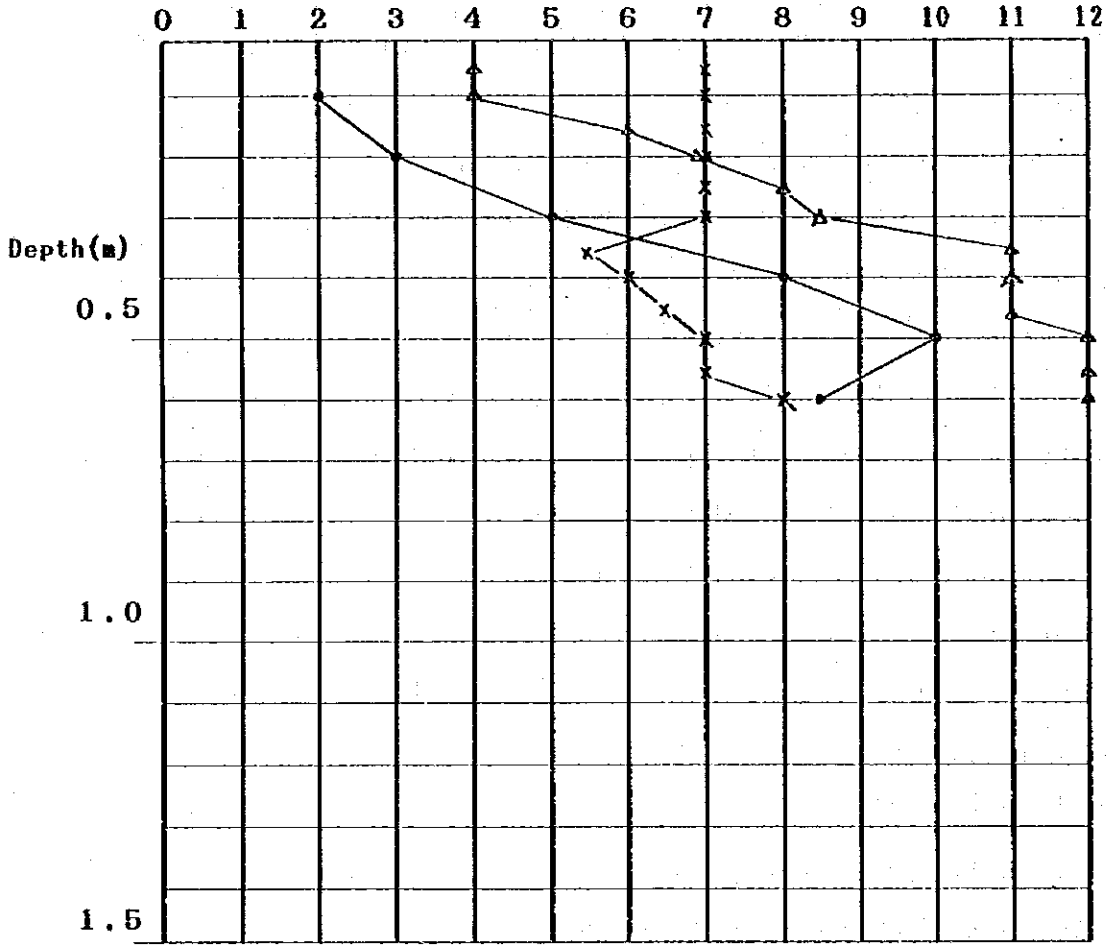
Since the soil properties of the five farms do not differ much, the load bearing capacities should not vary much. Based on this objective judgement, the load bearing capacity of the soil was measured only at the Messer farm as a representative of the five.

The result is shown in Fig. 3.1, on which no foreseeable problem is observed judging from the fact that the strength is more than 2 Kg/cm^2 at the depth of 10 cm from the surface. The minimum value desired for the construction machine operation is 1.5 Kg/cm^2. The soil is fine grain alluvium with clay. As such, very little percolation loss of 2 mm depth is expected to be sufficient. The total water requirement is as follows:

Water depth for puddling : 150-200 mm/day
(Report on Survey for Five Satellite Fields on RMPP, May 1987, JICA)

Total water duty for irrigation : 9.3 mm/day
(Survey Report for Detail Design on RMPP, May 1982, JICA)

Fig2. 1 Soil Bearing Capacity (kg/㎠)



TESTED POINT. Messer Farm

● The 1st Try

× 〃 2nd 〃

Δ 〃 3rd 〃

Vertical Angle 30° Base Area 2 ㎠

2-4 The Gaimmeza Farm

2-4-1 General Description

This farm is located in the center of the Nile Delta, 60 Km south of RMC, Gharbia Governorate. The total area of this farm is 1500 feddan, 150 feddan of which is used for growing rice, and another area is used for maize, cotton, barley, wheat, bean, potato, onion, etc. The average yield of rice is 3 t/feddan, which is relatively high. The soil is clay loam. The water supply is sufficient and no problem has occurred from the salt concentration. The farm for the present investigation is plot No. 2 at Bandara District, which covers 45 feddan. The south side of the farm faces to the main irrigation canal form P.S. No. 1 from which the water is supplied.

2-4-2 Irrigation and Drainage Status

The water for irrigation is provided from the canal, pump station No. 1 (pumped up from the Baher Shibin Canal). Its intakes are located as follows; two on the south side and one on the east side. The block east of the existing road is supplied water by the east side intake and the west block by the south intakes. By using the north side intake whenever water supply is insufficient in the north side of the west block, uninterrupted water supply is guaranteed. Since water continuously flows in the main canal, whenever the water supply becomes insufficient at the downstream side Plot No. 1 (pumped up from the Ganabiya Canal during a 4 day cyole), the water in the main canal is used by

closing the south intake and therefore making more water available for the Plot No.1. The drain canal is placed in the north side, along the east side of the road, and in the west side. The north and the east side canals lead to the north, and the west side canal to the south.

2-4-3 Field Elevation

The number in Fig. 2.2 represents the field elevations, the elevation of the bottom of the canals, and the elevation of the road surfaces. These elevations are measured with respect to the tentative reference elevation of EL=10 m made as a bench mark during the survey. The elevation of a field is the average of 3 to 5 measurement points.

The site is generally flat. The east side slightly goes down to the north and the west side to the south. The end of the drainage is at northeast and southwest corners, conforming logically to the geodesic nature of the earth surface. Some area in the northwest side has about a 5 cm. uplift, which requires a movable pump for the smooth supply of water.

2-4-4 Roads and Entrances to the Field

There is only one road in the farm running north-south on the east side, which does not satisfy the needs of farming. Also, though there are one entrance to the field on the west side and three on the south side, these are grossly under the sufficient level. Therefore, construction of new roads and entrances to the fields are needed. Because of the only 20 cm. difference in

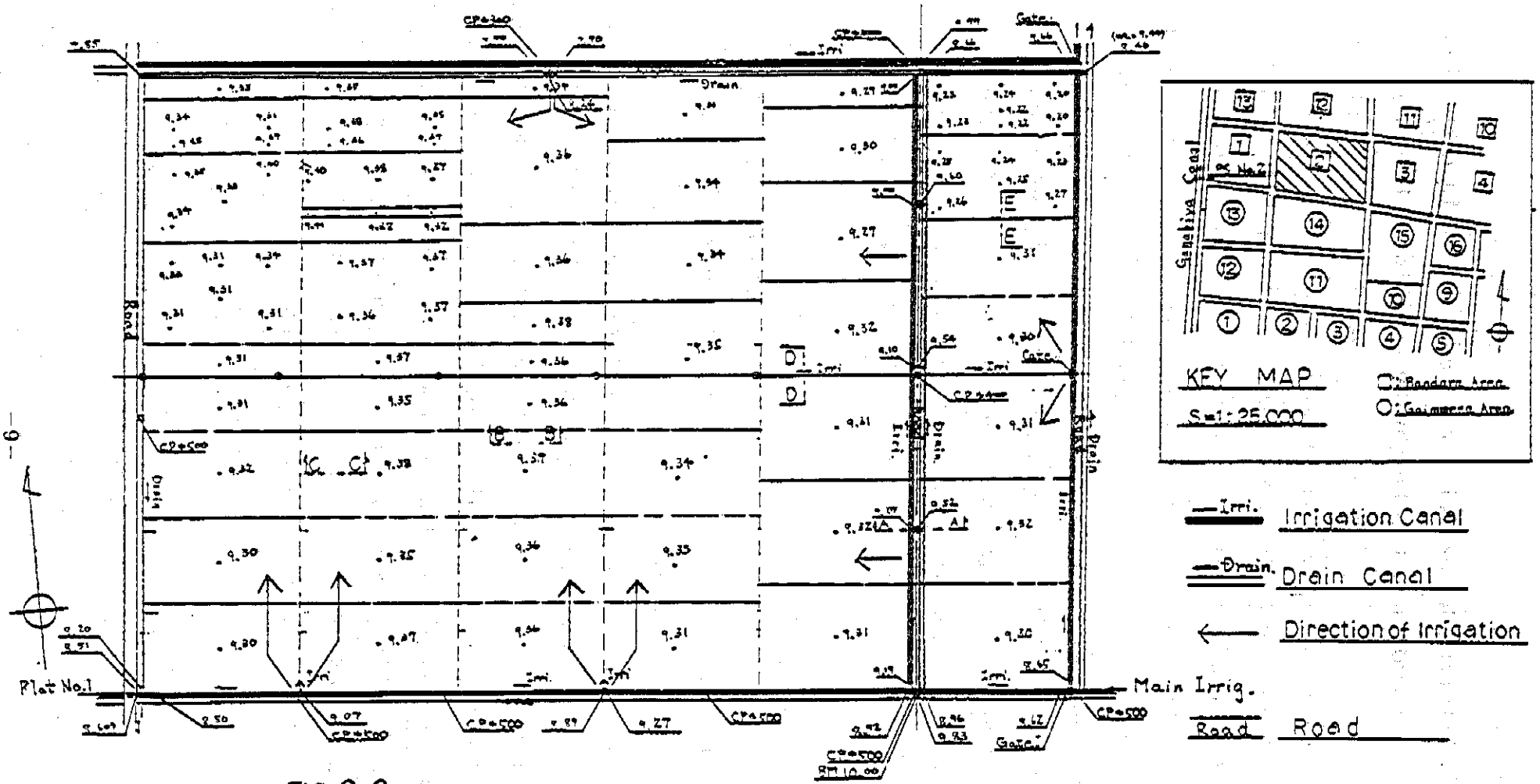


Fig. 2.2

PLAN of EXISTING FACILITIES

GAIMMEZA SATELLITE FARM (BANDARA PLOT NO.2)

S = 1:5,000

elevations between the existing road and the field elevation, it is necessary to elevate the height by additional banking.

2-5 The Messer Farm

2-5-1 General Description

This farm is located at the center of the Nile Delta, 30 km. from RMC, in Kafel Sheikh Governorate. The total area is 1700 feddan and 400 feddan of which is used for growing rice. Other products are cotton, maize, wheat, etc. The average yield of rice is 1.9 t/feddan. The soil is clay loam. The water supply is relatively good and no problem from the salt concentration has been experienced. The farm for the present investigation is Plot No.4-1 and 4-2 (Farm II), 46 feddan in size. The water is pumped up from the Kahoageiya Canal (pump station No. 1 and 2) to the irrigation canal by a 10-inch pump.

2-5-2 Irrigation and Drainage Status

The irrigation water is provided from the Kahoageiya Canal. The main irrigation canal receives pumped water from Pump station No. 1 in the north side of the farm (16-inch pump) and supplies water to Farm II. The main canal in the south side accepts water from Pump Station No. 2 (12-inch pump) and supplies to Farm III. The farm for the present investigation receives water from P.S. No. 1. Water is pumped up into the irrigation canals from the Kahoageiya canal by a 10-inch pump. Sub-irrigation canals are built around segments of a farm for easy irrigation. The irrigation canals, however, are insufficiently built and improvements for the following problems are required.

a) The 10-inch pump is aged and frequent failures are experienced.

b) There are no irrigation canals in the south side, and hence the water supply to the south field is not appropriate. Presently, therefore, an additional water supply is made occasionally from the drain which tentatively accepts irrigation water from the main canal in the south.

c) The difference of the elevations between the sub-irrigation canals and fields is small (0 to 10 cm). The drains run east and west and meet the central drain. The drain canal runs farther down from the main drain canal in the south-east to the Birsh Drain in the south. Because of the fact that the south drain has hardly any gradient and sizable sediments have accumulated in the vicinity of the meeting point with the center drain, it is necessary to dredge and reshape the bottom of the canal. Finally, the culverts built at the intersect of the road and the drain in the east side and center part of the farm are aged and dilapidated. It is suggested that these culverts be replaced. (See Fig. 2.3)

2-5-3 Field Elevation

The surveyed results (Fig. 2.3) of the field elevation show a slope to the south side of the central drain. The irrigation canals and drains are appropriately situated.

2-5-5 Road and Entrances to the Field

A road runs east and west in the center of the farm. The

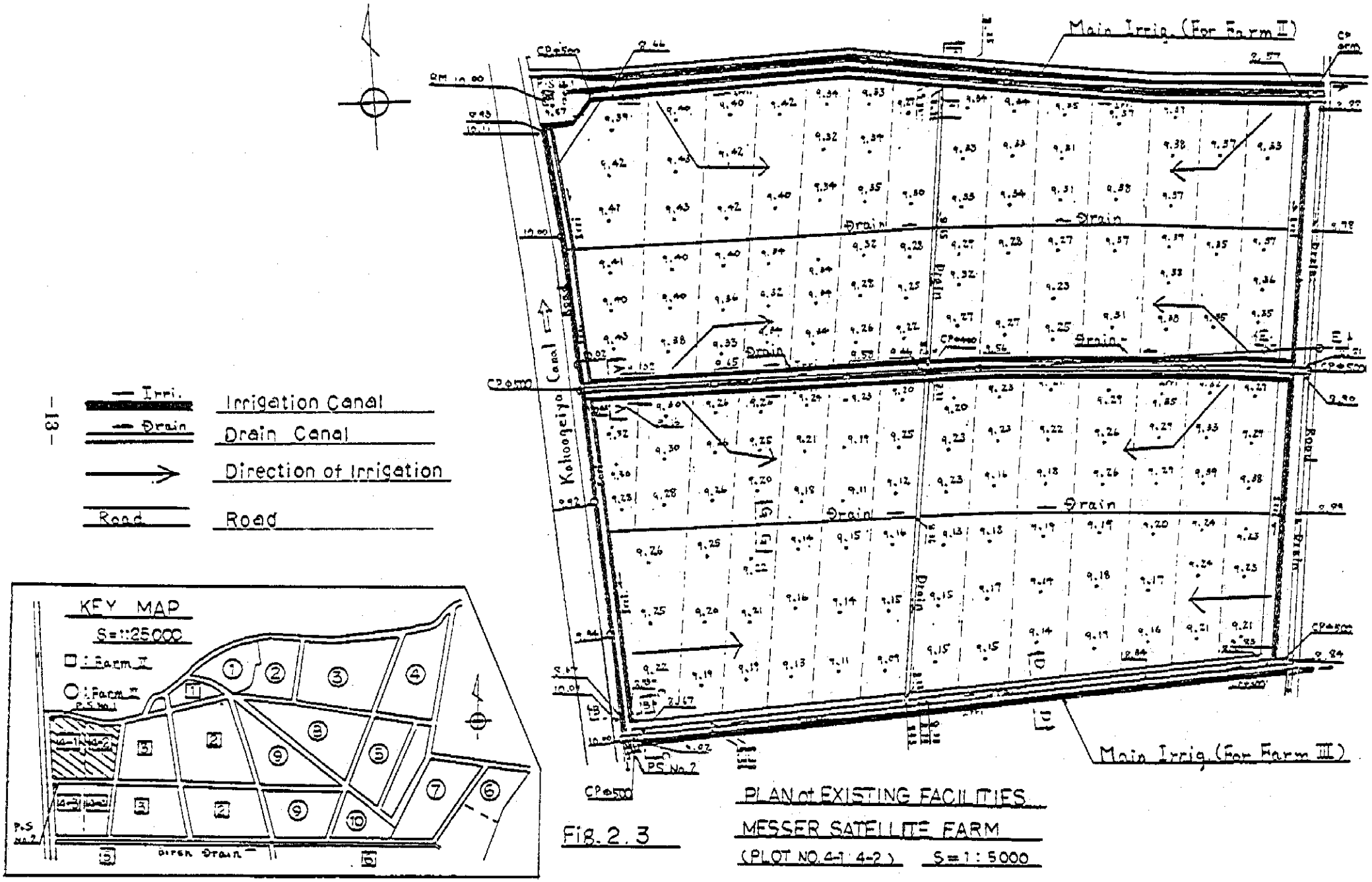


Fig. 2.3 PLAN of EXISTING FACILITIES
MESSER SATELLITE FARM
(PLOT NO. 4-1, 4-2) S = 1 : 5000

width (3.2 m), however, is not enough for the present needs. In addition, the surface has many ups and downs because of the land subsidence. Reconstruction is recommended. Other roads, however, are running along the canal surrounding the farm, no additional road construction is needed. No entrances to the fields are provided and a pile of straw is thrown in the canal as a substitute entrance whenever a farming machine must enter the field.

2-6 The Saft Khaled Farm

2-6-1 General Description

It is located at 60 Km west of RMC, Beheira Governorate. The total area is 1500 feddan, 300 feddan of which is used for growing rice. Other crops are maize, cotton, barley, wheat, soy beans, etc. The average yield of rice is consistently 3 t/feddan. The soil is silty clay. No problem from salt concentration has been experienced. The total amount of water available for irrigation is, however, very low. The farm for the present investigation is Farm II, Plot No. 2, 53 feddan in size. The north side faces to the main irrigation canal to which P.S. No. 1 provides water. The water supply to this farm is from this main canal and in addition from the underground water (P.S. No. 3 and 4).

2-6-2 Irrigation and Drain Status

The water for irrigation is provided from P.S. No. 1 through the main canal that runs along the north side of the farm. The water is pumped up from this main canal to the canals in the farm (five days in field puddling season, four days on-off cycle at regular periods). Since the supply of water frequently runs insufficiently dependent on the needs of other farms, supplemental water supply is made from the following pump stations:

P.S. No. 2 (from the Itai el Brud Drain)

P.S. No. 3 (pumps up underground water)

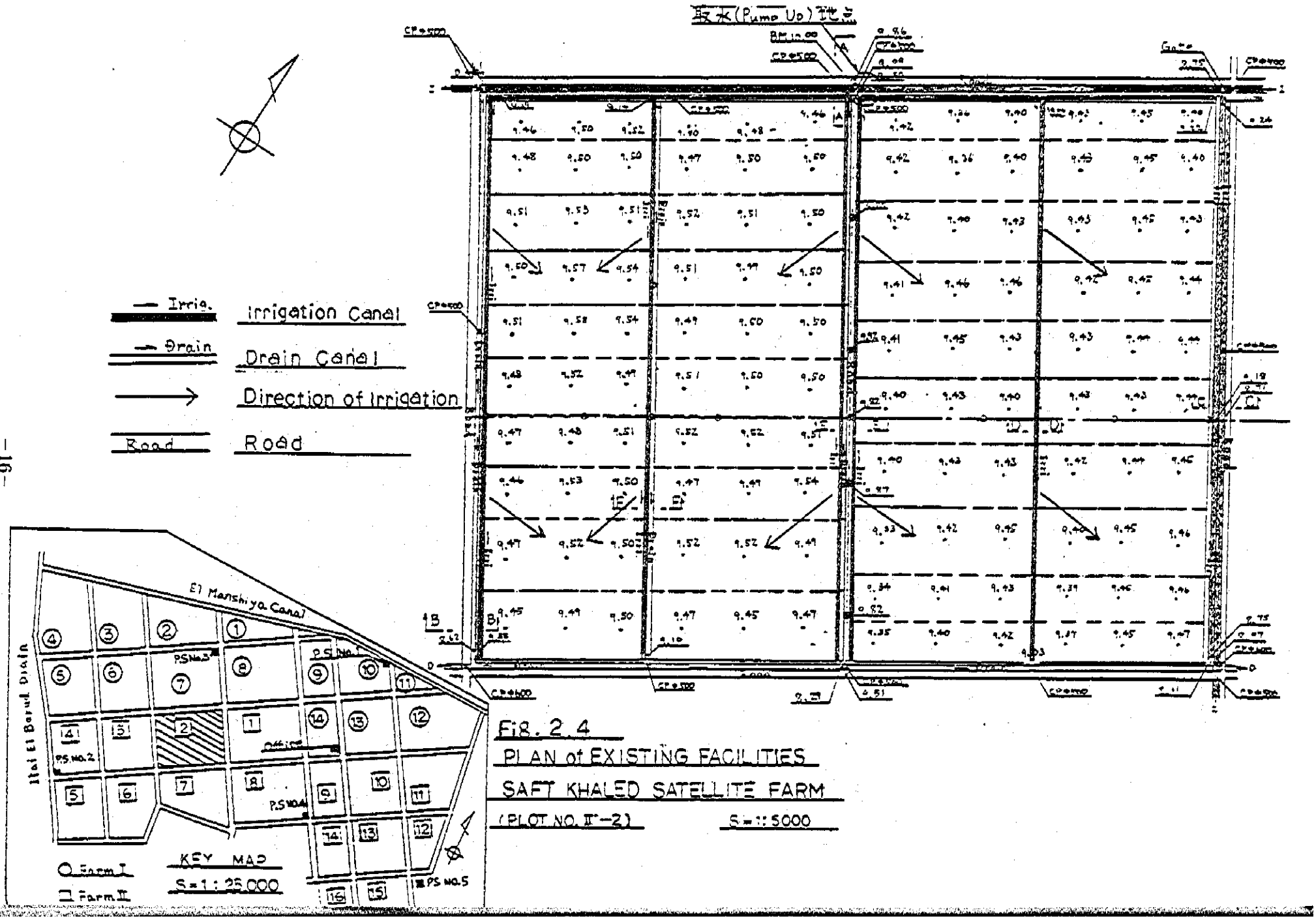


Fig. 2.4

PLAN of EXISTING FACILITIES

SAFT KHALED SATELLITE FARM

(PLOT NO. II-2) S = 1 : 5000

P.S. No. 4 (pumps up underground water)

The intake of water is at the center of the north side where the pumped-up water is distributed to the east, the west and the south canals. The canal at the distribution point is broken. Repair work is desired. The gradient of the canal is nearly level and near the farthest end of the field especially in the south side does not receive enough water. A mobile pump could facilitate a smooth water supply. Except for the field on the west side of the center road, the drain canal is not in contact with the field. The irrigation canals are used commonly as the drain, which flows out to the Itai el Brud Drain. (See Fig. 2.4)

2-6-3 Field Elevation

As shown in Fig. 2.4, this farm is nearly level all over.

2-6-4 Road and Entrances to the Field

Though there exists a road in the center running north and south, the width is not sufficient and reconstruction is needed. Other than that, since the roads are surrounding the farm no more roads are needed. The entrances to the field are located one on each of the north side, the east side and the west side, and two on the south side but more entrances are needed.

2-7 The Serrw Farm

2-7-1 General Description

It is located at 90 Km north east of RMC, Damietta Governorate. The total area is 1200 feddan, 250 feddan of which is used for growing rice. Other crops are alfalfa, wheat, barley, etc. The average yield of rice is as low as 1.5 t/feddan. It is believed that this is due to the saline clay in the soil. The farm for the present investigation is Farm I, Plot No. 4-1 and 5-1, 51 feddan in size. It receives water from the El Shoka Canal which runs along the north side of the farm.

2-7-2 Irrigation and Drainage Status

The source of the irrigation water is the El Shoka Canal running along the north side of the farm. Though there are three intakes of water, the main intake is north of the east side road. The on-off cycle of water supply lasts four days in puddling season and five days in any other season. Since this farm is located at the end of the El Shoka Canal, it is said that the water level frequently goes down. An introduction of pumping equipment is thought to be necessary.

The gradient of the canal is 1/5000 to 1/6000. The flow of the irrigation water is satisfactory except that the slightly high elevation in the south-east field requires the pumping up of water. Presently, P.S. No.3 supplements the water to the west side irrigation canal. Though there are enough drain canals provided, because of the massive vegetation of weeds, an improvement is necessary. The drain water flows out to the Serrw

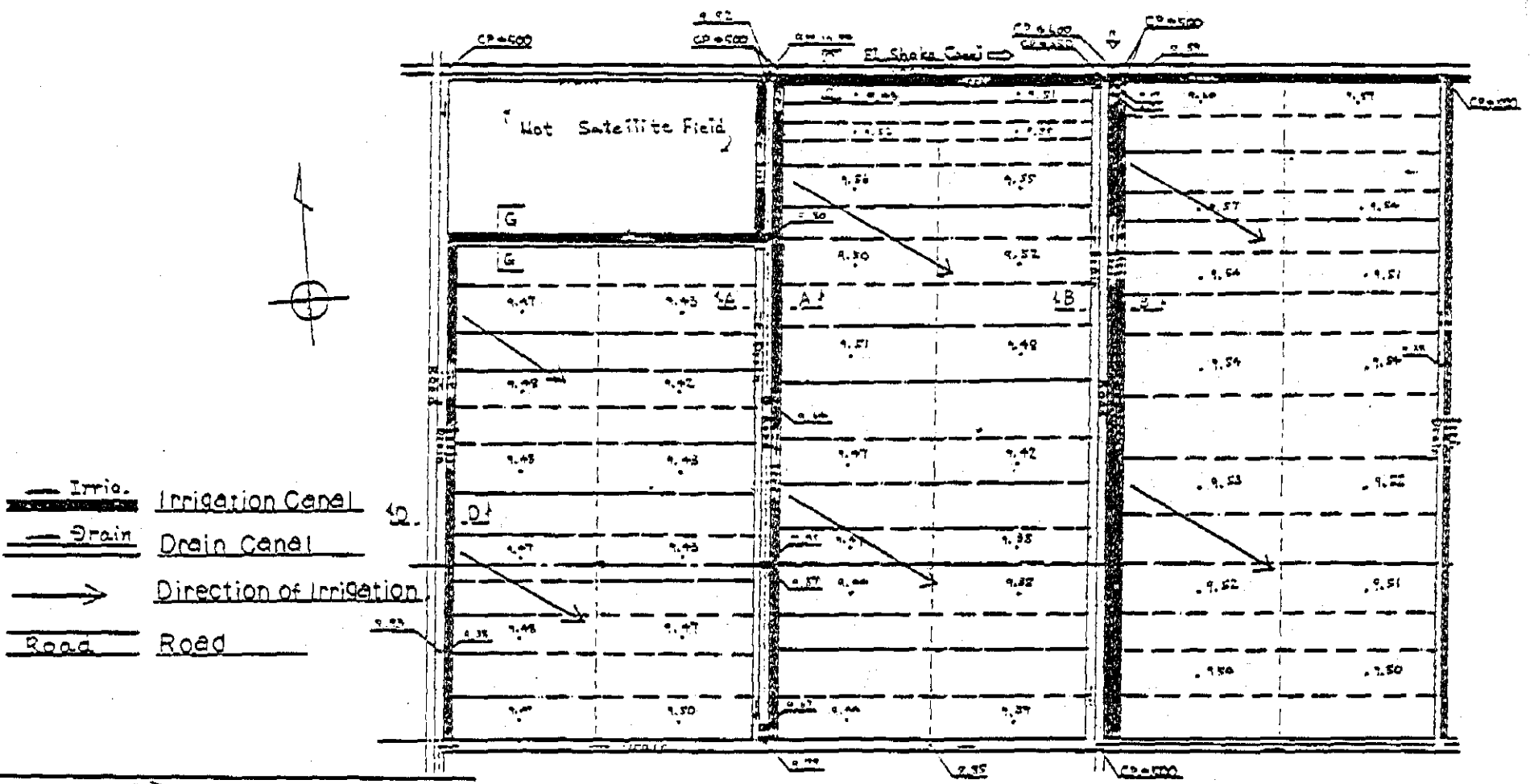


Fig 2.5

PLAN of EXISTING FACILITIES

SERRW SATELLITE FARM (PLOT NO. 4-1, 5-1)

S = 1:5000

Drain Canal at the southeast side. (See Fig. 2.5)

2-7-3 Field Elevation

The result of the survey in Fig. 2.5 shows the east and central fields slightly go down from the north to the south conforming with the direction of the drain. The west fields go up almost 5 cm from the north to the south. It is, therefore, necessary to supplement water from P.S. No. 3 whenever the water level of the El Shoka Canal
is low.

2-7-4 Road and Entrances to the Field

Among these two roads in the farm, the elevation of the west side road in the center is not sufficiently different from the elevation of the field. This makes it necessary to add more height. There is only one entrance to one farm block presently. More entrances are needed.

2-8 The Edfina Farm

2-8-1 General Description

This farm is located 70 Km north west of RMC, Beheira Governorate. Its total area is 400 feddan, 100 of which is used for growing rice. Other products are wheat, barley, etc. The soil is made of saline clay. The average yield of rice is as low as 1.5 to 2.0 t/feddan, possibly because of the high salt content in the irrigation water. Especially at rice transplanting season, the salt content becomes as high as 2,700 micro mho. The farm plot for this investigation is Plot No. 5 whose area is 41 feddan, and the water resource is the El Buseili Drain Canal.

2-8-2 Irrigation and Drainage

The irrigation water is fed from the El Buseilli Drain Canal, and the irrigation canal runs along the south west side of the field. The water flow is controlled at the south corner gate, sent to the canal in the east south side and distributed to four canals in the field. The intake of water to the field is only by natural flow. The gradient of the canal is about 1/1000 which gives relatively easy water supply to the farm except for the south west lots where the elevation is about 10 cm higher. Three drain canals are located logically in the farm which lead to the El Muhit Drain Canal.(See Fig. 2.6)

2-8-3 Field Elevation

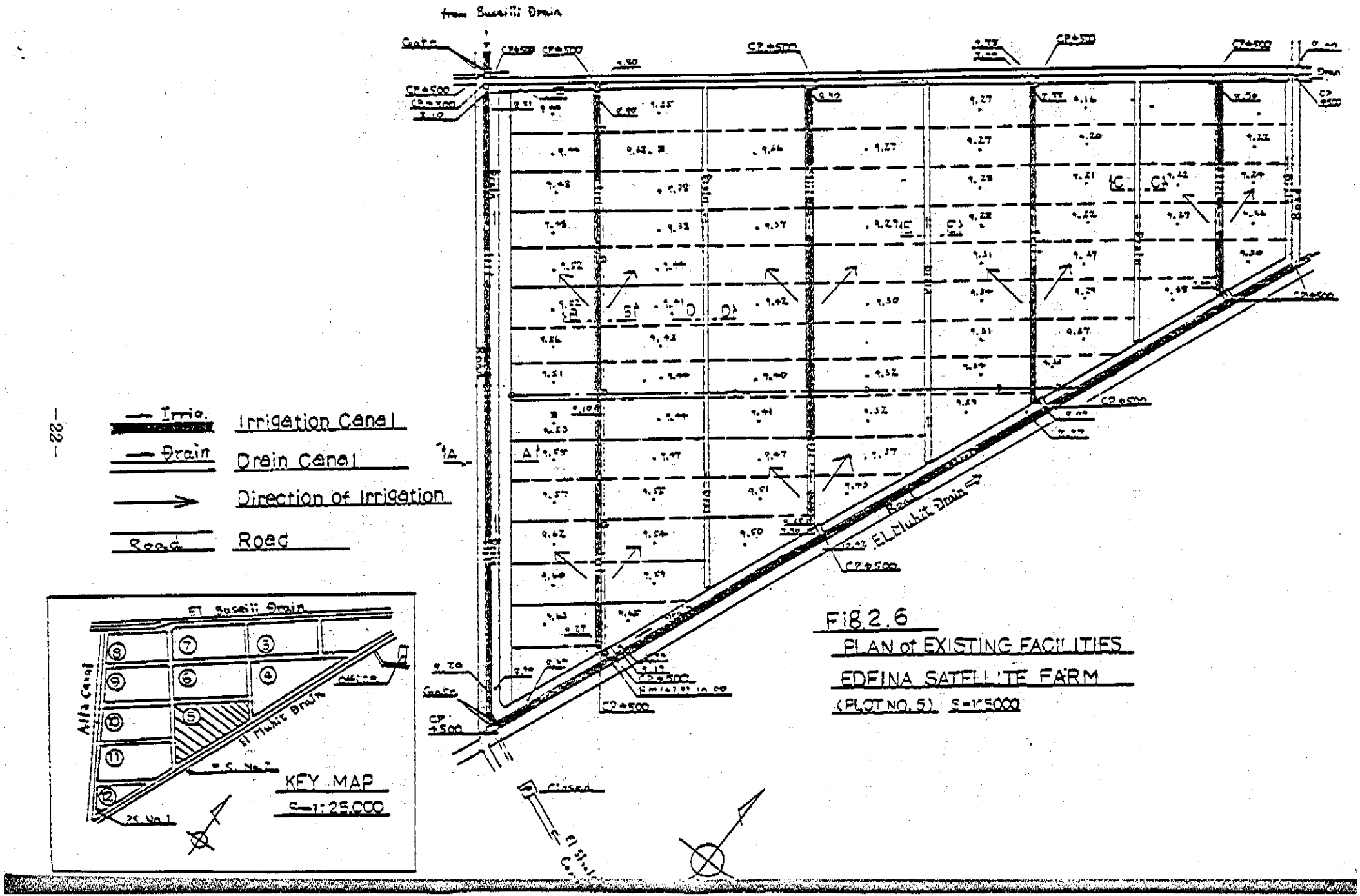


Fig 2.6

PLAN of EXISTING FACILITIES

EDFINA SATELLITE FARM

(PLOT NO. 5) S=1:5000

According to the results of the survey shown in Fig. 2.6, the south side has higher elevation and the north low. In comparison to other satellite farms, the range of the elevation is large (40 cm). The size of a field lot is, therefore, made small(0.4 feddan) for better water management, and there is not a field lot higher than water level.

2-8-4 Road and Entrances to the Field.

Since there is no road in the farm, about 3 m space along the canal (inside of the rice field) is used temporarily for passing tractors. The access road to the field is on the north west side. Presently it has only eight entrances on the north west and south east side for one farm block. More entrances are needed.

2-9 Conclusions

1) Field Elevation

All the field are reasonably situated with respect to water flow. Though some lots in the Edfina farm have an elevation discontinuity of about 10 cm between the two sides of the canal, this can be overcome by raising the water level of the canal. Leveling of the field is, therefore, not planned for any farm.

The short water supply is due to mismanagement of the irrigation canal and the low water level which is inevitable for those canals simply excavasted in the ground. Because the water level of the irrigation canal itself is low, adding to the elevation of the canals within the field can not raise the water

level. This is not a problem that can be solved within a short period of time.

To cope with this situation, mobile pumps are needed for those fields which get short water supply. Sufficient water can be supplied by pumping up from the main irrigation canal to the irrigation canals in a field after separating canals by soil bags. This practice should not take long because only a few fields need it.

2) Roads

New roads are necessary in both the Gaimmeza Farm and Edfina Farm for establishing systems of irrigation and drainage, and for providing proper growth care. In the other three farms, roads have been built wherever necessary. But the roads are dilapidated and some are too narrow. It is necessary to rehabilitate these roads.

3) Entrances to the Field

Presently the number of entrances to the fields is grossly short. For a tractor to enter the field by crossing a canal, the canal must be temporarily plugged. The irrigation and drain system is greatly disturbed by this practice. Distributing entrances at appropriate locations is definitely necessary.

4) Irrigation and Drain Canals

Canals are clogged in spots because of an irregular cross-section of the canal and thick vegetation in the canal. Upgrading of the canals is desired. The irrigation and drain system must be rational and if it is not compatible with the need, it should be abolished and a new system must be put in.

5) Others

Small structures for water management, which were strongly requested for by the Egyptian counterpart, need to be constructed. Removing soil piles, clearing and grubbing, are also necessary.

Chapter 3. Plan for Implementation

3-1 Scope of the Work

3-1-1 Standard of the Land Consolidation

Several meetings were held among the heads of the five satellite farms, the Egyptian counterparts and the team of experts to discuss the necessary upgrading, new roads, and irrigation and drain systems based on the results of the on-site investigations. Basically, the following objectives and goals were agreed upon.

Objectives

1) To increase the rice yields, a mechanized rice growing system should be further enhanced.

2) To proliferate the system easily among those farmers near the satellite farms, goals conformal to the reality of the surrounding area are to be aimed at.

Items for upgrading

1) Building of roads and rearrangement of irrigation and drain system based on the existing farm plot.

2) No leveling of land is to be performed and tentative banking and mobile pump are to be used for a smooth water supply.

3) Roads which lack width or height are to be repaired.

4) New roads must be built in some farms.

5) Ineffective irrigation canals need refurbishing or must be replaced by new ones.

6) Ineffective drain canals need refurbishing or must be replaced by new ones.

7) By providing an entrance to a field, rational farming must be promoted.

8) Remove objects that hinder proper farming and water management.

9) Aged culverts must be replaced.

10) Construction of some structures are needed for better water management.

3-1-2 Basic Plan

(1) Farmland Readjustment

The standard division prototype is shown in Fig 3.1. Though the present division is already done this way, some areas need modification where canals are not properly located.

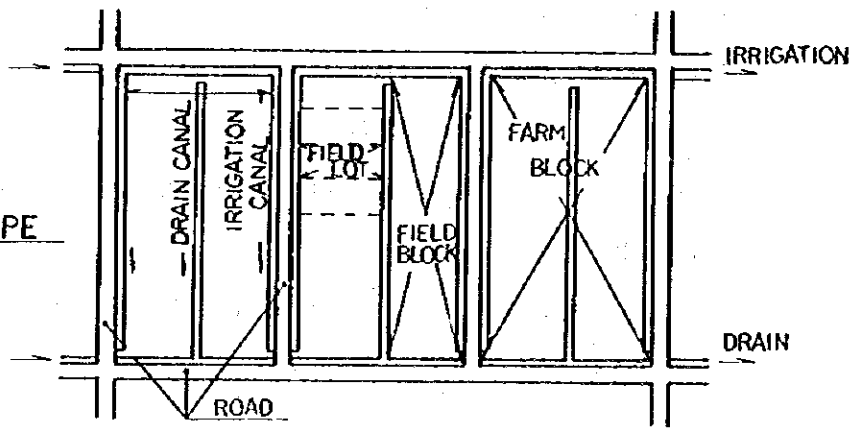


Fig. 3.1
THE STANDARD DIVISION PROTOTYPE

Farm block ; Its four sides are surrounded by roads.

Field block ; Its four sides are surrounded by canals.

Field lot ; The smallest farming unit.

(2) Road plans

a) Rehabilitation of the present roads

Each satellite farm is equipped with farm roads except for the Edfina farm. Rehabilitation is necessary for those roads that have the following problems because of poor planning.

1) Driving a farming machine through is seriously hindered by the insufficient width. Widening of the road is necessary.

2) It is not easy to drive a farming machine on a road with low elevation when both the field and the road are covered with water. Additional banking is necessary.

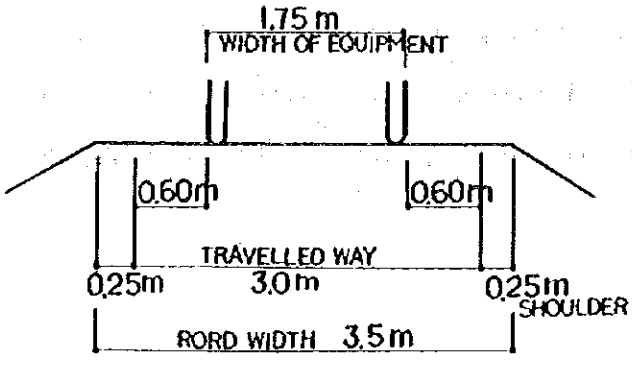
3) Because of the insufficiently compacted soil, the land subsides when farming machine passes through. Sufficient compaction must be performed.

4) The shoulder and the slope of the road are often ruined. Rehabilitation of such parts of the roads is necessary.

b) Construction of New Roads

New roads must be constructed for more effective farming in the Gaimmeza and the Edfina farms because they are equipped with insufficient or no roads. Approximately one road per one field block is the standard.

* Width : The width of the road is 3.5 m for farming machines to pass through.



* Surface : Roads in the farm are not paved presently. Since the goal is set on the present status of roads nearby, no surface finish by gravel is planned. Currently when it rains, dents are created by the wheels of the machinery. To prevent this, soil must be piled evenly and sufficiently compacted.

* Corners : At the intersection of the two roads, 1.5 x 1.5 m corner cuts are to be placed.

* Additional banking of the road : The soil for banking is the one that will become available by digging drain canals instead of being brought in from other places. The gradient of the slope is 1:1.5. The slope will be given sufficient compaction.

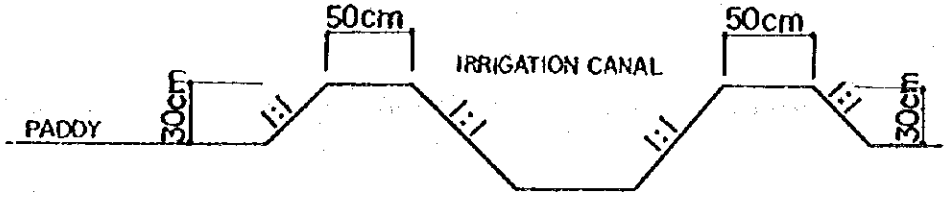
* Height : Secure 30 cm minimum above the field level.

(3) Irrigation Canals

a) Repair

*Any spot that is considered a bottleneck in passing water must be repaired.

*Insufficient cross section	Enlargement
*Reverse gradient canals	Correct gradient
*Ruined slope	Repair
*Vegetation in the canal	Clearing and grubbing
*Levee	50 cm wide, 30 cm above the field level

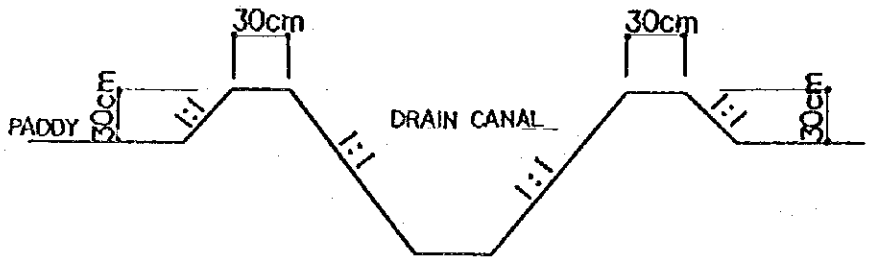


b) New Construction

An irrigation and a drain canal must be built on both shorter sides of a field lot. The volume of excavation and banking of soil must be balanced and the shape of the cross section is as shown in a).

(4) Drain Canals

The procedure for repair and new construction of the drain canal is the same as the irrigation canal except that the width of the levee is 30 cm.



(5) Entrances to the Field

As mentioned in Chapter 2, Section 9, the total number of entrances is not sufficient. Approximately three for each farm block need to be added. The entrance passage are decided to be 3.0 m wide, the same as the effective width of the roads in the farm. Two concrete pipes (3.0 m long) are to be buried underneath of the road for connecting the canal. The diameter of the pipe is either 50 cm or 30 cm depending on the canal cross-section. The sand bed foundation is placed underneath to pipe.

(6) Others

* Small structures such as an intake or foundation of a pump

must be constructed wherever necessary at the intake of irrigation water.

* Concrete pipes must be placed at the intersection of a road and a canal. The existing dilapidated pipes must be replaced.

* Old structures that hinder proper farming operation must be removed.

*Heavy vegetation of weeds and shrubs along the canal are becoming the obstacle for the farm management and need to be grubbed and removed.

3-1-3 Quantities of the Work

Based on the standard and conditions described thus far, the quantities of the work are determined as shown in Table 3.1.

Table 3.1 EXTENT OF CONSTRUCTION WORK

ITEM	UNIT	GAI	MES	SAF	SER	EDF	TOTA
ROAD REPAIR	m	385	550	490	405		1,83
NEW ROAD	m	385				680	1,06
IRRIGATION CANAL REPAIR	m	220	2,460	2,250	1,290	1,180	7,40
NEW IRRIGATION CANAL	m	760	485				1,24
DRAIN CANAL REPAIR	m	760	1,495		695	1,330	4,28
NEW DRAIN CANAL	m	760		850		685	2,29
CULVERT	PLACES	1	4				
FIELD ENTRANCE, TYPE A	PLACES	4			14	6	2
FIELD ENTRANCE, TYPE B	PLACES	12				7	1
FIELD ENTRANCE, TYPE C	PLACES		12	4			1
FIELD ENTRANCE, TYPE D	PLACES		4	6			1
INTAKE (STOP LOGS)	PLACES	2					
REMOVAL OF CONCRETE CANAL	m	270					27
CONDITIONING PUMP SITE	PLACES			1			
CLEARING & GRUBBING	m	3,496				4,750	8,24

GAI ; Gaimmeza, MES ; Messer, SAF ; Saft Khaled, SER ; Serrw,
EDF ; Edfina

3-2 The Gaimmeza Farm

3-2-1 Road

(1) Repair of the existing road, Length=385 m.

Torn surface, low banking must be repaired.

(2) New construction, Length=385 m.

In the middle of the existing road and the west boundary of the farm, a new road is to be added in such a way that at least one side of a field block is facing with a road for easy access to the field.

3-2-2 Irrigation Canal

(1) Canal repair, Length=220 m.

A part of the existing canal from the center of the east side to the west side is thick with heavy vegetation and needs repair. This canal is used to supply water to the east side field plots. By the request of the Egyptian counterpart, this canal is to be connected to the new irrigation canal in the center.

(2) New irrigation canals, Length=380 m x 2=760 m.

The west side of the present road consists of small field plots and not clearly divided by roads and canals. A road and a drain canal in the center and also an irrigation canal in the middle of both right and left sides are to be constructed. Thus the west side of the farm is to be divided into four field blocks.

3-2-3 Drain Canal

(1) Rehabilitation of Drain Canal, Length=380 m x 2=760 m.

The existing drain canals need repair of slope and gradient.

(2) New Drain Canal Construction, length=380 m x 2=760 m.

The soil that became unnecessary by digging the drain is used to refinish the road surface.

3-2-4 Entrance to the Field

Three entrances for a field block are to be constructed on the road.

(1) Entrance type A, 4 places.

For crossing irrigation canals and relatively large drain canals, 50 cm diameter pipes are used underneath of the entrance.

(2) Entrance type B, 12 places.

For crossing small drain canals, 30 cm diameter pipes are used underneath of the entrance.

3-2-5 Others

(1) Intake of water (Stop log), 2 places.

When the irrigation water of the main canal is being used in Plot No. 1, sometimes it becomes necessary to close the intake. Therefore, at the starting point of the irrigation canal (the south side), a stop log must be constructed.

(2) Removal of a concrete canal, Length=90 m x 3=270 m.

There exist an old canal in the north east side of the farm block boundary. This poses a hindrance to farming operation and need to be removed.

(3) Cleaning and grubbing, Width=8 m, Length=380 m.

The east side irrigation canal bank.

(4) Culvert, 1 place.

Severely decayed culvert at the intersection of the canal for repair and the existing road needs to be replaced by 30 cm diameter concrete pipes.

3-3 The Messer Farm

3-3-1 Road

(1) Repair, Length=550 m.

Lack of width, bad surface condition.

3-3-2 Irrigation Canal

(1) Repair of canal

A : For easier water management, clearing and rework of slope are to be performed. Length=440 m.

B : Construct levees for field management. Length=570 m.

C : Clearing and repairing of the slope. Length=410 m.

D : Increase of the height of the levees, digging of the soil for road construction. Length=1,040 m.

(2) Construction of new irrigation canal, Length=485 m.

One canal is built to improve water supply to the southern fields.

3-3-3 Drain Canal

(1) Repair and repair of drain canal

A : Clearing, repairing of the slope and correction of the gradient.

B : Construction of levees for field management.

3-3-4 Entrance to the field

Two for each field block.

(1) Type C, 12 places.

To cross the irrigation canal and the large drain canal, 50

cm diameter pipes are used to connect canals.

(2) Type D, 4 places.

50 cm diameter pipes.

3-3-5 Others

(1) Road Crossing Pipes, 4 places.

Old culvert replacement is necessary. The pipe diameter is 50 cm.

3-4 The Saft Khaled Farm

3-4-1 Road

(1) Repair of the existing road, Length=490 m.

Additional width and surface reconditioning.

3-4-2 Irrigation Canal

(1) Repair of canal

A : Construction of a levee and repair of the slope, Length=1,130 m.

B : Digging soil for additional banking of the road and levees, Length=425 m.

C : Additional banking on levees and slope rework, Length= 695 m.

3-4-3 Drain Canal

(1) New drain construction, Length=425 m x 2=850 m.

Since three farm blocks are not facing to a drain canal at all, a new drain canal is to be built.

3-4-4 Entrance to the Field

Construct three entrances per one farm block.

Type C, 4 places.

Type D, 6 places.

3-4-5 Others

(1) Cleaning of pump site

The pumping site at the northern side if the center of the farm
needs rehabilitation because the bank, culvert and irrigation canal are damaged and dilapidated, also a sizable sediment has beenpiled.

Foundation of pump : Concrete 1.0 x 1.5 x .2 m.

Discharge basin : Concrete 1.2 x 1.2 x 1.2 m.

Road Crossing Culvert

: Concrete pipe 50 cm diameter

3-5 The Serrw Farm

3-5-1 Road

(1) Road repair, Length=405 m.

Reconditioning of the surface and additional banking.

3-5-2 Irrigation Canal

(1) Rehabilitation of canal

A : Cleaning, repair of slope and correction of gradient, Length=300 m.

B : Additional banking of levees and rework of slope, Length=590 m.

C : Additional banking on levees and rework of slope, Length=400 m.

3-5-3 Drain Canals

(1) Repair of drain

I : Digging soil for road construction, and additional banking on the levees, Length=395 m.

II : Additional banking on the levees, clearing, rework of slope etc., Length=395 m.

3-5-4 Entrance to the Field

Three entrances for one field block.

Type A, 14 places.

3-6 The Edfina Farm

3-6-1 Road

(1) New road construction, Length=680 m

Since there is no road in the farm, new roads must be constructed to run along the longer sides of the field block except for the small three blocks in the north.

3-6-2 Irrigation Canal

(1) Repair of irrigation canal, Length=1,180 m.

Additional banking on the levees and repair of the slope.

3-6-3 Drain Canal

(1) Repair of drain canal

I : Clearing and grubbing of both banks, additional banking on the left bank. Excessive soil on the bank is moved to the new road I. Canal slope rework. Length=480 m.

II : Additional banking on the levees, repair of the slope, Length=375 m.

III : Additional banking on the levees, repair of the slope, Length=285 m.

IV : Additional banking on the levees, repair of the slope, Length=190 m.

(2) Drain Canal Construction

I : On one side of the new road I, Length=390 m.

II : On one side of the new road II. The soil for the road is the removed soil to excavate the canal. Length=295 m.

3-6-4 Entrance to the Field

The northern three blocks need one entrance per one block, others need two.

Type A, 6 places.

Type B, 7 places.

3-7. Cost Estimates

3-7-1. Cost Estimates

The project cost estimated as shown in the following list.

RMPP : CONSTRUCTION OF PILOT INFRASTRUCTURE

COST ESTIMATION (Unit LE.)

I. DIRECT COST		
1. GAIMMEZA	34,662	
2. MESSER	51,351	
3. SAFT KHALED	31,780	
4. SERRW	24,688	
5. EDFINA	31,032	
6. SUPPLY OF PUMP	16,900	10 UNITS
7. PREPARATION WORK	46,500	
SUB-TOTAL	236,913	
II. INDIRECT COST		
I x 20 %	47,382	
MID. TOTAL (I+II)	284,295	
III. PREPARATION COST		
(I+II) x 10 %	28,429	5 % *
CONSTRUCTION COST (I+II+III)	312,724	
MISCELLANEOUS	15,636	5 %
GRAND TOTAL	328,360	

* INCREASE OF COMMODITY PRICE

Breakdown of Construction Cost

A. Gaimmeza Farm

Discription	Unit	Quantity	Unit Price	Total Price	Remarks
Rehabilitation of Road	m	385		1,694	
Proposed Road	〃	〃		4,320	
Rehabilitation of Irrigation Canal	〃	220		3,020	
Proposed Irrigation Canal	〃	760		4,918	
Rehabilitation of Drain Canal	〃	〃		2,131	
Proposed Drain Canal	〃	〃		3,221	
Stop Log Structure	each	2		532	
Demolition of Concrete	m³	67.5		4,394	
Road Crossing	each	1		388	
Farm Entrance A	〃	4	854	3,416	
〃 B	〃	12	335	4,020	
Clearing & Grubbing	m²	3,486		2,608	
Portable Pump φ6"	LS	1		3,380	
Preparatory Work	〃	1		9,300	
Total				47,342	

B. Messer Farm

Discription	Unit	Quantity	Unit Price	Total Price	Remarks
Rehabilitation of Road	m	550		5,530.50	
Rehabilitation of irrigation Canal					
A	〃	440		1,242.12	
B	〃	570		2,860.96	
C	〃	410		757.68	
D	〃	1,040		7,794.41	
Proposed Irrigation Canal	〃	485		1,997.44	
Rehabilitation of Drain Canal					
A	〃	490		1,940.40	
B	〃	1,005		6,771.98	
Road Crossing φ500, L=6.0	each	4	538.26	2,153.04	
Farm Entrance D	〃	4	704.54	2,818.16	
〃 C	〃	12	1,457.04	17,484.48	
Portable Pump φ6"	LS	1		3,380	
Preparatory Work	〃	1		9,300	
Total				64,031.17	
			Round Up	64,031	

C. Saft Khaled Farm

Discription		Unit	Quantity	Unit Price	Total Price	Remarks
Rehabilitation of Road		m	490		6,145.22	
Rehabiritation of irrigation Canal						
	A	〃	1,130		4,656.92	
	B	〃	425		1,138.48	
	C	〃	695		3,217.48	
Proposed Drain Canal		〃	850		5,237.12	
Farm Entrance	C	each	4	1,457.04	5,828.16	
〃	D	〃	6	704.54	4,227.24	
Discharge Basin		LS	1		805.64	
Road Crossing		〃	1		524.28	
Portable Pump		〃	1		3,380	
Preparatory Work		〃	1		9,300	
Total					44,460.54	
				Round Up	44,460	

D. Serrw Farm

Discription	Unit	Quantity	Unit Price	Total Price	Remarks
Rehabilitation of Road	m	405		3,513.35	
Rehabiritation of Irrigation Canal					
A	〃	300		396	
B	〃	590		3,822.44	
C	〃	400		2,211.44	
Rehabiritation of Drain Canal	1	300		1,737.36	
〃	H	395		1,052.18	
Farm Entrance A	each	14	854.01	11,956.14	
Portable Pump	LS	1		3,380	
Preparatory Work	〃	1		9,300	
Total				37,368.91	
			Round Up	37,368	

E. Edfina Farm

Discription		Unit	Quantity	Unit Price	Total Price	Remarks
Proposed Road	I	m	390		7,867.42	W=3.5m
〃	II	〃	290		3,820.46	W=3.5m
Rehabiritation of Irrigation Canal		〃	1,180		3,243.56	
Rehabiritation of Irrigation Canal						
	I	〃	480		1,215.72	
	II	〃	375		370.92	
	III	〃	285		281.16	
	IV	〃	190		551.42	
Proposed Drain Canal						
	A	〃	390		1,197.12	
	B	〃	295		1,253.26	
Farm Entrance	A	each	6	854	5,124	
〃	B	〃	7	335	2,345	
Clearing & Grubbing		㎡	4,750		3,762	
Portable Pump φ6"			1		3,380	
Preparatory Work		〃	1		9,300	
Total					43,712.04	
				Round Up	43,712	

3-7-2 Basis for Cost Estimation

The labor cost was determined in reference to the wage paid to employees of national farms since this contract involves mainly soil maneuvering. The prices for the construction materials were determined by checking the market. The rental fees for construction machines are the current rates that the machine center of the ministry of agriculture charges to the general public.

The overhead cost was determined based on "The Standard Cost Evaluation for the Land Reclamation" by Japanese Ministry of Agriculture, Forestry and Fisheries, and the report of the work similar to this project, "Report of the Detailed Design for the Rice Mechanization Project", May 1983, since there were no standard to be referenced.

3-7-3 Estimated Inflation Rate

This construction is to be started in March and may 1989. Since estimate is based on the price of November 1988, the increase of cost during this period must be considered in view of 10 % annual inflation. The rate of inflation is calculated based on the wholesale price index in "Statistical Year Book 1988" since it does not include the middle margin.

WHOLESALE PRICE INDEX (1965/1966 = 100)

ITEM	1984	1985	1986	1987
AGRICULTURAL PRODUCTS	566.1	655.7	829.8	786.1
FOOD & DRINK	552.0	587.4	642.0	767.2
PETROLEUM & FUEL	284.2	352.2	414.1	524.6
CONSTRUCTION MATERIALS	616.7	690.1	744.6	750.5
AVERAGE	430.9	487.8	572.1	650.2
		13.2%	17.3%	13.7%

As shown above, the average price increase of the past three years is 14.7 % . Based on this, we assume 15 % annual price increase and 5 % for the four months before the contract starts in March.

3-7-4 Quantities of Materials, Equipments and Labor-force

(1) Materials

Materials needed for each farm are as shown in the following table.

TABLE 3. 2 (1) NECESSARY MATERIALS

	GAIMMEZA	MESSER	SAFT-KHALED	SERRW	EDFINA	TOTAL
CONCRETE PIPES						
50 cm dia.	24	192	90	84	36	426 m
30 cm dia.	79				42	121 m
SAND	11.2	26.8	12.3	12.6	9.5	72.4 m^3
GRAVEL	.7		1			1.7
CONCRETE (1:2:4)	.9		1.6			2.5
FORM WORK	6.4		12.4			18.8 m^2

(2) Man Power

Table 3.3 contains needed number of laborers for each farm and for each type of work item. The Messer Farm requires the most people, 2,224 people. To complete the task within a month, 80 people per day are needed.

(3) Construction machineries

The required construction machineries are shown in the Table 3.4.

TABLE 3.3 NECESSARY LABOUR-FORCE

ITEM	UNIT	GAIMMEZA		MESSER		SAFT KHALED		SERRW		EDFINA	
		QUANTITY	NUMBERS REQUIRED	QUANTITY	NUMBERS REQUIRED	QUANTITY	NUMBERS REQUIRED	QUANTITY	NUMBERS REQUIRED	QUANTITY	NUMBERS REQUIRED
REHABILITATION OF FARM ROAD	m	385	12	550	185	490	274	405	89	—	
PROPOSED FARM ROAD	〃	385	62	—		—		—		680	314
REHABILITATION OF IRRIGATION CANAL	〃	220	187	2,460 (A~D)	837	2,250 (A~C)	590	1,290	487	1,180	246
PROPOSED IRRIGATION CANAL	〃	760	288	485	127	—		—			
REHABILITATION OF DRAIN CANAL	〃	760	129	1,495 (A~B)	583	—		695	212	1,330	184
PROPOSED DRAIN CANAL	〃	760	245	—		850	310	—		685	165
ROAD CROSSING	each	1	10	4	44	1	8	—		—	
FARM ENTRANCE ϕ 500	〃	4	96	16	448	4	136	14	322	6	144
FARM ENTRANCE ϕ 300	〃	12	96	—		6	102	—		7	56
INTAKE STRUCTURE	〃	2	12	—		—		—		—	
DEMOLITION OF CONCRETE	m^3	67.5	63	—		—		—		—	
CLEARING & GRUBBING	m^2	3,496	51	—		—		—		4,750	56
DISCHARGE BASIN		—		—		1	16	—		—	
TOTAL			1,251		2,224		1,436		1,110		1,165

TABLE 3.4 REQUIRED CONSTRUCTION MACHINERIES

UNIT : DAYS

	BULLDOZER 11 t	EXCAVATOR 0.3 m³	TRACTOR 75HP
1. CAIMEZA			
REHABILITATION OF ROAD	2		
PROPOSED ROAD	2	2	
REHABILITATION OF IRRIGATION CANAL		1	
PROPOSED IRRIG. CANAL		3	
REHABIL. OF DRAIN CANAL		1	
PROPOSED DRAIN CANAL		1.5	
DEMOLITION OF CONCRETE	2		6
CLEARING AND GRUBBING	2.5		2
TOTAL	8.5	8.5	8
2. MESSER			
REHABIL. OF ROAD	2.4	2.8	
REHABIL. OF IRRIG. CANAL		3.9	
PROPOSED IRRIG. CANAL		0.8	
REHABIL. OF DRAIN CANAL		2.5	2
TOTAL	2.4	10	2
3. SAFT KHALED			
REHABIL. OF ROAD	2.1	2	
REHABIL. OF IRRIG. CANAL		3	
PROPOSED DRAIN CANAL		2.8	
OTHERS	1	1	2
TOTAL	3.1	8.8	2
4. SERRW			
REHABIL. OF ROAD	2.3	1.2	
REHABIL. OF IRRIG. CANAL	1		
REHABIL. OF DRAIN CANAL	1		
OTHERS	1	1	2
TOTAL	5.3	2.2	2
5. EDFINA			
PROPOSED ROAD	3.0	3.1	24.7
REHABIL. OF IRRIG. CANAL	1		
PROPOSED DRAIN CANAL	3.9	0.7	
OTHERS	1	1	2
TOTAL	8.9	4.8	26.7
GRAND TOTAL	28.2	34.3	40.7 (DAYS)

3-7-5 The Unit Price of Materials and Labor

(1) Construction materials

Concrete pipe, 50 cm dia.	LE.35/m
Concrete pipe, 30 cm dia.	LE.20/m
Sand	LE.15/m^3
Gravel, max 25 mm dia.	LE.25/m^3
Portland cement	LE.120/t

(2) Labor

Foreman	LE.15/day
Soil worker	LE.12/day
Operator	LE.15/day
Carpenter	LE.15/day
Common labor	LE.12/day

(3) Machine

Both construction equipments and farming machines are rented from the Machine Center of the Ministry of Agriculture. The price includes the operator and the fuel costs.

Backhoe (.3 m^3)	LE.40/hour
Bulldozer (11 t)	LE.75/hour
Tractor (80 HP)	LE.120/day

3-7-6 List of Unit Prices

The following is the unit price table upon which the total cost of the project was calculated.

LIST OF UNIT PRICE

Description	Quantity	Unit	Unit Price (LE)	Total Price (LE)	Remarks
1. EXCAVATION BY MANPOWER	1	m^3		13.20	
2. BACKFILL BY MANPOWER	1	〃		8.84	
3. SHAPING OF SLOPE	1	m^2		1.32	
4. CLEARING & GRUBBING	1	〃		1.32	
5. EXCAVATION BY MACHINE	1	m^3		5.00	
6. SPREADING & COMPACTION BY BULLDOZER	1	m^2		1.10	
7. CLEARING, GRUBBING & LEVELLING BY BULLDOZER	1	〃		0.66	
8. TRANSPORTATION OF SOIL L=180m	1	m^3		10.45	
9. CONCRETE DEMOLITION	1	〃		33.31	
10. TRANSPORTATION OF DEMOL. CONCRETE	1	〃		23 -	
11. CONCRETE 1:2:4	1	〃		136.56	
12. FORM WORK	1	m^2		33.28	
13. SAND FOUNDATION	1	m^3		60.72	
14. GRAVEL FOUNDATION	1	〃		54.28	
15. CONCRETE PIPE ϕ300	1	m		33 -	
16. 〃 ϕ500	1	〃		65.31	
17. DEWATERING	1	LS		67.10	
18. FARM ENTRANCE A ϕ500 L=6.0m	1	〃		854.01	
19. FARM ENTRANCE B ϕ300 L=6.0m	1	〃		335.08	
20. COMPACTION OF BANK BY MANPOWER	1	m^3		4.22	

3-8 Construction Schedule

This construction is mainly the soil maneuvering and largely dependent on the manual labor. The construction must be over by the end of April in consideration of the rice planting season. Allowing some time for necessary diplomatic procedure, it will be not until the beginning of February before contracting negotiation can begin. It will take one month to complete contracting and make advance payment before the construction starts. To complete the task by the end of April, it is necessary to secure number of people shown in the following. To reduce the maximum number of people at the peak, therefore, it is desirable to start the construction as soon as possible and to utilize machines effectively.

TABLE 3.5 CONSTRUCTION SCHEDULE

	WORK ITEMS	QUANTITY	UNIT
1. GAIMMEZA	REHABIL. OF ROAD	385	m
	NEW ROAD	385	〃
	REHABIL. OF IRRIG. CANAL	220	〃
	NEW IRRIG. CANAL	760	〃
	REHABIL. OF DRAIN CANAL	760	〃
	NEW DRAIN CANAL	760	〃
	DEMOLITION OF CONCRETE	67.5	m^3
	ENTRAME TO THE FARM TYPE A&B	16	each
	CLEARING AND GRUBBING	3,496	m^2
	OTHERS	1	LS
2. MESSER	REHABIL. OF ROAD	550	m
	REHABIL. OF IRRIG. CANAL	2,460	〃
	NEW IRRIG. CANAL	485	〃
	REHABIL. OF DRAIN CANAL	1,495	〃
	ENTRAME TO THE FARM TYPE	16	each
	ROAD CROSSING	1	〃
3. SAFT KHALED	REHABIL. OF ROAD	490	m
	REHABIL. OF IRRIG. CANAL	2,250	〃
	NEW DRAIN CANAL	850	〃
	ENTRAME TO THE FARM TYPE	10	each
	ROAD CROSSING	1	〃
	DISCHARGE BASIN	1	〃
4. SERRW	REHABIL. OF ROAD	605	m
	REHABIL. OF IRRIG. CANAL	1,290	〃
	REHABIL. OF DRAIN CANAL	695	〃
	ENTRAME TO THE FARM TYPE	14	each
5. EDFINA	NEW ROAD	680	m
	REHABIL. OF IRRIG. CANAL	1,580	〃
	REHABIL. OF DRAIN CANAL	1,330	〃
	NEW DRAIN CANAL	685	〃
	ENTRAME TO THE FARM TYPE	13	each
	CLEARING, GRUBBING & LEVELING	4,750	m^2
6. OTHERS	NEGOTIATION FOR CONTRACT		
	PREPARATION WORK		
	CLEARING OF THE CONSTRUCTION SITE		
	FINAL INSPECTION