III-3. The counter-measure on water management from the administrative field.

Among the paddy field of 177,160 km^2 in about 23% of Thai territory, it is said that about 25% of 28,835 km^2 have completed with irrigation net work up to 1979. On the other hand, the land have been completed with agricultural productive fourdation reaching the terminal by on-farm development are in about 10,000 ha up to 1981 and, at the present, the land consolidation is scheduled to perform at the standard of 20,000 ha per year. On the view point of that dry season crop in the passed 10 years has been performed in about 4.8%, as a great aim of land consolidation affairs on terminal, there are execution of double-cropping, increase of unit yield. But the works mentioned above are on premise of water management of on-farm level.

Although it is only work of execution of water management, it is different to the works of irrigation facility or land consolidation which may be completed by investment of capital and labour based of policy of state but, in the case of water management, it is obvious that unless the farmers themselves participate in, the result can not be met.

In consideration of this point, the administrative field shall try to efficiently utilize the water on the Project of land consolidation being completed and perform the operation and management of irrigation facility. As to the on-farm level, it shall try to organize the farmers (water users'group) who shall operate and maintain and let the state and people organically connected to execute the water management. However, on the matter in the present, it is hard to recognize that the system has been fully organized.

As the problem on the administrative field , the following items shall be proposed :

1). It is necessary to make clear-cut line on the sectors in charge of water management.

On the province, the Province Committee for land consolidation will be constituted and compose of RID's Regional Director, Provircial Official for Land Consolidation (under CLCC), Kaset Changwat (under Agricultural Extension Department), Provircial Official of Cooperatives Promotion Department, Provincial Official of Communication Development Department and Representative of other government agencies.

At the present, the necessary legal procedures for land consolidation have been promulgated but, for water management, although the various organizations have cooperated and discharged their administrative duty but the works and duty are not always distinct.

The contents of works of CLCC relating to land consolidation are explanation for farmers, negotiation about the land, the disposition for substitute lot, and to let BAAC collect the share from farmers on the construction fees.

Agricultural Extension Department despatches its officers to the Amphoe Office, unit of a district, as official in charge to perform the works of extension of agriculture, 1 official shall control the farmers'house in about 2,000 houses (in Japan about 500 houses) so that the activity of him is limited.

The main service of Cooperatives Promotion Department are trying to make the farmers organized, to organize the water users'group which performs the water management which work can be said as the real work of the Department.

on the Pilot Project, although the representative of each water users'group will select the chairman of group and it seems as being organized but the concrete activity are placed under other organization that is to say, as for giving education about operation and maintenance of facilities, distribution of water, it has no engineer and the work of direct contact with the farmers is held as belonging to the field of Extension.

RID is the organization to perform planing, design, execution, operation and maintenance on the land consolidation affairs. In consideration of its organizing ability and executive ability, it is a most suitable organization to perform the work of water management. In the past, it has tried to organize the water users'association and given the training of water management to its staff. On this connection, when the water management will be performed from the administrative field , it shall be made as central organization to work but, on the view point of causing the farmers to participate in, the cooperation of other agency is necessary.

At the present, to fix the field of what organization shall take over the charge of water management may be the urgen subject. In connection of this matter, the World Bank which gives loan to the RID for performing this affairs has also demand the RID to do so and RID itself has positively begun to deal with this matter by holding reguler study meeting so that its result is expecting.

2). The agencies concerned to agriculture are in great number and each have its farmers'group but they appear as little connection with one another.

For executing the water management efficiently, the irrigation associational group of farmers themselves is necessary through which execution of training will be performed. However, should all the groups

will hold their meeting or training, the farmers will be tired down and bewildered thus the effect will be little.

In fact, to arrange and combine those groups and let them carry out the affairs themselves is necessary not only for the water management but also for other works.

At the present, the farmers'group concerned with Pilot No.1 are as follows :

(1) What concerning with Japanese expert are as follows :

(a) Water Users'Group ..... They are constituted for water management and in number of 21 groups and they will hold meeting individually or jointly on necessity. The Provincial Official of Co-operatives Promotion has started them in expecting to collect the fee for water management and calls all the farmers to join.

(b) Paddy Cultivation Study Meeting ..... Mr. Tsutsumi, Agriculture Extension Expert, has started it with 30 applicants as object and it holds meeting on 1st each month (No.1 has not yet constituted this meeting).

(c) General Farmers'Training Meeting ..... The experts will give study and training according to their position respectively to the farmers of the Pilot in about 150 persons. The meeting is held in suitable time and the participants are in 100-200 persons. The number of participants present in meeting of each time is different.

(d) Model Farmers ..... We select 3 farmers as model farmer and the appropriate expert will give them direction.

(2) What concerning with Cooperatives Promotion Department :

(a) Agriculture Cooperatives ..... It is the main body constituted for having the loan of the agriculture fund on the assistance of government. The meeting will be held once a month but the rate of member of this group are comparatively less.

(b)Water Users'Group ..... it is similar to that of (1)-(a).

(3) What concerning to BAAC (Bank of Agriculture and Agricultural Cooperatives) :

(a) BAAC Croup ..... In order to give loan to the farmers, the BAAC Branch has organized the farmers'group and executed the affairs.

(4) What concerning to Agriculture Extension Department :

(a) Rice Farmer Group

(b) Sugar Farmer Group

The farmers of each products is constituted to groups and in order receive the advice, they hold meeting once a month.

(c) Young Agriculturists Group ..... This group is constituted with the young farmers of age from 10-20 years as the object and in the aim to make them growing to be enthusiastic farmers.

(d) House Wives Club ..... It is constituted with the farmer house wives as the object and aimed at improvement of dietary life and the way of living. It holds meeting once a month.

There are groups of various kind as mertioned above. They are connecting to one another on the farming or on development. However, since the farmers have to connect with or participate in many meeting, they will be bewildered or losing their interest. On the other hand, owing to that, on some district where poor paddy crop or insufficiency of water may occur each year (consequently, the farmers may work away from home or leave for side business), the instructing sector will get no much result.

In the future, accompanying the work of land consolidation are expanded, the agricultural foundation of land will be improved. On this opportunity, we hope the groups will be tightly orgarized

and made to lively motion as well.

Fortunately, the officials concerned to the local people have being commenced to give a priority instruction to the district on which the land consolidation is completed and, in order to cross-wise relation among the agencies, they also hold the meeting. As a national policy to foster this affairs, we hope the authority will establish clear-cut line (reorganization or combination of the groups backed by law) of all agencies.

3). The law or regulations for water management is necessary.

The RID has promulgated the regulations in 1966 in the type of ministerial decree on Water Users'Associations (Regulations of the Water Users'Association) and the Water Users'Association Center of O & M Division has worked as the wirdow of motion. The Center has tried to put 187 Associations possessing about 72,000 members covering 5f0,000 ha in Northern and Middle Part of Thailand as center to be organization but, owing to that the works have not yet been well executed, most of them are in name only. According to Mr. Metha, Official in charge, has pointed out the reason of poor work as follows :

(1) Up to this time, the Association has only selected the representative, member of board but they have no subordinates,

(2) The regulations has not composed with compelling forces so that the farmers are not necessary to fullfil.

(3) Some of the farmers will use armed force to resist the order of the officer so that the compulsion is not effective.

(4) The Water Users'Association Center is placed on Bangkok and the men are short in the province.

In the meantime, he has also expressed his opinion on the point of how to make the works go well as follows :

(1) The state Irrigation Act shall be amended and made ready to put in force and it will compose the compelling force.

(2) The works are aimed at the organization of farmers level and let the farmers themselves to participate in. This is to let each lateral canal to select a leader (called "chak leader" by Thai language) under the base of the water users'group and this leader work together with the common irrigator on water management.

There are 254 groups on which the land consolidation have been completed as center on the Northern of Thailand.

As to the work efficiently executed for water management irside the RID at the present, the committee is constituted and the study is being given but we hope that the other agricultural agencies will join it and formal law, regulations will be promulgated.

Futher, the central land consolidation office has promulgated the regulations for collection of O & M fee of water management (see the ANNEX 1) on June, 1982 and it shall be collected through Provincial Cooperative Office. Pilot Project No.1 is known as to be charged with fee of 90 ฿ per rai.

4). The allotment for manpower and fund is necessary for water management.

At the present, the Cooperatives Promotion Department has propelled to organize the Water Users'Group but it has not yet introduced in the field of activity. Up to this time, RID has the section in charge of C & M in the Regional Office and perform the works of C & M until sub-lateral. The on-farm level is beyond their control. There is Water Management Training Section in the RID and this section is for its staffs in charge of C & M only but do not giving training to the farmers.

The writer has stated repeatedly as that if the water management is not participated in by the farmers, the entire effect will not be gotten. At this time, the RID may be not able to afford the allotment on manpower and budget.

In fact, the organization of RID has emphasized in ensuring irrigation water and completion of irrigation and drainage facility in the past but how much the works mentioned above have been able to give emphasis to the C & M, water management including the farmers is a question uneasy to answer. When we observe the budget of Tha Maka C & M Office, which controls the Pilot No.1, in 1981 is 2,356,680 ฿ covering area of 283,800 rai (45,400 ha) which is in unit rate of 8.3 ฿/rai (52 ฿/ha). When it is compared with the figure of 4,0 ฿/rai in 1978, 6.6 ฿/rai in 1979, 10.6 ฿/rai in 1980, it can be held as without special increase.

In the meantime, when we observe substantial staff in charge of C & M, the present state is that there are 2 water master and 14 zone men are placed under the master who operates and maintains the facility for area of about 20,000 rai (3,200 ha) together with his assistant.

On the other hand, the budget of Kam Thaeng Saen C & M Office, which controls the Project No.2, in 1981 is 5,536,400 ฿ for covering

the Project area of 316,000 rai which is in unit rate of 17.5 ฿/rai. In this figure, the personnel and miscellaneous expenses share 74% of the whole budget. The amount left for use in improvement and rehabilitation is merely in 26%. Should we consider the case of Pilot No.1, for the result of 1981 or 1982, the O & M expenses should be in about 100 ฿/rai at least. Although the farmers shall share the expenses but to invest with the government fund is a matter can not avoided in the future.

5). Others

① To make the steady price of paddy on farm land is a necessary way to meet the desire of the farmers.

The voice of the farmers at the project is that the first problem on the farming is the irrigation water and they also emphasize that the low price of rice makes them difficult. For the dry season crop of paddy in 1981, the price was in the standard of 34-36 ฿/1 Tung. Now we take the grain of the dry season crop in 1982 as example, it showed the price of 22 ฿/Tung (1 Tung = 10 kg.), 23.66 ฿/Tung, 24 ฿/Tung different depending on the buying price of rice-mill. Although the price might happen to fall in with the matter of export and receive the direct influence of the world market price, when it was in the last ten days of September, the price went up to 33-34 ฿/Tung but, owing to that the farmers had no storing facility, they has already sold all the grain. As the direct producers, it is a matter of course that farmers hope emphatically that the price floor will be placed for the grain purchase but it is a great difficulty to solve this problem. For the farmers it is true that recognition of effect of water management result in increase of yield as well as the increase of income.

② Enthusiasm to deal with the water management is necessary.

As to the water management with the farmers as subject, as it has been mentioned above, the work was tried in the past but it was quite difficult because, in general., there are several factors entangled together although various try have been made, no result would be realized. Although the authority might understand its importance and urgency, in order to deal with it enthusiastically, the special decision and exertion are necessary. As for this case, although an authority may understand the matter but the work may be beyond its right and duty and it will think as that anyone else may perform this work and give up the work at all example of which have appeared repeatedly.

III-4. The counter-measure to the water management from the farmers field.

In view of the farmers'operation on the Pilot Project in the past, the problem and counter-measrue for smooth performance of water management are as follows :

1). The farmers themselves shall be interesting in the necessity of water management.

Up to this time, the farmers have experienced in the rainy season crop by waiting for the water from up-stream plot and rain fall to irrigate their field which was the method of setting the condition of water suit their farming.

As the farmers'way of water management, they will stay only in carming up the water drainage or lifting up the water by temporary pump and they have no habit to agree upon the distribution of water

among the farmers so that the water management becomes matter uneasy to be understood.

The zone man has ever called the farmers of several irrigation unit to the meeting of explanation at field but there was only 30% attended and most did not hear the call of the zone man.

2). Although the cultivation in the dry season and rainy season is different to each other, there shall be any counter-measure.

In the rainy season, all the farmers will till their own field as usual but, in the dry season, they may work away from home for tenant or work for their own account for living. As to the dry season crop in 1981, 60% of the field in the Pilot No. 1 were tilled by the tenant and they are not so enthuse in the irrigation facility or water. If we will generally, spread the dry season crop in the future, it may relieve that situation.

3). To love the irrigation facility or water is necessity.

On the area on which land consolidation is completed, although the farm inlets or diversions have been fixed with wooden gate and they have been able to control the water quantity but the gates will be taken out immediately. Although it may be replaced soon, they will be missing again. The grass will grow briskly on the water way and caused a poor flow but they have little work of grass cutting, earth dicging or clean.

There are many example of that the dike is dug for catching rats. It is left without repair thus it will waste the water. The buffalo is prohibited to tresspass into the field but it can walk freely on the irrigation or drainage canal and damage them.

4). Since the farming cycle has no relation with the farmers, it is necessary to join them together.

On the nursery period for which the irrigation water is much consumed, since each of the farmers will perform nursery or seedling individually and the irrigation water must flow to all the farming plots simultaneously thus the quantity of water to be wasted is much, The farmers of upstream will take in the water for long time (more than 1 month) but they still not till thus give obstacke to the down-stream farmers. The nursery period planed is in 48 days but they will prolong the time to 60-75 days actually. As the dry season crop and next rainy season crop are overlapped, the control of water can not be done.

In the meantime, after the land consclidation has completed, the method to till with buffalo has been abrogated and the work using small (middle) size tractor or tiller on contract is spreading and the works will not concern to farming or plan of irrigation water but have tendercy to be under the control of convenience of the machines.

5). It shall have interest in the organization of group.

The individual farmer always shows as understand in the explanation or proposal, but when it is in time of necessity to be adjusted or cooperated with other person, they will show negative. Meantime, they will not complain on that the farmers of the upstream waste the water or someone dam up the water of drainage and cause the damage of submergence by the rain fall but rare farmers will request any relief or explanation among them.

6). The farmers must believe the call from the top and keep the promise.

The farmers show as they do not quite believe the training or instruction of the officers. They hold as a matter of impossible and hesitate or refuse to practice. With regard to pump fuel charge in 1981 and O & M fee in 1982, that have already been agreed to be paid by the farmers but when it has come to the time of practice, they would not follow .

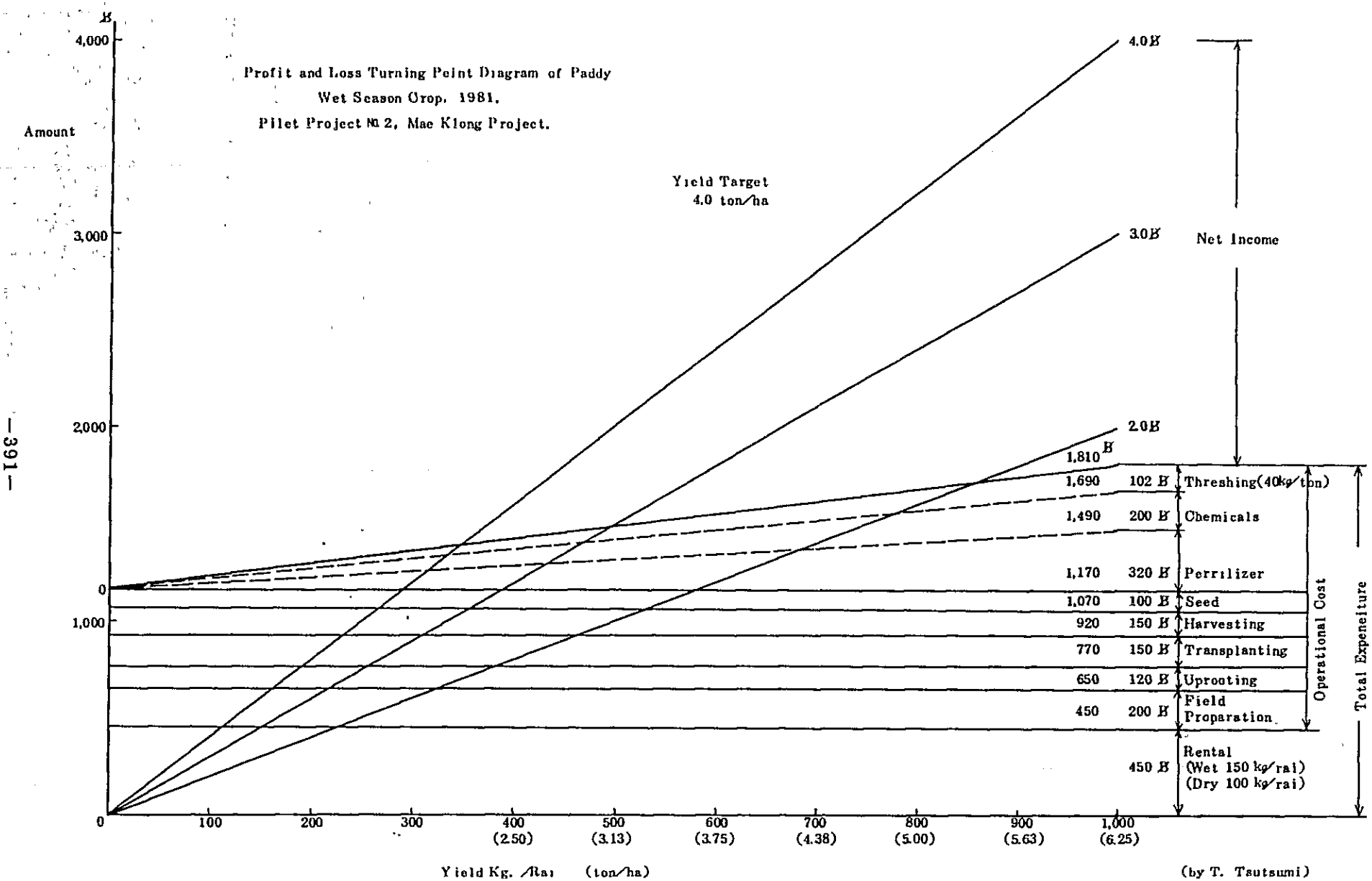
If it is strongly insisted, there grows resister. Finally, the matter will be suspended.

7). To allot the fund for farming to farmers is necessary.

On the time of the agricultural foundation is completed and the conditions for double cropping are prepared, the new farming including water management is required.

Accompanying this matter, the expenses of machinery, materials and activity will increase. In considering the present state, we are concerning on the part of fund, whether it can be met with or not (on the result of investigation among the 42 farmers on the downstream of Pilot No. 1, the 34 (81%) farmers are raising loan by the report of servey for evaluation on agriculture extension working (1982, JICA).

For the reference of this matters, one figure is shown on next page (profit and loss Turning Point Diagram of Paddy).


Profit and Loss Turning Point Diagram of Paddy
Wet Season Crop. 1981.
Pilet Project № 2, Mae Klong Project.
Amount
B
4,000
3,000
2,000
1,000
0
Yield Target
4.0 ton/ha
4.0B
3.0B
2.0B
1,810 B
1,690 102 B Threshing(40kg/ton)
1,490 200 B Chemicals
1,170 320 B Perrilizer
1,070 100 B Seed
920 150 B Harvesting
770 150 B Transplanting
650 120 B Uprooting
450 200 B Field Proparation
450 B Rental (Wet 150 kg/rai) (Dry 100 kg/rai)
Net Income
Operational Cost
Total Expenelture
100 200 300 400 (2.50) 500 (3.13) 600 (3.75) 700 (4.38) 800 (5.00) 900 (5.63) 1,000 (6.25)
Yield Kg. /Rai (ton/ha)
(by T. Tsutsumi)

ANNEX 1

Plan of Water Supply to the Farmers'Field in Dry Season, 1981.

1. Proposed irrigation area :- 144 ha (900 rai)

2. Irrigation requirement :- 0.181 m^3/s
   = 11 m^3/min. (0.2 l/s/rai)

3. Pumping irrigation plan :-
   Total head 15 m.
   Type of pump Centrifugal pump
   Capacity of pump
   ø150 mm., 2.8 m^3/min., 15 kw or 20 Hp.
   No. of pump required
   11 m^3/2.8 m^3 = 4 units

4. Fuel consumption
   Fuel requirement for diesel engine
   210 g/ps/hr, 0.250 l/ps/hr (gravity 0.84)
   Fuel requirement/unit
   0.25 l/ps/hr. x 20 = 5 l/unit/hr.
   Fuel requirement/4 unit/day
   5.0 x 24 x 4 = 500 l/day
   Total fuel requirement
   500 l/day x 100 day = 50,000 l.
   50,000 l. x @ 6.54 = 327,000 ฿
   Fuel cost/rai
   327,000 ÷ 900 = 363 ฿

5. Ratio of fuel cost
   Production 4,000 kg/ha = 640 kg/rai
   Gross income 640 kg x 3.5 ฿/kg = 2,240 ฿
   Ratio of fuel cost
   (363 ฿ - 2,240 ฿) x 100 = 16.2 %

ANNEX 2.

CONTRACT

Name of Contract : Fuel loan for pumping on Dry Season Crop

This Contract is executed on this 27th of March 1981 at Mae Klong Project, between :

Mr. Vinai Youngpueng, Machanic engineer 5, hereinafter called "Lender" of one part, and Mr. Pramual Jeenapak, Kamnan, hereinafter called "Borrower".

Both parties mutually agree under the term of this Contract as follows :

1. "Borrower" borrow fuel (diesel) 7,000 l. and get the fuel on March 27, 1981.

2. "Borrower" promise will use the fuel for planting on this dry season crop only, and will pay the fuel back in the same method.

3. "Borrower" will back the fuel in the same type (diesel) and same quantity to the "Lender" within 30 days after harvesting.

4. If "Borrower" does not follow the condition above the "Lender" agree to pay for any damage if it occur to the "Lender".

This Contract is executed two, one for each party. Both the "Lender" and "Borrower" have set their signature and affixed the seals thereto in the presence of the witness.

Mr. Vinai Youngpueng ... Lender
(Machinery engineer of RID)

Mr. Pramual Jeenapak ... Borrower
("Kamnan" official of district
& elected by farmers)

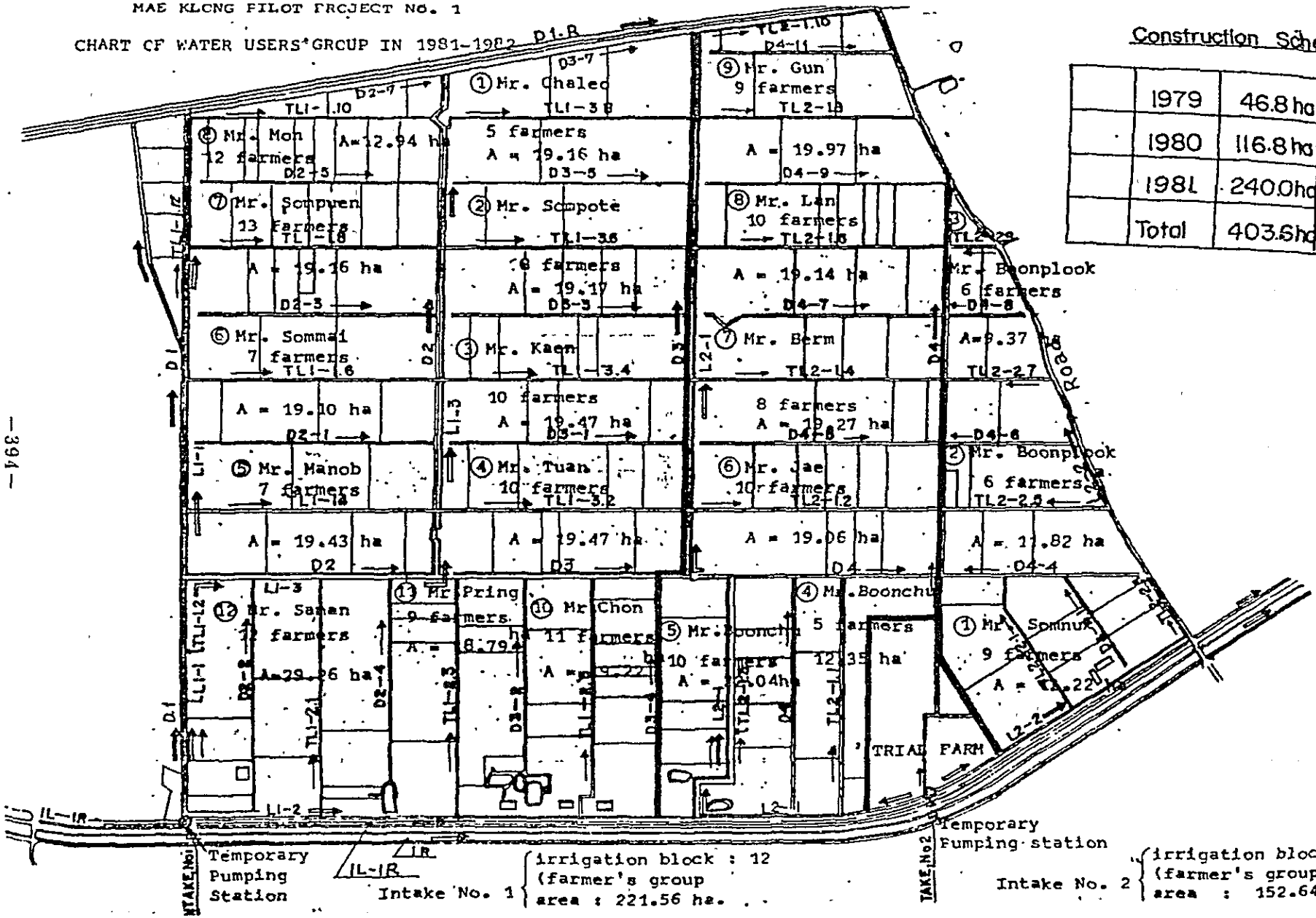
Mr. Piya Sunipasa ..... Witness
(Electric engineer of RID)

Mr. Sunipasa Litruengyut.. Witness
(Zone man of O & M Office,RID)

ANNEX 3.

MAE KLONG PILOT PROJECT NO. 1

CHART OF WATER USERS' GROUP IN 1981-1982



Construction Schedule

	1979	46.8 ha
	1980	116.8 ha
	1981	240.0 ha
	Total	403.6 ha

Include Trial Farm 9.9 ha

ANNEX 4.

Comparative table for the both of plan and results on the water fee of dry season crop, 1981

Mae Klong Pilot Project No.1

Item	Plan	Results	Remark
1. Proposed area to be irricated	144 ha (900 rai)	95.4 ha(596.4 rai) ... 66% among the whole area item {transplanting 335.8 rai(56.3%) direct sowing 260.6 " (43.7%) about 61% of irricated area was cultivated by tenant.	excluding the farm land of Trial Farm.
2. Number of farmers	55 farmers	43 farmers (78%)	
3. Irrigation quantity	0.181 m^3/s = 11 $m^3/min.$ (0.2 l/s/rai)	Max. 0.320 m^3/s = 19.2 $m^3/min.$ (0.54 l/s/rai) Average 0.280 m^3/s (irrigation period) (0.47 l/s/rai)	the rate of pumped up water per rai 0.47/0.2 = 2.35
4. Pump dimensions ① type ② total head (gross head) ③ ø x unit ④ pumping out quantity	① centrifugal pump ② 15 m. ③ 150 mm.(6") x 4 unit ④ 11.2 m^3(2.8 m^3/min/unit ... 15 kw or 50 Hp)	① centrifugal pump ② 6.7 m. (4.5 m.) ③ 300 mm.(12") x 1 unit ④ average 16.8 m^3/min (90 Hp)	4) Supplement pump in 6" was temporarily operated

Item	Plan	Results	Remark
5. Operation ① hour/day	① 24 hours	Average Feb. 13.2 hr/day (225 hr/17 days) Mar. 12.3 " (344 hr/28 days) Apr. 9.5 " (208 hr/22 days) May. 11.4 " (171 hr/15 days) Average 11.6 hr/day (948 hr/82 days)	
② period	② 100 days	② 98 days (actual operated day = 82 days) date of begining : Feb.10 " stop : May.18	② operation was suspended due to the movement, checking, rainfall and the collapse of coffer dam in 1R canal.
③ way of operation	③ -	③ RID Provided the pump and operator oOperation hour was controlled by the farmers'requirement for water	③ Standard operation shift Commencement : 8:00 a.m. Stop : 6-8 p.m.
④ Consumption of fuel	④ ⓐ Volume of per day 5.1 l/hr/unit x 4 unit x 24 hr = 490 ≒ 500 l/day ⓑ Total volume 500 l/day x 100 days = 50,000 l.	4	

Month	days(operation days)	operation hr.	diesel oil	l/hr	oil
Feb(10~28)	19 days(17 days)	225 hr	3,150 l.	14.0	10 l
March	31 " (28 ")	344 "	4,824 l.	"	35
April	30 " (22 ")	208 "	3,136 l.	15.1	32
May(1~18)	18 " (15 ")	171 "	2,392 l.	14.0	35
Total	98 days (82)	948 hr.	13,502 l.	average 14.2	112 l

Total volume of fuel ≒ 14,000 l.

④ Total fuel came to about 14,000 l. due to the supplement pump

Item	Plan	Results	Remark
6. Fuel charge ① total cost	① 50,000 l. x 6.54 ฿/l. = 327,000 ฿	① 13,502 l x 7.5[illegible] ฿/l = 102,075 ฿ farmers'payment for fuel 7,000 l x 7.5[illegible] = 52,920 ฿	1 RID subsidized to the fuel of 7,000 l. for farmers.
② unit cost per rai	② 327,000 ฿/900 rai = 363 ฿/rai	② 102,075 ฿/596.4 rai = 171.2 ฿/rai farmers'payment 52,920 ฿/596.4 = 88.75 ฿/rai	
7. Yield of paddy	assumed yield 4,000 kg/ha=640kg/rai	3,812 kg/ha ≒ 610 kg/rai {direct sowing 3,641 kg/ha transplanting 3,983 " }	
8. Gross income	640 kg x 3.5 ฿/kg = 2,240 ฿/rai	610 kg x 3.5 ฿/kg = 2,135 ฿/rai	average price per kg ≒ 3.5 ฿
9. Rate of fuel charge (water fee) acainst gross income for farmers	(363 ฿/2,240 ฿)x100=16.2%	(171.2 ฿/2,135 ฿) x 100 = 8 % actual farmers'expenditure (88.75 ฿/2,135 ฿) x 100 = 4.2%	

ANNEX. 5 A PLAN OF WATER MANAGEMENT AT MAE KLONG P/P No. 1

(DRAFT)

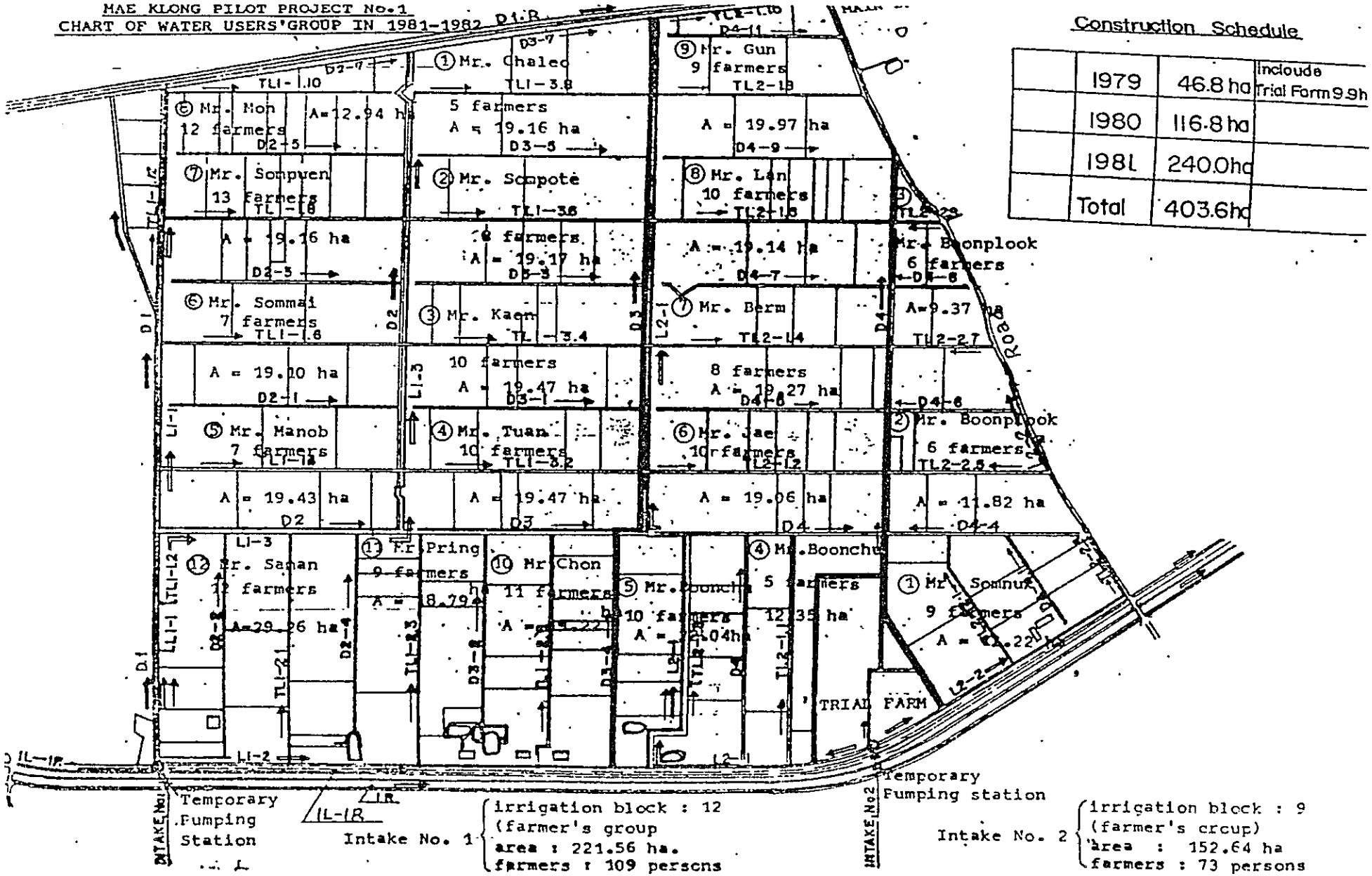
DECEMBER 1981

CONTENTS

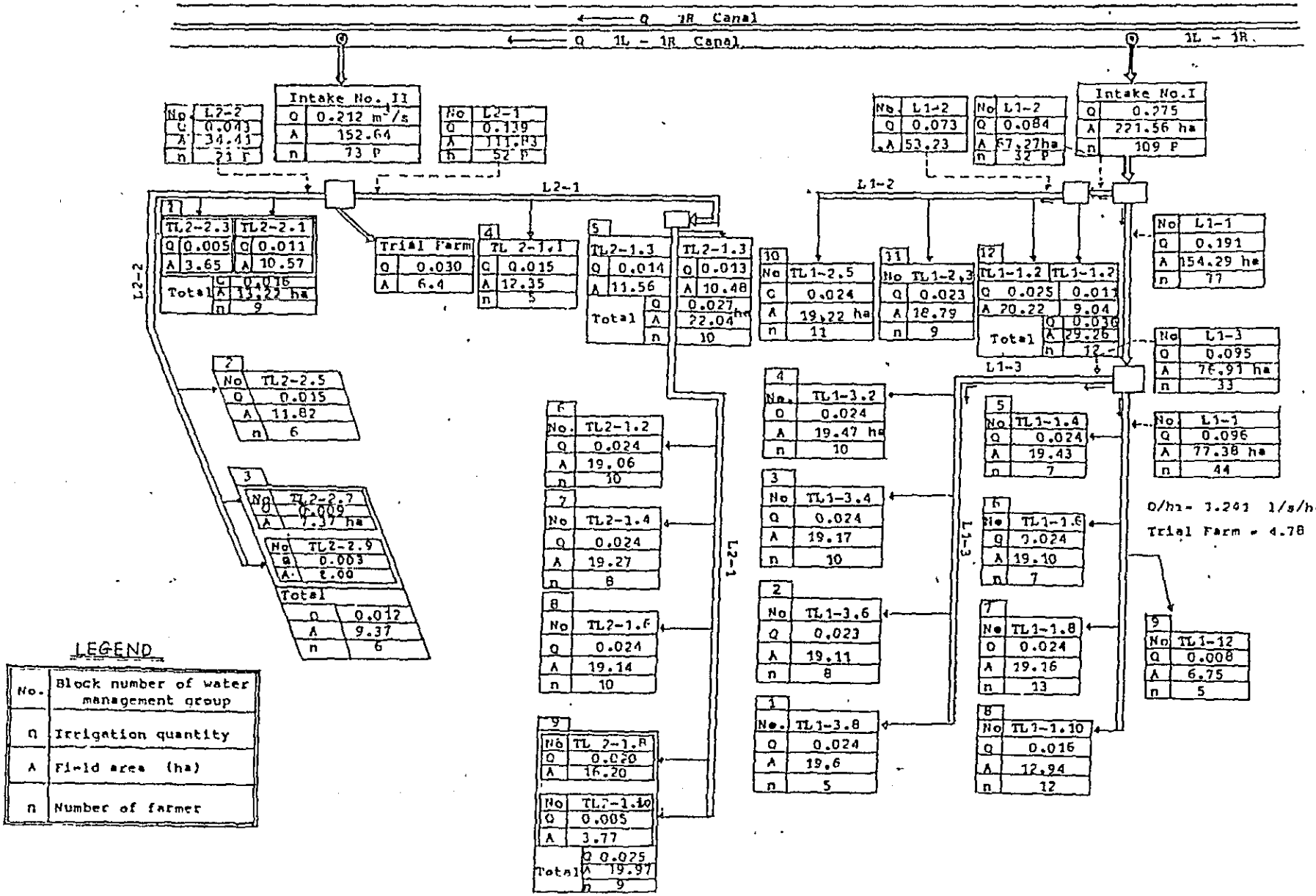
a. Plan of Water Supply to the Farmers'field in Dry Season, 1982

Items	Intake No.1	Intake No.2	Remarks
1. Proposed irrigation area	A = 221.56 ha (1,385 rai)	A = 152.64 ha (954 rai)	Total A = 374.20 ha (2,339 rai)
2. Irrigation water requirement	Q = 0.275 m^3/s (16.5 m^3/min.)	Q = 0.212 m^3/s (12.7 m^3/min.)	Total Q = 0.487 m^3/s (29.2 m^3/min.)
3. Pumping irrigation plan			
① Type and No. of pump	ø 12" (Centrifugal) x 1 unit (300 m/m)	ø 12" (Centrifugal) x 1 unit	Total ø 12" x 2 unit
② Capacity of pump	0.300 m^3/s (18 m^3/min.) (total head : 7 m.)	0.300 m^3/s (18 m^3/min.)	0.600 m^3/s (36 m^3/min.)
③ ⓐ Spare pump at the intake position	ø 6" (150 m/m) x 1 unit	ø 6" (150 m/m) x 1 unit submerge pump 1 unit for trial farm	Total Centrifugal pump ø 12" .. 1 unit " ø 6" .. 4 "
ⓑ ditto at the field	ø 6" x 1 unit leading drainage D2→TL1-3	ø 6" x 1 unit leading drainage D3→TL2-1	vertical pump .. 7 "
ⓒ ditto (for rent) at the field	vertical pump 4 units	vertical pump x 3 units	submerge pump (motor) .. 1 "
	total ø 12" ..... 1 unit ø 6" ..... 2 " vertical .. 4 "(rental)	total ø 12" ..... 1 unit ø 6" ..... 2 " vertical .. 3 " submerge .. 1 "	from RID from RID .. 2 units and Project ... 2 from Project ditto

Items	Intake No. 1	Intake No. 2	Remarks
4. Fuel Consumption			
1 ø12" (main pump)	12.0 hr/day x 14.2 l/hr x 85 day = 14,500 l.	the same as the left 14,500 l.	1 if we use ø6" pump instead of ø12" pump, we have to prepare 4 units pump
2 ø6" (spare pump)	4.0 hr/day x 5 l/hr x 85 day = 1,700 l.	the same as the left 1,700 l.	
	(Spare pump at the field will be operated by 30 % of main pump's working)	(" ")	12 hr/day x 5 l/hr x 85 day x 4 unit = 20,400 l.
	total 16,200 l/season	total 16,200 l/season	
	total	32,400 l.	
5. Fuel cost per rai			
① total fuel cost	16,200 l x 7.56 ฿/l. = 122,472 ฿	" " 122,472 ฿	
② cost per rai	122,472 ฿/1,385 rai = 88.5 ฿/rai ≒ 89 ฿/rai	122,472 ฿/914 rai = 134 ฿/rai 914 rai = 954-40 (trial farm)	cost per rai of total area 244,944 ฿/2,299 rai = 106.54 ฿/rai ≒ 107 ฿/rai
6. Ratio of fuel cost			
① Production per rai	640 kg/rai (	= 4,000 kg/ha)	
② Gross income	640 kg/rai x	3.6 ฿/kg = 2,304 ฿/rai	
③ Ratio of fuel cost	(88.5 ฿ - 2,304) x 100 = 4 %	(134 ÷ 2,304) x 100 = 6 %	mean ratio (107 ÷ 2,304) x 100 = 5 %
7. others			operator and lubricanting oil will be supported by RID


MAE KLONG PILOT PROJECT No.1
CHART OF WATER USERS'GROUP IN 1981-1982
Construction Schedule
1979 46.8 ha Incloude Trial Farm 9.9h
1980 116.8 ha
1981 240.0ha
Total 403.6ha
① Mr. Chalee 5 farmers A = 19.16 ha
② Mr. Sompote 8 farmers A = 19.17 ha
③ Mr. Kaem 10 farmers A = 19.47 ha
④ Mr. Tuan 10 farmers
⑤ Mr. Manob 7 farmers
⑥ Mr. Mon 12 farmers A=12.94 ha
⑦ Mr. Sompuen 13 farmers
⑧ Mr. Lan 10 farmers A = 19.97 ha
⑨ Mr. Gun 9 farmers
⑩ Mr Chon 11 farmers
⑪ Fr. Pring 9 farmers
⑫ Mr. Sanan 12 farmers A=29.26 ha
Mr. Boonplook 6 farmers
Mr. Berm A=9.37 ha
Mr. Boonplook 6 farmers
Mr. Somnuk 9 farmers
Mr. Boonchu 5 farmers 12.35 ha
TRIAL FARM
Road
Temporary Pumping Station
Intake No. 1
irrigation block : 12
(farmer's group
area : 221.56 ha.
farmers : 109 persons
Temporary Pumping station
Intake No. 2
irrigation block : 9
(farmer's group)
area : 152.64 ha
farmers : 73 persons

FLOW CHART OF IRRIGATION AT PILOT No. 1



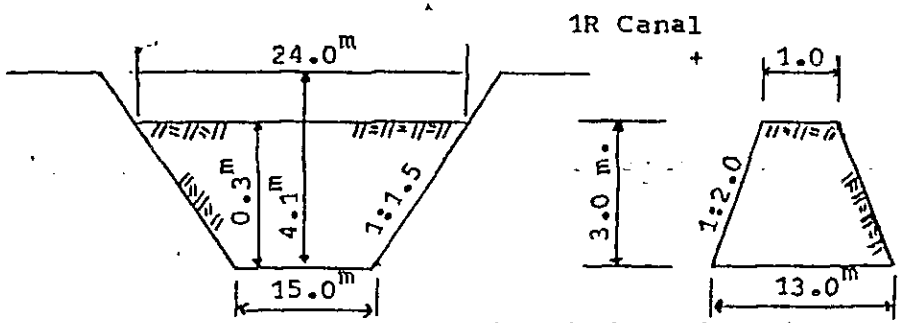
Arrangement before operating of pumps

1. To build a coffer dam at the point 150 m. away toward downstream from trial farm

Soil volume

$$\frac{1.0+13.0}{2} \times 3.0 \times \frac{24.0+15.0}{2}$$

$$= 409.5 \doteqdot 400 \text{ m}^3$$



Note : If 1R canal keeps adequate water, the structure mentioned above is not necessary

2. To provide pumps

a.) ø12" pump x 2 units and 2 units of ø6" pump as a supplementary pump at the temporary pumping stations

b.) 2 units of ø6" pump at the both leading drainage D2 and D3 in order to supply drain water to the irrigation ditch

① D2 ⟶ TL1 - 3.6

② D3 ⟶ TL2 - 1.6

c.) 1 unit of a motor pump for a trial farm

d.) 7 units of a small vertical pump for supplying irrigation water to the end area

e.) other pumps which farmers hold by themselves

3. Arrangement of inside of area

a.) to make a coffer dam at the end of drainage ditch with soil and concrete pipe ($\phi 200^{m/m}$)

b.) to block the water at the end of leading drainage canal by means of putting on the wooden or other materials infront of the existing pipes.

c.) to make a temporary pumping station at the place where $6^{"}$ pump will be installed beside the drainage canal

d.) to make canals and ditches clean

1 digging piled soil

2 cutting wild

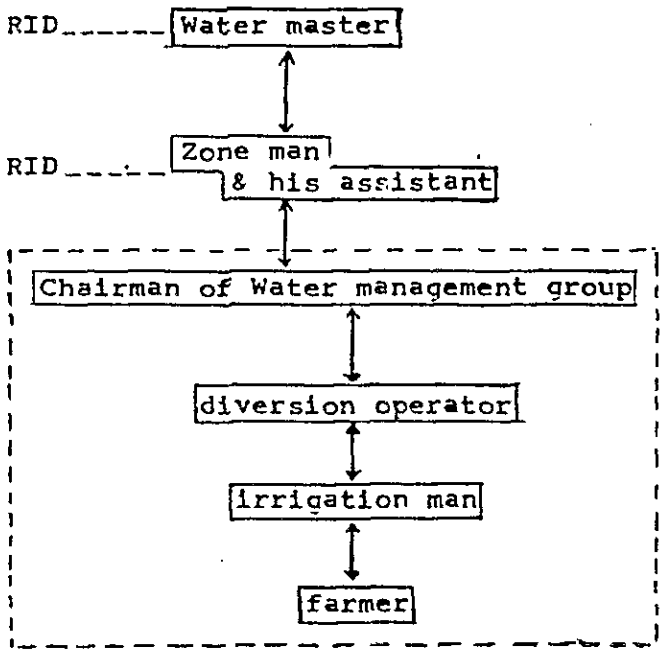
e.) to provide gates for diversion boxs and farm inlets to control the irrigation water

4. To perform a water requirement

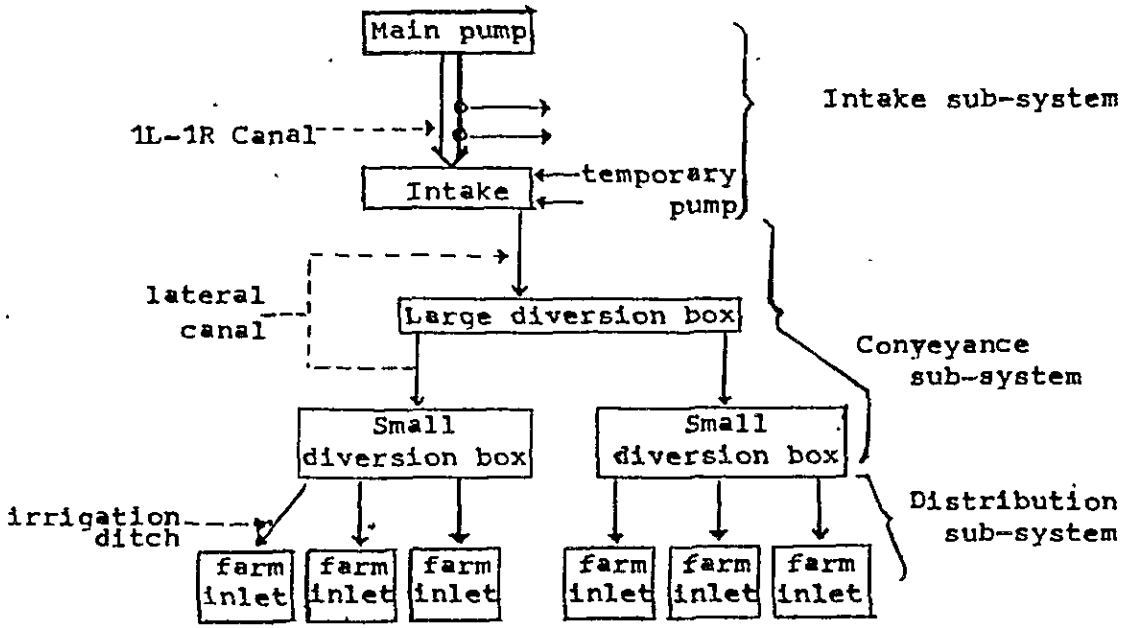
Refer to attached paper

Annual Plan of Operation & Maintenance at Pilot Project No. 1

1). Organization



2). Irrigation system



Note :

1 A chairman is selected by farmers

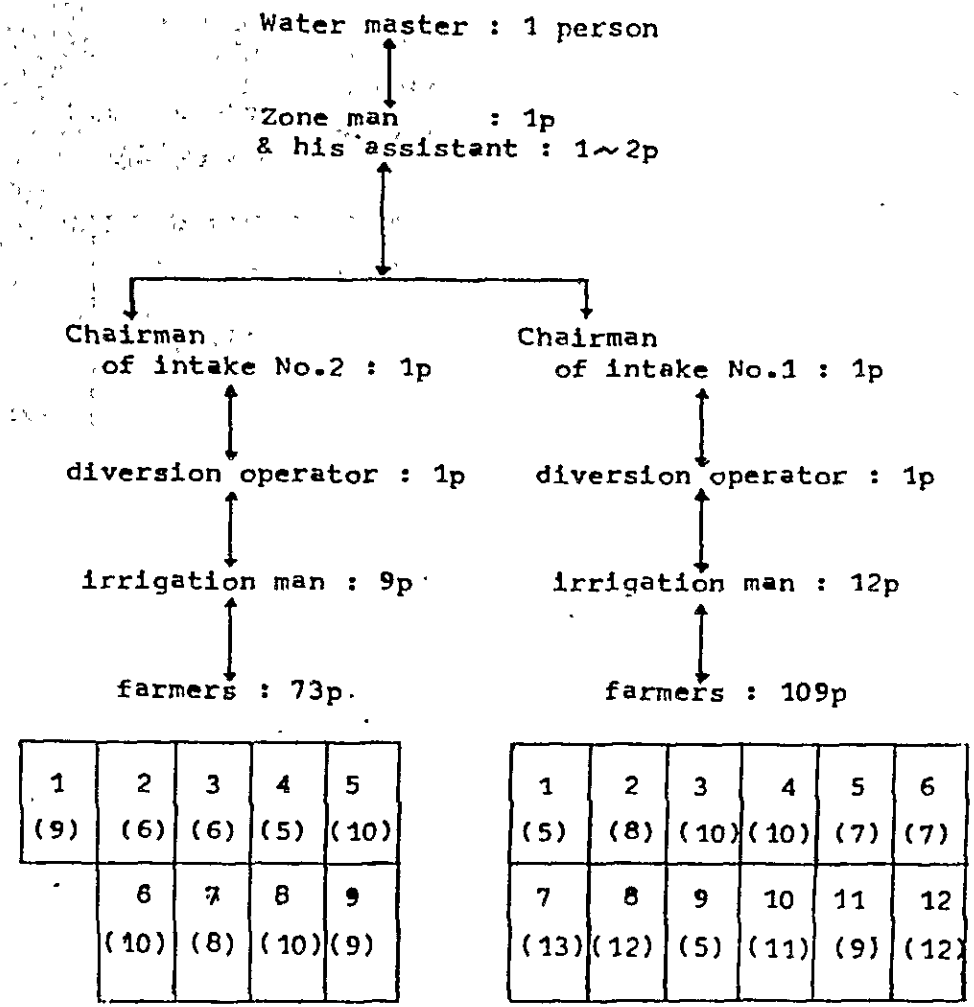
2 A diversion operator is selected by irrigation man

3 An irrigation man is selected by farmers who are belonging the irrigation block

4 The chairman decides the definite day of maintenance working for canal, ditch and structures according to the discussion with operators and irrigation men

5 the irrigation man gathers the farmers and supervises the working for O & M

3). Function of Group



To generalize a water management

O & M for intake sub-system

1 main pump

2 1L-1R canal

3 intake No.1, No.2

4 large diversion box

To generalize a farmers'group

O & M for small diversion box

Observe and check

1 Canal, ditch

2 farm inlet & outlet

} Conveyance & Distribution sub-system

O & M

1 lateral canal

2 irrigation ditch

3 drainage ditch

} cleaning

4 farm inlet & outlet

4). Annual working schedule for O & M

① General C & M

Name	Operation of gate	Maintenance			
		Canal and ditch		Concrete structure	Extra work
		digging	wild cutting		
Zone man & his assistant	every day	observe and check box every day	1L-1R Canal, intake and large diversion		
Chairman	to decide a rule of working and order the maintenance to the farmers				
Diversion operator	to operate and check a gate every day			small diversion box	
Irrigation man	ditto	observe and check canal, ditch every day			
Farmer	to operate and check an inlet gate every day	① in the dry season 1 time (end of Jan) ② in the rainy season 1 time (end of June) ③ to maintenance the road, canal and ditch which locate along the farm plot	① in the dry season 1 time/2 months (from end of Jan) ② in the rainy season 1 time/1.5 months (from end of June)		to set a temporary pump to repair incase of emergency

② Schedule of maintenance

i). Schedule of one irrigation block (0.8^{ha} x 24^{plots} = 19.2^{ha} = 120 rais) per year

Name of facilities	Items of facilities	Mean volume of facilities	Name of working	Joint working schedule (1 = 1st week of month, 2 = 2nd " " , 3 = 3rd week of month)												total
				1	2	3	4	5	6	7	8	9	10	11	12	
				dry season					wet season							
Road	Community	$350^{m.}$	repairing	3 ○		3 ○			3 ○		2 ○	3 ○		2 ○		6^{times}
	farm	$630^{m.}$														
Canal	lateral	$350^{m.}$	digging	3 ○					3 ○							2
	farm ditch	$600^{m.}$	cutting wild	3 ○		3 ○			3 ○		3 ○	3 ○		2 ○		6
Drainage	leading	$350^{m.}$	digging	3 ○					3 ○							2
	drainage ditch	$300^{m.}$	cutting wild	3 ○		3 ○			3 ○		3 ○	3 ○		2 ○		6
Structure	canal culvert	1^{place}	repairing (checking)													
	small diversion box	1^{place}		3 ○		3 ○			3 ○		3 ○	3 ○		3 ○		6
	drainage culvert	1^{place}														
	farm inlet	24^{place}					—	—		—			—			
				◎ ○		○			◎		○	○		○		◎ — 2^{times} ○ — 4^{times}

ii). Volume of labour

Ⓐ Joint working
- ordinary working
  - ◎ 2 times a year ----10 farmers-2 days-2 times=total 40 farmers
  - ○ 4 " " ----10 " -1 " -4 " = " 40 "
- extra working △ 2 " " (plan)...10 " -1 " -2 " = " 20 "

total = 100 farmers

Ⓑ Operation working
- Chair man
- diversion operator every day 1 person - 150 days - 2 seasons = 300 days
- irrigation man

3 Calculation of O & M fee per year

Mark	Items of O.& M	Volume	Intake No.1 (12 groups)	Intake No.2 (9 groups)	Total (21 groups)
Ⓐ	Joint working ..	100 farmers x 50 ฿/day = 5,000 ฿	5,000 x 12 = 60,000 ฿	5,000 x 9 = 45,000 ฿	105,000 ฿
Ⓑ	Operation working				
	Chairman	1 person fixed amount	1,000	1,000	2,000 ฿
	Diversion operator	300 days x 10 = 3,000	3,000 x 12 = 36,000	3,000 x 1 = 3,000	6,000 ฿
	irrigation man	ditto	3,000 x 12 = 36,000	3,000 x 9 =27,000	63,000 ฿
Ⓒ	Reserve fund for materials & extra fee	2,000 ฿/group	2,000 x 12 = 24,000	2,000 x 9 =18,000	42,000 ฿
	total		124,000 ฿	94,000 ฿	218,000 ฿
	Unit cost per rai		÷1,385 rai = 89.5 ฿ ≒ 90 ฿/rai	÷914 rai = 102.8 ฿ ≒ 103 ฿/rai	÷2,299 rai = 94.8 ฿ ≒ 95 ฿/rai

Note :

1. farmers can work themselves instead of paying money about Ⓐ } intake No.1 ... 64,000÷1,385=46.2=47 ฿/rai

2. farmers have to pay money for Ⓑ + Ⓒ } intake No.2 ... 49,000÷914 =53.6=54 ฿/rai

3. Maintenance fee for intakes and diversion boxes will be paied by O & M Office of RID

4. (O & M fee + gasoline) per rai ..... intake No.1 = 47+89 = 136 ฿/rai .... intake No.2 = 54+134 = 188 ฿/rai

WATER MANAGEMENT REGULATION

a. Puddling period

1). Maximum amount of intake water are as follow :-

Intake No. 1 0.281 m^3/s Water measurement : C.H.O

" No. 2 0.211 m^3/s " " : Wear

Shown annex hydrograph ANX - 1, ANX - 2

2). Irrigation hour is 24 hours

3). Puddling period 48 days

Water requirement for puddling 150 mm.

4). 1 plot (10 rais = 1.6 ha) is irrigated during for 2 days

5). Irrigation time from farm inlet are shown annex - 3

b. Growth period

1). Each canal's diversion system shown annex flow chart. Adjustment of water amount should be controlled by wooden controller that is installed the each diversion works.

2). Irrigation hour is 24 hours.

3). Irrigation water requirement of each farm ditch should be judged by water depth in farm ditch.

Shown annex H - Q Curve ANX - 4

4). Rotation interval is six (6) days + 1 spare day = 7 days

5). Standard changing time of irrigation water is twice a day.

changing hour : 1st 6:00 A.M.

2nd 6:00 P.M.

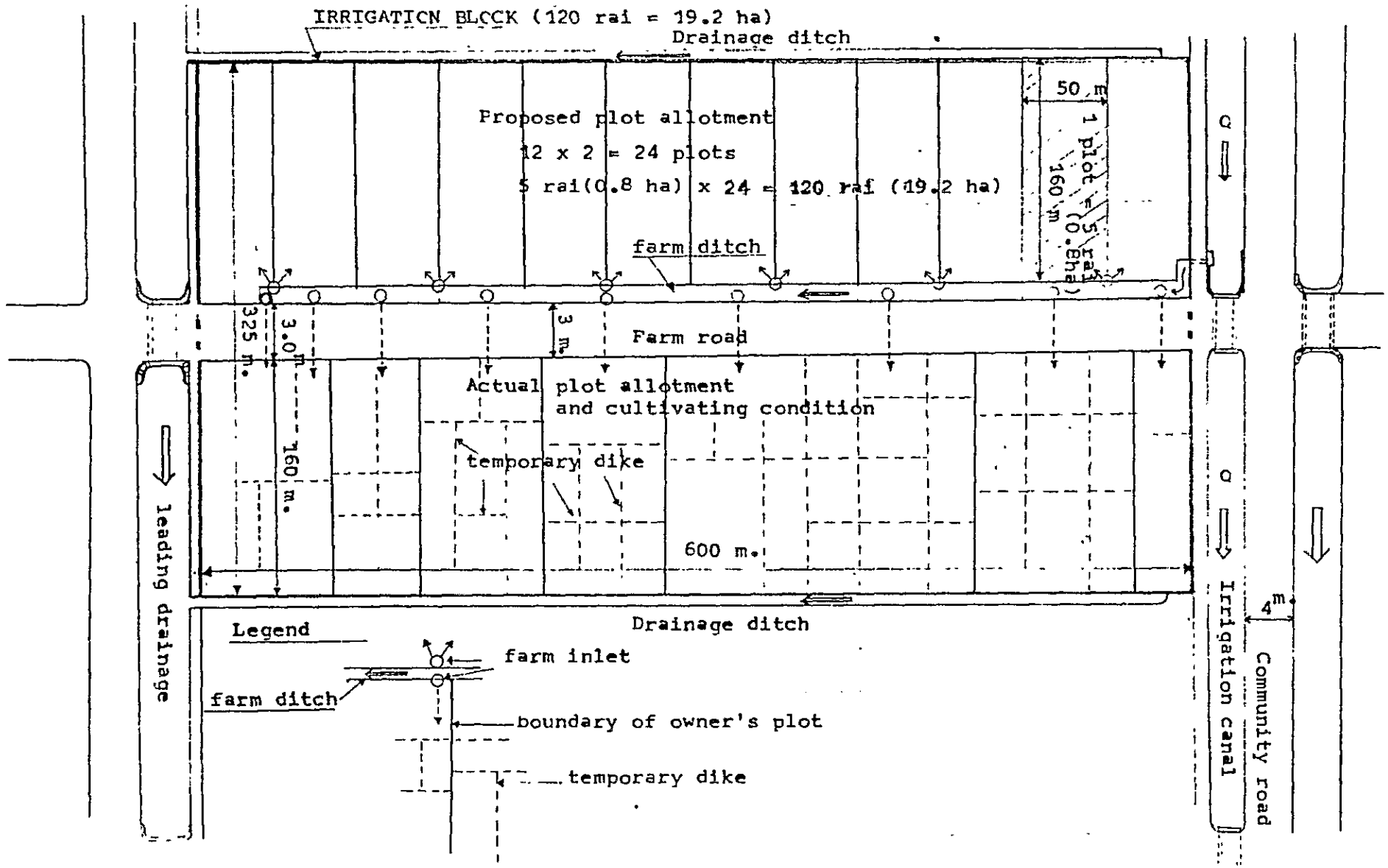
Irrigation plot per 1 time : 2 plots (this is maximum water requirement time, standard plot $160^{m} \times 50^{m}$)

6). Actually, the plot size is different respectively due to the acreage of owners, so that the changing time of irrigation water would be determined according to the plot size.

∴ Shown example : ANX - 5

7). Rotation system should be postponed, if daily rainfall has more than 10 mm.

Figure A PROFILE OF IRRIGATION BLOCK OF PILOT PROJECT No.1



Summary of Water Requirement in Pilot Project No. 1

1 ha = 6.25 rai = 10,000 m^2

1 rai = 0.16 ha = 1,600 "

1. Unit water requirement (by design)

   a). Puddling period

   Q max. = 1.250 l/s/ha

   b). Growth period

   Q max. = 1.163 l/s/ha = 0.19 l/s/ha

2. Standard irrigation block

   A = 120 rai (= 19.2 ha) : 24 plots x 0.8 ha

   1 plot = 5 " (= 0.8 ha) : 160 m x 50 m.

3. Rotation irrigation interval

   a). Puddling period : 48 days

   b). Growth period

   6 days + 1 day to spare = 7 days (= 1 week)

4. Coverirg area per day

   a). Puddling period

   120 rai (24 plots) ÷ 48 days = 2.5 rai (0.5 plot)

   b). Growth period

   120 rai (24 plots) ÷ 6 days = 20 rai (4 plots)

5. Irricable area per hour

a). Fuddling period

2.5 rai ÷ 24 = 0.104 rai (= 166.4 m^2)

b). Growing period

20 rai ÷ 24 = 0.833 rai (= 1,333 m^2)

6. Irrigation time per area

a). Fuddling period : Shown ANX - 3

b). Growing period : (A rai)

24 hours x $\frac{A}{20 \text{ rai}}$ = 1.2Ahour (= 7.5 x A ha.)

Reference

Rotation irrigation interval of 7 days (1 week) is available for farmers to control the water at the same day of a week. Though the covering area per day is calculated by 20 rai (rotation interval = 6 days) in rotation irrigation plan, 1 spare day can be used for adjusting the irrigation situation.

Comparison between water requirement and discharge for 1 irrigation block.

Maximum water requirement during paddy growing period 120 rai (= 192,000 m^2) x 7 days = 13,507.2 m^3

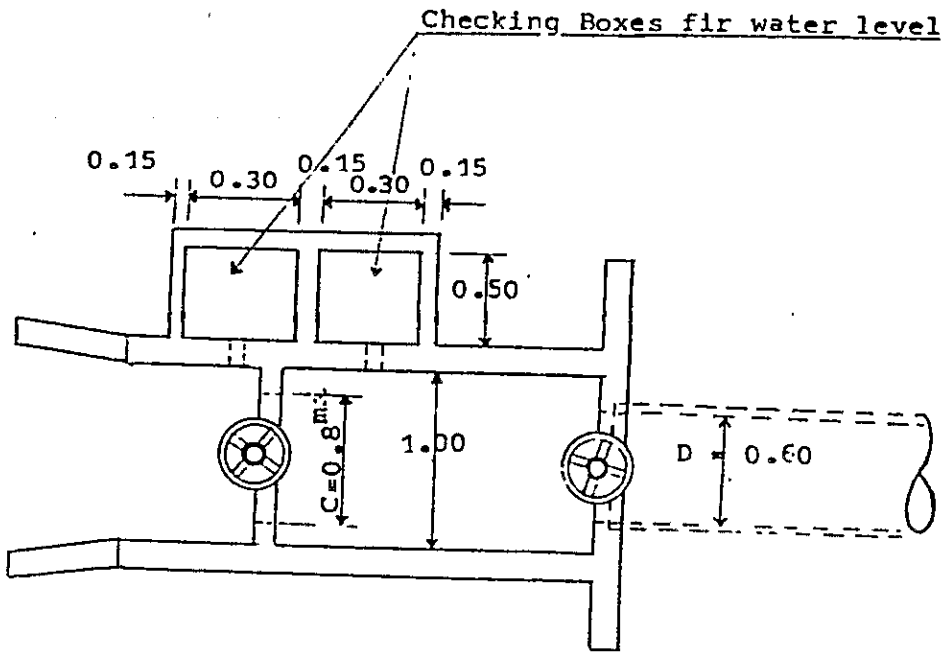
Maximum irrigation discharge

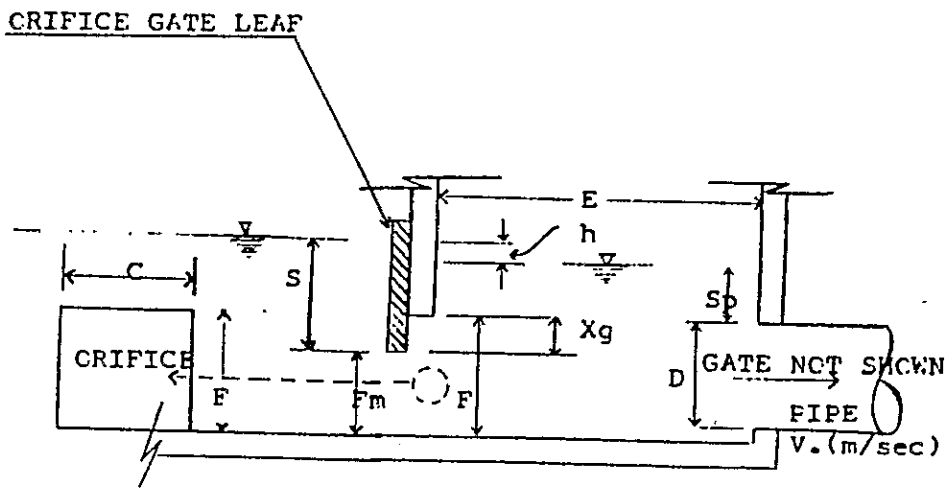
0.024 m^3/Sec (= 2,073.6 m^3/day) x 7 days = 14,515.2 m^3

Calculation of Discharge of Intake No. 1

Constant Head Orifice (CHO.)

CHO. has a combination reculating and measuring structure that uses and adjustable submerge orifice for the discharge measurement. At least two (2) gates are required for the structure to operate. The first gate at the upstream controls the size of the rectangular orifice. A second gate, at downstream, controls the water depth below the orifice and is operated to maintain the head across the orifice at a constant value.





(1) Hydraulic calculation

Formula

$$Q = \sqrt{CxA\ 2\ g\Delta h}$$

Determine the area of orifice

gate : $$A = \frac{Q}{c.\sqrt{2\ g\Delta h}}$$

Q : Discharge (CMS)

C : 0.65 - 0.7 orifice coefficient

A : Orifice area required (M^2)

g : 9.8 (M/sec^2)

h : Differential head 0.06 M

Consider an orifice gate c (width) by F (hich), the area equals CxF (m^2) gate rise $\frac{A}{C}$ = Fm

0.75 F = Fm = 0.8 F

The gate must be 75-80% open to provide the required area. This meets the requirement that the orifice area must be furnished in 75 to 80 percent of the gate rise.

Assume the velocity (V) in culvert pipe : 0.8 M/sec - 1.2 M/sec

$$Q = V.A. = V \times \frac{\P . D^2}{4}$$

$$D = \sqrt{\frac{4\ Q}{\P\ V}}$$

A : Area of pipe (M^2)

D : Diameter of pipe (M)

$\P$: 3.14

(2) Main dimension in structure

$E \geq 2.75\ Fm$

$Xg = t\ (min.)$

$Sp \geq 1.75 \times \frac{V^2}{2g} + 0.08$

$S \geq Fm$

where V : velocity in pipe (M/sec)

(3) Installed gate size for CHO. at Intake No. 1

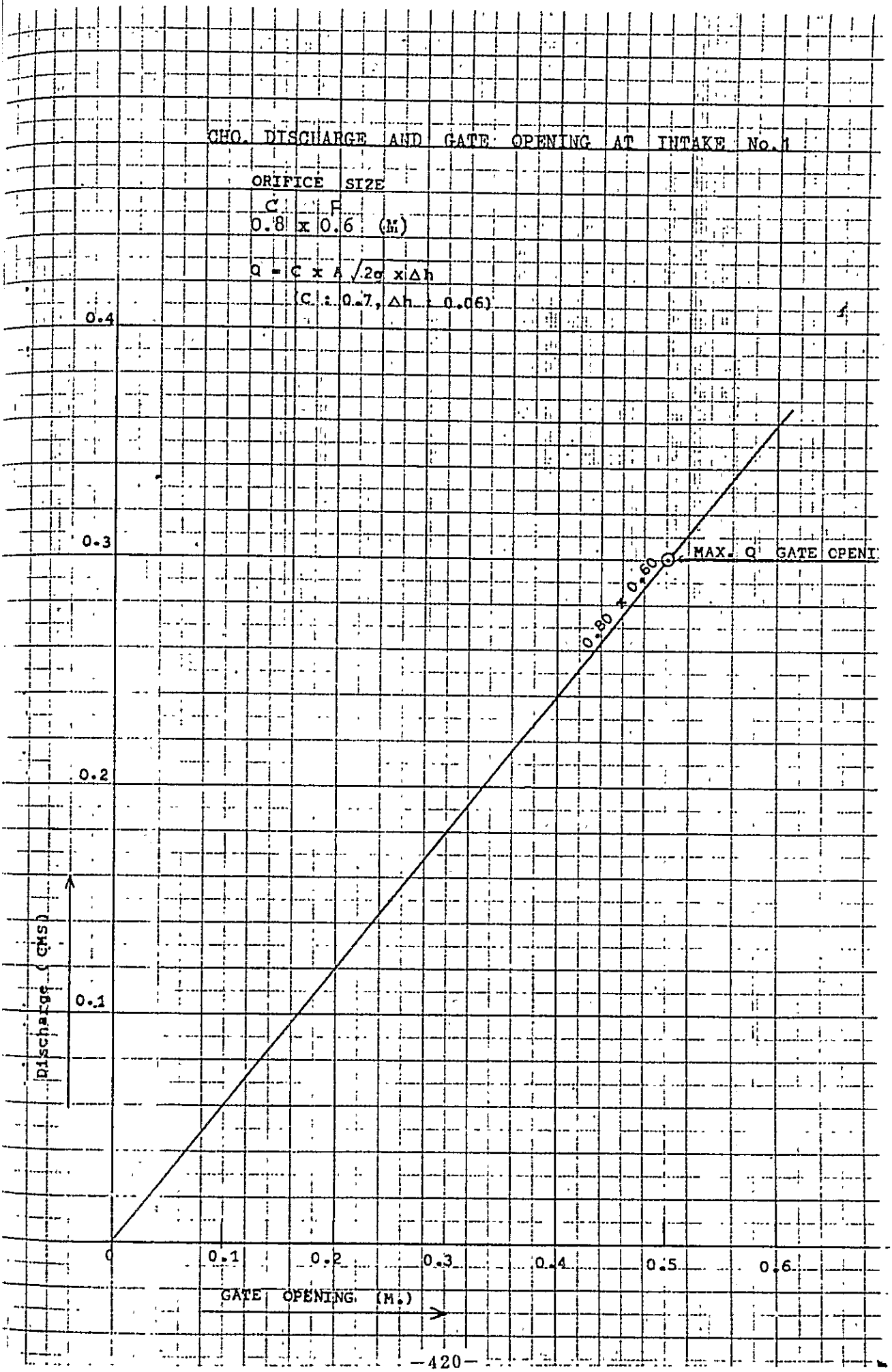
Type	Crifice Size (M) C	F	Gate Size (M)	Discharge (CMS) Fm (M)	Δh = 0.06 M	Culvert Pipe Gate (M)
	0.80	x 0.60	0.80 Square	0.50	0.30	ø0.60 - 0.80

Note :

(1) Round size of pipe gate is provide for culvert gate

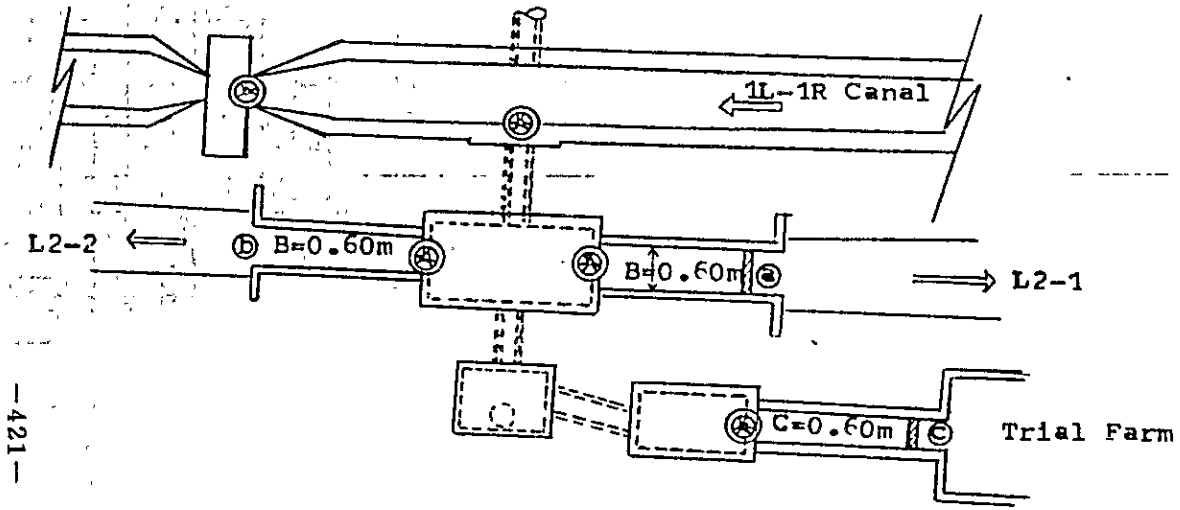
(2) Diameter of culvert pipe can be selected according to the required head loss

(3) Design orifice size will be determined based on next page, CHO. Discharge illustration

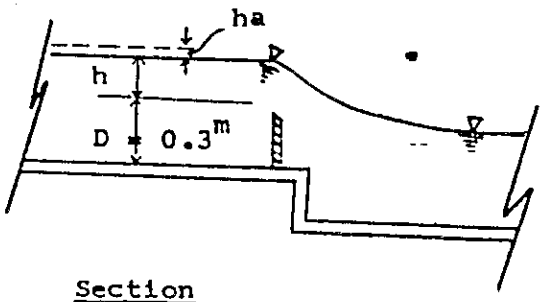

CHO. DISCHARGE AND GATE OPENING AT INTAKE No.1
ORIFICE SIZE
C F
0.8 x 0.6 (M)
Q = C x A √2g x Δh
(C : 0.7, Δh : 0.06)
0.4
0.3
0.2
0.1
MAX. Q GATE OPENI
0.80 x 0.60
Discharge (CMS)
0
0.1
0.2
0.3
0.4
0.5
0.6
GATE OPENING (M.)

Calculation of Discharge of Intake No. 2

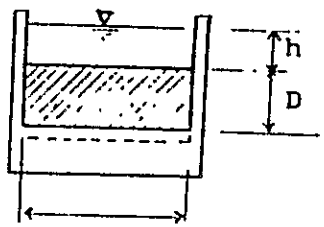
Rectangular weir



Plan



Section



1). Hydraulic calculation

① Formula (in case of ha=0)

$Q = C \cdot B \cdot h^{3/2}$ (full width weir)

where Q = Discharge (CMS)

C = Coefficient of weir

B = width of weir (M)

h = water depth of overflow (M)

Coefficient of weir

$$C = 1.785 + \left(\frac{0.00295}{h} + \frac{0.237h}{D}\right)(1+\varepsilon)$$

D = height of weir (M)

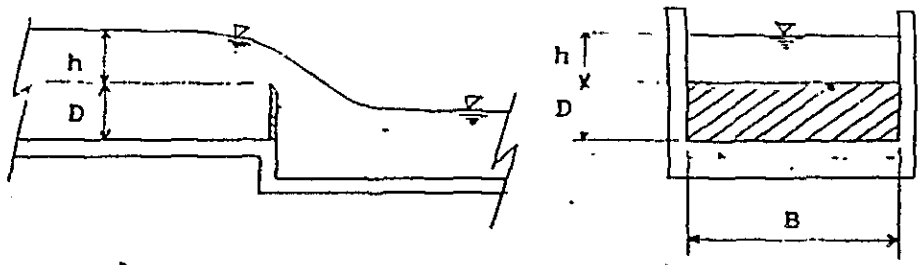
ε = Coefficient of revision

Available range

$B \geq 0.5$ M, $0.3 \leq D \leq 2.5$ M,

$0.03 \leq h \leq 0.8$ M ($h \leq D$ and $h \leq B/4$)

Full width weir



$$Q = C \cdot B \cdot h^{3/2}$$

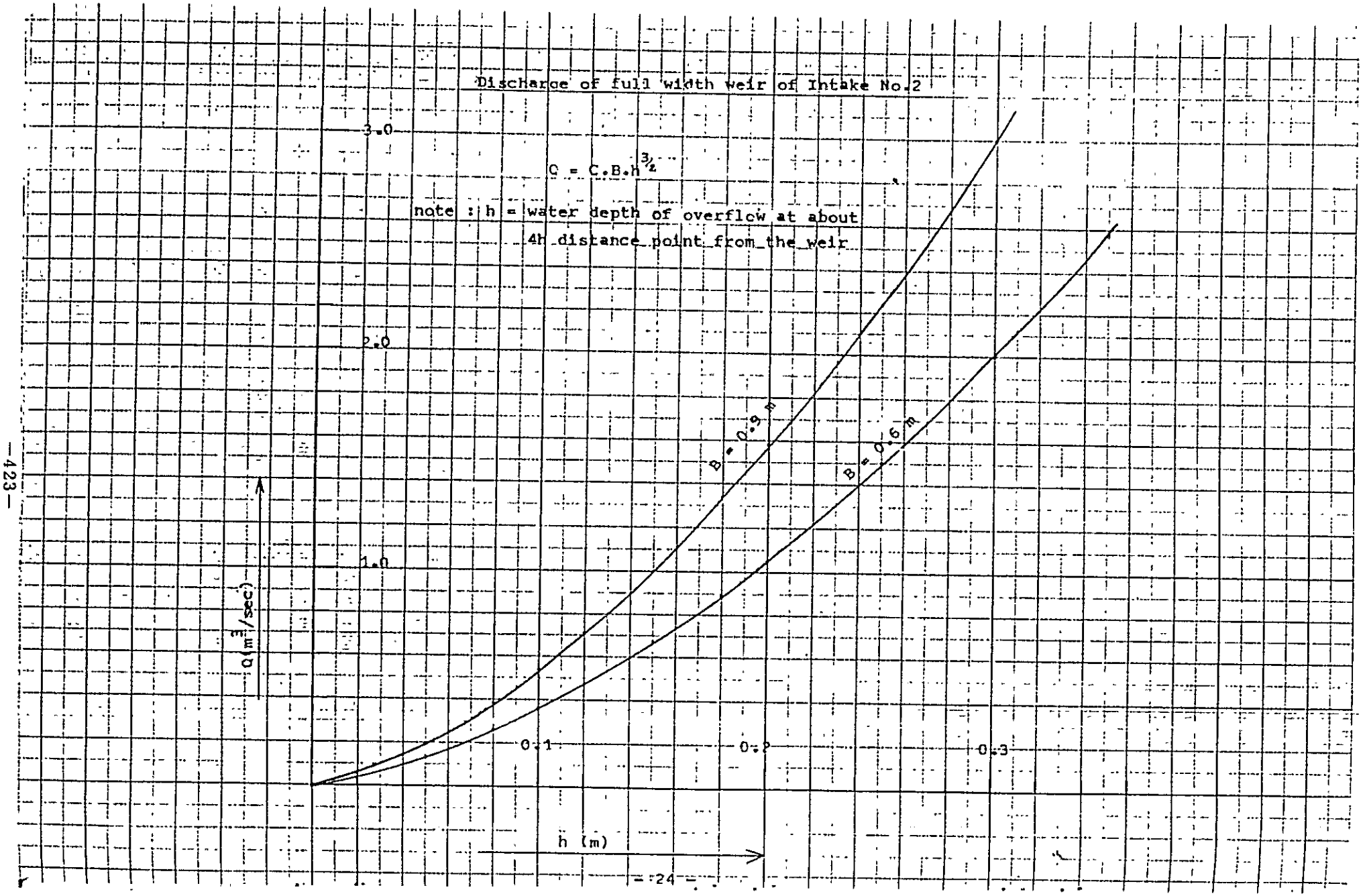
where $C = 1.785 + \left(\frac{0.0295}{h} + \frac{0.237h}{D}\right)(1 + \varepsilon)$

$D = 0.3$ M

$\varepsilon = 0$ (in case of $D \leqq 1$ M)

B = { 0.6 M - - - canal No. L2-2 (ⓑ) & ditch for trial farm (ⓒ)
    { 0.9 M - - - canal No. L2-1 (②)

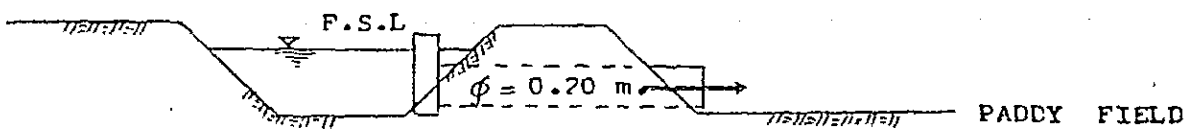
h	① $h^{3/2}$	② $\frac{0.00295}{h}$	③ $\frac{0.237h}{0.3}$	④ C $1.785+②+③$	Q B = 0.60 $0.6\times①\times④$	Q B = 0.90 $0.9\times①\times④$
0.02	0.0028	0.148	0.016	1.949	0.003	0.005
0.05	0.0112	0.059	0.040	1.884	0.013	0.019
0.08	0.0226	0.037	0.063	1.885	0.026	0.038
0.10	0.0316	0.029	0.079	1.893	0.036	0.054
0.12	0.0415	0.025	0.095	1.905	0.047	0.071
0.15	0.0580	0.020	0.119	1.924	0.067	0.100
0.18	0.0764	0.016	0.142	1.943	0.089	0.134
0.20	0.0894	0.015	0.158	1.958	0.105	0.158
0.25	0.1250	0.012	0.198	1.995	0.150	0.224
0.30	0.1643	0.010	0.237	2.032	0.200	0.300


Discharge of full width weir of Intake No.2
Q = C.B.h^3/2
note : h = water depth of overflow at about 4h distance point from the weir
3.0
2.0
1.0
Q (m³/sec)
B = 0.9 m
B = 0.6 m
0.1
0.2
0.3
h (m)

IRRIGATION TIME FOR VARIOUS WATER REQUIREMENT FROM FARM INLET

IRRIGABLE AREA (RAI)	WATER REQUIREMENT 80 MM/DAY		WATER REQUIREMENT 120 MM/DAY		WATER REQUIREMENT 150 MM/DAY	
	VOLUME OF WATER M^3/DAY	PERIOD OF OPERATION (HRS)	VOLUME OF WATER M^3/DAY	PERIOD OF OPERATION (HRS)	VOLUME OF WATER M^3/DAY	PERIOD OF OPERATION (HRS)
1	128	1.48	192	2.22	240	2.78
2	256	2.96	384	4.44	480	5.56
3	384	4.44	576	6.67	720	8.33
4	512	5.92	768	8.89	960	11.11
5	641	7.40	960	11.11	1,200	13.89
6	768	8.89	1,152	13.33	1,440	16.67
7	896	10.37	1,344	15.56	1,680	19.44
8	1,024	11.85	1,536	17.78	1,920	22.22
9	1,152	13.33	1,728	20.00	2,160	25.00
10	1,280	14.81	1,920	22.22	2,400	27.78
11	1,408	16.30	2,112	24.44	2,640	30.56
12	1,536	17.78	2,304	26.67	2,880	33.33

Farm Inlet, ϕ = 0.20 m.
Q = 0.024 m^3/Sec. = 86.4 m^3/hour



ANX - 4

Discharge computation and cross section of canal (ditch)

Discharge in canals (including ditches) are completed by the following formula

$$Q = A.V \qquad V = \frac{1}{n} \times R^{\frac{2}{3}} \times I^{\frac{1}{2}} \qquad R = \frac{A}{S}$$

where Q = Discharge (m^3/sec)

V = Average velocity (m/s) ... by the meaning formula

A = Flow section (m^3)

n = Coefficient of roughness

R = Hydraulic radius (m)

I = Hydraulic gradient

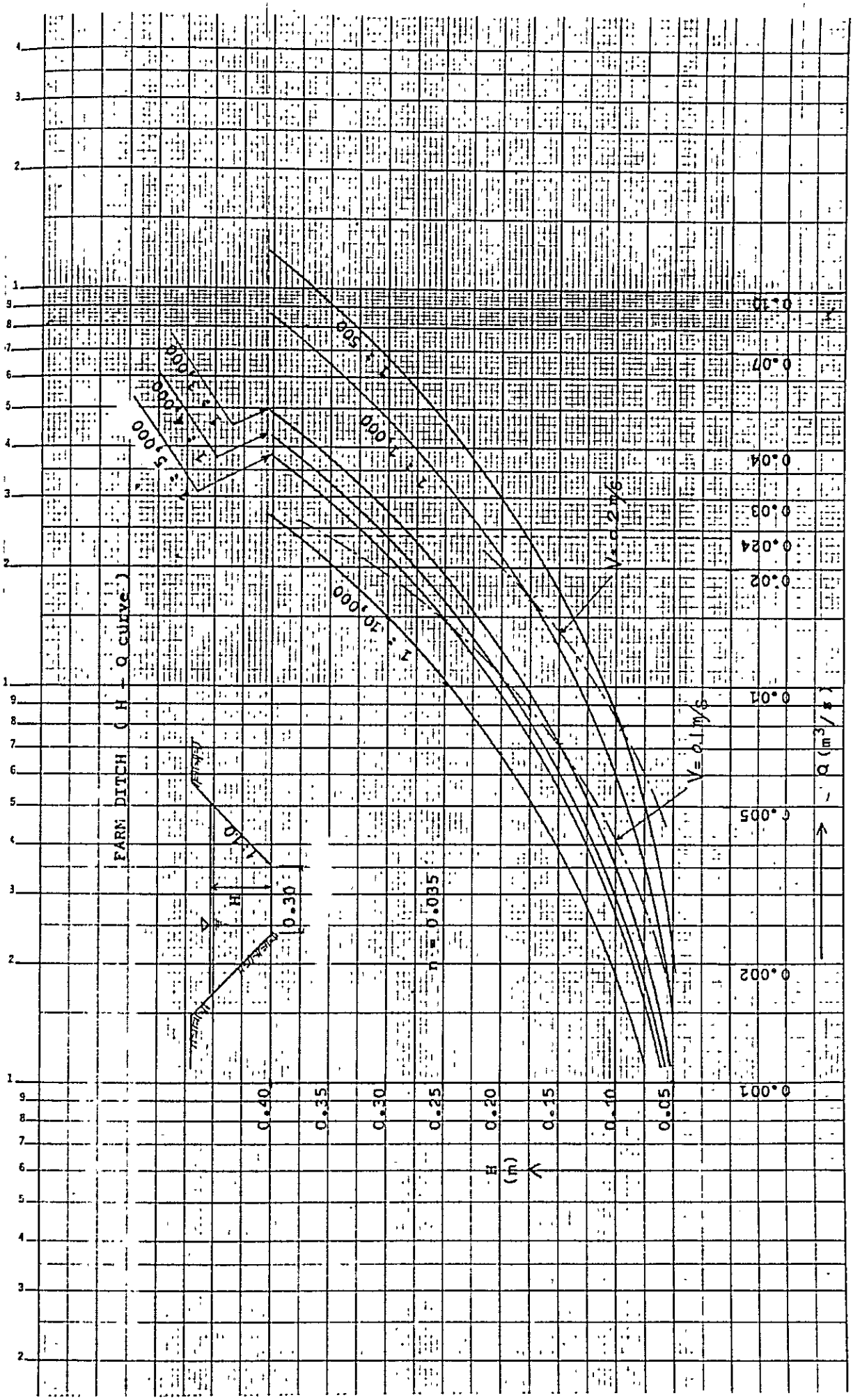
S = Wetted perimeter

1 Coefficient of roughness (n)

Coefficient of roughness of the meaning formula for the regular earth canals are shown as follows :

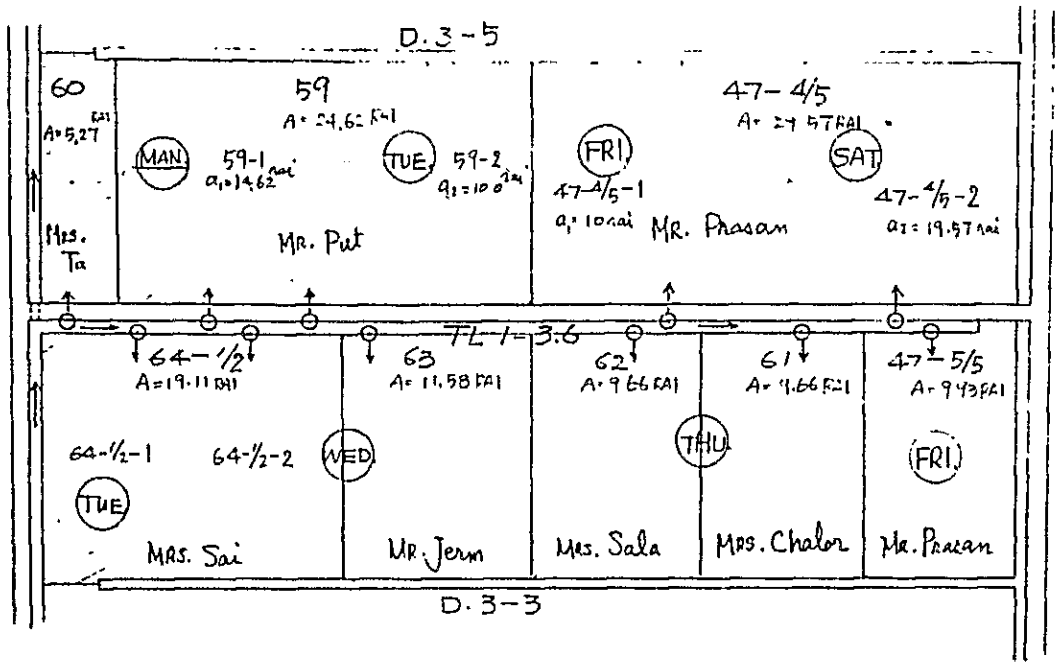
Materials around canal and their condition	n		
	Poor	Standard	Fine
earth foundation, straight earth base with rough	0.033	0.027	0.022
earth foundation, not straight earth base with grasses on both bank	0.040	0.035	0.030

Considering insufficient ditch maintenance and thick growth of weeds, n = 0.035 of coefficient for earth ditch is adoptable


FARM DITCH (H – Q CURVE)
n = 0.035
V=0.2 m/s
V=0.1 m/s
H (m)
Q (m³/s)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.10
0.07
0.04
0.03
0.024
0.02
0.01
0.005
0.002
0.001

ANX - 5

TABLE OF IRRIGATION ROTATION FOR GROUP No. 2, INTAKE 1



Name of ditch	TL1-3.6
Irrigable area	119.4 (19.11) RAI
Number of farmer	8
Name of chief	Mr. Sompoto

FARM DITCH

FARM INLET

BOUNDARY LINE OF OWNNER

day of the week	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday
time	6:00	12:00 6:00	6:00	6:00	6:00	6:00	6:00	6:00	6:00	6:00	6:00	6:00	6:00
LEFT plot No.	60	59-1	59-2							47-4/5-1	47-4/5-2		
name	Mrs Ta	Mr. Put									Mr. Prasan		
RIGHT plot No.					64-1/2-1	64-1/2-2	63	62	61	47-5/5			
name					Mrs. Sai		Mr Jern	Mrs. Sala	Mrs. Chalor	Mrs. Prasan			
plot No.													
name													

Back Data of Water Management Plan

1. Maximum irrigation water requirement (discharge water) for the puddling period. According to cropping pattern, paddy crop will be planed twice a year generally.

1st crop (Dry Season Crop) middle of Jan. - middle of June

2nd crop (Wet Season Crop) middle of July - middle of Dec.

and it takes forty-eight (48) days for puddling each crop

Main factors are as follow :-

Net Water Requirement (NWr)

NWr = Cu + P

Cu = Consumption Use of Crop

P = Percolation

Water Requirement (Wr)

Wr = (NWr + Lp - E)/Ef

Lp = Land preparation water

E = Effective Rainfall

Ef = Irrication efficiency

Diversion Requirement (Dr)

$$Dr = Wr/Ed$$

Ed = Conveyance efficiency

As the result of above mentioned factors, irrigation water discharge peak will be occurred on the last day of puddling period in dry season paddy crop (later Feb.).

Calculation basis for peak water discharge are as follow :

$$NWr = (4.^{DF}18 \times 0.^{K}95) + 1.^{P}0 = 4.97 \text{ mm.}$$

$$Wr = \frac{(4.97 \times \frac{23}{24} + 150 \times \frac{1}{48})}{0.8} = 9.85 \text{ mm.}$$

$$Dr = \frac{9.85}{0.9} = 10.94 \text{ mm.}$$

$$\begin{cases} 0.8 = \text{Irrigation efficiency} \\ 0.9 = \text{Conveyance efficiency} \end{cases}$$

Irrigation discharge per 1 farm ditch

$$\frac{10.94^{mm} \times 19.2^{ha}}{86,400} = 0.024 \text{ m}^3/\text{s}/19.2$$

$$(0.00125 \text{ m}^3/\text{s/ha})$$

2. Maximum irrication water requirement during paddy growth period, irrigation water discharge peak will occur month of April

$$NWr = (5.20 \times 1.20) + 1.0 = 7.24 \text{ mm.}$$

(EP: 5.20, K: 1.20, P: 1.0)

$$Dr = 7.24/0.9 \times 0.8 = 10.05 \text{ mm.}$$

3. Rotation interval during the paddy growth period

Rotation Block :

One (1) farm ditch coverage area is 19.2 ha

(24 plots x 0.8 ha)

Standard plot size : $160^{m} \times 50^{m} = 0.8$ ha

Relationship between rotation interval and irrigation water requirement is shown next chart.

per 1 plot (15 rai = 0.8 ha.)

Rotation interval in days	5	6	7	8	9	10
Water requirement for once irrigation	402 m^3	482	563	643	724	804
Irrigation hours required	4.7 hrs	5.6	6.5	7.4	8.4	9.3

Irrigation water required per hour :

$$0.024 \times 60 \times 60 = 86.4 \ m^3/hr/one\ ditch$$

Irrigation water required per day :

$$8{,}000 \ m^2 \times 0.01005 \times 1 = 80.4 \ m^3$$

As the result of above mentioned reason, water supply hour should be fixed every day to make easy water management. Consequently, six (6) days rotation interval is most considerable.

No. of irrigation plot for one (1) day

24 plots/6 = 4 plots

* Changing hour for water supply

In case of two (2) plots irrigation once a time (two inlet should be opened) and twice changing a day.

Changing hour : 1st 6:00 A.M.

2nd 6:00 P.M.

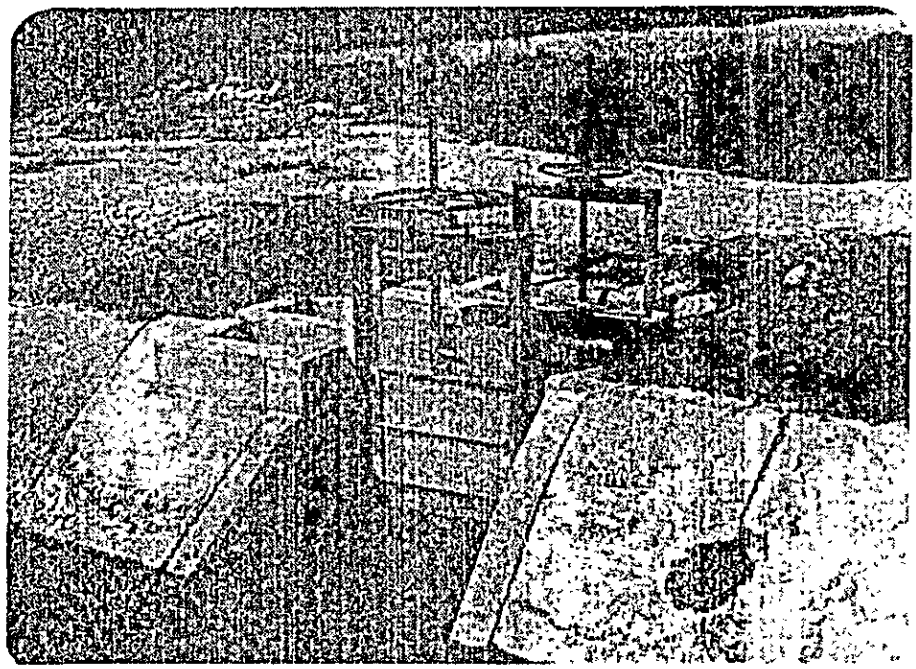
Water management for different growth stage

1). Changing time should be the same hour as above mentioned.

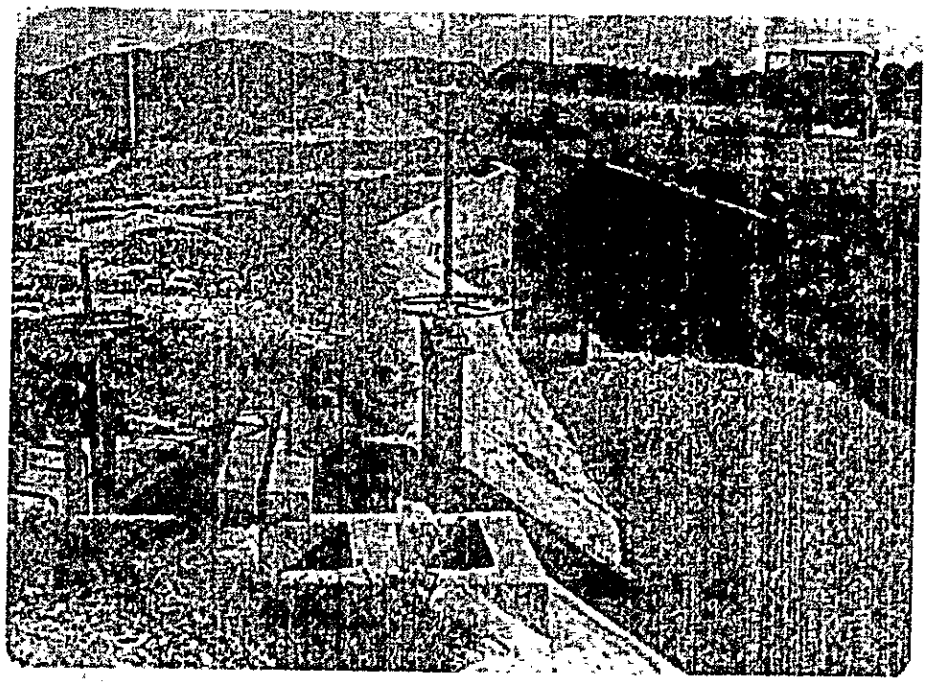
2). Irrigation water quantity to the field lot should be adjusted by wooden controller installed the each farm inlet (gate). Thus, number of irrigation plot is also adjustable.

3). Actually, the plot size is different from the standard (proposed) it due to the acreage of owners, so that the rotation irrigation system would be determined according to the plot size.

CHO. (Constant Head Crifice) of Intake No.1

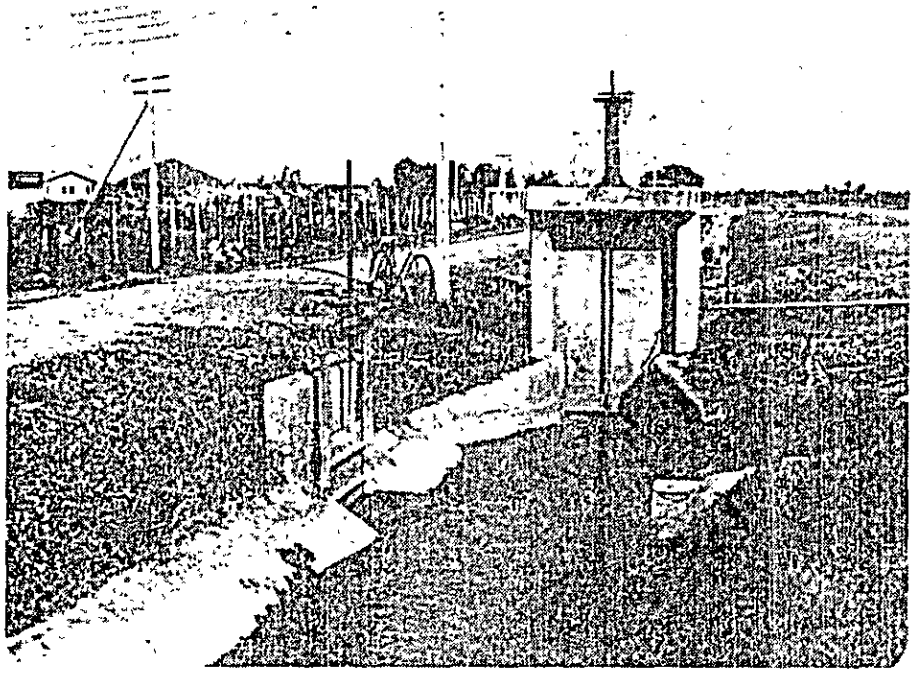


Check gate of 1L-1R canal (right) and CHO.(left)

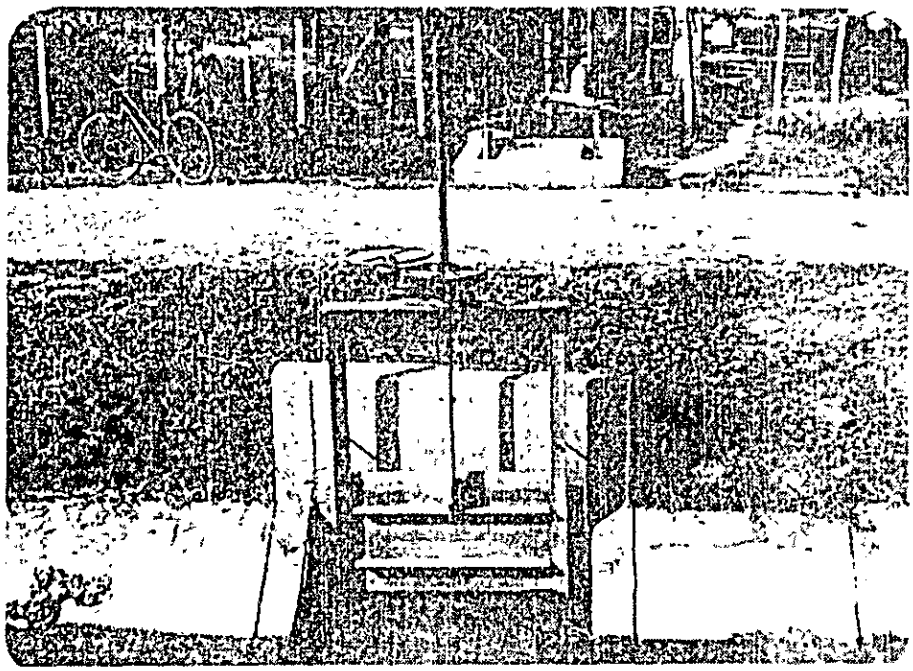


CHO.

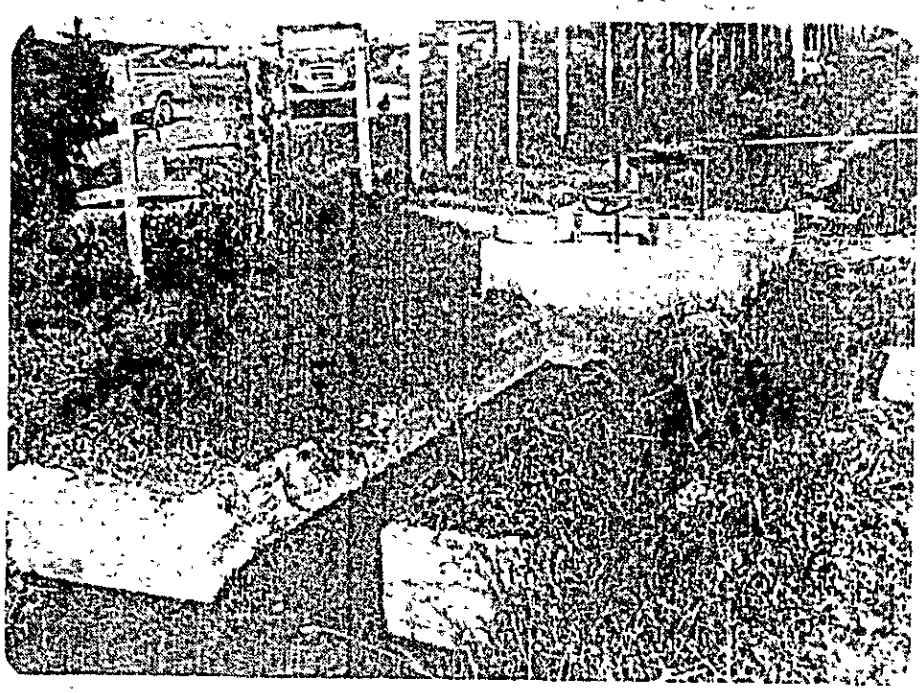
Structure of Intake No.2



Check gate of 1L-1R canal (right) and gate of intake No.2 (left)



a gate of intake No.2 (front) and control box



control box and L2-1 (front), L2-2 (rear)

ANNEX 6

The second Meeting of the Water Users Group
on P/P No. 1

Date : 30 August 1982.
Time : 10:30 - 13:00
Place : Trial Farm

Attendants 46
Present

1. Mr. Boonchan Kittipanya - Representative of Tha Maka Office
2. Mr. Avuth Pisal - Chief of Tha Muang Agriculture Extension Office
3. Mr. Piboon Areechon - The last president of Thailand Farmers Group
4. Mr. Kusol Dongduan - Chief of Cooperative Promotion Office
5. Mr. Siamchai Fuckdej - Cooperative Promotion Official 3
6. Mr. Visit Lekmanee - Cooperative Promotion Official 2
7. Mr. Supachai Kaewlamyai - Agronomist 3
8. Mr. Siroj Prakunhungsit - Agronomist 4
9. Mr. Surachai Ritrueng - Zone man of Tha Maka Office, RID
10. Mr. Tadashi Tsutsumi - JICA expert

The Chairman of Water Users Group, Mr. Sompuen, declared open the meeting and carried out the meeting as the following items :-

1. Summary of irrigation expenses of dry season crop 1982

The chairman and Cooperative Promotion officer indicated various items of irrigation expense of dry season crop 1982 as the following details :-

1.1. The paddy collected from farmers in the area of 2,000 rais had been transfered to 3 rice mills :

Rice Mill "Jinapak"

Paddy	3,434	Tung
each tung (1 tung = 10 kg)	x 22	฿
Amount	75,548	฿

Rice Mill "Thanayakit"

Paddy	1,195	Tung
Each tung	x 23.66	฿
Amount	28,276	฿

Rice Mill "Srisaensak"

Paddy	186	Tung
Each tung	x 24	฿
Amount	4,464	฿
Total of paddy	4,815	Tung
Total Amount	108,288	฿

1.2. Other Expense

Rice Mill "Jinapak"	93,690.77	฿
Rice Mill "Thanayakit"	+ 32,500.00	"
Total amount	126,190.77	฿

1.3. Debt

Expense	126,190.77	฿
Income	- 108,288.00	"
Debt	17,902.77	฿

Expense for the operator (open and shut the irrigated gate)

Paddy 975 Tung

The meeting agreed

2. Utilization of irrigated water

Mr. Surachai Ritrueng, zone man of Tha Maka office, indicated the problem of water irrigation on P/P area that the irrigation system of 1L-1R canal was not smooth. So farmers couldn't get water adequately

and tried to drill the dike along the ditch. It was unfertile to the water by such a way.

3. Management and maintenance the irrication ditch

Mr. Kusol Dongduan, Chief of Cooperative Promotion Office, suggested the members of water users group on P/P area to clean and excavate the irrigation ditch at least twice : year (once before wet season crop and once before dry season crop).

In case of some bad spots of the irrigation ditch (plenty of weed, shallowness) which caused the irrigation system to be trouble. The water couldn't be pumped up to the up-stream, Mr. Kusol requested the members to realize how trouble it was and suggested them available water utilization name "Rotation Method"

Moreover, farmers on P/P area who brought their own cattle and buffalo to the paddy field and caused the irrigation ditch a damage. They had to be responsible for their performance. And the Cooperative Extenison Official also suggested that the road of P/P area shouldn't have an overload truck running on. In this case, the concerned agency ought to have a notice for farmers all of P/P area.

4. Collecting service charge for maintenance and irrigation cost

Since the farmers on P/P area did not pay attention in maintaining the irrigation system, farm road and pubblic benefits. Therefore the Cooperative Promotion Office suggested the land lord or tenure to pay service charge in rate 90 ฿ : rai : Year. This charge is for the labour's workforce in maintaining, cleaning the ditch and other pubblic benefits. The service charge collection would be started from dry season crop 1983.

The meeting agreed.

5. Agriculture Extension

Mr. Avuth Fisal, Agronomist of Tha Muang, informed the members about modern paddy cultivation and pest control. He also suggested the members about "rat control plan". Because in the area of pilot area, the member of rat grew rapidly. So the Agriculture Extension officials would supported the chemical and advised the application. This plan would be started after the wet season crop 1982. For the farmer whose paddy was going to get a disease, they should select the infected sample for an analization.

6. Others

Mr. Supachai Kaewlamyai, Japanese expert's counterpart, incuired the farmer about the paddy of Trial Farm. The farmer who did not return the paddy to Trial Farm, wouldn't be allowed to borrow it on the next season crop.

The meeting agreed.

ANNEX 7

Payment for Water Supply and Maintenance

on Pilot Project Area

.....

The ministry of Agriculture and Cooperatives approved that the Cooperative Office of Pilot Project area had a duty to collect the service charge for water supply and maintenance.

Rate and rules for collecting service charge

The board of Central Land Consolidation has set the rules and rate of collection service charge for water supply and maintenance as following :-

1. The land lord or tenure has to pay the service charge within 1 year after the land consolidation work has been finished.
2. The collection fee should be once a year
3. The payment rate must be according to the amount of rai area.
4. The Cooperative Office of pilot project area is the collecting agency.
5. The Provincail land consolidation Office is an agency to inform the details of time-table for water supply and maintenance charge to the farmers.
6. The Cooperative Office of Pilot Project area has to submit the account of receipts and expense to the Province and Central Land Consolidation Office not less than twice a year.
7. If the production of land lord or tenure was seriously damage, the collection fee would be given up or decreased.
8. In case that the land lord or tenure don't pay the service charge, they must be considered by the board of Central Land Consolidation.

Brief of Water Supply and Maintenance charge on Pilot Project Area

1. Rate of collection fee for water supply and maintenance on Intensive and Extensive is different, due to the difference of maintenance work of irrigation system, drainage system, construction and transportation.

2. Collection fee must be paid by cash. But if there are many farmers who want to pay the service charge by its production, they must be an approval from the board of Central Land Consolidation.

3. Rate for water supply and maintenance service charge is limited as a "Labour force" per the area 1 rai. For example :-

   3.1. Intensive

   Rate of "Labour force" is not less than 1.60 : Rai : year and not more than 1.80 : Rai : Year

   3.2. Extensive

   Rate of "Labour force" is not less than 3.5 : Rai : Year and not more than 1.50 : Rai : Year

4. In the case that water supply is not sufficient during the time of dry season crop. The service charge should be collected as rate of item 3, but only the dry season crop cultivated area. And for the area which cann't cultivate dry season paddy crop. The collection fee is 50% of normal rate. For example :-

   4.1. Intensive

   Rate of "Labour force" is less than 0.80 : Rai : Year and not more than 0.9 : Rai : Year

   4.2. Extensive

   Rate of "Labour force" is not less than 0.675 : Rai : Year and not more than 0.75 : Rai : Year

5. In the case that the collection fee is not sufficient for supplying water and maintaining irrigation system. The rate of collection fee should be proposed to Province and Central Land Consolidation for an adjustment.

The Expenditure of Operation & Maintenance on Land Consolidation Area

.....

1. The items of expense

The land lord or cooperative or the farmers'group who have plots in the land consolidation area ought to pay the fee for operating and maintaing on irrigation facilities, farm road and water management as following :-

1.1. Water management fee

It is an expense for the staffs who operate on irrigated water supply.

1.2. Operation and Maintenance fee

There is an expense for operating and maintaining on irrigation facilities which are composed of :-

1.2.1. irrigation ditch

1.2.2. drainage ditch

1.2.3. farm road or transportation

2. Work volume which use for the expense calculation

2.1. Water management work

The operation on main canal, irrigation ditch and farm turnout is a duty of O & M staff. For the operation on-farm, it is a duty of Cooperative Office that he can employ the member of the water user group to work. The operator whom is employed by Cooperative Office will be responsible in area 400-500 rais. He will take care and operate on irrigation system. Furthermore, he must collect the data for making a water management plan.

2.2. Operation and Maintenance work

The works are necessary to use labour force as following :

2.2.1. Weed control

Cleaning of irrigation ditch ought to do twice a year. For the farm road must be done once a year. One labour can work is about 267 m^2/day or in the other way, it is calculated as following :

irrigation ditch	- 0.028	labour force/m
drainage ditch	- 0.0165	" " "
farm road	- 0.0075	" " "

2.2.2. Excavation

One labour can dig or excavate the soil of 3 m^3/day and the excavation must be done twice a year before starting rainy season crop. It is calculated as following :

irrigation ditch	- 0.028	labour force/m
drainage ditch	- 0.0167	" "

2.2.3. Transportation maintenance

For the farm road of laterite, 4 m in width must be maintained once a year (using of soil volume 0.10 m^3/m). It is calculated to use of 0.033 labour force/m.

2.2.4. Irrigation structure maintenance

The maintenance of irrigation facilities such as farm inlet, culvert and etc., must to do once a year. The fee of maintenance is about 1% of the construction cost.

3. Mean of Irrigation system, Drainage system and structure

There are intensive type and extensive type of land consolidation. The length average of irrigation ditch, drainage ditch,

farm road and structure per area 1 rai are shown as the table below :-

Type	Irri. ditch m/rai	Drain. ditch m/rai	Farm road m/rai	Structure place/rai
Intensive	7.80	6.60	7.62	0.176
Extensive	6.30	4.95	5.20	0.100

ANNEX 8

November 24, 1982.

Discussion

Subject : Plan of water supply into the Pilot Project No.1 for Dry Season of 1983.

1. to decide the area to be irrigated
   - whole area of P/P No.1 = 403.6 ha, C = 0.487 m^3/s
   - area of intake No.1 = 240.0 " , Q_1 = 0.275 "
   - " " No.2 = 163.6 " , Q_2 = 0.212 "

2. to decide the date of starting of irrigation
   - the dead line for dry season paddy

3. how to supply the water
   - the relation between construction schedule (refer to ANNEX 1) and the dead line for dry season paddy

3-1. Construction Plan

① When will the rehabilitation of 1L-1R canal be finished ? Is it no problem for the on-farm development of area to let the water flow into the 1L-1R canal ?

② When is the repairing of 1R canal finished ?
cleaning of 1R canal
repairinf the structures of culvert, inlet, outlet, lining and so on.

③ When is the new pumping station completed ?
the location is a point of upper-stream of Intake No.2

3-2. How to supply the water

① Operation & Maintenance of pumps located the head of 1L-1R

lateral by staff of Tha Maka Office.

- pumps sometimes get out of order

2) The supplemental pumps at intake No. 1 and No. 2

to decide the staff of O & M and the capacity and number of pumps.

who pay O & M fee (especially for the fuel) ?

Is the cofferdam (by soil) necessary at the point of + 8.0 in 1R canal ?

4. others

4-1. Who has a responsibility for the water supply plan mentioned above ?

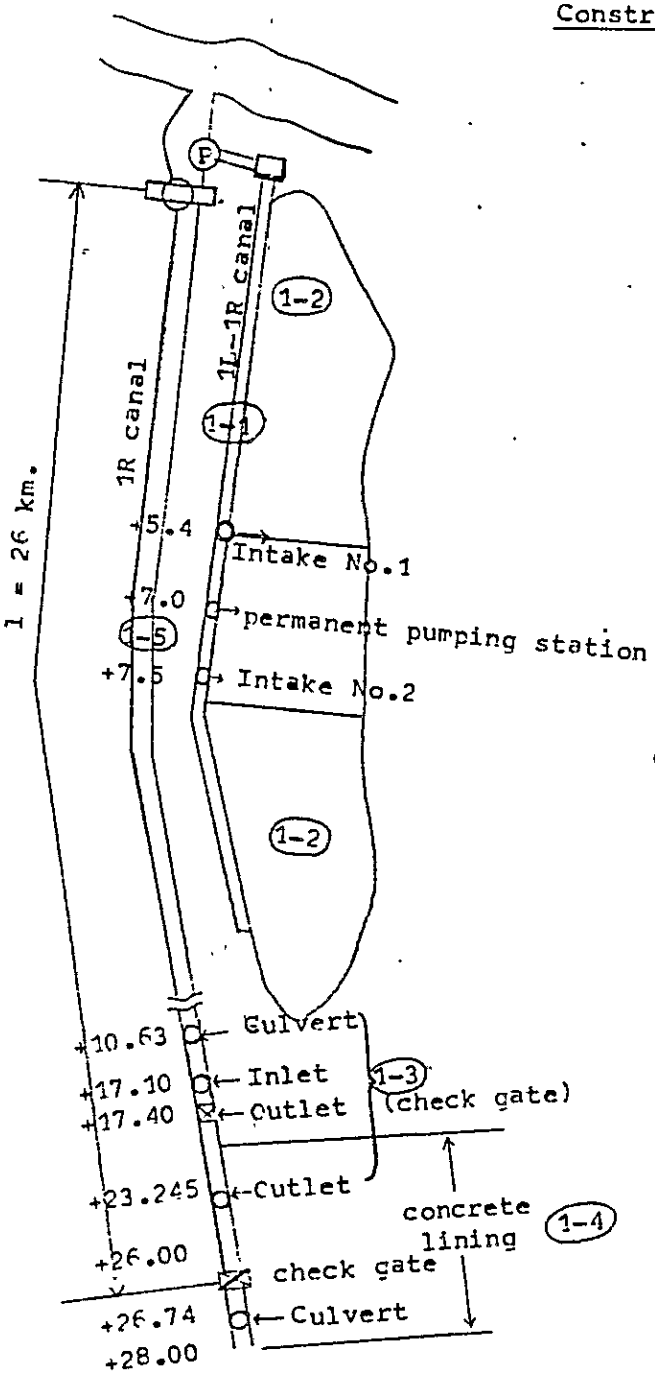
- in case of stop the water supply by some troubles.
- the relationship with farmers in connection with O & M fee or demand of water.

4-2. We have a plan to survey and measure on the water management of Mae Klong Pilot Project No.1 and No.2 in dry season crop.

- in this connection, we will have a discussion with the concerning staffs, Thai side, Japanese side and consultants in the near future.

ANNEX 1.

Construction schedule for Dry Season in 1983



(1-1) Rehabilitation of 1L-1R by Force account

Jan. - Feb.

(1-2) On-farm development by Force account

Jan. - June

(1-3) Improvement of irrigation structure by Force account

Jan. - May

(1-4) Improvement of canal & structure by Contractor

Feb. - May

(1-5) New pumping station by Contractor

? - ?

(depend on the contract)

Ways of solution

1. Whole area should be cultivated

2. The middle of Febuary (in case of the worst condition = 25th of Feb.)
   cf. Date of irrigation for this dry season was on 12th of Feb.

3.

3-1.

1. The rehabilitation of 1L-1R canal of distance between the head and +7.5 km. point (intake No.2) will be finished in short time.

   There is no problem between the irrigation water of 1L-1R lateral and on-farm development.

2. Those works will be performed by forced account in the condition of Dry.

   We can not say whether it will be finished by the middle of Feb. or not.

3. This pumping station will be constructed by contractor at the point of 7.00 km. of 1L-1R canal (in front of intake No.2). Now we are making necessary documents to bid it, so that we can say the date to be finished. Anyway we will try to complete it without giving any damages to 1L-1R lateral for intake No. 2.

3-2.

1. As for O & M of pumps, Tha Maka Office has a responsibility and will take necessary activities mentioned below, to keep them good condition.

   a. damage of electric line of a control panel and a transformer

      - repairing by a specialist

   b. fluctuation of water level

      - extension of suction pipe of length in 70 cm.

   c. fluctuation of voltage

      - no way to avoid it

2. We are afraid that the pumping station will be completed without giving any damage against the water flow.
On the occasion of the worst cordition, we can plan to install the supplemental pumps to supply water from 1R canal into the 1L-1R canal.

It is necessary to make a coffer dam into the 1R canal to stock the water for supplemental pumps but we want to avoid it as long as we can.

The fuel of pumps will be assisted by RID but, O & M fee will be provided by farmers (conducted by a staff of Co-operative Promotion Office).

4.

4-1. Water supply - Tha Maka Office
O & M - Tha Maka Office and Cooperative Promotion Office

4-2. We need a working group to execute this plan organized Thai and Japanese staffs.

Nov. 19, 1982.

Memorandum

Tentative schedule of the measurement on the Water Management of Mae Klong Pilot Project No. 1 and No. 2

1. Nov. 22 (Mon.) - 26 (Fri.)

Meeting with Thai side (Tha Maka O & M Office and other offices)
and ILACC

1 Water supply for next dry season crop
2 Relation between P/P and on-farm development

↓

2. Nov. 29 (Mon.) - Dec. 3 (Fri.)

Meeting among the Japanese engineers concerned

1 The scope of the measurement of the water management
2 The way of the measurement

↓

3. Dec. 6 (Mon.) - 10 (Fri.)

Meeting with Thai side (staffs of concerning the water management and other section)

Y. MATSUYA.

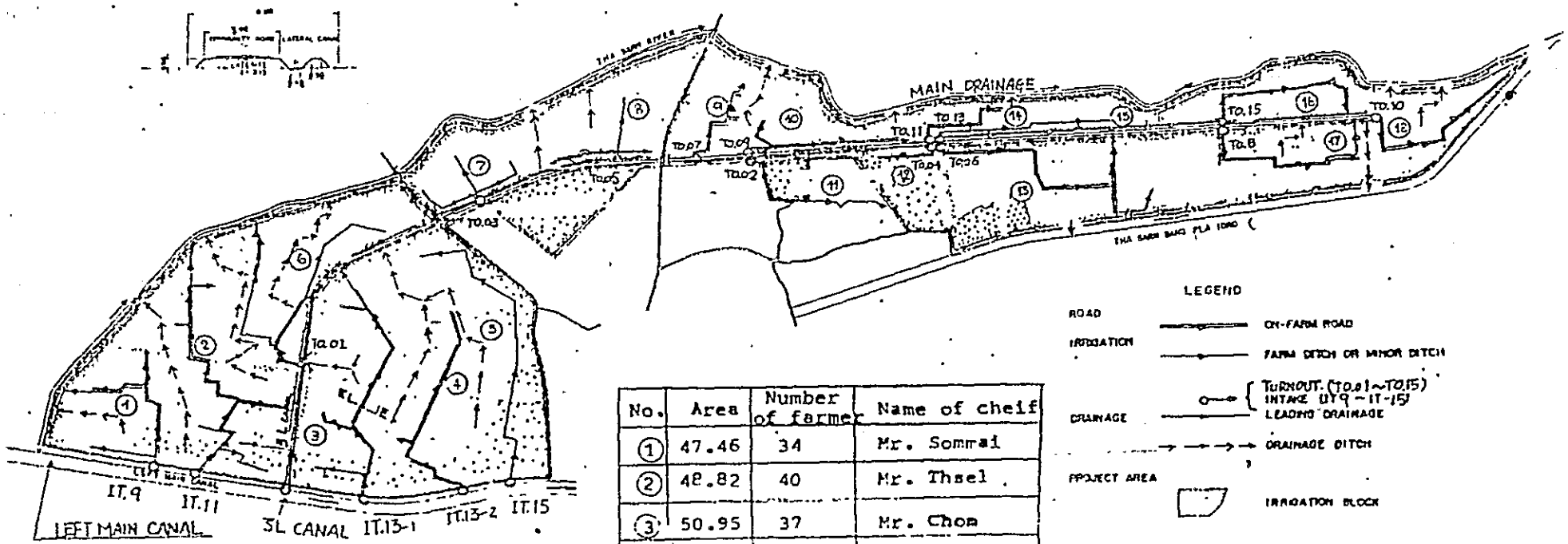
ROAD AND CANAL NETWORK OF MAE KLONG NO.2 PILOT PROJECT

CONSTRUCTION SCHEDULE

YEAR	AREA	
1981	314.2 Ha	
	CONTRACT	243.8 Ha
	FORCED ACCOUNT	70.4 Ha
1982	236.3 Ha	
TOTAL	550.5 Ha	

CHART OF WATER USER'S GROUP

8		Mr. Kerd	12		Mr. Pum	16		Mr. Boonme
9		Mr. Pua	13		Mr. Sombat	17		Mr. Chaen
10		Mr. Chua	14		Mr. Som	18		Mr. Snith
11		Mr. Auam	15		Mr. Wong			



No.	Area	Number of farmer	Name of cheif
1	47.46	34	Mr. Sommai
2	48.82	40	Mr. Thsel
3	50.95	37	Mr. Chon
4, 5	82.04	57	Mr. Sort
6	43.80	35	Mr. Sroi
7	17.76	16	Mr. ...

LEGEND

- ROAD — ON-FARM ROAD
- IRRIGATION — FARM DITCH OR MINOR DITCH
- TURNOUT (TO.01~TO.15), INTAKE (IT.9 ~ IT.15)
- DRAINAGE — LEADING DRAINAGE
- DRAINAGE DITCH
- PROJECT AREA — IRRIGATION BLOCK