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**TECHNICAL MANUAL**  
**THA NGON AGRICULTURAL DEVELOPMENT PROJECT**  
**(LAOS)**

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JAPAN INTERNATIONAL COOPERATION AGENCY

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## CHAPTER I. INTRODUCTION

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Tha Ngon Project Leader

### I-1. Preface

It has lately been decided to issue a Technical Manual for the technicians related to the Tha Ngon Project. This Manual contains relatively important problem points among those which have been daily taught to technicians from each specialist hitherto.

This Manual is not only indispensable for technicians in executing the Project but is a vital guidebook necessary as a guiding principle in farmer guidance.

Since the term up until the termination of the bilateral agreement between the Governments is short (April, 1975), it is regretful that a sufficient Manual could not be prepared. Nevertheless, since it is considered to be a precious guidance to technicians, we hope that you will thoroughly read through this Manual and pick up its contents and on matters which are difficult to comprehend, you will make inquiries to each specialist until your satisfaction is obtained.

Since descriptions have been made by each specialist on detailed problem points of each section, I wish to briefly relate on those which are considered to be most important among them.

### I-2. Irrigation section

The irrigation section is the life line of this project and particularly, since the pump station is the motive power in being able to conduct a double cropping of paddy, it is important to always provide care in pump operation.

Nextly, it is necessary to closely watch whether or not the precious irrigation water is pertinently utilized. That is, care should be provided in water leakages due to damages of irrigation canals, diversion gates, etc., unequal irrigation water distribution, unevenness of fields, etc., and efforts should be made so that irrigation is smoothly performed.

In planning the irrigation project, duty of water more than the calculated volume is necessitated up until the harvest of the field and since the shortage of irrigation water can be particularly considered in case of dry season crops, it is important to provide sufficient considerations in the saving of irrigation water.

#### I-3. Agricultural machinery section

Since a considerable amount of capital is necessitated in the disbursement of operation funds such as repair expenses, cost of parts, fuel expenses, etc., the technicians should constantly place efforts in the training of repairmen and operators and must use the expensive machineries as long as possible. Particularly, inspection and consolidation of machineries should be instructed daily during operation and efforts should be made so that no impedance is made in operation. For this purpose, an inspection book, parts inventory book, etc., should always be fully equipped.

#### I-4. Rice cultivation section

In comparing the unit area harvest volume of rice during the 2 years of 1973 and 1974, both the Sanpaton and IR24 have shown a slight harvest increase, however, a conspicuous result is not observed. In searching and analysing this cause, the imperfection of fields, inferior drainage, delay of puddling, non-improvement of acid soil, imperfection of measures against damages of insects and pests, etc., can be considered. It is a matter of course that these problem points should be promptly solved, however, particular care should be provided in enhancing the volition of the farmers.

In observing the situation during the past 2 years, we find that the number of working days of the farmers during the cultivation period is extremely small. That is, weeding and repair of canals, consolidation of borders, evening up of fields, digging of small channels for facilitating irrigation, diggings for inferior drainages, etc., which should be performed by the farmers are totally not done.

For solving this problem, it is necessary to let this fact known to all farmers through the medium of group leader meetings. Moreover, on extermination of insect and pest damages, repairs of irrigation canals, etc., guidance should be made so that the farmers will perform group work by all means.

I-5. Upland crops section

We believe that the cultivation description of this Project is suitable at being designated as rice cultivation for some time, however, since it can be considered to introduce a slight amount of dry field crops in the future under the desire of the farmers, the test farm should be effectively utilized and sufficient researches should be made on the variety of dry field crops, their cultivation techniques, etc., which are suitable crops for the concerned area.

I-6. Farmers' organization

Whether or not a farmers' organization is established and it will play an active role is a vital point in determining whether or not this Project will succeed in the future.

Presently, the Farmers' Association has been organized and its formality only has been arranged, however, activities of the Association, itself, have not yet been performed so much. It is scheduled to form a Farmers' Cooperative Association in the near future, however, it is necessary to form its mother-body as promptly as possible. That is, the following items are the requisites in building up the mother-body.

6-(1). It is important to hold a group leader meeting of the farmers occasionally and instruct the execution of each work project and sufficiently well let known the affairs which the farmers should perform upon respecting the opinions of the farmers.

6-(2). Site a simple temporary office of the Farmers'

Association at a corner of the Government building and hire one to two clerks with the allotment from the Association members and it is necessary to let them perform a portion of the agricultural work planning, affairs on goods delivery, etc., which are presently performed by the staffs of the Government for training them.

- 6-(3). This temporary office will become the mother-body from which the Farmers' Cooperative Association will be formed in the future and for the time being, it will become a place for various consultations by the farmers and a place which will be greatly pleased by the Association members.

I-7. Stock-raising section

The Manual for the stock-raising section could not be prepared in time so the Manual prepared by the Stock-raising Bureau of Thailand was to be distributed.

I will only mention on the important problem points in the stock-raising section of this area.

- 7-(1). Establishment of the self-supporting accounting system setup for the stock-raising section

The stock-raising section which has hitherto been maintained by a special fund shall be aimed at making it a self-supporting accounting system so sufficient efforts must be provided in its operation aspect.

Although profits are earned in cattle and chicken, that for pigs has ended up in red figure operation. Therefore, efforts should be made so as to produce as much as self-supplied fodder as possible (Corn, kiyasaba, etc.) in raising of pigs and chickens which necessitate a large amount of purchased foddors. Fortunately, since an expanse farm is

possessed, the amount of purchasing fodders can be decreased if the farm is sufficiently utilized. Although it is presently already been performed, it is a very good conception that the farmers perform rice cleaning work and are obtaining the rice bran.

7-(2). Measures against livestock sanitation

The thing which we most undergo anxiety in stock-raising is the measures against epizooty. Since there are actual examples where livestocks have annihilated during a single night due to epizooty, scrupulous care should always be provided against epizooty measures.

7-(3). Contact with settlers

Hitherto, there has not being much contact with settlers, however, in the event that the living foundation of the farmers has stabilized, the introduction of livestocks should be encouraged.



## CHAPTER II. IRRIGATION AND DRAINAGE

(At the Tha Ngon Project)

Yoshihisa Ito

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fig. 1, 2, 3, 4, 5, 6, 7

## 1. Main facilities at the Tha Ngon Project

It is extremely important that the various facilities set up at the Tha Ngon Project be adequately utilized and a rational irrigation and drainage be executed and moreover, that the facilities be suitably operated and maintained.

For this purpose, the technicians who undertake this duty must fully grasp and be sufficiently aware of the scale and specifications of the various facilities.

The specifications of the main facilities of the Tha Ngon Project are as follows:

### 1-(1). Irrigation pumping station

Type and Nos. of pumps	:	Submersible pumps, 3 sets of 500mm $\phi$
Total head	:	19.0m
Capacity	:	32.4 m <sup>3</sup> /min (each)
Rating	:	160 KW (each)

### 1-(2). Regulating pond

Dimension	Width	:	160m
	Length	:	95 to 160m
	Depth	:	1.7m
Effective storage capacity	:	13,000 m <sup>3</sup>	

### 1-(3). Drainage pumping station and flood gate

#### • Drainage pumping station

Type and Nos. of pumps	:	Submersible pumps, 2 sets of 600mm $\phi$
Total head	:	6.0m
Capacity	:	52.0 m <sup>3</sup> /min (each)
Rating	:	75 KW (each)

• Flood gate

Type	:	Corrugated metal pipe
Length	:	67.0m (each barrel)
Diameter	:	1,200mm
Flood gate	:	3 sets of 1,200mm $\phi$ flap gate

1-(4). Nong Sam Kha Dam and wasteway

• No. 1 reservoir and dam

Type of dam	:	Homogenous type of earth fill dam
Crest elevation	:	EL. 169.00m
Flood water level	:	EL. 167.46m
Crest width	:	4.0m
Crest length	:	1,170m
Design flood discharge of spillway	:	1.8 m <sup>3</sup> /sec
Crest elevation of spillway	:	EL. 167.00m

• No. 2 reservoir and dam

Type of dam	:	Homogenous type of earth fill dam
Crest elevation	:	EL. 168.80m
Flood water level	:	EL. 167.30m
Crest width	:	4.0m
Crest length	:	426m

•Wasteway and flood protective embankment

Type : Trapezodial open canal  
and earth embankment  
Length of wasteway : 4,700m  
Base width of wasteway : 5.0m  
Crest width of embankment : 2.0m  
Crest elevation of  
embankment : EL. 167.80m

1-(5). Flood protective embankment along the Nam Ngum

Type : Trapezodial earth  
embankment  
Length : 8,800m  
Crest width : 2.0m  
Side slope, outside : 1 : 2  
Side slope, inside : 1 : 1.5  
Crest elevation along  
the south main canal : EL. 168.30m  
Crest elevation along the  
north main canal and at  
the irrigation pumping  
station : EL. 168.30m  
Crest elevation along the  
north main canal and at  
the drainage pumping  
station : EL. 167.80m

1-(6). Irrigation main canal

Type : Trapezodial open  
earth canal  
Design discharge  
North main canal : 0.12 to 0.86m<sup>3</sup>/min  
South main canal : 0.12 to 0.22m<sup>3</sup>/sec

Length		
North main canal	:	6,100m
South main canal	:	2,400m

1-(7). Drainage canal

Type	:	Trapezodial open earth canal
Length	:	30,000m in total

1-(8). Farm road system

Effective width	main	:	6.0m
	secondary	:	4.0m
Length	main	:	24,000m
	secondary	:	32,000m

2. Irrigation requirement

In order to perform irrigation deliberately and yet rationally, the duty of water necessary for each control area of each farm laterals must be grasped besides the entire duty of water required. It is necessary to obtain this duty of water on the water requirement for preparation of paddy field and on the gross duty of water.

Moreover, in the computation of the rough duty of water, the condition of the paddy field and also the water control capability of the farmers must be taken into consideration as well as consideration on water losses.

Hereunder, we will relate on positive achievements hitherto as well as describing a computation method of this duty of water.

Moreover, the net duty of water and the gross duty of water are represented under the following formulas.

$$\text{Net duty of water} = \text{Evaporation} + \text{transpiration} + \text{percolation} - \text{effective rainfall}$$

$$\text{Gross duty of water} = \text{net duty of water} + \text{water losses}$$

2-(1). Measurement of water requirement in depth per day

The water requirement in depth per day in paddy field rice cultivation consists of the evaporation from the water and soil surfaces, transpiration from the paddy field rice and the percolation into the earth. The measurement of the water requirement in depth per day, which consists of these 3 factors shall be in accordance with the following method. For measurement, several field lots within the area with different soil conditions shall be established as observation districts and continuing observations shall be made.

- (a) In case the entire 1 hectare is to be made the observation district:

Measure the quantity of water supplied to the paddy field for each fixed period by utilizing the flash board weir which is installed in each paddy field and upon converting it into daily volume, obtain the daily consumption volume. In this case, go round inspections should be made so that there are no leakages from the borders.

The formula used for converting the daily consumption water quantity ( $Qm^3/ha/day$ ) into the water requirement in depth per day ( $h$  mm/day) is as follows:

$$h = \frac{Qm^3/day}{10,000m^2} \times 1,000 \text{ mm/m} = \frac{Q}{10} \text{ mm/day}$$

Moreover, for discharge measurement by the flash board weir installed at each paddy field, please see 3 - (3).

- (b) In case small observation districts are established:

Small section observation districts are provided within the paddy field as shown in Fig. -1 and the daily water requirement in depth shall be measured

by using a hook gauge.

In this case, it is necessary to adjust the water level so that the difference between the water level within the observation district and the surrounding water level does not become so great.

The results which have been observed for March to April, 1974 are as shown in Table 1.

Moreover, in comparing the observation results of a fixed date under the (a) and (b) methods, we find that the (a) method is slightly larger as shown in the table. It is considered that this is due to the leakages from the borders.

Fig. 1. Observation on the Water Duty in Depth Per Day

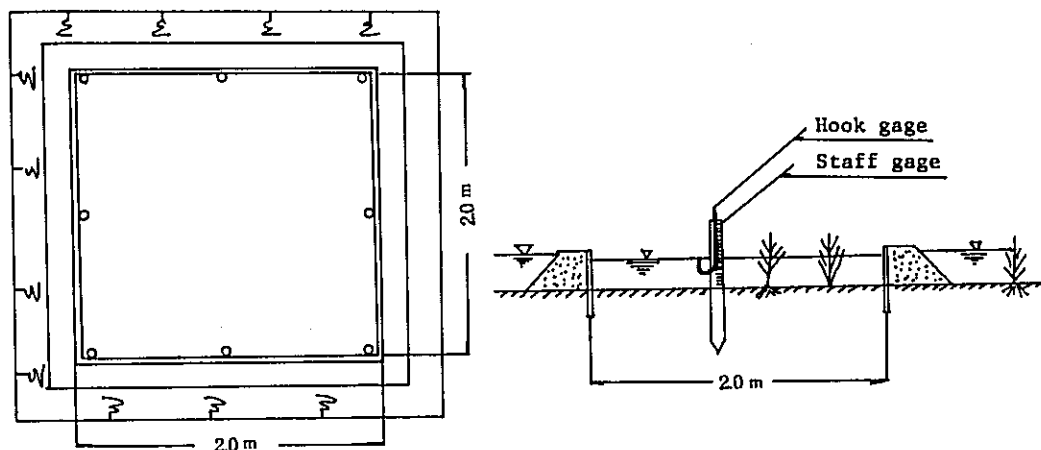


Table 1. Results of the Observation on the Water Duty in Depth Per Day

Name of the plots	Average value of the water duty in depth per day (mm)	Comparison between 4 m <sup>2</sup> lot and 1 ha lot		Remark
		4 m <sup>2</sup> lot	1 ha lot	
T - 1	17.2	14.0	16.0	Using rotary
T - 3	14.9	11.0	11.0	- ditto -
D - 2	25.5	23.0	30.0	Using disk harrow
D - 4	20.0	18.0	20.0	- ditto -
J - 2	17.2	18.0	16.0	- ditto -
J - 11	8.8	8.0	8.0	- ditto -
N - 5	16.6	15.0	17.0	- ditto -
N - 14	9.0	8.0	7.0	- ditto -



The water requirement in depth per day cannot be accurately judged from a single observation, however, it can be said that there is about 15 - 25mm/day at high level parts and about 10mm/day at low level parts. However, as years go by and with the maturing of the paddy field, it can be considered that the quantity of percolation will decrease in order and the water requirement in depth per day will also decrease so it is necessary to perform observations also in the future. Moreover, it is also important to grasp the evapotranspiration of rice for each of its growth period.

2-(2). Water requirement for preparation of paddy field

Theoretically, the water requirement for preparation of paddy field is the water quantity necessary for saturating the gaps within the soil and also for flooding the paddy field about 5cm from its surface. The water quantity required for this is generally about 100 -200mm.

In the Tha Ngon area, however, a considerable amount of water requirement for preparation of paddy field is necessitated at the beginning due to the following reasons.

- o The subsoil has been disordered due to stumping work by a bulldozer.
- o It is still a newly reclaimed land and the plow sole has not yet been formed.
- o During the dry season, besides large and deep cracks originating, holes made by small animals are found everywhere.
- o The water level of the neighboring Nam Ngum river drops by ten odd meters in the dry season and the groundwater also declines in pursuant to this.
- o On top of one section being 1 hectare (50m x 200m) and big, it is still not uniformly even and not only is time required until flooding but the quantity of percolation during the time is great.

In the water requirement for preparation of paddy field which was conducted during the dry season of January - February, 1974, a water depth of about 700mm was required. As seen here, since a great volume of water requirement for preparation of paddy field is still necessitated during the dry season, the measures for reduction of duty of water in Item 4 should be performed and it is necessary to exert efforts so that it is lowered to about 250mm in the future.

2-(3). Effective rainfall

Since rainfall is practically nil in the dry season, it is not necessary to consider effective rainfall then, however, it is to be considered in the irrigation planning of wet season crops. In the wet season, this rainfall should be utilized as irrigation water as effectively as possible and the reduction of water cost should be plotted through this.

Due to this, deep water irrigation should not be performed on all field lots and a space should be provided so that in case of a rainfall, the rain can be stored within the paddy field lots to extents possible. This fact also becomes a temporary storage effect of drainage.

In the calculation of the duty of water, the computation of the necessary effective rainfall is affected by the raining method, however, it would be preferable to refer to the method indicated by USDA (United States Department of Agriculture).

The USDA system stipulates the effective rate per inch part for each rainfall amount and the cumulative rainfall as follows:

Rainfall amount	Effective rate	Cumulative rainfall
1 inch	0.95	0.95 inch
2 inches	0.90	1.85 inches
3 inches	0.82	2.67 inches
4 inches	0.65	3.32 inches
5 inches	0.45	3.77 inches
6 inches	0.25	4.02 inches
More than 6 inches	0.05	

2-(4). Water losses

Farm waste and conveyance loss can be considered as water losses.

- o Farm waste is the water volume lost at the paddy field due to seepage and leakage from paddy dikes.
- o The conveyance loss consists of the evaporation from the water surface within the canal and the seepage and leakage from the wetted perimeter of the canal, however, in the Tha Ngon area, the leakage from large and small holes which originate in the canals occupy a great weight. Therefore, minimizing leakage links to minimizing conveyance loss so repairs of the canal must be performed periodically.

For the measurement of the conveyance loss under this project, the following methods are considered to be convenient.

(a) Loss measurement of main canal

The measurement of loss in the main canal is computed under the following formula upon utilizing the intake gate

and check gate from the regulating pond. The loss rate is computed by dividing the difference between the quantity of flow at the upper stream gate ( $Q_1$ ) and the quantity of flow at the lower stream gate ( $Q_2$ ) by  $Q_1$ .

$$Q = C \cdot B \cdot h_o \sqrt{2g \Delta H} \dots\dots\dots (1)$$

whereas,

- C : Coefficient of discharge 0.6
- B : Gate width (m)
- $h_o$  : Opening degree of gate (m)
- $\Delta H$  : Water level difference of upper stream and lower stream of gate (m)
- g : Acceleration due to gravity 9.8m/sec/sec

(b). Loss measurement of farm laterals

Measurement of quantity of flow of farm laterals can be performed by flash board weir which is installed within the canal. The computation formula of quantity of flow is as shown below.

$$Q = 1.84 (b - 0.2h) \left\{ \left( h + \frac{V_a^2}{2g} \right)^{3/2} - \left( \frac{V_a^2}{2g} \right)^{3/2} \right\} \dots\dots (2)$$

Whereas,

- b : Width of flash board weir (m)
- h : Overflow water depth (m)
- $V_a$  : Approaching velocity (m/sec)
- Q : Quantity of flow ( $m^3$ /sec)

2-(5). Computation of duty of water

The computation of necessary duty of water is obtained for each growth step of crops and the irrigation planning is plotted.

The computation of the water requirement in the period of surface soil puddling and gross duty of water can be obtained from the following rough calculation formulas.

o Water requirement in the period of surface soil puddling

$$Q_1 = (q_1 \times A + q_2 \times \frac{D}{2} \times A) \times \frac{100}{100 - \alpha} - Re \times A \leq Q' \times D \dots\dots\dots (3)$$

o Gross duty of water

$$Q_2 = (q_2 \times A) \times \frac{100}{100 - \alpha} - Re \times A \leq Q' \dots\dots\dots (4)$$

Whereas,

- q<sub>1</sub> : Water requirement for preparation of paddy field (m<sup>3</sup>/ha)
- q<sub>2</sub> : Duty of water per day and per hectare (m<sup>3</sup>/ha/day)
- Q' : Irrigation water supplying capability (m<sup>3</sup>/day)
- A : Irrigation area (hectares)
- D : Period of surface soil puddling (day)
- α : Water loss (%)
- Re : Effective rainfall (m<sup>3</sup>/ha)

'Example 1'

Calculation example for obtaining the number of days of surface soil puddling in a wet season crop. The various irrigation factors are as follows.

- Water requirement for preparation of paddy field ..... 400mm ... 4,000 m<sup>3</sup>/ha
- Duty of water per day .. 10mm/day ... 100m<sup>3</sup>/ha/day
- Planted acreage ..... 400 ha
- Effective rainfall during the period of surface soil puddling ..... 180mm ... 1,800 m<sup>3</sup>/ha
- Irrigation water supplying capability ..... 60,000m<sup>3</sup>/day
- Number of days of surface soil puddling ..... x

When calculating under the aforementioned formula (3), it becomes as follows.

$$(4,000\text{m}^3/\text{ha} \times 400\text{ha} + 100\text{m}^3/\text{ha}/\text{day} \times \frac{x}{2} \text{ day} \times 400\text{ha}) \times \frac{100}{100 - 30} - 1,800\text{m}^3/\text{ha} \times 400\text{ha} = 60,000\text{m}^3/\text{day} \times x \text{ day}$$

$$(1,600,000 + 20,000x) \times \frac{1}{0.7} - 720,000 = 60,000 \times x$$

$$2,280,000 + 28,500x - 720,000 = 60,000x$$

$$\therefore x = 50 \text{ days}$$

In case of the irrigation factors as mentioned above, 52 days will be required for surface soil puddling irrigation. The nursery bed and sowing plannings must also be performed based on this.

### "Example 2"

Example of obtaining the irrigation possible area. When trial computing the planted acreage of dry season crops for the year of 1974 based on the actual results of the dry season crops for the period from January up to May of 1973, it becomes as follows.

Water requirement for preparation of paddy field .....	600mm ...	6,000m <sup>3</sup> /ha
Duty of water per day ...	15mm/day ...	150m <sup>3</sup> /ha/day
Number of days of surface soil puddling .....	50 days	
Water loss .....	30%	
Irrigation water supplying quantity .....	60,000m <sup>3</sup> /day	
Effective rainfall ....	0	

From the aforementioned formula (3), the following is obtained.

$$(6,000\text{m}^3/\text{ha} \times x^{\text{ha}} + 150\text{m}^3/\text{ha}/\text{day} \times \frac{50}{2}^{\text{days}} \times x^{\text{ha}}) \times \frac{100}{100 - 30}$$

$$= 60,000 \text{ m}^3/\text{day} \times 50^{\text{days}}$$

$$(6,000x + 3,750x) \times \frac{1}{0.7} = 3,000,000$$

$$9,750x = 2,100,000$$

$$\therefore x = 215\text{ha}$$

The required duty of water of the dry season crops for the year of 1974 is extremely large as shown in Example 2. The water requirement for preparation of paddy field is particularly great due to the reasons aforementioned in Item 2-(2).

The target of the irrigation factors for irrigating the area of about 700ha in dry season rice cultivation in the future is as mentioned below. For this purpose, four of the "Measures for reduction of duty of water" must be performed.

The aim of the irrigation factors in the future.

Water requirement for preparation of paddy field .....	250mm
Water requirement in depth per day .....	12mm
Water loss .....	25%
Number of days of surface soil puddling .....	60 days
Daily supply amount .....	86,000m <sup>3</sup> /day

### 3. Distribution of irrigation water

In order to rationally utilize the irrigation water, it is necessary to grasp the required duty of water and perform proper distribution

of it. For executing this suitable and exact irrigation water distribution, measurement of the discharge becomes necessary.

In the measuring methods of the discharge, there is the method using the current meter and methods which use facilities such as gate, weir, orifice, parashall flume, etc. However, the method in which simple measurement can be made by utilizing the facilities located at the actual site is preferable.

It is believed that the following method is suitable as one of these methods.

3-(1). Measurement of the discharge in the main canal

The measurement of the discharge by the gate provided in the main canal can be obtained under the following formula as described in Item 2-(4) - (a).

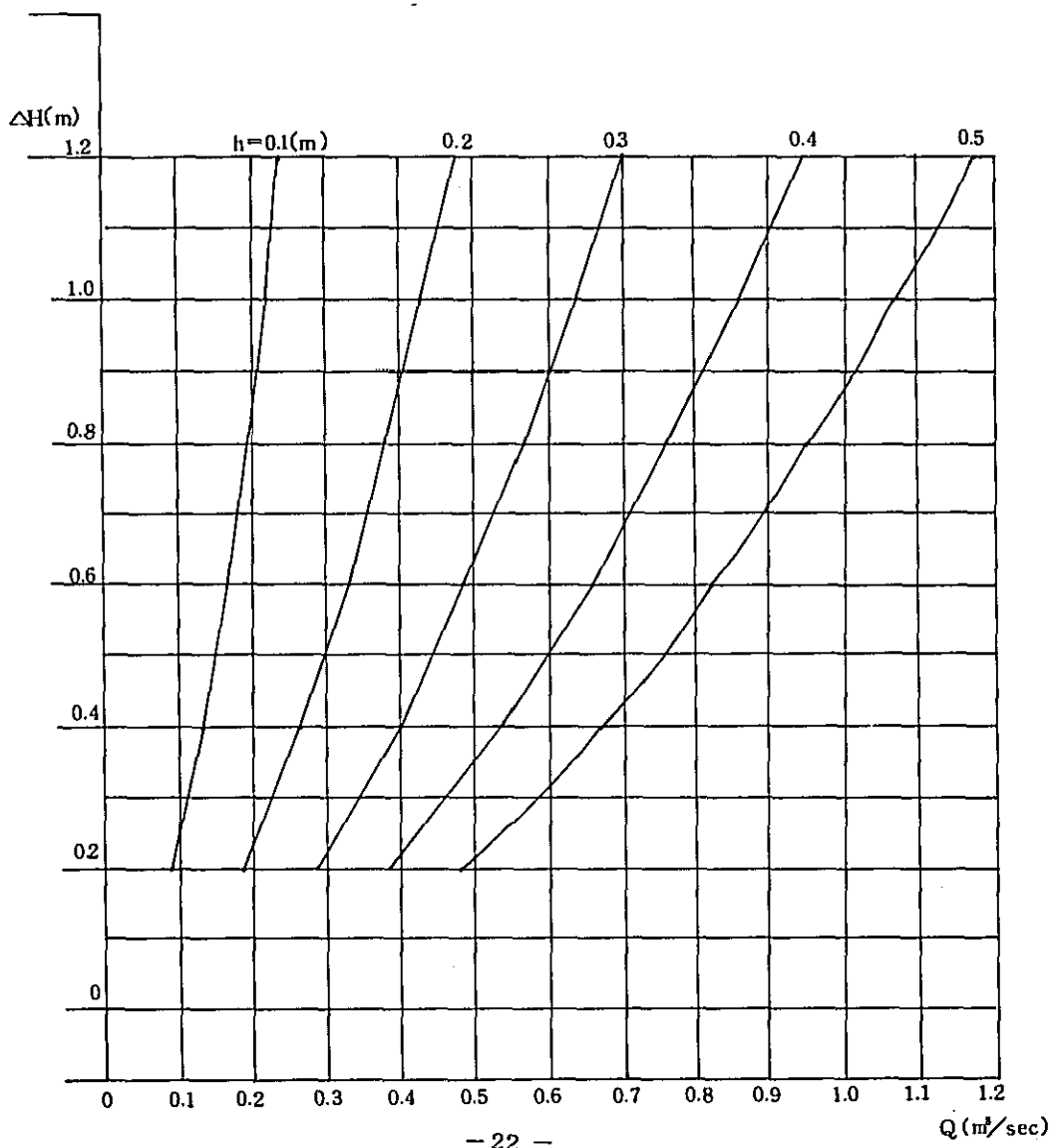
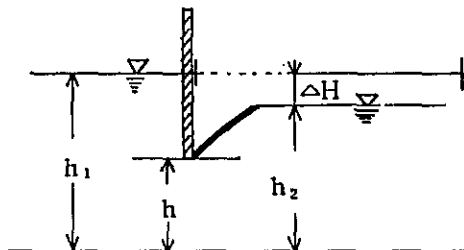
$$Q = C \cdot B \cdot h \sqrt{2g\Delta H} \dots\dots\dots (1) .$$

Fig. 2 is the drawing in which the runoff from the regulating pond to the north main canal has been calculated by this formula and the curve of  $\Delta H - h - Q$  has been obtained.



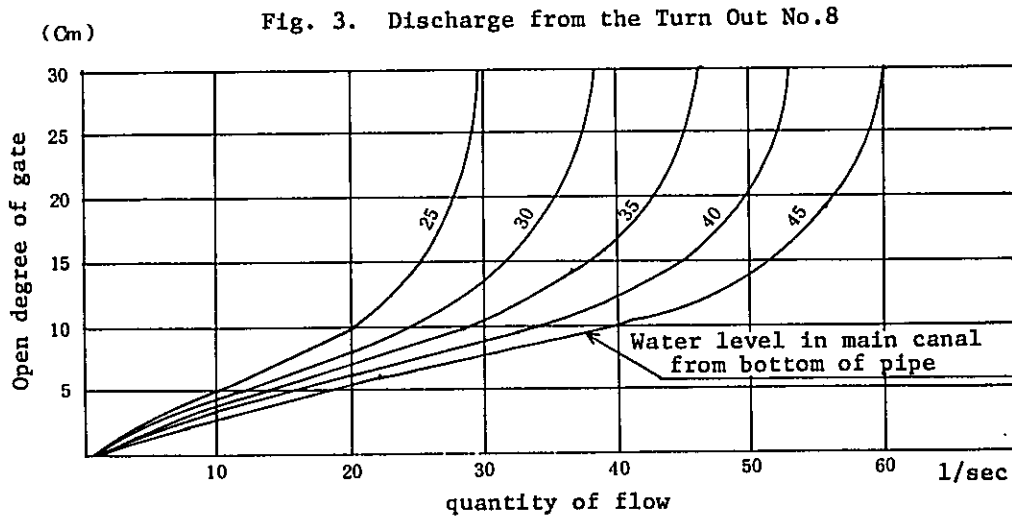
Fig. 2. Discharge from the Main Gate

$\Delta H - h - Q$  Curve



3-(2). Measurement of the quantity of water intake from the main canal to the farm laterals

The adjustment of the quantity of water intake to the farm laterals from the main canal is made by the turn-out gate. We attempted the method of obtaining this quantity of water intake under calculation from the relation between the opening degree of the turn-out gate and the water level of the main canal, however, since it did not coincide with the observation value, the following Fig. -3 was prepared according to the observed value. This drawing was prepared upon changing the water level of the main canal and the opening degree of the turn-out gate and measuring the quantity of water intake for each time by the method explained in the following item 3 - (3).



3-(3). Measurement of the quantity of water intake to the farm laterals and paddy field

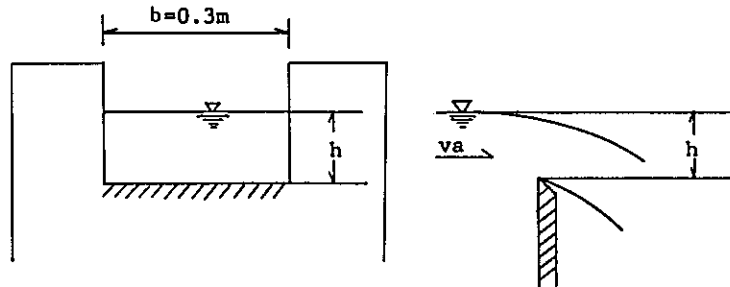
In farm laterals, a flash board weir of 40cm width is provided at 50m intervals and in each field lot, a flash board weir of 30m width is provided. Therefore, it is convenient to rely on this facility in the measurement of the discharge.

The discharge measuring formula is the following formula which has been aforementioned in Item 2 - (4) - (b).

$$Q = 1.84 (b - 0.2h) \left\{ \left( h + \frac{Va^2}{2g} \right)^{3/2} - \left( \frac{Va^2}{2g} \right)^{3/2} \right\} \dots\dots\dots (2)$$

When illustrating the relation between the overflow water depth and the discharge on the flash board weir widths of 30cm and 40cm, they become as shown in Fig. -4 and Fig. -5.

Fig. 4. Discharge from the Weir (B=0.3m)



$$Q = 184 (b - 0.2 h) \left\{ \left( h + \frac{V_a^2}{2g} \right)^{\frac{3}{2}} - \left( \frac{V_a^2}{2g} \right)^{\frac{3}{2}} \right\}$$

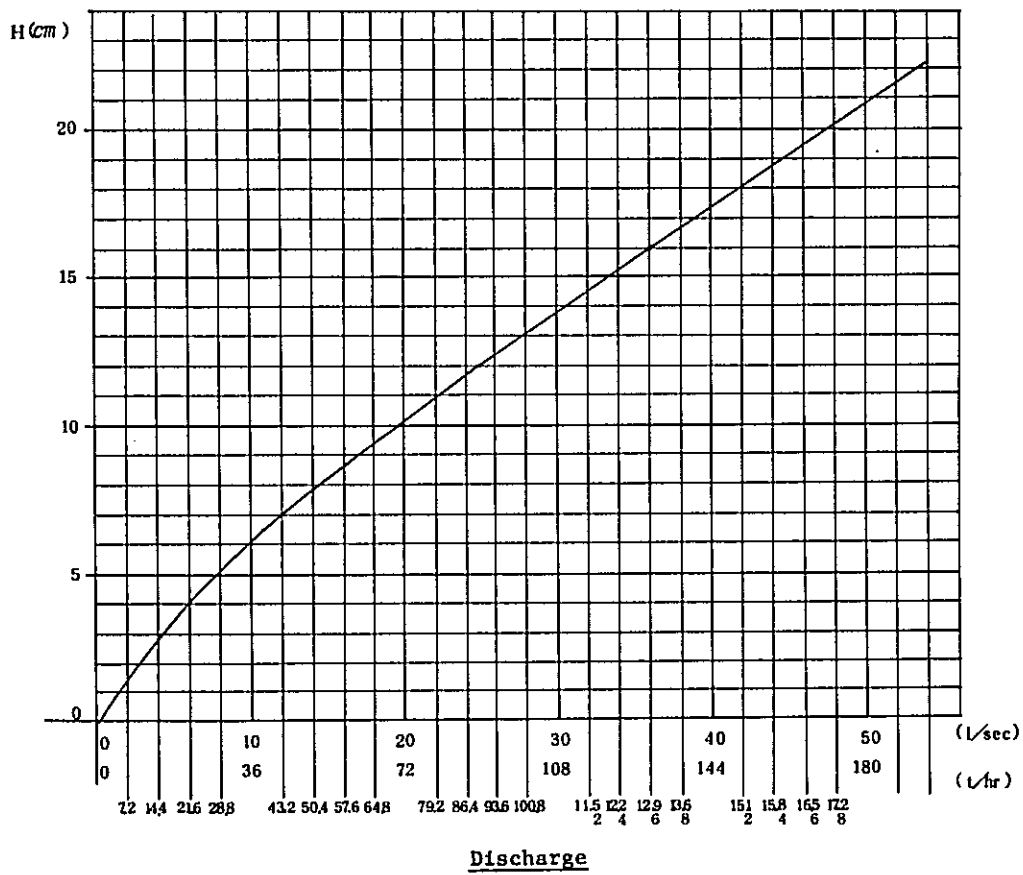
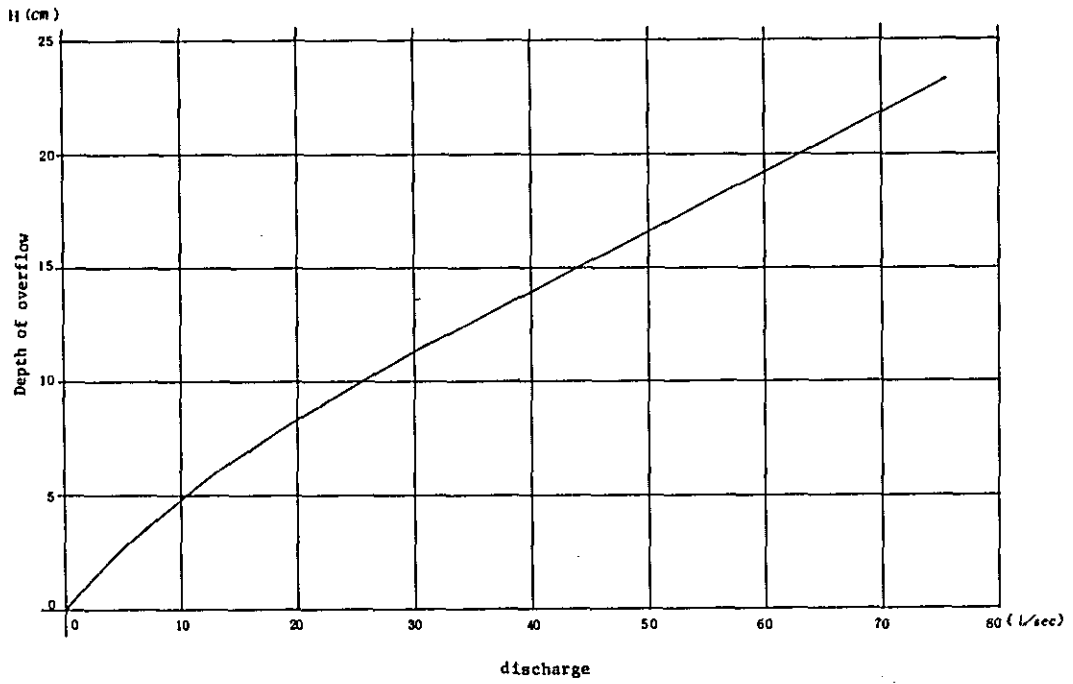


Fig. 5. Discharge from the Weir (B=0.4m)



3-(4). Control of duty of water

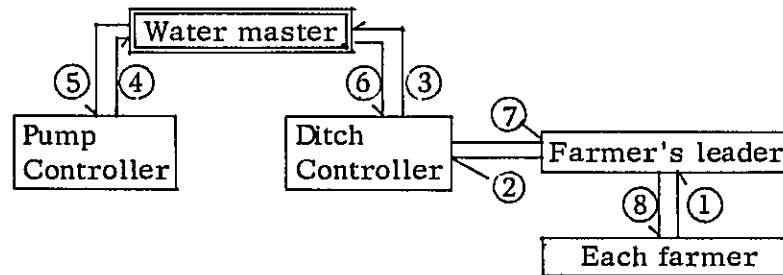
The quantity of water intake from the regulating pond to the main canal and the distribution quantity to farm laterals must be appropriately controlled upon taking into consideration the following points.

- o Irrigation area
- o Number of surface soil puddling field lots
- o Existence of paddy field with percolation property
- o Conditions of paddy field
- o Growth condition and growth period of rice

Moreover, when there has been a rainfall, it is necessary to discontinue the irrigation or confine irrigation to extremely limited paddy fields for minimizing the burden of the drainer and minimizing the ponding damage of slough paddy fields.

It is necessary to establish the instruction system for conducting the control of these duty of water.

An example of this instruction system is indicated below.



- ①. Make contact on the condition of the paddy field and particularly, on the excess and deficiency of irrigation water.
- ②. Contact the irrigation necessary area for each farm laterals.

- ③. Contact the necessary water volume for each block in charge.
- ④. Presentation of the operation diary.
- ⑤. Calculate the necessary duty of water and indicate the quantity of lift.
- ⑥. Indicate the distribution of the duty of water.
- ⑦. Joint operation and maintenance of the turn-out gate by the technicians and farmer's leaders.
- ⑧. Indication of the intake procedures.

Control of irrigation water must be appropriately performed under each respectively allotted task.

As the duty of each assignment of work, the following items can be considered.

o Duties of the water master

Formulation of an irrigation and drainage planning.

Revision of the planning pursuant to the execution of irrigation and drainage.

Pump operation instructions

Distribution instructions of irrigation water

Instructions on measurement and observation

Instructions on repair of various facilities

Operation instructions of discharge pumps

o Duties of the pump controller

Pumping of the indicated duty of water

Discharge pump operation

Inspection and reporting on pumping and discharge facilities

Presentation of the operation diary

Preparation of the monthly operation tabulation

- o Duties of the ditch controller
  - Gate operations based on the drainage plan
  - Inspection of various facilities
  - Guidance of irrigation water and drainage control to the farmers
  - Execution of measurement and observation
- o Duties of the Farmer's leader
  - Consultation with the technician on the irrigation procedures
  - Operation of the turn-out gate
  - Instructions to the farmers on the operation and maintenance of the facilities (For example, instructions on the simultaneous execution of cleaning work of the canals).
- o Duties of the farmers
  - Control of the irrigation water and drainage based on the instructions of the technician.
  - Operation and maintenance of canals, roads and other facilities.

#### 4. Measures for reduction of duty of water

Generally, the duty of water in a newly reclaimed land during the initial period is extremely great. Therefore, the construction of an irrigation facility under the necessary duty of water at that time will mean the construction of an excess facility. In the Tha Ngon area too, the facility has been planned and executed on the basis of the necessary duty of water for several years ahead.

Due to this, the shortage of irrigation water has originated at the present stage and particularly, it is subject to restrictions on the planted acreage in the dry season.



For the purpose of overcoming this water shortage and plotting the expansion of the planted acreage and the successive diminution of the water cost, it is necessary to urgently enforce the following measures for reducing the duty of water. In other words, the following must be performed.

- o For avoiding extreme drying of the soil and origination of cracks, start the raising of dry season crops as quickly as possible after harvest of wet season crops.
- o Perform periodical patrols and repairs so that the leakages from canals, borders and various facilities are minimized to the utmost.
- o In order to prevent the quantity of percolation of the water for surface soil puddling to extents possible, irrigation of the surface soil and surface soil puddling work are performed at the same time. Particularly, it is necessary to strictly observe this on paddy fields of percolation property.
- o For plotting the smoothening and rationalization of irrigation, build a temporary border matching the height of the paddy field together with providing a semi-permanent small canal along the lengthwise side.
- o For the purpose of preventing even the slightest declining of the ground-water level in the dry season, provide a simple weir in the drainage canal.
- o Together with plotting the consolidation of the farmer's organization which becomes necessary for conducting the abovementioned measures, establish the penal regulations system.

## 5. Drainage

### 5-(1). Drainage within the area

The drainage system within the area is as follows.  
Small drainage canals along the shorter sides of field lots → (Branch drainage canals) → Main drainage canals which utilize conventional small rivers → Nam Ngum River.

Drainage to the Nam Ngum River is performed under the following 2 methods.

- o In case the water level of the Nam Ngum River is lower than the landside water level, it is spontaneously drained through the flap gate.
- o In case the water level of the Nam Ngum River is higher than the landside water level, the flap gate is spontaneously closed. When the landside water level becomes EL 160.3, a pumping drainage is performed.

The capacity of the drainer is as follows.

$$52\text{m}^3/\text{min} \times 60 \times 24\text{hr}/\text{day} \times 2 \text{ set} \doteq 150,000\text{m}^3/\text{day}$$

This corresponds to the total runoff in case there has been a rainfall of 15mm within the drainage basin of 1,000ha. Therefore, in case there is a concentrated heavy rain within the area, it becomes to be tentatively stored within the area. In this case, if the field lots at the high elevation parts are to drain this rainfall all at one time, the field lots at the low elevation parts will be subject to ponding damages. For preventing this ponding damage, guidance should be made so as to temporarily store the rainfall at each field lot and perform drainage little by little.

Moreover, since the operation and maintenance of the discharge canal is often apt to be neglected, all farmers should simultaneously perform cleaning of the drainage canal and particularly, before the wet season.

5-(2). Drainage outside of the area

In the regions outside of the Tha Ngon area, the drainage of regions which had conventionally been drained by the Nong Sam Kha River adopts the following drainage system for the purpose of allowing natural drainage without inflowing this within the area.

Nong Sam Kha Dam No. 1 → Wasteway → Nong  
Sam Kha Dam No. 2 → Wasteway → Nam Ngum River

For adequately ensuring the functions of this drainage system and also for preventing harms to the surrounding residents, the sufficient operation and maintenance of these facilities are necessary.

5-(3). Drainage of field lots

After the elapse of the maximum tillering stage during the growth period of the rice, it is preferable to make it into a dry field condition for about 1 week. This intermediate drainage is serviceable for control of fruitless tillering, improvement of the air permeability of the soil, origination prevention of hydrogen sulfide, etc.

Since the scale of field lots is 200m X 50m and large, it is preferable to dig several temporary catch drains for performing smooth drainage.

This temporary catch drain is also effective in the improvement of faulty drainage which is a cause of the lodging phenomenon that is often observed at Sampaton.

6. Operation and maintenance of the pumps

On the operation and maintenance of the water lift pumps and drainage pumps, detailed mentionings have been made in the "Pump Operation Manual" so undergo pertinent executions based on this.

As a matter for providing particular care, there is the observation of changes in the oil gauge of the oil tank, ampere meter, voltage meter, pressure gauge, etc. During operations, patrol at fixed periods and in case there is an abnormality, operation must be stopped and urgent contact must be made to the water master.

It is normal that the oil surface of the oil tank gradually lowers little by little. Since the damage of the oil seal can be considered in case of sudden drops or rises, particular care is necessitated.

Moreover, the cleaning within the cubicle must be borne in mind and the troubles of the electrical system due to insects, spiders, etc., must be prevented. Furthermore, it is necessary to perform periodical weeding within the site of the transformation facility and provide care as to prevent trouble originations such as electric leakage, short-circuiting, etc., due to harms of snakes and rats.

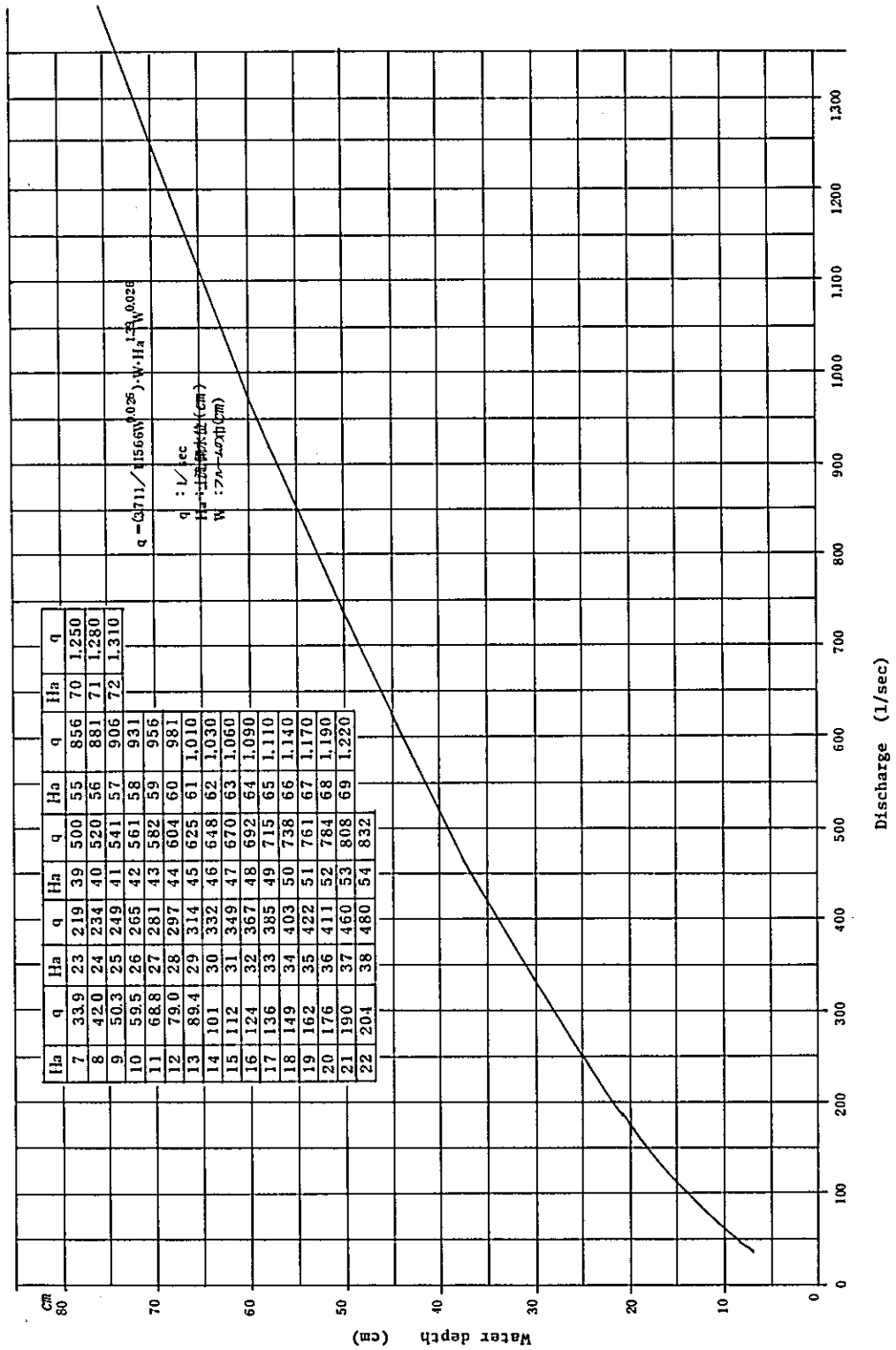
Besides the above, it is necessary to prepare an operational daily report and monthly tabulation of the pumps for performing a suitable pump operation and also for setting up the water lift planning.

Their forms shall be of those indicated in Form-1 and Form-2. The measurement of the pumping volume on this occasion shall be made by the parashall flume which is provided and can be obtained from Fig. -6.

From the actual results of operations hitherto, the relation between the water level of the Nam Ngun River and the pumping volume per unit time ( $m^3/min$ ) and the pumping volume per unit electricity volume ( $m^3/K.W.H.$ ) are obtained. This being illustrated is Fig. -7.

Since these are data indispensable for the setting up of the irrigation planning and for income and expenditure calculation of farmer's operation, it should be continuously obtained in the future also and it is necessary to add amendments to the diagrams.

Fig. 6. The Ngon Pumping Station Parshall Flume



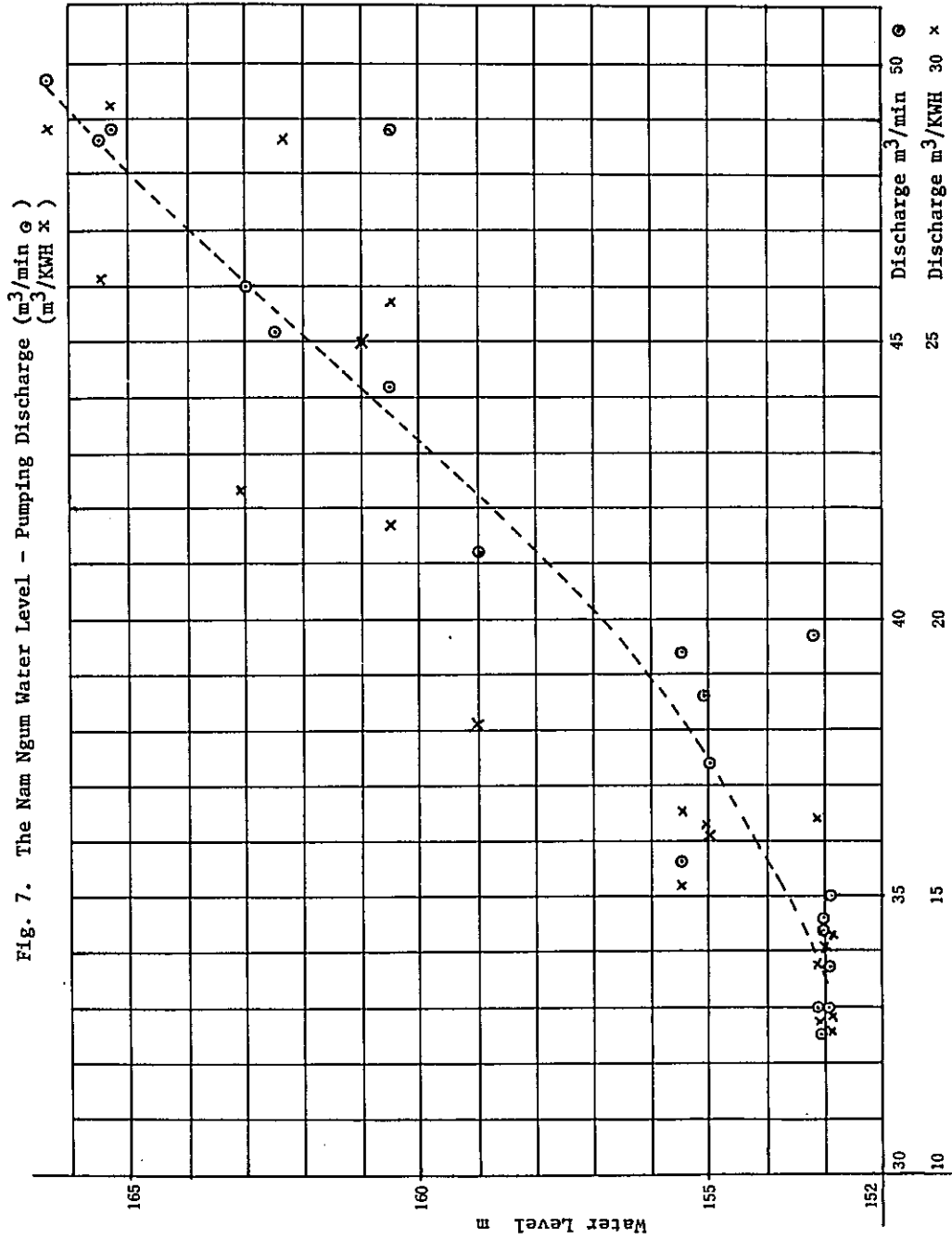




Fig. 2

STOCK ISSUE CARD

1. SPAIR PARTS NO. & NAME
2. EQUIPMENT NAME
3. PRICE

DATE	RECEIVED	ISSUED	ON HAND	USE EQUIP NAME	CHECKER NAME	OTHERS

Fig. 3

Bill for Working and Repairment

Entry by orderer		Entry by order acceptor	
1. Date		1. Acceptance date	
2. Name of orderer	Section	2. Name of person in charge of work	
3. Name of work	Name of repair	3. Name of used type of machine	
4. Working area	Place of repair	4. Initial observation condition of work or repair	
5. Completion date of work	Completion date of repair	5. Scheduled date of work completion	
6. Others		6. Necessary expenses	



### III. AGRICULTURAL MACHINERY

Seiko Goto

#### 1. General

For those who handle agricultural machineries, the origination of troubles to machineries during their usage is the greatest cause of losing confidence. For not losing confidence from others, those who handle machineries must be well accustomed to the machineries.

Since machines are living things which do not tell lies, machines should not be subject to unreasonable usage and it is the duty of the machine technicians to sufficiently take care of the machines and let them work without originating any troubles.

The persons in charge of agricultural machineries must always bear in mind the following matters for sufficiently utilizing the agricultural machineries.

- a. Become fully accustomed to the machineries which they handle.
- b. Quickly get used to the engine noise so that one is not frightened by it.
- c. Become serious when contacting machineries.
- d. Do not become a captive of surrounding noises.
- e. Do not operate the machine until all problem points are cleared.

#### 2. Machine repairers

Although machine repairers are specialists of machine repair, they must also be capable of operating the machine. It is the duty of the repairers to repair the troubles machine and let it engage in work promptly.

Since the failure of the repairer also greatly relates to the failure of the machine operator, he must provide care to the following matters daily.

- a. Whether or not he has become a friend with the machine?
- b. Whether or not he has been able to learn of the troubled place from the operator?
- c. Whether or not there is a trouble which the operator does not know?
- d. Whether or not he has checked all of the entire machinery?
- e. What are the opinions of the fellow repairers?

It is important to commence repairs after becoming thoroughly familiar with the abovementioned 5 items.

In performing repairs, it is necessary to provide exact care such as perfectly arranging removed parts, etc., and see to that no usage place unknown bolts, nuts and washers are left over after completion of repair.

In order to acquire many techniques and experiences as a machine repairer, it is important to inquire to those experienced on problem points which cannot be judged without the slightest hesitation.

In other words, the actually experienced technique is not lost forever.

### 3. Machine operators

Those who most effectively operate the machine under the method which well suit the purpose are the trustworthy operators.

In order to become a trustworthy operator, one must constantly well know the movement of the machine. The machine operators must always be sure to perform the following matters.

- (1). Prior to operation
  - a. Check whether there is fuel or not.
  - b. Check whether there is lubrication oil or not.
  - c. Check whether or not there is a puncture of tires.
  - d. Check whether or not the brake works.
  - e. Check whether or not there is cooling water.

- (2). Engine start
  - a. Check whether or not the fuel cock has been opened.
  - b. Check whether or not water is in the fuel cleaner.
  - c. Check whether or not the air cleaner is dirtied.
  - d. Check whether or not there is battery liquid.
  - e. Check whether or not the color of the exhaust gas is correct.
  
- (3). Operation commencement
  - a. Check whether or not there are people or obstacles in the neighborhood.
  - b. Check whether or not you have looked around the land condition of the field lots.
  - c. Check whether or not the gears properly engage.
  - d. Check whether or not the attachment of the farm working implements is proper.
  - e. Check whether or not the farm working implements operate well.
  
- (4). Completion of operation
  - a. Car washing
  - b. Inspection and recording of trouble parts
  - c. Recording of the operation diary

#### 4. Depreciation of the machineries

Machineries consume their lives through usage. Upon completely consuming the life of a machinery, a new machinery must be purchased. For this purpose, it is necessary to collect the rent fees of the presently used machineries in order to allot them as the cost of machineries to be purchased next.

A simple computation method of the rent fee of a machinery is as follows.

- a. Purchased cost of machinery ÷ Durable hours = Cost per hour
  - b. Expenses of used fuel and lubrication oil per hour
  - c. Expense of operator per hour
  - d. Administration expenses and repair expenses
- a + b + c + d = Rent fee of machine per hour

Although the machine cost and expenses can be collected by merely this, the renewal expense, profits, etc., must be further added.

Example 1. Comparison of possible usage hours of agricultural machineries

	Japan	Tha Ngon
Tractor - 60 h.p.	9,000 hours 10 years	4,500 hours 3 years
Tractor - 24 h.p.	7,000 hours 10 years	3,000 hours 2 years
Tractor - 10 h.p.	5,000 hours 6 years	3,000 hours 2 years

The cause why the possible usage hours of agricultural machineries at the Tha Ngon farms is of small quantity as abovementioned also lies in the soil relation, however, since a considerable amount of deficiency and defects can be observed in the management of machineries, that is, in operations, repairs, etc., sufficient efforts should be exerted in management in the future.

The most important thing in mechanized farming is to exert efforts so that the machineries can be used as long as possible.

Example 2. Rent fee per hour of 10 h.p. tractor

a.	Kubota K900 tractor	Price 650,000 kip	
	650,000k ÷ 3,000Hr =		217 kip
	Fuel 1 liter per hour =		136 kip
	Engine oil 0.1 liter per hour =		54 kip
	Repairs =		136 kip (Approximately the same as fuel.)
	Total		<hr/> 542 kip
b.	Iseki KL901 tractor	Price 1,200,000 kip	
	1,200,000k ÷ 3,000Hr =		400 kip
	Fuel 1 liter per hour =		136 kip
	Engine oil 0.1 liter per hour =		54 kip
	Repairs =		136 kip
	Total		<hr/> 726 kip

When moving a 10 h.p. tractor, the amount of 542 kip is consumed per hour for a Kubota tractor and the amount of 726 kip is consumed per hour for a Iseki tractor. Therefore, when performing farm work by using a 10 h.p. tractor, losses will be suffered if an income above the abovementioned amount is not made.

In order for a tractor utilizer not to suffer losses, he must use the tractor to its maximum above the durable time of 3,000 hours and minimize to extents possible the repair expenses.

5. Method of machinery management

The most important thing on machinery management is to keep recorded all matters on machineries. By observing this record, the method of repair and operation becomes clear and works can be promptly performed. The machinery management record is just like an occupational career or a *circulum vitae* and it is also a *Karte* of a doctor.

The record book must be of a form which is easy to fill up by those concerned and easy to read.

We will hereby append the prescribed forms of the record book which must be commonly furnished.

#### IV. RICE CULTIVATION

Hiroshi Yanagida

At the beginning, I will summarize the technical matters which are considered vital in continuing the rice crop at the Tha Ngon Project in the future.

Particularly, since the theme with which we are confronted lies in increased yield, it is centered around matters which are related to this so I would like you to utilize it as a text for guiding the settling farmers in the future.

##### 1. Nursery bed and raising seedling

###### 1-(1). Seeds

Conditions as seeds

- o They should be enriched.
- o They should be healthy ones which are not stricken with damages of insects and pests, etc.
- o They should be pure ones in which different grades are not mixed.
- o They should be those with a high percentage of germination.

Sowing quantity

IR·RD family	23 - 25 kg/ha
Local family	It is sufficient with 20 - 23 kg/ha.

###### 1-(2). Seed-bed

- o Area ... 30 - 35% of transplanting area.
- o It shall be a rectangular shape of a lifted bed form and it would be preferable to start work upon letting the earth settle well for about 2 days after nursery bed puddling.





- o In case it is of low temperature during hastening in the dry season, there is also the method of burying it in the ground.
- o It is the suitable period for sowing when hastening but has germinated by 1mm - 2mm.

1-(4). Sowing

- o The suitable sowing volume is 60 - 80g/m<sup>2</sup> by the dried unhusked rice weight and it should be sowed uniformly. (After hastening, 75g - 100g/m<sup>2</sup>).
- o After sowing, push the seed rice into the earth by the stem of bamboos or bananas.

1-(5). Management

- o Avoid deep water submerging and ordinarily perform flooding upon matching it with the growth of the nursery plant and about 1cm from the bed surface so that the nursery plant is not overhead flooded.
- o When there is a fear of cold-weather damages due to low temperature, raise the temperature of the nursery bed by performing drainage of residual water in the morning and protect the nursery plant by providing deep-water in the evening and repeat these measures every day.
- o For after manuring, provide about 5g/m<sup>2</sup> of nitrogen components before 3 - 5 days of transplantation when necessary.
- o Make it of deep-water from about 3 days prior to transplantation so as to facilitate pulling of rice seedlings.
- o Plant protection
  - Rice blight Kasumin (Liquid or powdered chemical)
  - Injurious insects Sumithion (Liquid)
  - Sevin

## 2. Transplantation

### 2-(1). Plowing

- o In the same field lot, plow uniformly to the same depth (20 - 30cm).
- o There is a fear of leakage if it is too deep in a fertile soil.
- o The growth will become bad if it is not deeply plowed in red infertile earth.

### 2-(2). Puddling

- o It is also important from the meaning of irrigation water control to promote puddling immediately as water enters together with irrigation.

Plowing → Provision of basic fertilizer →

Pumping-in → Puddling → With 1 - 2 days between  
Transplantation

- o The effectiveness of basic fertilizer is higher when provided before pumping-in and puddling and after plowing, however, it is provided upon matching the schedule of pumping-in and puddling. If the number of days after fertilization and up to puddling is in excess of 3 days, the loss of nitrogen is great.

### 2-(3). Transplantation

After puddling, start transplantation after the earth has sufficiently settled.

- o The points in which young nursery plants transplantation excel to aged nursery plants transplantation are that rooting are quicker and many effective tillers are secured also in tillering and become a great prerequisite in increased harvest. In the IR · RD family, nursery plants of 17 - 20 days are the most suitable in the wet season and nursery plants of 20 - 25 days are most suitable in the dry season and in the Local family, nursery plants of 20 days are most suitable in the wet season.

- o The maintenance work in the future would be facilitated if the planting method would be of the square or rectangular planting.
- o For the planting density, it is important to make it of dense planting in infertile land and of thin planting in fertile land adapting to the land condition.

IR . RD family            14 - 16 plants/m<sup>2</sup>  
 Local family                9 - 12 plants/m<sup>2</sup>

- o Absolutely avoid deep planting. The suitable depth is about 3 - 5cm. The following harms are originated when deep planting is performed.
  - a. Rooting is delayed and tillers are few in number.
  - b. It is weak against lodging.
  - c. The growth is overally delayed and the harvest volume declines.

In order to avoid deep planting, transplanting is started upon sufficient settling of the earth after puddling.

Transplantation Comparison Test According to Age of Nursery Plant

April, 1973 At Test Farm

Type IR - 24

Classification of nursery plant age	Date of sowing	Date of trans-planting	Date of earing	Date of harvest	Amount of harvest kg/ha
15 days nursery plant	Mar. 15	Mar. 30	June 6	June 30	3952.5
20 days nursery plant	-ditto-	Apr. 4	June 8	July 4	2295.0
25 days nursery plant	-ditto-	Apr. 9	June 18	July 11	2987.5
31 days nursery plant	-ditto-	Apr. 15	June 20	July 12	1285.0

Basic fertilizer    40-40-20 kg/ha  
 Planting density    25cm X 25cm  
 Area                250m<sup>2</sup>/district

2-(4). Amount of fertilizer provided

The provision of fertilizer is indispensable when raising crops, however, when solely relying upon fertilizer (chemical), we wish to make special mention here that it will inevitably lead to gradual decrease of the harvest amount in the future. Particularly, since rice is a crop that is greatly controlled by soil conditions, soil improvement should have priority rather than provision of fertilizer. For this purpose, the improvement of the following matters is hoped for.

(a) Improvement of acid soil . . . Input of lime is desired.

Although rice is a crop which is most suited for raising in a soil with a certain degree of acid soil (PH6 - 6.5), since many field lots of PH4.0 and PH 4.5 can be observed around the Center Farm area of the Tha Ngon area, they should be improved. In places with many clayey soils, the lime provision amount should be more than 600 - 800 kg/ha in case of PH 4.0 and more than 450 - 600 kg/ha in case of PH 4.5 and it should be examined again after each crop and additionally provided.

Harms of strong acidity (Alumina property soil)

- o In case PH is less than 4.5, the aluminum becomes soluble and troubles are caused to crops.
- o Since phosphoric acid is well absorbed by earth and not utilized for crops, the deficiency of phosphoric acid is originated.
- o Since the absorption of ammonia and potassium is impeded, even though fertilizers of nitrogen property and potassium property are provided, they become invalid.

(b) Input of organic matter

The input of compost is the best, however, since it is labor-wisely and time-wisely difficult, return the rice straws after threshing completely to the former paddy fields and plow inwards by means of a plow.

(c) When providing chemical fertilizer, be sure to firstly take into consideration that it is to be supplementary provided.

o Basic fertilizer

Local family . . . . Since the growth period is comparatively long, it is to be provided with after manuring as the emphasis. For basic fertilizing, phosphoric acid should be sufficiently provided.

N	P	K
0 - 10	20 - 30	5 - 10 kg/ha

IR · RD family . . . Since the growth period is short and the tolerability for heavy manuring is high, it is made as below, however, it can be considered of making N (Nitrogen) slightly conservative according to the soil condition.

N	P	K
20 - 30	30 - 40	10 kg/ha

o After manuring

Local family . . . . Since it is subject to lodging and affected by damage of insects and pests when too much is provided at the first-half of growth, wait until the forming period of the young spike.

N
0 - 20 kg/ha

Observe well as there are many places where the provision of N is not necessary.

IR · RD family ... After transplantation, it may do to perform after manuring of phosphoric acid according to the growth condition. The N property is provided at the time the young spike forming period has been entered.

N

10 - 20 kg/ha

We have mentioned on the rough providing standard above, however, since the soil condition within the area is full of variety, an increase or decrease volume should be provided for each field lot.

### 3. Management after transplantation

#### 3-(1). Plant protection

If diseases and injurious insects are not controlled at a suitable period, there will be no effect and the damage will increase.

- Genus of rice-borer .... They should be controlled about 3 times after transplantation. When adult imagines (moths) are observed, immediately spray insecticide uniformly and well up to the lower leaves and stems.
- Rice blight ..... This particularly originates on rice variety of the local family. If this originates after the young spike formation period, it will become a spike neck blight when not completely controlled and the grain yield will decline sharply.

Name of chemical	Kasumin (dust) 30 kg/ha Kasumin (liquid) 500 - 1,000cc/ha
<ul style="list-style-type: none"> <li>• Rice leaf roller</li> <li>• Pigling</li> </ul>	<p>To be sprayed per 15 days.</p> <p>They originate at the latter growth period of rice and they cause damages by eating up the leaves. In case of a great outbreak, the grain yield will sharply decline so they should be controlled in good time.</p>

Name of chemical	Sumithion 1/1000 solution Sevin
<ul style="list-style-type: none"> <li>• Bacterial leaf blight</li> </ul>	<p>Starts to develop from around the young spike formation period. The reasons why it originates in a paddy field of comparatively well growth are that the nitrogen fertilizer is in excess, the water is deep, there are many tillers and the rice body has feebly grown.</p> <p>Since this pathogenic fungi invades from wounds of leaves, it spreads after rain. Since the bacteria live in irrigation water, paddy fields which have been overhead flooded should be immediately sprayed with chemical after drainage.</p>

Name of chemical	Shirahagen 30 kg/ha
<ul style="list-style-type: none"> <li>• Sheath blight</li> </ul>	<p>This also develops after the young spike formation period and when it intensely develops</p>

around the harvest period, lodging occurs. However, the reason why the spike does not ripen if the development is early is excessive thick growth due to excess supply of nitrogen fertilizer elements, deep water, etc., and the major factors are inferior ventilation and inferior lighting.

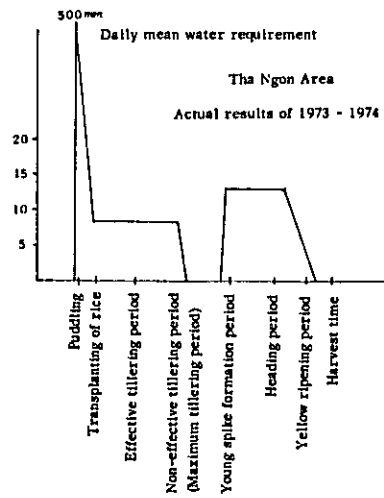
3-(2). Weeding

Weeds are pulled out while they are still small. If they are left alone until they become big, they will impede the growth of rice. If they are not always pulled out, they will regrow so be sure to pulled them out and step them into the earth.

3-(3). Water control

If the control of irrigation water is made well, there will be an increased yield of more than 30%.

The variation of water requirement is as shown in the table below.





After transplantation, sufficient overhead flooding is made until securement of the fruitful culm, however, once the fruitful culm (About 12 - 16 ea/plant for the IR·RD family and about 10 - 13 ea/plant for the Local family) is secured, drainage of residual water is made for holding down the tillering of the fruitless culm and sufficient oxygen is supplied to the earth and root. If this drainage is not performed, the fruitless culms will increase and the rice body will become weak and lodging and development of diseases and injurious insects will be brought about and resultantly, the grain yield will be reduced. The period of drainage will be about 5 - 10 days and up till the time light cracks originate on the paddy surface but not until the paddy surface becomes white. When overhead flooding is performed again, additional fertilizer shall be provided. At just about this time, it will enter into the young spike formation period. When it enters into the young spike formation period, it should never be made to run short of water. Drainage of residual water is made about 12 - 14 days after it starts heading and the paddy field is made to dry until rice mowing.

3-(4). Prevention of lodging

Despite the fact that the rice has been raised with devotion at great pains, if lodging starts somewhere around the heading period, the grain yield is sharply decreased.

In order to prevent this, frankly speaking, it can be prevented if healthy and strong rice is raised, and in listing its main proximate causes, they become as follows.

a. Excessive nitrogen fertilizer elements

The facts of the soil being fertile and the excessive input of organic matters are also included, not to mention the oversupplying of chemical fertilizer.

b. Close planting

If it is too closely planted during transplantation,

the ventilation and lighting will become inferior and the rice will feebly grow.

c. Deep irrigation

If rice is raised in deep water, it will not only become weak but it is uneconomical as extra water is consumed.

d. Early planting (Cultivation period is too long.)

In the case of Sanpatong, if it is early planted, it is inevitable that the culm overextends and is subject to lodging in entering the ripening period.

e. Deep planting

If it is deeply planted, the lengthy part between the upper node comes at the soil edge so it is subject to lodging.

f. Diseases and harmful insects

Particularly, when it suffers genus of rice-borer, node blight and sheath blight, the stem and node will be invaded so it is subject to lodging.

As preventive measures, it will do to avoid the proximate causes from a - f and they can be listed as below.

- a. —→ The nitrogen content of the chemical fertilizer shall lay its emphasis on after manuring. In case straws, green grass, etc., are inserted, insert lime and perform transplanting of rice after complete decomposition. Phosphoric acid and potassium are provided as basic fertilizer.
- b. —→ Fertile land shall be thinnly planted and infertile land shall be closely planted.
- c. —→ Always make it of shallow water and perform water patrol daily. In places where the difference of altitude of paddy fields is great, provide a temporary levee

and in low places, provide a drainage canal prior to transplantation.

Perform drainage immediately upon securing the fruitful culm. Drainage is performed up until cracks enter into the paddy surface (5 - 10 days) and control of excessive tillering and supply of oxygen are sufficiently performed.

- d. —→ In case of Sanpatong, perform transplantation during August as much as possible. If it is too early, the culm will overgrow and will be subject to lodging and if it is too delayed, the growth will be insufficient and the grain yield will decline in both cases.
- e. —→ Plant the seedling as shallow as possible (3 - 5cm). Under the customary method, it is planted at the depth of 10 - 12cm. After puddling, it would be preferable to perform transplantation upon letting the earth settle well for one-half to one day.
- f. —→ Perform chemical spraying earlier than usual.

#### 4. Harvest

Make it so that harvesting is completed during 20 - 25 days after heading. When harvest is delayed, it will be subject to flailing and when becoming over ripened, notched-belly rice kernels will originate. Since the temperature is high and ripening is quick for the harvesting season of dry season crops, the crops should be harvested earlier than usual.

##### 4-(1). Quadrant sampling

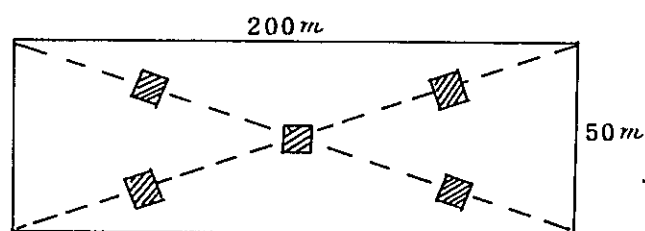
Quadrant sampling is for estimating in advance the grain yield and when it is not accurately performed, it totally

loses its meaning. The more the provision of sample collection points, the more accurate the obtained value will be. The area of a single point will be sufficient at 3 - 5m<sup>2</sup>.

On sample collection at uneven growth paddy fields, perform collection upon well observing the ratio of the growth area.

The minimum of 5 spots should be collected in a single field lot.

Example: Sample collection spots



When the collected sample is dried, threshed and adjusted, it is dried again and weighed and the obtained numerical value is calculated in terms of per hectare or per area of the field lot.

#### 4-(2). Reaping

Start reaping even from a single field lot which has performed heading early. Those reaped shall be dried by avoiding places subject to morning dew and places of abundant moisture. After drying, leave them stacked for 1 - 2 days and perform threshing after this. When using an automatic thresher, make it of a revolution of about 400 - 450 r.p.m. When threshing is performed under high speed rotation, notched-belly rice kernels will originate and since it will become of inferior germination as a seed, care should be provided.

Since the shattering characteristics of the Local family variety is extremely high, manpower threshing would be more desirable.

4-(3). Drying

In case the unhusked rice is to be ground dried after threshing, avoid drying from around 10 a.m. to 3 p.m. when the direct sunlight is strong and provide a cover. Sudden drying leads to increasing of notched-belly rice kernels and when rice polishing is performed, a great amount of crushed rice will be originated and the quality will decline.

The moisture of the unhusked rice will become close to 14% when dried for 1 - 2 days so perform wind selection after this and remove straw wastes, stones, sand, empty husks, etc., and store.

During storage, provide care to ventilation, draft, origination of vermin and rats and absolutely avoid high temperature and dampness.

5. Matters worthy of special mention for plotting the increased yield of the Tha Ngon Area

- (1) Transplantation of young age nursery plants.
- (2) Strict enforcement of shallow planting.
- (3) Discontinuation of deep water and submerging cultivation and strict enforcement of drainage.
- (4) Plot the effectivation of the fertilizer providing amount and the accurate grasping of the after manuring period.
- (5) Weeding
- (6) Control of diseases and harmful insects.
- (7) Prevention of lodging.

## V. TEST FARM AND UPLAND CROPS

Masuo Hamada

### 1. Preface

It is hardly necessary to mention on the importance of upland field cultivated plant crops as a nourishment improvement and as a cash crops for farmers living within the area of this Project.

In hereby leaving the Tha Ngon area due to the expiration of the Agreement, matters which can be considered necessary as a specialist, who has took part in upland field cultivated plant crops hitherto, can be listed as follows.

### 2. Fruit gardening

It can be presumed that fruit gardening will also become a very important thing for the agricultural development of the Tha Ngon area in the future.

The variety of fruits introduced from Thailand hitherto in about one year has already reached a great quantity. In the future, these should be actively increased and the production of nursery stock and their sales should also be taken in as the business of the Test Farm.

### 3. Vegetable gardening

On the cultivation period and cultivation method, please refer to the Table concerning the agricultural standard which has already submitted from Mr. Haga.

Moreover, on the fertilizer providing planning, take into full consideration the Report concerning the soil examination result which I have submitted.

On clericulture, similarly as for fruits, the distribution of seeds and seedlings to farmers within the Project area should be made the main purpose and for this purpose, the multiplication setup of seeds should be urgently established.

If natural conditions are taken into consideration in this Project area, leafy vegetables such as onions, cabbages, etc., can be considered as suitable so it is desirable that tests be continued on the economical condition of these also in the future.

#### 4. General upland field cultivated plant crops

- 4-(1). On the dry season cultivation of general upland field crops, the restriction from the side of irrigation is great so when planning this, the thing in which particular care is necessary is that efforts must be exerted so that the irrigation efficiency is elevated as much as possible.

Since the field lot within the Project is that of paddy field lot and it is extremely great having a long side of 200m, the length of the levee will become a problem when wishing to perform irrigation between levees.

#### 4-(2). Corn

The grade deterioration of the presently used corn race PB-9 is conspicuous and unless it is urgently replaced with other races, a high grain yield cannot be hoped for in the future.

Under the present conditions of the Test Farm, the production of the FI race is also technically difficult. Therefore, it is considered desirable that either the FI race be introduced and used as it is for several years or that a composite variety be introduced.

#### 4-(3). Soybean

On the variety of soybean, it seems that the variety considered suitable here for the present cannot be found other than the SJ-1 and SJ-2. However, since rust tremendously develops in wet season cultivation, their diffusion to the farmers should be aimed for dry season crops as the present theme.

In field lots of high acidity, however, care should be provided as physiological acidity harms will appear.

It would also be desirable to raise the so-called "Levee soybeans" in the levees of the paddy fields and adopt the method so as to gradually permeate the cultivation techniques among the farmers.



## VI. FARMERS' ORGANIZATION

Ryusaku Ohno

### 1 Status Quo of Organization

- 1-(1) Organizational Setup of Tha Ngon Farmers' Association
- 1-(2) Activities

### 2 Strengthening of Organization

- 2-(1) General Picture of Settlers
- 2-(2) Upbringing and Strengthening of Farmers' Groups
- 2-(3) Functions of Farmers' Groups
- 2-(4) Preparation of Statute of Association

### 3 Withdrawal of Loans and Management of Resources and Equipment for Farm Management

- 3-(1) Method for Extension of Loans and Collection of Funds
- 3-(2) Management of Resources and Equipment for Farm Management

### 4 Balance Sheet for Management of Standard Immigrated Farmhouses (Trial)

- 4-(1) Net Income for Standard Immigrated Farmhouse for 1973-74
- 4-(2) Income in Project Area
- 4-(3) Income Gained from Outside Project Area
- 4-(4) Livelihood Expenses for Standard Farmhouse
- 4-(5) Economic Surplus of Standard Farmhouse

(Reference)

Statute of Association of Agricultural Cooperative (an Example)

## 1. Status Quo of Organization

### 1-(1) Organizational Setup of Tha Ngon Farmers' Association

The Tha Ngon Farmers' Association was established on June 23, 1973. The constituents of this organization are settlers under the Tha Ngon Agricultural Development Project (FPDT) (Note 1). The membership of this association was 80 persons in the beginning but has now increased to 256 persons (as of the end of November 1974).

The executives of this association include one President, one Vice-President and one Secretary. All of these executives are elected by unsigned ballot.

The farmers' groups (Note 2) are considered to be subordinate organs. One Group Leader is elected for a farmers' group (additionally, one Sub-leader for a special farmers' group). Furthermore, one delegate each is elected from six hamlets and a war veterans' group.

### 1-(2). Activities

General assemblies of the Association have been held four times since the first General Assembly was held on June 23, 1973. Each assembly has deliberated primarily on the rice price, land issues, water control, repayment of the funds for farm management and other matters.

The farmers' groups coworked in removing earth and sand from the lateral canals, weeding the adjacent areas of these canals and other projects.

The staff of the Association, members of the Associations, and technicians have communicated with one another through their routine work. The President of

the Association, group leaders and other staff members of the Association meet one another as occasion calls, and it may be said the function of information, albeit insufficient, has been established.

Note 1: Settlement: The first settlement was conducted in June 1972. The settlers in the beginning totaled 12 persons, but the figure later increased step by step. By the time the third group of settlers moved in (in May 1974), the settlers increased to a total of 256 persons (the number of settlers at present accounts for 64 percent of that of settlers initially planned).

In selecting the settlers, preference is given in the following order:

- (1) Persons once possessed of the cultivation right in the project area.
- (2) Farmers in the areas buried under water as a result of the construction of a dam.
- (3) Inheritors to the persons mentioned in (1) and (2), above.

As indicated in the following table, the persons once living in the hamlets near the project area are many when they are classified by hamlets, whereas the persons mentioned in (1) and (2), above, are many when they are classified by reasons.

### Settlement Classified by Hamlets

(As of the end of Nov., '74)

	First (June, '72)	Second (June, '73)	Third (June, '74)	Total
Latk Houei	-	-	55	55
Tha Sommo	3	20	25	48
Tha Ngon	2	21	36	59
Ban Na	1	17	22	40
Keng Khay	6	1	3	10
Don Noon	-	4	23	27
Others	-	3	3	6
War Veterans	-	2	9	11
<b>Total</b>	<b>12</b>	<b>68</b>	<b>176</b>	<b>256</b>

Note 2: Farmers' group: A farmers' group is organized by the settlers operating their farms along one or several lateral canals to take care of the effective utilization of water and the maintenance and management of the farm roads and water control facilities at its common responsibility.

Note 3: General Assemblies of Farmers' Association

	Date	Place	Participants
First	June 23, 1973	Tha Ngon School	65
Second	Nov. 13, 1973	Tha Ngon School	49
Third	June 17, 1974	PDT Meeting Room	187
Fourth	Sept. 25, 1974	Temple in Project Area	72

## 2. Strengthening of Organization

### 2-(1) General Picture of Settlers

The general picture of settlers may be described in the following manner:

- a. Many of the settlers have come from the hamlets adjacent to the project area. In the allocation of arable land, however, the fact that they have come from these hamlets is not reflected to the full measure for reasons ascribed to the dis-franchised right of cultivation (Note 1). Consequently, each farmers' group is made up of the farmers who do not know one another.
- b. Many of the settlers, retaining the pattern of socioeconomic life they had before their settlement, are engaged in farm management under the project.
- c. The abodes of many of the settlers are situated at places far away from the project area (in fact, some of the settlers live in the city of Vientiane).
- d. The distribution of arable land to the settlers is not fianlized.
- e. Insofar as the socioeconomic life of the settlers is concerned, they have not been placed in a condition where they are fully and speedily adaptable to organized activity.

Special consideration ought to be given to the above points for a further strengthening of the farmers' organization in the future.

Note 1: The following is a classification by hamlets of the settlers (scheduled to work in the dry season of 1975) for representative lateral canals:

Nine in Tha Ngon, four in Ban Na, one in Keng Khay, four in Tha Sommo, three in Don Non, and five in Latk Houei, totaling 26 persons.

2-(2). Upbringing and Strengthening of Farmers' Group

As has been described in the foregoing, the Farmers' Association has been established and attempts have been made to organize farmers' groups. It is desirable that insofar as guidance is concerned, emphasis will be placed on the upbringing and strengthening of the farmers' groups for the time being on the basis of the recognition that progress in the organization of their activities will enable a federation of their organizations to unfold its activities in a smooth manner.

For the upbringing and strengthening of the farmers' groups, the execution of the following projects is considered necessary for the time being:

- a. The identification cards for settlers would be kept up to date (those for the first and second groups of settlers have already been completed). A name list for each group of settlers would be prepared for distribution to all its members.
- b. A statute of association incorporating the purposes of organization of the farmers' group, line of business and other matters would be prepared (this statute could be a simple one). It would be printed for distribution to all its members.
- c. To enhance the settlers' competition-mindedness in production, a system of commendation would be established for individuals or groups while making allowances for the output, shipment and working hours on the farms.
- d. No communication networks are established from the Association (or PDT) to its members and vice versa. It is necessary to establish them as soon as possible.
- e. Each group would hold a meeting at regular intervals (the meeting could be utilized for the training of settlers).

- f. A council of group leaders would be formed. It would hold a meeting at regular intervals (the meeting could be utilized for the training of settlers).
- g. An office (a simple one) would be established for the Farmers' Association. A permanent secretary would be assigned to this office. (The expenses would be appropriated for with the dues imposed on farmhouses.)

2-(3). Functions of Farmers' Groups

In general terms, the projects that ought to be implemented by farmers' groups for their members may be enumerated as follows:

- a. Supplying of funds, resources and equipment for farm management.
- b. Storage, processing and sales of farm produce.
- c. Maintenance and control of irrigation and drainage canals, farm roads and farm machinery.
- d. Supplying of daily necessities.
- e. Education and training on agriculture.
- f. Other projects associated with the development of the Association members' farm management and strengthening of their organization.

For the management of these projects, however, there will be a need for the availability of sufficient facilities and funds as well as the sophisticated control and market survey abilities.

Of the aforementioned projects, the entire part of a and b and some portion of c, e and f are placed under the management of the Agency for Vientiane Plains Development, whereas some part of c, e and f is placed under the management of the farmers' groups.

For the time being, it is desirable that the farmers' groups will put emphasis on a substantial replenishment

of the existing projects and that as the foundations for their activity are progressively solidified in the future, they will gradually incorporate additional projects.

2-(4). Preparation of Statute of Association

To clarify the projects, organization, management and other matters associated with the farmers' group, there will be a need for the preparation of a statute of association.

In the preparation of a statute of association, it will be necessary to give full consideration to the special circumstances which existed in the initial stage of settlement, while being aware of the basic philosophy that the association is managed by and for its members. (At the end of this paper, an example of the "Statute of Association of an Agricultural Co-op" is given for reference purposes.)

3. Withdrawal of Loans and Management of Resources and Equipment for Farm Management

3-(1) Method for Extension of Loans and Collection of Funds

Loans for farm management are extended to settlers not in cash but in the forms of goods, such as fertilizer and agricultural chemicals, and services, such as land redevelopment. Loans are withdrawn primarily by means of collection of farm produce (rice).

In order that the activities by settlers for farm management may turn out to be of much effect, it will be necessary to assure a full availability of resources and equipment required for farm management as well as to distribute and control them in a fair and reasonable manner. There will also be a need to withdraw loans extended for farm management as scheduled in terms of both amount and time.

At present, the execution of the aforementioned lines of related business is almost completely systematized,



and their management may be considered satisfactory in general terms. To cope with a rise in the number of settlers and a resultant increase in the volume of business, there seems to be a need to work further for the enhancement of work efficiency and the updating of documents.

The withdrawal of loans and others for farm management (Note 1) stood at 63.2 percent in the rainy season of 1973 and 74.1 percent in the dry season of 1974. These withdrawal rates are favorable for the initial phase of settlement. However, there are signs for a rise in settlers' debts to ADVP or PDT (this signifies a rise in the debts by ADVP or PDT to outside institutions). It is necessary to upgrade the withdrawal rate, while taking the repaying ability of the debtors into account. Incidentally, an Operating Procedure for Rice Collection was drafted on June 5, 1974, and has already been distributed to technicians for reference purposes.

It is necessary that the persons in charge of the withdrawal of loans should be updated on the following matters: There is also a need to prepare a monthly (seasonal) table of statistics, which will be on file for a specified (fairly long) period of time.

- a. Balances (in amount or quantity) due on loans classified by terms and settlers.
- b. Outputs by terms and settlers.
- c. Repayments (in amount or quantity) by settlers during a given term.
- d. The urgent task is to assign a number to each settler and, on the basis of this assigned number, to do work. This would enhance the work efficiency.

3-(2). Management of Resources and Equipment for Farm Management

The persons in charge of this business must be accurately aware of the following matters at all times. It would also be necessary to prepare a monthly (seasonal) table of

statistics and keep it on file for a specified (fairly long) period of time.

- a. Supplies classified by resources and equipment and suppliers.
- b. Distribution (consumption) classified by resources and equipment (including services).
- c. Stocks classified by resources and equipment.
- d. Distribution (consumption) as classified by immigrants and resources and equipment (including services).

Note 1: Fund and Others for Farm Management

- a. Of the fund and others for farm management, the fund for farm management is computed for all settlers at a rate of 35 percent of the output (in terms of amount or quantity). (This percentage was used for the crops in the rainy season of 1973 and the dry season of 1974.) The percentage of "35 percent" was introduced while taking into account the relationship between the initially estimated total yield and the total amount of resources and equipment invested. Consequently, the fund for farm management, which is assessed with the percentage of "35 percent", is estimated at a lower level than in actuality, because the actual output is lower than the initial estimate (this signifies a drop in the burden of settlers). In the event that the actual output exceeds the estimate in the future, it will mean that the fund for farm management, in whose assessment the percentage of "35 percent" is used, exceeds the amount of actually invested resources and equipment (this exemplifies a rise in the burden of settlers).

- b. The actual withdrawal of the loans extended for farm management is lower in percentage than the aforementioned withdrawal. The balance due on the loans increase in each rice planting season. This signifies a rise in the debts by ADVP or PDT to outside institutions and is indeed undesirable.
- c. At present, the differentials in yield between settlers are great. Whether the yield in the initial phase of settlement is favorable or unfavorable, it is contended, depends on the endeavors by settlers for farm management and also on the conditions of their allocated land. For a lessening and balancing of the burdens of settlers, it would be realistic and reasonable to carry on the percentage system (although there may be some argument over the pros and cons of the percentage of "35 percent").

#### 4. Balance Sheet for Management of Standard Immigrated Farmhouse (Trial)

In providing guidance on farm management, it would be considerably important for PDT to be updated on the fluctuations in the post-settlement income of immigrated farmhouses and the level of consumption as well as their ability to save money.

On the basis of the indices associated with manufacture for 1973 and 1974, a trial balance sheet is prepared for the management of a standard farmhouse. This balance sheet is outlined in the following:

4-(1) Net Income for Standard Immigrated Farmhouse for 1973-74

The net income for the standard immigrated farmhouse for 1973 and 1974 is estimated at US\$483.30. The livelihood expenses are estimated at \$468.40. The surplus is estimated at \$14.90 (which accounts for 3.1 percent of the disposable income). These figures indicate a fairly larger increase in income than before the settlement, but much of the gain appears to have been absorbed in an upgrading of the consumption level.

4-(2) Income in Project Area

- a. Rice cultivation was carried out both in the rainy season of 1973 and the dry season of 1974. The species used for both seasons and the area cultivated are IR-24 and local Sanptong (hereinafter referred to as S. P. T.) for one hectare in the rainy season of 1973 and IR-24 for one hectare in the dry season of 1974.
- b. The yields are 1,206 kilograms per hectare for IR-24 and 2,352 kilograms per hectare for S. P. T. in the rainy season of 1973 and 1,853 kilograms per hectare for IR-24 in the dry season of 1974. The total income of a standard farmhouse is \$583.50 (including the amount of rice to be set aside for self-consumption).
- c. The selling price (the price on delivery from the farms) is \$107.80 per ton on the average (i.e., the effective price). The total income of a standard farmhouse is \$583.50.
- d. The total production cost is estimated at \$245.20, including \$204.30 worth of loans facilitated by PDT in the forms of land maintenance, fertilizer, agricultural chemicals, etc., and \$40.90 for manpower outlays. The net income gained by subtracting the production cost from the total income is estimated at \$383.30.

4-(3) Income Gained from Outside Project Area

Most of the settlers (82.8 percent) have come from the periphery of the project area. Upholding the pattern of socioeconomic life they had before the settlement, they earn from this source to some extent. This type of income is estimated at \$145, or 25 percent of the total income.

4-(4) Livelihood Expenses for Standard Farmhouse

The livelihood expenses (including the consumption of rice for self-sustenance) for a standard farmhouse (with a membership of 6.5 persons) is estimated at \$468.40. Here, the consumption of rice (polished) is estimated at 200.5 kilograms a year per capita (Note 1).

The outlays for the purchase of rice are estimated at 75 percent of the expenses for foodstuffs and drinks. The expenses for foodstuffs and drinks are estimated at 75 percent of the livelihood expenses.

4-(5) Economic Surplus of Standard Farmhouse

As a result, the economic surplus of a standard farmhouse, is estimated at \$14.9 (with the ratio of savings at 3.1 percent) for 1973 and 1974.

Note 1: In 1973, a total of 580,000 tons of rice (polished) were supplied to Laos, and they include 530,000 tons of domestically produced rice and 50,000 tons of imported rice (according to a survey of the Department of Agriculture). Laos had a population of 3,181,000 in 1973 (Bulletin de Statistique, 1974), and this means that the per capita consumption of rice stood at 182.3 kilograms. For the sake of trial computations in this paper, the consumption is raised by 10 percent to 200 kilograms. Incidentally, the

consumption of rice a year per capita is set at 180 kilograms in the territory of the Royal Lao Government according to the Second Development Plan for 1976-80 published by the Royal Lao Government (op. cit., p.25).

**Balance Sheet for Management of Standard Immigrated  
Farmhouse (Trial)**

	Unit	Planted in Rainy Season, 1973		Planted in Dry Season, 1974		Total
Area cultivated	ha		2		1	3
Yield per unit	kg.	IR	1,206	IR	1,853	
		SPT	2,352			
Total yield	kg.		3,558		1,853	5,411
Unit price	US\$/ton	IR	101.20	IR	113.10	
		SPT	107.10			
Gross income	\$		373.90		209.60	583.5
Production cost	\$		155.20		90.0	245.2
Net income (A)	\$					483.3
(a) in project area	\$		218.70		119.60	338.3
(b) outside project area	\$					145.0
Livelihood cost (B)	\$					468.4
Surplus	\$					14.9
Ratio of savings (B/A)	%					3.1

Note 1: The production cost includes only the direct production cost.

2: The conversion rate is 840 kip at US\$1.00.

(For Reference Purposes)

Statute of Association of Agricultural Cooperative  
(An Example)

The following statute of association is hypothetically prepared while taking the following points into account:

- (1) The statute of association must be fully understood by all the members of the cooperative.
- (2) The doctrines and ideals of an agricultural cooperative must be fully embodied.
- (3) Consideration is given to the special circumstances of the Farmers' Association, which is in the initial phase of settlement.

Chapter 1: General Rules

**Article 1:** This cooperative aims at encouraging its members to join in enhancing the production efficiency in agriculture and elevating the socioeconomic position of farmers, thereby contributing to the development of the Vientiane Plains.

**Article 2:** This cooperative carries out the following lines of business in the interests of its members:

- (1) Supplying of commodities necessary for the business or living of the members.
- (2) Extension of funds necessary for the business or living of the members.
- (3) Maintenance and management of water control facilities and roads to be used for agricultural purposes.
- (4) Transportation, processing, storage or sales of commodities produced by the members.
- (5) Education programs for the elevation of technology and management associated with the members' farm work.
- (6) Incidental projects associated with each paragraph, above.



Article 3: This cooperative is named " \_\_\_\_\_ Agricultural Co-operative. "

Article 4: The area with which this cooperative has concern is the 800-hectare area under the Tha Ngon Agricultural Development Project.

Article 5: The secretariat of this cooperative shall be placed at \_\_\_\_\_.

## Chapter 2: Members of the Cooperative

Article 6: The members of this cooperative come in the following two statutes:

- (1) Regular member.
- (2) Special member.

Article 7: The person who wishes to become a regular member must satisfy the following conditions:

- (1) A person who is engaged in farm work and possessed of land in the project area.
- (2) A person who is of Lao nationality and 18 years or over in age.
- (3) A person who is mentally and physically sound and healthy.

Article 8: The special member is a person who has tremendously contributed to the development of the cooperative and recommended by the President of ADVP.

Article 9: Each member of the cooperative shall pay a membership fee of \_\_\_\_\_ kip and a cooperative's upkeep fee of \_\_\_\_\_ kip and finance the cooperative at a rate of \_\_\_\_\_ kip per share.

Article 10: The members of the cooperative are invested with rights and must meet their obligations as described in the following:

- (1) The members shall cooperate with the cooperative and safeguard its interests and honor.

- (2) The members shall faithfully observe the guidance to be provided by PDT or the cooperative on farm management.
- (3) The members may utilize the commodities and places of the cooperative without discrimination. The purposes of the utilization, however, shall not go beyond the scope of this statute of association.
- (4) The members shall render cooperation in technical training.
- (5) The members shall render cooperation in the upgrading and development of farm management.
- (6) In using the machinery, facilities, resources and equipment of the cooperative, the members shall see to it that they will not be damaged during the course of their utilization.
- (7) When the cooperative has gained a profit, the members may have access to its apportionment as stipulated in a separate regulation.

Article 11: The members may secede from the cooperative for any of the following reasons:

- (1) Death.
- (2) Resignation.
- (3) Dismissal.

Article 12: Any member who has fallen under any of the following categories may be expelled from the cooperative upon an approval of the president of ADVP and a resolution of the general assembly. In this instance, notice shall be served to the member to that effect at least 10 days before the date on which a general assembly is to be convened or the date of opening of its regular session, and the member shall be given a chance of vindication at the general assembly.

- (1) A member who has failed to comply with the instructions from PDT or the cooperative on farm management over a long span of time.

- (2) A member who has neglected to pay dues or carry out his obligations for the cooperative.
- (3) A member who has resorted to such conduct as interfere with the business of the cooperative.

### Chapter 3: Bearing of the Expenses

Article 13: The cooperative may impose dues on the members to appropriate for the expenses of the projects enumerated in Article 2, Paragraph 3.

(2) With respect to the payment of the dues mentioned in the preceding paragraph, the members shall not be able to have effect against the cooperative by means of an offset.

(3) The amount of the dues mentioned in Paragraph 1, the method of their imposition, the date and method of their collection shall be determined upon an approval of the president of ADVP and a resolution of the general assembly.

### Chapter 4: Executives

Article 14: The cooperative shall have \_\_\_\_\_ executives including a president.

Article 15: The executives shall be elected by the members in a manner described in a separate regulation.

Article 16: Executives may be reelected even during their terms of office at a request of one-fifth of all the members or the president of ADVP.

Article 17: On behalf of the members, the president shall exercise overall supervision over the management of the business of the cooperative.

Article 18: Of the line of business of the cooperative, the following matters shall be decided at a general assembly:

- (1) Matters pertaining to a policy for the execution of the business.

- (2) Matters pertaining to an election of executives.
- (3) Matters pertaining to the convocation of a general assembly and the referral of measures to the general assembly.

Article 19: The committee shall be convened by the president.

(2) The deliberation at the committee shall be conducted in the presence of over half of the members of the committee, and a resolution shall be made with the vote of a majority of the attending members. In case of a tie, the president shall decide the issue.

(3) The president shall serve as the chairman of the committee.

Article 20: In the event that members of the committee have committed a deliberate or grave fault during the execution of their duties, they will be jointly liable to make compensation to the third party or parties for such fault.

Article 21: The tenure of office of an executive is \_\_\_\_\_ years.

#### Chapter 5: General Assembly

Article 22: The committee shall convene a general assembly every year.

Article 23: In case the convocation of a general assembly has been requested in writing with a vote of two-thirds of all the members of the cooperative or by the president of ADVP, the committee shall convene it within 15 days after such request.

Article 24: The following matters shall be subject to a resolution of the general assembly:

- (1) Amendments of the Statute of Association.
- (2) Matters which are to bring about grave changes in the rights and obligations of a member or members.

Article 25: Neither a deliberation nor a resolution may be made at a general assembly without the attendance of more than half of the regular members.

(2) In case the attendance is short of the necessary quorum, a deliberation can be conducted and a resolution can be made at the second general assembly notwithstanding the provision of the preceding paragraph.

Article 26: A general assembly shall be convened after a bill describing the date and time, place and agenda has been posted in the secretariat and a notice served at least seven days before its convocation.

Article 27: Each member of the cooperative reserves the right to take part in a general assembly, and only the regular members are invested with the right of voting. In case of a tie, the chairman shall decide the issue.

Article 28: The chairman of a general assembly shall be elected by the members in a procedure described in a separate regulation.

Article 29: Each member may present or explain his own views at a general assembly.

#### Chapter 6: Business Execution and Accounting

Article 30: The business year of this Association shall commence on July 1 and terminate on June 30.

Article 31: The funds of this Association shall originate from the following:

- a. The membership fee, upkeep fee and investment stipulated in Article 10.
- b. The dues specified in Article 13.
- c. Others

(2) The regulation concerning accounting shall be determined separately.

Article 32: No regular pays shall be paid to members of the committee but a legitimate appraisal shall be made on their service activities.

Article 33: The cash of this Association shall be deposited in national and other banks in its name. The person in charge of accounting may keep not more than \_\_\_\_\_ Kip as a reserve fund.

Article 34: The drawings from the banks shall be approved and signed by the person in charge of accounting and the president.

Article 35: The president may make cash payments in connection with the routine business of the Association, providing that the amount does not exceed \_\_\_\_\_ Kip at one time. Any cash payments exceeding this amount is subject to an approval of the committee.

