

P. 15 NO. 10 ✓

特出禁止

保存用

REPORT ON PADDY DRYING
AND STORAGE UNDER MUDA IRRIGATION SCHEME

TOSHIKI ASHIZAWA

Colombo Plan Expert

65
FEBRUARY 1970

OVERSEAS TECHNICAL COOPERATION AGENCY

JAPAN

113
MI
EX

BRARY

2537
2538
2539

國際協力事業團		
受入 月日	'87. 6. 4	113
登録 No.	08592	84.1
		EX

113
841
EX

禁止出貸

保存用

Preface

The Overseas Technical Co-operation Agency (OTCA) has the great pleasure of presenting the Report on Paddy Drying and Storage under Muda Irrigation Scheme prepared by Mr. Toshiaki Ashizawa, an expert in the field of Paddy Drying, who was dispatched to Malaysia for the period between October and November in 1969 by OTCA upon instruction from the Government of Japan for a preliminary survey on the above-mentioned project in response to the request of the Government of Malaysia.

We are sure his survey in Malaysia was quite successful in collecting data from various sources with the great help of the Govt. of Malaysia and having useful discussions with the Malaysian authorities.

After his return home, we are very happy to inform you, he devoted himself to preparing the report after his careful studies about the data collected and information given in Malaysia.

Finally, on behalf of OTCA, I do wish to take this opportunity to express my sincere gratitude for the generous cooperation and assistance extended to the expert by the Government of Malaysia.

February 1970

Keiichi Tatsuke
Director-General
Overseas Technical Cooperation Agency
Tokyo, Japan

JICA LIBRARY



1059848[0]

CONTENT

ITEM

1. PURPOSE OF SURVEY
2. PADDY DRYING
3. STORAGE OF PADDY
4. DAILY AMOUNT OF PADDY DRIED
5. NUMBER OF DRYING UNITS AND THEIR LOCATIONS
6. ARTIFICIAL DRYING METHODS IN RELATION TO THE STORAGE METHODS
7. PADDY PLANTING SCHEME AND WATER CONTROL
8. PROGRAMME OF SETTING UP PADDY DRYING UNIT
9. CONCLUSION

1. PURPOSE OF SURVEY

I was requested by the Malaysian Government as the first expert under Colombo Plan to do a brief survey of the whole Muda Project Area. The purpose of the survey is to make recommendations to the Malaysian Government as regards basic plan for paddy processing with particular emphasis on paddy drying. The recommendations so made will pave way for another technical expert who will be responsible for the planning, design, construction and the operational supervision of paddy dryers.

2. PADI DRYING

2.1 Fundamental knowledge on paddy drying

There is a lot of problems in connection with paddy drying. The problems created are not only due to drying paddy alone but also due to paddy cultivation and paddy storage and milling. To a certain degree the local conditions and customs have some effect on the problems of paddy drying.

2.1.1 Quality Control

(a) If paddy having high moisture content (above 20%) is kept too long (over 10 hours), the quality of the paddy namely nutrient value, texture, appearance and germinative capability will be greatly reduced. The weight of paddy will also be considerably reduced owing to germination, mold and fungi attack. To prevent these, it is vital to rapidly dry the paddy immediately after it has been harvested.

(b) Stress checks and cracks in paddy should be prevented in order to have high head yield. To gain high head yield paddy should be dried carefully and slowly.

2.1.2 Equality of Drying

If a portion of stored paddy has moisture content appreciably higher than the rest, fungi attack will begin there first and spread over the bulk of paddy, thus reducing the quality. To prevent this all paddy should be equally dried before storage, i. e. there should not be any difference in the moisture content of the whole bulk of paddy.

2.1.3 Economy of Paddy Dryers

It is important to have the set-up cost and operational cost reduced to minimum, so that the farmers' income will be indirectly increased and the consumers will get the cheapest rice. The drying unit should be set up bearing in mind that it is easy to operate, maintain and repair.

2.2 Methods of Paddy Drying

There are two methods of paddy drying listed below:-

(a) Natural Drying

This depends on sunshine and wind and it is most economical method under favourable conditions such as enough sunshine and wind, cheap labour, and willingness of farmers to employ sunshine drying.

(b) Artificial Drying

Paddy can be dried artificially by blowing forced air with high temperature and low relative humidity over the paddy. The method is most efficient and requires very much less labour force. It could be done under any weather condition but require higher set-up and operational cost.

2.3 Necessity of Artificial Dryer

If we consider the existing conditions in this area, namely the weather condition, paddy productive condition, labour force and customs including farmers' desire, then we cannot help employing the artificial drying method.

If condition ever changes in any area under the Muda Irrigation Scheme, natural drying should be employed as far as possible. The paddy can be dried in two stages, first with the paddy dried by sunshine from about 25% to 18% and later by mechanical dryer from 18% to 13%. This is because it is very much economical to employ sunshine drying. But now, if artificial drying method is not employed, the following results will occur:-

- (a) If the paddy is not dried immediately after harvest it starts germinating and the rate of germination is very fast under wet weather. This leads to loss of weight of paddy.
- (b) Due to loss of weight of paddy, the farmers will get less monetary return, thus resulting into the fact that they may not be very keen in double-cropping.

In conclusion, artificial dryers should be introduced in order to achieve for advantage of double-cropping. Under the local condition, it is not possible for individual farmer to buy his own dryer, and therefore Governmental bodies should set up dryers for the farmers.

3. STORAGE OF PADDY

Storage of paddy should be done under the condition that the quality of paddy will not be reduced and the operational cost should be the lowest.

The best way of retaining the quality of paddy during storage is to keep the paddy in paddy form, not with the paddy husked, because paddy form maintains germinative capability of paddy and prevent attack by insects, molds and fungi.

The changes in temperature and moisture content of paddy must be controlled properly to maintain the quality of paddy. The best way to control temperature and moisture content is to employ the bulk storage method. With this method, the paddy is rotated and aeration is possible.

4. DAILY AMOUNT OF PADDY DRIED

The factors determining the size of paddy dryer are the total amount of paddy and operating period of dryer.

4.1 The total acreage for double cropping in the Muda Irrigation Project area is 261,500 acres. Paddy yield per acre during the off-crop season is targeted at 532 gantangs. The whole production of paddy in this area is 39,000 tons.

4.2 The number of farmers who are to become members of Farmers' Associations is limited to 50% of the total farmer households.

4.3 Considering 50% of the total farmers household, the acreage considered here is nearly 131,000 acres. The total production of paddy to be considered for drying is nearly 170,000 tons.

4.4 The operating period of dryers depends on various factors and are discussed under later section "Rice Planting Scheme and Water Control". For the time being the operating period of paddy dryers is fixed from 30 to 45 days.

$$\begin{aligned}\text{For 30 days Amount of Paddy dried} &= \frac{170,000}{30} \\ &= 5,667 \text{ tons/day}\end{aligned}$$

$$\begin{aligned}\text{For 45 days Amount of Paddy dried} &= \frac{170,000}{45} \\ &= 3,778 \text{ tons/day.}\end{aligned}$$

5. NUMBER OF DRYING UNITS AND THEIR LOCATIONS

5.1 Generally it is more economical to set up a few large drying units than to set-up many small units.

5.2 By using few large dryers, the transportation cost from the fields to the drying units and from the drying units to rice mills will become higher.

5.3 From the section "Rice Planting Scheme and Water Control" it will be seen that it is necessary to carry the paddy to the drying unit everyday as planned.

5.4 The adequate number of drying units in this area is in the range from 15 to 30. Considering the total production equivalent to 170,000 tons of paddy, the capacity for each drying unit is in the range of about 5,000 tons to 10,000 tons.

5.5 The location of drying units should be determine by:

- (a) the distance from the field to the drying units
- (b) the distance from the drying unit to rice mills
- (c) the soil bearing capacity at the site.

5.6 The total and daily operating capacity for one unit is worked out as follows:

No. of Drying Unit	Operating Days	Total Operating amount per drying unit (ton)	Daily Operating amount per drying unit (tons)		
			Net	Over es- timated 20%	Over es- timated 10%
15	30	11,334	378	473	420
	45		253	314	282
30	30	5,667	189	238	201
	45		126	158	148

6. ARTIFICIAL DRYING METHODS IN RELATION TO THE STORAGE METHODS

Artificial drying methods may be roughly classified into the following two groups.

6.1 The "flat-bed drying method" is able to dry paddy with simple equipments. But it is unsuitable to dry paddy with high moisture content.

6.2 The "Paddy Circulating Drying Method" can be classified into several types namely;

- (a) One-pass dryer
- (b) Multi-pass dryer
- (c) Multi-pass dryer with tempering.

This method is suitable for drying paddy in huge quantity with high moisture content. It is safe and the paddy is equally dried. But it involves high construction cost. Among these types, multi-pass dryer with tempering is the best because of its safety to paddy qualities and operational cost.

6.3 There is a very close relationship between drying unit and storage unit. The relationship can be classified into three methods.

- (i) First is the method which dries paddy in parallel to storing the paddy, known as "Storage Drying" where storage bin dryer is used.
- (ii) Second method is to store the paddy after drying.
- (iii) Third method is store and dry paddy after reducing the moisture content of the paddy to 18%.

The first method is not suitable to dry paddy of high moisture content, especially at places where ambient relative humidity is high. This is because increasing the drying speed results in stress checks and cracking of paddy at the bottom side of bin. If the drying speed is low, attack by molds and fungi will occur on the upper portion of the bin.

6.4 To provide drying and storage facilities for paddy of high moisture content in this area, a compromised design between the second and third methods should be achieved. The superiority between these two methods depends on construction expenditure, operating cost and ease of operation under local conditions. The most suitable dryers and storage units should be determined by comparing the merits and demerits of the designs.

7. PADDY PLANTING SCHEME AND WATER CONTROL

If the paddy harvesting period is prolonged up to 45 days, the intake of paddy to the drying units per day will be lesser. In this case, the drying units of smaller capacity can be set up, hence resulting into lesser set-up cost.

To achieve this, paddy planting should be carried out as previously planned. And, to assist this, water irrigated into paddy field should be properly controlled to regulate the period of land preparation, transplanting and hence harvesting.

The fact of success or failure of this paddy planting scheme and water control is the keypoint to success of Muda Irrigation Scheme. Therefore the government should help the farmers to carry out their paddy planting as previously planned.

8. PROGRAMME OF SETTING UP PADDY DRYING UNIT

8.1 The recommendations made below on basic aim of paddy drying throughout the Muda Irrigation Scheme area should be closely followed.

The future programme should be as follows:

- (a) Drawing works for Blue Prints
- (b) Construction and supervision
- (c) Training for personnel operating the drying unit.

8.2 For drawing of blue prints, the two methods of drying paddy (i. e. (a) storage after drying (b) storage and drying

after drying to intermediate stage) should be compared and a compromised method for maximum performance of the drying unit should be adopted.

It is recommended that 4-5 individual experts should make field survey for some 2 months as an expert and require about 4 months to secure their successful accomplishment of the above specific tasks.

In view of the above, it would be imperative to form a team of experts from the fields of study such as the science of agriculture, economics, mechanical engineering and others. The said team of experts must be able to obtain all the necessary information from Malaysian Government at the time of field survey.

8.3 Malaysian Government should be capable of supervising the construction of the drying units and if possible experts can be sought from Japanese Government.

8.4 The training of personnels operating and maintaining the smooth running of the drying units should be fulfilled by the firms which are offered to set up the drying units. It is recommended that at least five persons per drying unit are required for operating the unit.

9. CONCLUSION

1. For double cropping to be successful in the Muda Irrigation Project, it is necessary to install the artificial drying units under fullest assistance of the Malaysian Government.
2. The artificial drying units should consist of the multi-pass dryers and silos or bins for the paddy storage.
3. The number of paddy drying units may range from 15 to 30.
4. For reducing paddy drying and storage cost, it is necessary to introduce the paddy planting scheme in relation to water control.
5. It is vitally essential to further investigate the problems of paddy drying.

