Farmer's Technical Knowledge And Adoption Behaviour On Rice Production Technology Package In Pyinmana Area

Nyein Nyein Htwe 1, and Khin Oo 2

Abstract

This study was conducted to examine the farmers' existing technical knowledge and adoption behavior on rice production technology package in Pyinmana area in the year 2000. The data were collected by individual interviews using a questionnaire from random sample of 127 farmers from Kyaukchet, Ayinlo, and Thanutpinsait agriculture extension camps.

The extent and conditions of adoption behaviour of farmers on rice production technology package were determined. The research findings reveal that high proportion of the farmers adopted the HYV and correct age of seedlings whereas the adoption of recommended fertilizer application, optium plant population and proper weedling were relatively low in monsoon rice cultivation. In summer rice cultivation, most of the farmers adopted the proper weeding and optimum seed rates (optimum plant population). Adoption of recommended fertilizer application practice was comparatively low in the study area. Application of farm yard manure during land preparation, pest control and optimum harvest time was adopted in both monsoon and summer rice. Most of the farmers could not practicse systematic water management although they had knowledge for proper time of irrigation and drainage.

The survey provided some indications of the problems faced by the farmers practicing the innovations in both monsoon and summer rice cultivation. The most important problems were unavailability of sufficient water on time, high cost and scarcity of inputs (both organic and inorgainc fertilizers) and labor and adverse weather condition at harvest.

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1. Demonstrator, Agronomy Department, Yezin Agricultural University, Pyinmana.
2.Lecturer, Agronomy Department of Plant Pathology, Yezin Agricultural University, Pyinmana

Introduction

Agricultural development and the subsequent development of the rural areas depend largely on the adoption of HYVs, improved technologies and farming practices operated by farmers. Social, cultural, personal factors and the like can facilitate, hinder and / or cause the adoption and diffusion of new technology. And these factors varied according to community, geographical area and country (Copp, *et al* 1958; Campbell,1966; Rogers and Shoemaker, 1971; Ramos,1977). To understand adoption behavior of farmers. effect and successful transfer of technology, it is necessary to study the existing farming systems and diffusion and adoption of new technology.

Background

High yielding varieties (HYVs) were first introduced into Myanmar in 1966. The first Whole Township Rice Production Program was initiated in 1977-78 and had been nationwide in 1985-86 (Khin Win, *et al*,1981;Tin Htut Oo, *et al*, 1989).

One of the major achievements in promoting higher rice production is the introduction of summer rice on a large scale. The program was started in 1992-93.

Rice production technology had been investigated in all possible aspects by researchers of diverse scientific fields in Myanmar.

The study was carried out with the following objectives and hypotheses.

The objectives of this study are;

- to study the adoption behaviour of farmers with respect to rice production tech-nology package.
- to identify the reasons for non-adoption of rice production technology package and
- to find out difficulties, if any, faced by farmers.

Study Area and Research Methodology

Study area

Selection of the study area

The study area was chosen for the following reasons;

1. Pyinmana township is one of the high technology rice production townships,
2. Most of the rural people in this area is dependent on rice production,
3. This is a double rice cropping area and irrigation water is more available in this area,
4. Yezin Agricultural University and Central Agriculture Research Institute are closely located in this area.

Research methodology

This study was based on primary source of data which was collected from rice producing farmers with the structured interview questionnaire. Secondary data were taken from published and official records of Myanmar Agriculture Service.

Radom sampling procedure was used in organizing the data. Pre-test was administered in Novenber, 1999. Ten percent of the total respondents from Kyaukchet extension camp, Pyinmana Township were also included in the sample of 127 respondents.

After the data were collected, editing was done to continue data processing. The response categories were indentified and then coded for response types. The data were analyzed by using the MICROSTAT program.

Results and Discussion

The extent and conditions of adoption of rice production technology

Use of high yielding varieties

In this study, HYV was commonly used by 93.3 percent of the farmers (Table 3.1). It is obvious that adoption of HYV was greatly increased within 10 years.

The reasons of growing HYV were due to high potential yield (57.5 percent), good eating quality (42.5 percent), high price (39.2 percent) and short life duration which ensured enough time for second crops (29.2 percent) (Table 3.2). Most of the respondents obtained seeds initially from Central Agriculture Research Institute (CARI) (37.5 percent) and their friends (37.5 percent). They produced seeds every year from their own farms (69 percent) (Table 3.3).

In 1992, farmers used long and medium duration vareties whereas they grew short duration varieties to save enough time for summer rice in 1999. The farmers sow more than one variety in monsoon for home consumption (8.3 percent) and seeds for summer rice production (9.2 percent) for sale

The farmers assumed that newly harvested rice seeds of short duration varieties have better germination than older ones (seeds from last year). Because of this reason, they grew short duration varieties in monsoon for summer rice production.

It is evident that closeness to research institutions promoted the innovativeness of the farmers, so that use of new rice varieties and technologies were widely adopted among farmers.

High plant population per unit area

In this study, only 45.8 percent of the farmers adopted the optimum plant population in monsoon (Table 3.1) with 2-6 plants/hill (Table 3.4). Ninety percent of the summer rice farmers used recommended seed rates of 2-4 bskt/ac in direct seeding. It can be considered that most of the summer rice growers understood the importance of optium plant population in summer.

Seventy percent of the farmers refilled the missing hills within 30 days after transplanting which is too late for gap filling and it should be one week.

Application of recommended rates of chemical fertilizers

Majority of farmers (75 percent in monsoon and 82 percent in summer rice cultivation) partially applied (Table 3.1) recommended rates of fertilizer. Regardless of proper amount of fertilizer applied, all farmers applied Urea, and 42.5 percent and 41.7 percent of farmers used TSP and MOP in monsoon, respectively. In summer rice cultivation 26 percent of farmers applied TSP and MOP. The average fertilizer rates were 66.7, 19.2 and 13.3 kg/ha of Urea, TSP and MOP in monsoon and 69.8, 6.6 and 5.2 kg/ha in summer, respectively.

Times of Urea application were recovery time (64.1 percent), tillering stage (77.5 percent) and booting stage (52.5 percent) at the rates of 60 kg/ha in monsoon rice (Table 3.5). The farmers commonly used the split applications of 2-3 times, such as times of recovery + tillering + booting (15 percent), recovery + tillering + panicle initiation (16.7 percent), recovery + tillering (10 percent), tillering + booting (15 percent) by the majority of the farmers. In summer, most of farmers applied urea at 20 days after seeding (81 percent), and the remaining portion of fertilizer were applied at tillering (76.7 percent) and panicle initiation (46.4 percent).

Because of high cost of fertilizer and unusual practices, farmers did not use TSP and Muriate of potash in both season. Only 41.7 percent and 29.2 percent of farmer applied TSP and K2O respectively. It is evident that unavailability and high cost of fertilizer led to limited use and amount of application may decline below optium level.

Consequently, farmers used locally available commercial fertilizers with the main reason that fertilizer is to be applied under prolonged stagnant water condition (61.6 percent) (Table 3.6).

Use of 25-30 day old seedlings

The results indicated that 84.1 percent of farmers used correct seedling age (Table 3.1) to get better tillering capacity (80 percent) and rapid recovery (7.5 percent). Sixteen percent of the respondents did not use recommend seedling age of 20-30 days. Thirty six percent of the respondents stated that their transplanted fields recovered within one week but 47.5 percent of farmers had two weeks of recovery time. Immediate transplanting after uprooting and rapid recovery of the paddy fields indicated the successful transfer of this technology. Reasoning that older seedlings facilitate uprooting and transplanting and are also resistant to heavy rains. The farmers transplanted seedings after 1, 2 or three days after uprooting, corresponding to 40.8 percent, 43.3 percent and 14.2 percent of farmers respectively.

Proper weeding

With regard to timely weeding 41.7 percent and 63 percent of the monsoon and summer rice cultivatiors carried out one intercultivation followed by one hand weeding (Table 3.8). The rest of farmers practiced only one hand weeding or intercultivation due to the scarcity and high cost of labor. It was found that most of the farmers understood the importance of weed control.

It can be concluded that farmers did not follow the recommendations of MAS for proper weed control, however, almost all of the farmers partially conducted weeding with critical period depending on time and labor availability. Moreover, it can be assumed that use of intercultivator was increased because of time and labor saving and the intercultivation was widely adopted in direct seeded rice fields of summer rather than in monsoon.

Thorough land preparation

About 50 percent of the farmers prepared the land using both animals and machine power and the rest used only cattle. It is evident that farm

mechanization related to the introduction of new rice production technologies was convincingly accepted by farmers.

Post-harvest ploughing was generally operated immediately after the first crop was harvested. Two times of ploughing, 3-5 times of harrowing and levelling were sequences of land preparation upon the availability of water and labor to get puddled soil.

Use of farm yard manure

In this study, 90 percent of the respondents applied farm yard manure in both seasons. They applied cow dung (61.6 percent), compost (15 percent) and residues of food legumes (13.3 percent) as organic manure.

Water management

The farmers in the study area depended on rain (19 percent), both rain and irrigation water (80.8 percent) in monsoon and only irrigation water in summer rice production. But the farmers reported that availability of water was moderately difficult in monsoon (59 percent) and summer (75.6 percent). Number farmers who practiced the intermittent irrigation was 18.3 percent. Eleven percent of farmers stated that rice plant needs water all the time and they did not drain out and always stored the water in their fields. Nearly fifteen percent of the respondents understood and practised systematic water management and 55 percent moderately understood this practice (Table 3.10). However, farmers could not practise systematic water management due to unavailability or excess water in their fields and they faced the drought and excess water problems in this study area. Farmers' own solutions were growing short duration and drought resistant varieties for drought problems and using tall varieties and older seedlings for excess water problem. It can be assumed that due to excess water problem. adoption of high yielding varieties may not be

feasible to slove the problem and local, tall varieties would be continuously planted for future rice production in the study area.

Prevention of pests and diseases

Sixty five percent of the farmers' fields were occasionally infested with stem borer (48.3 percent and 13percent) and leaf folder (30 percent and 2.2 percent) as major pests in monsoon and summer respectively. Fifty five and a half percent of the farmers reported that these infestations were serious and reduced the crop yield. They normally sprayed insecticides (86.6 percent) just after infestation (Table 3.11). The farmers used many kinds of locally available commercial insecticides but they could not mention the correct dosage. The farmers mostly use Diazenon, Myanmarzenon, Pinlonepyant, Malarthiron and Sevin for pest control.

It can be concluded that the farmers in the study area were aware of the pests infestation which caused reduction in the crop yield. They controlled it by using locally available pesticides and however, they did not have knowledge of correct application of these chemicals.

In view of disease infestation, sixty one percent of the respondents did not have knowledge about disease infestation and they could not identify pest or disease infestation (Table 3.12). It can also be concluded that the farmers in the study area may have poor knowledge of disease infestation and control measure.

Minium yield loss at harvest

The survey data indicated that harvesting was usually operated manually (100 percent) and threshing was done by power threshers (92.5 percent). All farmers have been heard of the correct harvest time, so called maung-nyo (80 percent ripening of panicles) known from their ancestors an cestors. So all farmers usually harvested at Maungnyo stage. But due to scarcity of labour and untimely rains, they posponed till over-ripening stage. Threshing was done immediately

after the harvest of monsoon (35.8 percent) and summer rice (64.8 percent) (Table 3.13). It is evident that the farmers were not really aware the importance of timely threshing.

Problems encountered in rice production in Pyinmana area

Table (3.14) showed the problems faced by the farmers for adoption of recommended farming practices in rice production. In Pyinmana area, the major problems in rice cultivation were management of hired transplanters (44 percent), unavailability of irrigation water in time (43.3 percent) and difficultly in obtaining farm yard manure (41 percent). High cost of Urea (35 percent), TSP (26.7 percent) and MOP (29.2 percent) led to partial adoption of recommended rates of fertilizer. The major constraints in adoption of recommended weeding were scarcity of labor at peak season (17.5 percent) and high labor cost (16.7 percent).

Under such conditions it is necessary to solve fertilizer shortage problems by the use of low input technology such as use of compost and green manure. The alternative ways for recommended weed control may be thorough land preparation and application of weedicides systematically.

Summary of Findings, Implication and Conclusion

Because of high yield potential, HYVs were easily accepted by farmers to adopt. Introduction of summer rice cultivation demanded the adoption of short duration, high yielding varieties high yielding varieties which saved enough time for the following crops. Adoption of correct age of seedlings also dramatically increased due to its effects on promotion of more vegetative growth of short duration high yielding varieties.

Less adoption of recommended plant population was considered to be lack of understanding of importance of optimum plant popualtion by hired transplanters. They may be daily wage-earner or piece-work labors. If they

transplanted seedlings with wider spacing to finish quickly, it may cause the inadequate plant population resulting in low yields. It can be suggested that piece-work labour system should be negotiated between farmers and hired labours to transplant desired spacing.

The resource endowment is one of the major factors in adoption of innovations. Although most of the farmers were already convinced the benefits of sufficient and timely application of fertilizers and proper weeding, high cost and scarcity of inputs and labor led to partial adoption of these technologies. Under these circumstances, greater attention should be given to low input technology; applying compost and farm yard manure to substitute high cost fertilizers. To solve the labor problem in weed control, thorough land preparation, integrated weed control and use of cheaper weedicides are alternative measures. Utilization of small farm machineries, especially threshers and power tillers was helpful to the adoption of rice production technology and it was apparently accepted due to their relative advantages and observability.

The active control at the outbreak of pests or diseases rather than preventive measure was the real concept of farmers. It indicated that the preventive measures prior to outbreaks, are still needed in the study area to prevent from yield losses. The complexity of the pests and diseases preventive measures may postpone the rapid adoption of this technology. The peasants should be further educated, so that advantages of modern pests and diseases preventive techniques would be better understood and accepted on a broader perspective.

Although most of the farmers threshed rice immediately after havest in summer rice cultivation to escape from unexpected rainfall, they did not do so in monsoon rice. It is obvious that the farmers do not really emphasize on minimizing post-harvest loss.

High proportion of the farmers had knowledge of the systematic water management but unavailability of water in time might cause poor water

management. Water logged problem in low land areas forced the farmers to decline the adoption of high yielding varieties and the tall locall varieties will continuously be grown in future rice roduction.

In conclusion, majority of the farmers used high yielding varieties and correct seedling age in their farms and few of them adopted proper weeding practices. Under such conditions, it is necessary to encourage majority of farmers to adopt rice production technology package under full scale and efforts are to be made for strengthening. By doing so, greater attention should be given to improve extension methods and program for methods of technology transfer. At the same time, assistance of administrators and policy makers are also required to provide the farmer's needs and to find out the solutions which are difficult for the field level extension agents. In this case, problem census technique may help to identify the farmer's needs and problems.

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Table 3.1 Percentage of adoption of rice production technology in Pyinmana area

Recommended farm practices	Monsoon rice[a]		Summer rice[b]	
	Adopter	Non Adopter	Adopter	Non Adopter
- use of HYV	112 (93.3)	8 (6.7)	-	-
- optimum plant population per unit land area	55 (45.8)	65 (54.1)	84 (91.3)	8 (8.7)
- use of recommended fertilizer application	30 (25)	90 (75)	16 (17.4)	76 (82.6)
- use of correct aged seedlings	101 (84.1)	19 (15.8)	-	-
- recommended proper weeding	50 (41.7)	70 (58.3)	59 (64.1)	33 (35.9)

[a] n = 112

[b] n = 92

Figures in the parentheses are percentages.

Table 3.2 Reasons for growing high yielding rice varieties

Items	Farmers[a]	
	Frequency	**Percent**
- high yield	69	57.6
- good eating quality	51	42.5
- high price	47	39.1
- short duration	35	29.2
- resistant to pests and diseases	6	5.0
- resistant to adverse weather conditions	4	3.3
- others	6	5.0

[a] n = 110

Table 3.3 Sources of high yielding rice variety seeds

Source	Farmers[a]	
	Initially	**Every year**
- exchanging seeds with friends	45 (37.5)	24 (20)
- purchasing from dealers	12 (10)	2 (1.7)
- purchasing from MAS	16 (13.3)	9 (7.5)
- purchasing from CARI	45 (37.5)	23 (19)
- producing at own farm	-	83 (69)

[a] n = 110

Figures in the parentheses are percentages.

Table 3.4 Cultivation practices of monsoon and summer rice

Items	Farmers	
	Monsoon [a]	Summber [b]
1. Methods of crop establishment		
- transplanting	113 (94.1)	-
- direct seeding	23 (19.2)	90 (97.2)
- broadcasting	8 (6.7)	2 (2.2)
2. Seeding rates (Basket per acre)		
- 1.5	4 (3.3)	2 (2.2)
- 2	25 (20.8)	9 (9.7)
- 2.5	23 (19.2)	26 (28)
- 3	60 (50)	34 (36.7)
- 3.5	-	6 (6.2)
- 4	-	9 (9.7)
- 5	-	2 (2.2)
3. Number of seedlings per hill		
- 2-3	44 (38.9)	-
- 5-6	53 (46.9)	-
- 8-10	11 (9.7)	
- >10	3 (2.7)	-
4. Days to refilling the missing hills		
- within 10 days	28 (23.3)	-
- 11-20 days	34 (28.3)	-
- 21-30 days	31 (25.8)	-
- nil	27 (22.5)	-

[a] n = 112; [b] n = 92; Figures in the parentheses are percentages.

Table 3.5 Time of application of Urea in monsoon and summer rice cultivation

Application rates	No. of Farmer									
	Monsoon [a]					Summer [b]				
	Land prepara -tion	reco- very	tiller- ing	EPI	boot- ing	Land prepara -tion	20 DAS	tiller- ing	EPI	boot- ing
<30 kg/ha	6	10	11	4	11	2	7	4	3	3
	(27.2)	(13)	(11.8)	(8)	(17.5)	(20)	(20)	(5.6)	(6.9)	(8.1)
40 kg/ha	7	12	19	12	7	4	9	11	6	3
	(31.8)	(15.6)	(20.4)	(24)	(11.1)	(40)	(12)	(15.5)	(13.9)	(8.1)
60 kg/ha	8	41	40	25	35	4	41	46	29	23
	(36.4)	(53.2)	(51.6)	(50)	(55.5)	(40)	(54.7)	(64.8)	(67.4)	(62.2)
120 kg/ha	1	14	15	9	10	-	18	10	5	8
	(9)	(18)	(16.1)	(18)	(15.9)	-	(24)	(14)	(11.6)	(21.6)
Total	22	77	93	50	63	10	75	71	43	37
	(18.3)	(64.1)	(77.5)	(41.7)	(52.5)	(10.8)	(81)	(76.7)	(46.4)	(40)

[a] n = 120; [b] n = 92; Figures in the parentheses are percentages.

Table 3.6 Reasons of using other commercial fertilizers

Items	Farmers [a]	
	Frequency	Percent
- to get better plant growth	18	15.0
- to substitute unavailable of Urea, T.super and Potash	5	4.2
- to make low cost of production	3	2.5
- to apply for prolonged stagnant water condition	74	61.6
- to resist infestation of pests and diseases	3	2.5
- others	2	1.7

[a] n = 120

Table 3.7 Cultural practices of monsoon rice production

Items	Farmers [a]	
	Frequency	Percent
1. Age of seedlings		
< 2-5 days	10	8.3
26-30 days	85	70.8
> 31 days	12	10.0
2. Days after uprooting		
1	49	40.8
2	52	43.3
3	17	14.2
3. Days to recovery		
< 7	43	35.8
8 – 14	57	47.5
15-21	10	8.3
22	4	8.3

[a] n = 120

Table 3.8 Methods of weeding in monsoon and summer rice production

Items	Monsoon		Summer	
	Frequency	Percent	Frequency	Percent
- hand weeding only	60	50.0	13	14.00
- intercultivation only	1	0.8	6	6.50
- hand weeding and intercultivation	50	41.7	58	62.60
- weedicide spraying	-	-	6	6.50
- nil	6	5.0	3	3.24
- missing value	3	2.5	6	6.50
Total	**120**	**100**	**92**	**100**

Table 3.9 Time of weeding under farmer's condition

Days after transplanting/ seeding	Monsoon		Summer	
	hand weeding	intercultivation	hand weeding	intercultivation
<20 days	-	5 (9.8)	39 (54.9)	51 (79.7)
21-30 days	16 (14.5)	32 (62.7)	22 (30.9)	11 (17.2)
31-41 days	52 (47.3)	14 (27.5)	-	-
> 40 days	42 (38.2)	-	10 (14.1)	2 (3.1)
Total	**110**	**51**	**71**	**64**

Figures in the parentheses are percentages.

Table 3.10 Farmer's technical knowledge on systematic water management

Items	Farmers	
	Frequency	Percent
- intermittent irrigation	22	18.3
- systematic irrigation	17	14.2
- partially systematic irrigation	66	55.0
- need water all the time	13	11.0
- missing value	2	1.7
Total	**120**	**100**

Table 3.11 Seriousness of pest infestation and pest control

Items	Farmers [a]	
	Frequency	Percent
1. Yield loss		
- no obvious decrease in yield	36	37.1
- decrease in yield	54	55.7
- no response	7	7.2
2. Pest control		
- spray pesticides	84	86.6
- nil	13	13.4

[a] n = 97

Table 3.12 Seriousness of disease infestation in Pyinmana area

Items	Farmers	
	Frequency	Percent
- no infestation	18	15.0
- no knowledge of diseases	74	61.6
- occasional infestation	28	23.3
Total	**120**	**100**

Table 3.13 Threshing of harvested rice plant in monsoon and summer rice

Days after harvest	Monsoon		Summer	
	Frequency	Percent	Frequency	Percent
immediately after harvest	43	35.8	60	64.8
10 days after harvest	56	46.6	20	21.6
11-15 days after harvest	8	6.7	1	1.08
> 15 days after harvest	12	10.0	-	-
missing value	11	9.2	11	11.88
Total	**120**	**100**	**92**	**100**

Table 3.14 Problems encountered in rice production in Pyinmana in 1999-2000

Constraints	Farmers [a]	
	Frequency	Percent
- difficulty in management of hired transplanters	53	44.0
- unavailability of irrigation water in time	52	43.3
- difficulty in obtaining farm yard manure	49	41.0
- high cost of Urea	42	35.0
- unavailability of water during land preparation	36	30.0
- high cost of Potash	35	29.2
- high cost of T.super	32	26.7
- scarcity of labor at peak season for weeding	21	17.5
- high cost for weeding	20	16.7

[a] n = 120