Research article

Improving Upland Rice Production for Sustainability of Rice Self-Sufficiency in Ratanakiri Province, Cambodia

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Abstract Rice is the major source of carbohydrate, nutrient and income of poor farmers especially in rural areas in Cambodia, and Ratanakiri Province is one among them. Rice self-sufficiency was threatening while the population dramatically increasing and the rice production trend showed the declining. Given primary result showed that a few families were victims of rice self-insufficiency, notably, who possessed small farm, and large members' family. But none of those families experienced hunger as they superior to buy food aid from the market while the other mechanisms were also held. The linear multiple regression models showed that rice sufficiency of upland rice producer families were strongly depend on rice yield obtained. Traditional practices carried by many farmers resulting poor rice productivity. Thus, to meet and sustain rice self-sufficiency several management practices are needed to improve including increasing seeding rate, wisely select variety and planting method, fertilization while capacity building are more apparent for the rapidly adopt technological and economic environment and increasing income.

Keywords rice self-sufficiency, upland rice, upland community, Ratanakiri, Cambodia

INTRODUCTION

Rice is the staple food, source of carbohydrate and nutrient for Cambodian, especially for rural and poor resource farmers (FAO, 2009; Ros et al., 2011; MAFF, 2012, Work Bank, 2013). By 2012, Cambodia has covered 2.97 million ha for rice production with an average yield of 3.1 t ha^{-1} (MAFF, 2012). Cambodia, upland rice plays a key role in maintaining food security for rural areas, and account for around 20% of total rice production annually (MAFF, 2012). However, upland rice farming still follows traditional practices such as slash and burn for ethnic people while some have already adopted advanced technologies including land preparation, fertilization and pest control. Hence, the country's average upland rice production is only 1.2 t ha^{-1} (MAFF, 2012). Ratanakiri Province, well-known for highland rice producing in Cambodia, has about 30,000 ha potential for upland rice production. In 2012, MAFF reported the decreasing trend of upland rice yield during the last decade and suggested to improve rice production nationwide, not only on lowland but as well as upland rice. There is a reported reduction in wet season rice productivity of rainfed upland rice in Ratanakiri Province, despite the constant of upland rice production while the population is dramatic increasing from about 70,000 ha in 2000 to 191,000 ha in 2012 (NCDD, 2010; RPDA, 2012). Notably, population increasing and low rice

yield would push toward food crisis in the province, particularly rice sufficiency. Thus, the study was aimed to determine the rice consumption status of upland rice farmers in Lum Choar commune, Ou Ya Dav District, Ratanakiri Province, Cambodia, and identified the improvement options.

METHODOLOGY

The study was conducted in the dominantly upland rice production areas of Lum Choar commune, Ou Ya Dav district, Ratanakiri province where the most number of upland rice producers was reported (RPDA, 2012). Farmer respondents of the study were taken from the total families of rice producers in Lum Choar commune. The sampling of respondents was determined based on the Slovin's formula with ten percent (10%) margin of error. A total of 90 respondents out of 265 upland rice families were randomly selected. Direct interview (questionnaire survey) was administered describe the characteristics of farmer, upland rice production and household rice status. A combination of qualitative and quantitative, and Multiple Regression analysis using SPSS version 19.0 (SPSS Inc.) was employed.

RESULTS AND DISCUSSION

Level of Household Requirement

Table 1 show that the respondent have an average of 4 members and all of the respondent families are subsistence rice planting rather than commercial.Weekly plant height (cm) of the plants was taken in all treatments as shown in Table 1. It was found out that there was a difference of height in all treatments compared with the Control. However, based on the analysis of variance, it was found that the difference was insignificant in all treatments over the control plots.

For instant, based on self-sufficiency equation, we had estimation for the household rice requirement as in follow. The household survey showed that the requirement for food grains is fixed at 450 grams per person per day for rural areas. This translates into an annual requirement of:

$$\text{Household requirement} = 450 \text{ g/capita/day} \times 4 \text{ people} \times 365 \text{ days} = 657 \text{ kg} \quad (1)$$

Thus, to meet the rice self-sufficiency, each household has to produce at least 1,000 kg of paddy rice where the conversion ratio from paddy to polished rice was found about 64% (De Datta, 1981), and plus at least 30-40 kg of seed reserve for next planting (Table 1). Hence, rice self-sufficiency would be not the problem in the study area where the average yield of 1.46 ton per ha (0.93 ton polished) was recorded (Table 1).

However, Table 2 showed that about 8 percent of the respondent families were fell into rice insufficiency. Among those who faced rice insufficiency, majority was rice insufficiency for more than 50 days (85%). Difference in farmland size devoted for planting upland rice, yield and household member triggered this phenomenon (Table 1). About 10 percent of the respondent families own less than 1 ha devoted for rice production and about 8.9 percent got yield less than 1 ton per hectare. While production area is small and the rice yield is low, these families would fall into rice self-insufficiency.

In addition, none of the rice insufficiency families experienced hunger since they have coping mechanisms to feed rice to their family and children. All of seven respondents who suffered rice insufficiency resource to purchasing rice (100%), 85.7% asked from neighbours or their relatives, 28.6% said they sometimes milled some portion of their next cultivation seed in case of emergency. The result implied that most of farmers could afford to purchase supplementary food from market, even though majority of them obtained low income (Table 2).

Table 1 Household member, education attainment, rice production area, yield, seeing rate, planting purpose and family income of upland rice producer families

Descriptions	Frequency	Percent	Mean+S.E
Household Member (person)			
• =< 3	50	55.60	
• 4	21	23.30	4 ± 1
• >= 5	19	21.10	
Educational Attainment			
• No formal schooling	50	55.60	
• Primary school	31	34.40	
• Secondary school	9	10.00	
Upland Rice farm areas (ha)			
• <1	9	10.00	
• 1-2.0	76	82.20	1.20 ± 0.50
• 2.1-3.0	5	7.80	
Yield (ton ha^{-1})			
• >1.00	8	8.90	
• 1.00-1.50	49	54.50	1.46 ± 0.37
• 1.51-2.00	30	33.30	
• >2	3	3.30	
Seeding rate (kg ha^{-1})			
• 20-30	66	73.40	
• 31-40	20	22.20	30.10 ± 8. 90
• >40	4	4.40	
Purpose of planting rice*			
• Consumption	90	100.00	
• Income	51	56.70	
Family Income (US$/year)			
- <500	78	86.70	
- 500-800	3	3.30	
- 800-1,000	7	7.80	750 ± 420
- >1,000	2	2.20	

Table 2 Household rice sufficiency in Lum Choar Commune, Ou Ya Dav District, Ratanakiri Province, Cambodia

Descriptions	Frequency	Percent	Mean+S.E
Rice Status			
• Surplus	27	30.0	
• Sufficiency	56	62.2	
• Lacking	7	7.8	
Duration of Rice shortage			
• 50 days	1	14.3	43 ± 9
• > 50	6	85.7	
Coping mechanisms to rice shortage*			
• Purchase from market	7	100.0	
• Ask from neighbor/relative	6	85.7	
• Milled the seed for next cultivation	2	28.6	

** multiple responses*