

ECONOMIC EFFICIENCY OF RICE PRODUCTION IN WET SEASON: A CASE STUDY IN CO DO DISTRICT, CAN THO CITY

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ABSTRACT

A survey of 420 farmers and focus group discussions of seven groups of farmers in 7 communes in Co Do district, Can Tho city revealed that the profit of the Summer-Autumn rice season in 2012 contributed considerably to household income. However several factors affected rice production in this season, especially high input costs and low rice price at sale. In addition, using large amounts of pesticide and urea caused a decreasing in rice yield. The analysis also showed that the rice yield was influenced by education, age and the number of dependents in the household.

Keywords: *economic efficiency, rice production*

INTRODUCTION

The Mekong Delta of Vietnam is the largest rice bowl of the nation. It contributes more than 53% of national rice production and 90% of the total national rice export yearly. The master plan of Can Tho city indicates that its agricultural land is going to be reduced from 108,494 ha in 2010 to 99,527 ha in 2020 (Thu Ha, 2009), thus it is necessary to increase rice yield and rice production efficiency. However, the adoption of new rice technologies and understanding of market trends by farmers have been limited despite the fact that government has been working to increase farmers' skill and knowledge in rice production. Farmers still apply their old cultural practices with high cost of inputs leading to low net return. Measures to reduce input cost to increase the capacity in market competition are necessary. In the Mekong Delta, dry season rice produces higher yield than wet season rice. Co Do district is a major rice production area of Can Tho city, and its agricultural land occupies 77.3% of the natural land of the district. While farmers contribute greatly to national food security and export turn-over, farmers' rice income is still not enough to improve their standard of living. Rice income in wet season (HT) is often lower than dry season (DX). The survey in 2007 shows that the gross income in dry season (DX)

was 19.3 million VND/ha, and in wet season (HT) 12.4 million VND/ha. The net return received by farmers in dry season (DX) was 12 million VND/ha, and in wet season (HT) 5.59 million VND/ha. If imputed family labor was included in the calculation, the actual net return from rice would be much lower because imputed family labor varied from 1.2 to 1.5 million VND/ha depending on the crop season (Truong Thi Ngoc Chi, 2008). According to the World Bank (2010), the net return of wet rice season is low due to unfavorable conditions such as long lasting rains, submergence/flood and high insect and disease pressure. The cost to produce 1 kg paddy in An Giang in 2009-2010 was 2,870 VND in dry season (DX) and 3,960 VND in wet season (HT). The net return of 1 kg paddy was 1,530 VND and -0.03 VND in wet season (HT). Factors that positively affected rice production included the household major occupation being rice farming, being a better-off household, having more family labor, growing more than 1 rice crop/year and the farm being in an irrigation ecosystem (Truong Thi Ngoc Chi, 2008). Therefore, this paper aims to analyze the economic efficiency and factors affecting wet rice production to propose suitable measures in increase farmers' rice production efficiency to improve their living.

METHODS OF DATA COLLECTION AND ANALYSIS

Data were collected by individually and directly interviewing rice farmers in 7 communes of Trung Thanh, Trung An, Trung Hung, Thoi Dong, Thoi Xuan, Dong Thang and Dong Hiep (Co Do district, Can Tho city) using a structured pretested questionnaire. The information collected from survey included household characteristics, input and output of rice production for the wet season 2012. Seven focus group discussions were conducted in the above seven communes to learn farmers' advantages and problems in rice production. In each commune, 60 rice farmers were selected randomly for survey, for a total of 420. However, data from only 383 farmers were analyzed because the rest of the farmers did not remember well the inputs in rice production.

Descriptive statistics were used to summarize the data in the forms of frequency, percentage and mean. The qualitative information from the focus group discussions were integrated. Multivariable regression analysis was applied to determine the factors affecting economic efficiency in the wet rice season.

Maximum likelihood estimates – MLE was used to determine factors affecting rice yield by using the software developed by Coelli (1994).

Model is: $\ln Y_i = \beta + \beta_i \ln X_i + e_i \quad i=1, \dots, N,$

Of which, Y: Rice yield (t/ha), is dependent variable. X is the vector of independent variables as X_1 : Rice area (ha/household); X_2 : Seed rate (kg/ha); X_3 : N (kg/ha); X_4 : P (kg/ha); X_5 : K (kg/ha); X_6 : Labor (person days/ha); X_7 : Pesticide cost (1.000 VND/ha); X_8 : Power cost (1.000 VND/ha).

This analysis also estimates the technical inefficiency. The technical inefficiency is $1 - TE$ (Technical inefficiency) = $f(Z_i)$. Of which: Z_1 : Age of husband; Z_2 : Education of husband (years in schooling); Z_3 : Age of wife; Z_4 : Education of wife (years in schooling); Z_5 : Number of dependents (below 16 years old and above 60 years old).

To calculate NPK in household survey data, use the standard conversion factor to convert fertilizer quantity to nutrient equivalent. Exclude the weight of oxygen from the oxides. For example, Urea has 46% N. Hence, 100 kg of urea contains $(100 \times 46\%) = 46$ kg of N. This calculation is simple since Urea contains only the Nitrogen nutrient without oxides. Other types fertilizers contain all 3 elements with P and K in their oxide form. Consider a fertilizer which contains 10% N, 26% P_2O_5 (Phosphate) and 26% K_2O (Potassium Oxide). 100 kg of this compound fertilizer contains 10 kg of N. It also contains 26 kg of P_2O_5 but only $(26 \times 44\%) = 11.44$ kg of P. It has 26 kg of K_2O but only $(26 \times 83\%) = 21.58$ kg of K. The compound P_2O_5 contains 44% P and the compound K_2O contains 83% K. Follow a similar procedure for other fertilizers.

RESULTS AND DISCUSSION

Rice production status in wet season 2012

The average rice area was 1.72 ha/household with total rice production 9,137 kg/household. Nearly half of the farmers (47%) used certified seeds, 5% of them used foundation seeds, the rest mostly used uncertified seeds from previous season or from co-farmers. Only one-third of the farmers (33%) got seeds from seed producers such as seed centers, research institutes and university. On average, farmers applied herbicide 1 time per crop season, with a similar number of applications of molluscicide. Farmers sprayed insecticide and fungicide 3 times each. Majority of the farmers (98%) did not use rodenticide due to low rodent density in the wet rice season in the studied area. Farmers broadcast granular fertilizer 4 times/crop season and sprayed foliar fertilizer only 1 time on average. Most of the farmers sell fresh (undried) rice right after harvest. Family labor was mainly used for crop care (field gap filling, hand weeding, fertilizer and pesticide application). Hired labor was used for land preparation, harvesting and irrigation.

The majority of the farmers (76%) sold rice right after harvest to pay laborers and for pesticide and fertilizer which were bought on credit. Therefore, only 19% of rice production

was stored by farmers to sell later. The price of dry rice in wet season 2012 was 5,954 VND/kg. Based on focus group discussions with farmers and staffs of Co Do Agricultural company, the differences between fresh and dried rice price was 20%.

Economic efficiency of wet rice production

The average cost of wet rice production was 16,670,000 VND/ha. Fertilizer was the greatest expense (33%), followed by labor (25%), pesticide 17%, power 15% and seed expenses

10% (Table 1). The cost to produce 1 kg paddy was 3,145 VND.

The net return depends on rice yield, gross income and input cost. The mean yield was 5.3 ton/ha dried rice. The average gross income was 31,260,000 VND/ha. The total cost was 16,670,000 VND/ha. The average net income was therefore 14,590,000 VND/ha. The benefit cost ratio (BCR) = 1.88. This indicates that return from wet rice production was too low to improve farmers' life. Therefore, suitable strategies to increase economic efficiency of wet rice production are necessary.

Table 1. Cost and return from wet rice season 2012

Item	Mean	Percentage of input (%)
Power cost (1,000 VND/ha)	2,622	15
Material input cost (1,000 VND/ha)		
Seed	1,598	10
Pesticide	2,805	17
Fertilizer	5,457	33
Labor cost (1,000 VND/ha)	4,188	25
Total cost (1,000 VND/ha)	16,670	100
Cost of 1 kg paddy (VND/kg)	3,145	
Dried rice yield (t/ha)	5.3	
Gross income (1,000 VND /ha)	31,260	
Net income (1,000 VND /ha)	14,590	
BCR (benefit cost ratio)	1.88	

Regarding the factors that affect wet rice production, rice yield was affected by the amount of N, P and K applied, and by pesticide and power use. The farmers who used more N obtained lower rice yield. The farmers who used more P obtained higher rice yield. An increase of 1% of nitrogen fertilizer use corresponds to a reduction in the rice yield of 0.05%. An increase of 1% in phosphorus fertilizer use corresponds to an increase in the rice yield of 0.12%. Thus, farmers in the studied sites need to reduce nitrogen and increase phosphorus fertilizer applications. Increased pesticide use at a suitable level within the recommended dose can increase rice yield. Increased mechanization in land preparation and harvesting also increased rice production (Table 2). This analysis shows that it is necessary to have suitable measures to increase technical efficiency in wet rice season.

The technical inefficiency (1- TE) was affected by age and education of husband and wife, and number of dependents. In households with an older and more educated husband, the technical inefficiency in rice production was lower because he had more experience in farming and easily acquired technical information. In households with an older wife, the technical inefficiency was higher because an older woman was weak, and does not contribute much in farming. For households a more educated wife, the technical inefficiency in rice production was lower. For households with a higher number of dependents, technical inefficiency was higher because they do not contribute to farming and they need to be taken care of, thus reducing time available for main farming work (Table 3).

Table 2. Estimate factors affecting rice yield in wet rice season

Variable	Coefficient	Standard error	T-ratio
Constant	0.581*	0.224	2.590
Rice area/household (ha)	-0.006	0.009	-0.701
Seed rate (kg/ha)	0.006	0.013	0.505
Nitrogen fertilizer (N kg/ha)	-0.049*	0.016	-3.000
Phosphorus fertilizer (P kg/ha)	0.115*	0.020	5.834
Potassium fertilizer (K kg/ha)	-0.004	0.017	-0.226
Labor (person days/ /ha)	-0.011	0.016	-0.661
Pesticide cost (1,000 VND/ha)	0.101*	0.022	4.565
Power cost (1,000 VND/ha)	0.093*	0.013	7.038
σ^2	1.560*	0.385	4.056

Note : * significant at 5%

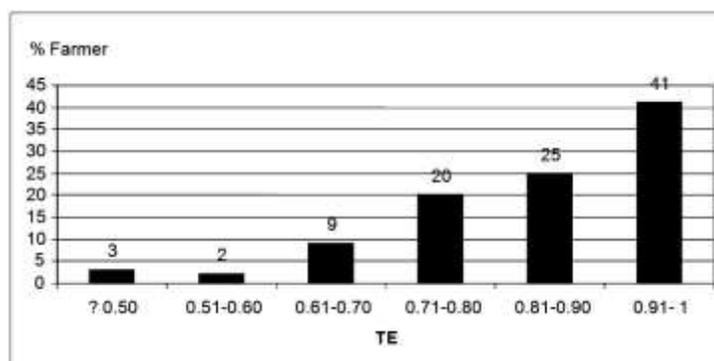
Table 3. Estimate factors affecting technical inefficiency in wet rice season

Variable	Coefficient	Standard error	T-ratio
Constant	-1.061*	0.412	-2.577
Age of husband	-0.013*	0.005	-2.568
Education of husband	-0.204*	0.047	-4.318
Age of wife	0.064*	0.015	4.163
Education of wife	-0.104*	0.026	-3.988
Number of dependents/household	0.401*	0.112	3.568

Note: * có ý nghĩa 5%

Regarding the distribution of technical efficiency (TE), nearly half of the farmer households obtained a high TE > 0.91; 25% of them obtained a TE from 0.81 to 0.90;

households with TE from 0.71 to 0.80 occupied 20%, and 11% of the households obtained TE below 0.7.

**Figure 1.** Distribution of farmers by technical efficiency (TE)

For the mean TE of 84%, the estimated yield loss from technical inefficiency was 16% which is equivalent of 848 kg dried paddy/ ha. With a mean rice price of 5,954 VND/kg and a mean yield of 5.3 t/ha, farmers lost 5,049,000 VND/ha due to technical inefficiency.

Advantages and problems in rice production

The focus group discussion with farmers revealed that synchronized seed sowing was a good way to reduce pest damage. Farmers received guidance in crop production from extension staffs. The other advantage mentioned

by farmers was the availability of water in irrigation canals. The problems mentioned regarding rice production included low rice price at harvest and high material input cost, lack of capital, labor and agricultural machines, flood and suppressed rice price by middleman.

CONCLUSION AND SUGGESTION

Production efficiency in wet rice production was low. The benefit cost ratio (BCR) was only 1.88. Many farmers still practice seed broadcasting with uncertified seeds. The cost to produce 1 kg paddy was 3,145 VND. Factors affecting rice yield were nitrogen and phosphorus fertilizer amount. Using high amount of nitrogen leads to low yield. Adding a suitable amount of phosphorous fertilizer will increase rice yield. Increased mechanization will increase rice yield. Higher education of husband and wife will reduce technical inefficiency. The estimated yield loss due to technical inefficiency in the wet rice season was 16% (equivalent to 848 kg dried paddy/ ha and loss of 5,046,000 VND/ha).

To increase efficiency in rice production, farmers need to adopt new innovations, increase contact with technical staff, acquire technical information from extension programs and mass media. Female farmers should increase their education and participate in technical trainings. Both male and female farmers should increase their participation in public associations, farmers' groups as large field models, farmer groups with same preference, to increase technical knowledge and exchange experiences.

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TÓM TẮT

Hiệu quả kinh tế lúa Hè Thu tại huyện Cờ Đỏ, thành phố Cần Thơ

Điều tra cá thể 420 hộ nông dân và phỏng vấn 7 nhóm nông dân tại 7 xã ở huyện Cờ Đỏ, thành phố Cần Thơ cho thấy lợi nhuận lúa Hè Thu 2012 đóng góp không nhỏ vào kinh tế hộ. Tuy nhiên sản xuất lúa vụ này còn gặp nhiều khó khăn, đặc biệt là chi phí phân thuốc cao và giá lúa bán ra thấp. Bên cạnh đó, việc sử dụng quá nhiều thuốc bảo vệ thực vật và lượng phân đạm là hai yếu tố chính trong việc làm giảm năng suất lúa vụ Hè Thu. Kết quả phân tích cho thấy yếu tố ảnh hưởng đến năng suất lúa là do sự chi phối bởi trình độ và tuổi tác của nam, nữ nông dân và số người phụ thuộc trong gia đình.