Enhancing food security and income through integrating an upland crop in the rainfed cropping systems in the coastal areas in Vietnam

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Abstract

Upland crops like maize, groundnut, casaba melon, and water melon were introduced with partial irrigation into the traditional 'rice- rice-fallow' pattern in the rainfed coastal areas of Tra Vinh Province, Mekong Delta, Vietnam to increase farm productivity through crop diversification and to improve the household income of resource-poor farmers. Farmers used to get an average net return of 4.2 million VND (~US$ 260) from the traditional rainfed pattern but with the introduction of upland crops, net benefits increased greatly depending on the crops grown. After two rice crops, each of a modern variety (MV), net returns per ha from the pattern with maize, groundnut, casaba melon, and water melon were US$ 197, US$ 360, US$ 555, and US$ 986, respectively. In contrast, net returns per ha from the pattern involving MV followed by traditional rice (TR) and those crops were US$ 345, US$ 423, US$ 252, and US$ 527, respectively. Farmers benefited from higher farm productivity and seasonal crop diversity from the improvement brought by the introduction of new cropping pattern. Incorporation of additional crops also generated opportunity to diversify sources of income and created employment opportunities directly or indirectly for the otherwise poor farming communities. Marketing of the new farm products and availability of capital are expected to be major issues in the expansion of the new cropping pattern.

Media summary

Rice-rice-upland crop' is a new cropping pattern being practiced by farmers for increasing household income, farm productivity and promoting crop diversity in rainfed coastal areas of Mekong Delta.

Key Words

Crop diversity, household income, Mekong Delta

Introduction

Rice production has gained a momentum in Vietnam during the last two decades or so due primarily to *Doi Moi* (renovation) policies in agriculture and rural development, improvement in irrigation systems, and fast adoption of new technologies, especially short duration high yielding varieties. However, about 720,000 ha of land are still cultivated mostly under rainfed or poorly irrigated condition. In coastal rainfed areas of the Mekong Delta, farmers grow one or two rice crops. In a single rice pattern in tidally inundated coastal areas, rice is grown during the rainy season (or *Mua)* using traditional varieties. Low elevation and poor drainage characterize these areas. Farmers rely on rain and grain yields are very low (1. 8 t/ha). In the rainfed double rice cropping pattern, farmers usually grow a modern variety (MV) of rice followed by either a MV or a traditional or a local (TR) variety. The average total grain yield for the pattern is about 5-6 t/ha or less as against about 8-9 t/ha from the two irrigated rice crops (De 2000; Thanh et al. 2003). Due to low productivity, farmers cannot produce enough food for their families and their household income is usually very low. Food security and income generation are, therefore, important issues for most of these economically disadvantaged farmers in the area.

Opportunities exist to grow an upland crop during the fallow period of the rice-rice-fallow pattern using partial irrigation from dug wells, which provide an opportunity to increase production and generate extra income (De 2003). Along the sand bars in the coastal Mekong Delta, some farmers already provide

partial irrigation to grow upland crops using water from dug wells. To increase productivity and diversify the agricultural systems in rainfed coastal areas of Mekong Delta, the rice-rice-upland crop pattern was tested in the Tra Vinh province using partial irrigation from dug wells. The specific objective of the study was to increase farmers' production and household income and to create opportunities to diversify sources of income. This paper presents the results of such studies conducted during 2002 and 2003.

Methods

Farmers tested maize (*Zea mays* L.), groundnut (*Arachis hypogaea* L.), casaba melon (*Cucumis melo* L.*)* and water melon (*Citrullus vulgaris* L.) during the fallow period (January to April) in the 'rice-rice-fallow' pattern (Figure 1; Table 1). The new cropping patterns were tested by the farmers under their management condition except for the growing of new upland crops. The first rice crop, a short duration MV, was grown during May to August; and the second rice crop, either a short duration MV or a TR, was grown during August to December (Figure 1). MVs commonly grown were Ham Trau, IR59606, OM2717, OM3536, and OMCS2000 while Trang Tep was the most popular TR cultivated by farmers. Supplementary irrigation was provided to the upland crops mainly from shallow, manually dug wells.

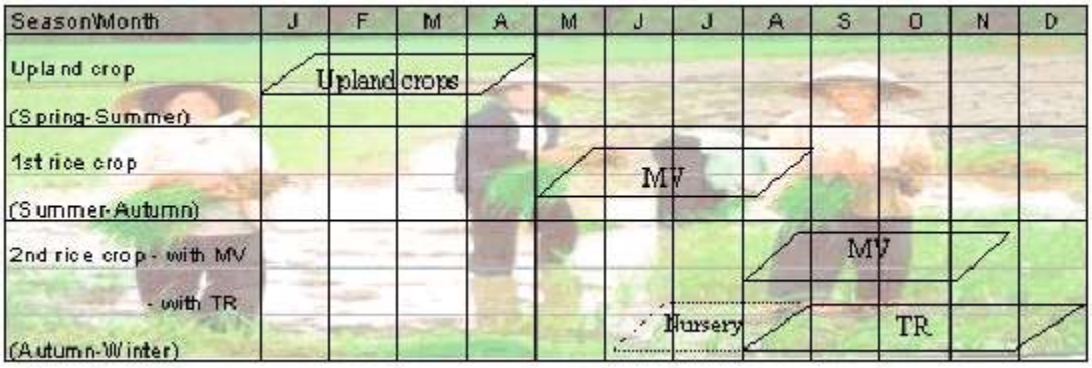

Figure 1. Seasonal calendar for 'rice-rice-upland crop' cropping pattern.

Agronomic and economic analyses were done to compare the different cropping patterns. Rice equivalent yield for the yield of the upland crops was computed by dividing the total value of the crop production by the price of rice as shown below:

$RE_i = (Y_i \times P_i) / P_x$ where: RE = rice equivalent yield, Y = yield, P = price
i = upland crop (groundnut, maize, casaba melon, water melon), x = rice

Net returns and benefit-cost ratios (BCRs) were calculated to compare profitability of the different cropping patterns.

Results

Farmers obtained an average yield of about 6.47 tons of paddy from two MV rice crops while from the combination of a MV and a TR, average yield was about 6.18 t/ha. Farmers also obtained an average yield of 4.38 t/ha of maize, 3.46 t/ha of groundnuts, 8.95 t/ha of casaba melon and 13.35 t/ha of water melon (Table 1). These yields were equivalent to 2.60, 2.90, 3.55, and 6.85 t/ha of rice, respectively.

Economic comparison of the different combinations of rice-rice-upland crop cultivation using MV as the second crop is shown in Table 2. Compared to the rice-rice-fallow pattern, all newly introduced crops were found to be profitable. However, integration of casaba melon, and water melon generated much higher net returns and farmers could get additional profits of about 4.81 and 11.57 million VND (US$ 306 and 740) per ha, respectively, than from the double rice cultivation. Among the combinations, rice-rice-water melon (Figure 2) was the most profitable combination with a BCR of 1.72 and net return of

around15 million VND (US$ 985). However, cultivation of water melon would require high cash investment. Considering the additional cash investment needed and increased net returns obtained, casaba melon was the most attractive. The net return from casaba melon was around 8.7 million VND (USD 550).

Economic comparison of the different cropping patterns where traditional rice was grown as the second rice crop is shown below (Table 3). All cropping patterns were found profitable as reflected by their BCRs. Farmers could choose from integrating maize, groundnut, casaba melon or water melon after two rices and could obtain an additional gain of 0.97 to 3.84 million VND (USD 60-240) per ha depending on the upland crop grown

Table 1. Average yield of the upland crops and rices in the rice-rice-upland crop pattern, Tra Vinh, Vietnam, 2002-2003.

Cropping season	Crops/Variety	Yield (t/ha)		
		Average	Rice equivalent	Range
Upland crops (Spring-Summer)	Maize	4.38	2.60	2.33-8.00
	Groundnut	3.46	2.90	3.00-4.00
	Casaba melon	8.95	3.55	2.67-25.01
	Water melon	13.35	6.85	6.50-21.10
First rice crop (Summer-Autumn)	Modern variety	3.34	-	1.60-4.60
Second rice crop (Autumn-Winter)	Modern variety	3.13	-	1.60-4.00
	Traditional rice	2.84	-	1.00-3.60

Table 2. Economic analysis of the different combinations of rice-rice-upland cropping pattern using a MV as the second rice crop.

Item	MV-MV-Fallow	MV-MV-Maize	MV-MV-Groundnut	MV-MV-Casaba melon	MV-MV-Watermelon
Total cost (10,000 VND/ha)	832	1,777	1,498	1,515	2,155
Material cost	450	880	854	884	1,138
Others	382	897	644	631	1,017
Gross return (10,000 VND/ha)	1,223	2,087	2,062	2,387	3,703
Net return (10,000 VND/ha)	391	310	564	872	1,548
Benefit-cost ratio (BCR)	1.47	1.17	1.38	1.58	1.72

1 USD=15,700VND

Figure 2. Water melon field after harvest of rice.

Table 3. Economic analysis of the different combinations of rice-rice-upland cropping pattern using a traditional rice variety as the second rice crop.

Item	MV-TR-Fallow	MV-TR-Maize	MV-TR-Groundnut	MV-TR-Casaba melon	MV-TR-Watermelon
Total cost (1000 VND/ha)	732	1,643	1,418	1,274	1,865
Material cost	366	864	844	525	1,020
Others	366	779	574	749	845
Gross return (1000 VND/ha)	1,176	2,184	2,082	1,669	2,693
Net return (1000 VND/ha)	444	541	664	395	828
Benefit-cost ratio (BCR)	1.61	1.33	1.47	1.31	1.44

1USD=15,700VND

With the existing double rice pattern involving a traditional rice as the second crop, farmers used to get about 4.4 million VND (US$ 280) per ha but with the integration of an upland crop in the pattern, they could receive an income of about 5.41 million VND (US$ 340) from maize, 6.64 million VND (US$ 420) from groundnut, 3.95 million VND (US$ 251) from casaba melon, and 8.28 million VND (US$ 530) from water melon. However, additional cash investment would also be needed to grow an upland crop to generate the additional income. Analysis of marginal rates of return showed that on an average casaba melon gave the highest rate of return for the additional cash invested in growing the upland crop after MV rice.

It was also observed that the households consumed part of the farm products, which would lead to reduction in rice consumption. This could possibly help address the household food and nutrition security of the farmers. Additional cash and employment generation would also lead to improvements in the livelihood.

Conclusions

The two rice crops and an upland crop cultivation in a calendar year was found feasible and beneficial for farmers. This cropping pattern would provide farmers with higher income than with 1 or 2 rainfed rice crops per year, and would promote diversification that could lead to improved consumption pattern leading to food and nutrition security at the household level as well as eating pattern. However, aside from the flood and drought that occur during both the wet and dry seasons, limited water availability, low labor supply, marketing of the new farm products, and high investment costs are major constraints to adoption of the cropping systems involving 3 crops. Farmers would need about 5-13 million VND (US$ 300-800) (depending on the upland crop) of additional cash investment for upland crop cultivation. Credit and other financial assistance must be provided to farmers to encourage them to adopt this technology and promote crop diversification. In general, farmers adopting ‘rice-rice-upland crop’ cultivation benefited

from increased household income, farm productivity, alternative sources of income, and increased seasonal crop diversity. Incorporation of an additional crop also generated additional employment opportunities directly or indirectly.

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