

ECONOMICS OF RICE PRODUCTION AND ITS COMPETING CROPS¹

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Abstract

The aim of the study was to work out the profitability of rice and its competing crops to ascertain the competitive advantage in rice farming via other crops. Chillies, soya beans, maize, watermelon, banana and leafy vegetables were chosen as competitive crops grown in the rice farm. The benefit-cost (B-C) ratio was worked out for each crop to show the competitive profitability. Results revealed that the B-C ratio was less than one for rice and greater than one for all the other competitive crops in the study. Returns from rice farming in the Polonnaruwa district -- where high incidence of farm suicide was reported -- were inadequate to cover the variable cost. Cultivation of non-rice crop in rice land could increase employment and income, thereby reducing the rural poverty. The study stresses the need for crop diversification towards the high value crops to sustain the agricultural sector in Sri Lanka and rice farmers should maximise their profit instead of production.

Key words: Profitability, competitive advantage, diversification

Introduction

Rice is the single largest crop grown in Sri Lanka occupying 45 percent of the total cropped area and over 75 percent of the irrigated area. Around 80,000 farm families representing one-fifth of the population directly involve themselves in rice farming (Task Force Report, 2003). At the time of independence in 1948, the country had imported 50 percent of the rice requirement, but today the country is self-sufficient and imports only when there are shortfalls in the domestic production due to reasons beyond control such as act of God. The country was able to achieve a high level of production after independence due to both increasing area and improvement of yield. Area has been increased mainly due to expansion of new land under irrigation and price oriented policies, while yield

¹ This paper is based on the first author's Ph.D thesis titled "Comparative Analysis of Rice Marketing System in Sri Lanka – Pre and Post Liberalisation Period".

improvement was due to application of green revolution technology. Over 90 percent of rice farmers in the country now use high yielding varieties.

The pressing problem has been declining profitability, and returns from rice farming are inadequate for better livelihood (Sanderatne, 2003). It was found that poverty was high in the rice sector (Jeevika *et al.*, 2002). Incidence of farmer suicide due to failure to repay loans has been reported only in the rice sector so far. In these circumstances, some progressive farmers are shifting to non-rice crops, while some are established in rice farming. Increasing trend in rice cultivation has changed since 1983 (Kendaragama & Bandara, 2003). The study was undertaken in 2005 focusing on computing profitability of rice and its competing crops in Sri Lanka to highlight the magnitude of the difference. The findings of the study would help policy makers to change their mindset from maximisation to optimisation of rice and divert resources for other crops.

Methodology

Profitability analysis was carried out to examine the competitive profitability of rice with its competing crops by using the simple budgeting technique. In this exercise, the costs and returns of rice and its competing crops were worked out taking into account both the fixed and variable costs. Finally, the benefit-cost (B-C) ratio was computed for each crop by taking the ratio of gross income to the total cost. This provides how much return would generate on a rupee investment.

Six districts, namely the Anuradhapura, Polonnaruwa, Kurunegala, Badulla, Hambantota and Kalutara were particularly selected for the study on the basis of importance of rice and its competing crops. Except for the Kalutara and Kurunegala districts, all others are in the dry zone and farming is under irrigation. The Kalutara district is located in the wet zone and the Kurunegala district belongs to the intermediary zone. After discussions with officials of the district agricultural offices in the selected districts, competing crops with rice were identified. One crop was selected for each district taking into account the nature of the crop as shown in Table 1. However, these crops are not strictly limited to the selected district and can be grown in other districts as well. And, the cost of production does not vary much between the districts. Maize has a growing demand as an animal feed and hence the farmers started cultivation of maize in irrigated rice fields. Watermelon was also introduced recently in irrigated rice fields for export. Banana is a popular fruit in the domestic market and many rice fields have already been converted into banana cultivation. Leafy vegetables were selected because they have been widely grown in rain-fed rice lands near major cities like Colombo, Kandy and Galle. Data were obtained from the cost of production survey conducted by the Department of Agriculture. Some data relating to interest on working capital and depreciation charges were not collected

in this survey, but these were obtained through informal interviews with key informants. Data refer to the 2005 *yala* (dry) season (April to September). *Yala* season was selected because non-rice crops were mainly grown in this season.

Table 1: Selected Competitive Crops by District

District	Zone	Crop
Anuradhapura	Dry	Maize
Polonnaruwa	Dry	Chilli
Badulla	Dry	Watermelon
Kurunegala	Intermediary	Soya beans
Hambantota	Dry	Banana
Kalutara	Wet	Leafy vegetables

The cost of cultivation includes both the paid cost and imputed cost of own inputs at market rate. The cost of hired labour was calculated at the prevailing wage rates paid per day (8 hours) in the study area for men, women and children. The same wage rates were imputed for family labour. While expressing labour in man-days, woman-days were converted into man-days by taking one woman-day equalling to a 0.7 man-day except for planting, harvesting and weeding; in such cases one woman-day equals to one man-day. A child working day was converted to a man-day using a conversion factor of 0.5. The interest on working capital was calculated at the rate of 12 percent per annum. It was charged for six months for crops, except for banana, because the crop duration was less than six months. The interest rate was based on the prevailing rates of the financial institutions in the study area on short- and medium-term loans.

Depreciation charges on implements such as water pump, sprayer and hoe were calculated by straight-line method. This comprised the original cost and the less junk value of the implement in terms of its expected life time. Interest on fixed capital was calculated at the rate of eight percent on the depreciated value, as the fixed deposits in commercial banks would fetch the rate of interest of eight percent. The amount so calculated was apportioned to the crop acreage based on the duration of the crops. Land revenue was taken at the rates levied by the government.

Results and Discussion

Profitability analysis for rice during the 2005 *yala* season is presented in Table 2. Per acre total cost of production of rice varied from the Anuradhapura district (Rs

29,285) to the Polonnaruwa district (Rs 36,919) under irrigation. It was Rs 25,640 for the Kalutara district under rain-fed. The cost of production of rice in Polonnaruwa was the highest due to high cost of labour and fertiliser. In the Polonnaruwa district, the cultivation commences at the same time in many areas causing a high demand for hired labour. Consequently, many labourers are migrants from distant districts such as Kegalle and Kandy, because the neighbouring districts are the major rice growing districts. In the case of fertiliser application, the highest usage was found in the Polonnaruwa district with 263 kg per acre, compared to 235 kg per acre in the Anuradhapura district, 205 kg per acre in the Hambantota district and 162 kg per acre in the Kurunegala district.

Table 2: Costs and Returns of Rice Farming during 2005 Yala Season

Particulars	Value in Rupees per Acre					
	A'pura	P'naruwa	Badulla	K'gala	H'tota	Kalutara
A. Variable costs	(80.92)	(83.47)	(77.48)	(76.06)	(75.78)	(86.48)
Labour	10050	15000	13000	11275	11100	10850
Seed	1125	1204	1500	1170	1800	1333
Fertiliser	3909	5000	4202	3578	3864	3307
Agro-chemical	1316	2100	1000	2025	2453	900
Machine power	5800	5850	4400	4832	6360	4800
Interest on working capital*	1200	1413	1068	1125	1246	734
Others	300	250	400	180	200	250
Sub total	23700	30817	25570	24185	27023	22174
B. Fixed costs	(10.08)	(16.53)	(22.52)	(23.94)	(24.22)	(13.52)
Rent on Land	5000	5500	6800	7000	8000	3300
Land revenue	50	50	50	50	50	50
Interest on fixed capital**	48	42	51	54	65	36
Depreciation	490	510	530	510	523	80
Sub total	5588	6102	7431	7614	8638	3466
Total cost (A+B)	29288	36919	33001	31799	35661	25640
Average yield (kg)	2195	2087	2267	2148	2200	1126
Producer price (Rs/kg)	13.00	13.00	12.00	13.50	14.00	12.00
Gross revenue	28535	27131	27204	28998	30800	13512
B-C ratio	0.97	0.73	0.82	0.91	0.86	0.52

Note: * - 12% per annum & ** - 8% per annum

The percentage to the total is given in parentheses

Of the total cost, the variable cost accounted for over 75 percent in all the districts studied. It ranged from 75.78 percent in Hambantota to 86.48 percent in the Kalutara district. Among the variable costs, the lion's share was attributed to human labour, which accounted for over 40 percent of the variable costs of all the

districts. The cost incurred on machine power ranked the second highest in the total variable costs. The rental value of land formed the major component of the total cost of cultivation in the fixed costs.

The total gross return per acre of rice cultivation ranged from Rs 27,131 (in Polonnaruwa) to Rs 30,800 (in Hambantota) for irrigated paddy, while it was Rs 13,512 (in Kalutara) for rain-fed rice. The return from rain-fed rice was considerably low due to low yield, which was Rs 1,126 kg per acre as against Rs 2,267 kg in Badulla. The B-C ratio was less than one for all the districts studied indicating an unprofitable situation. It ranged from 0.52 (in Kalutara) to 0.97 (in Anuradhapura). In the case of the Polonnaruwa and Kalutara districts, the returns do not cover even the variable cost. Upasena and Wickramasinghe (2003) found similar results in their study which was carried out in the Mahaweli 'H' area of Sri Lanka. They studied the profitability under four scenarios; including family labour and fixed inputs, excluding family labour, excluding fixed inputs and excluding family labour and fixed inputs. Out of these four, rice cultivation was only profitable under the scenario of excluding family labour.

Results of the profitability analysis of competing crops studied are presented in Table 3 for the *yala* season 2005. Since banana was a perennial crop, the discounted costs and returns were computed. In Sri Lanka, banana crops last for three years. The costs and returns were collected for three years and discounted at the interest rate of 12 percent. As shown in the last row in Table 3, the B-C ratios are greater than one for all the crops concerned ranging from Rs 1.29 for maize to Rs 2.38 for watermelon. Cultivation of horticultural crops is found to be highly profitable and provides high returns, though the cost of cultivation is substantially high compared to rice.

As could be seen from Table 3, the cultivation of competing crops with rice requires big capital investment especially with horticultural crops, which give high returns. For example by cultivating watermelon in rice land in Badulla, the farmers incurred a total cost of Rs 72,973 per acre instead of Rs 33,001 for rice farming, more than twice. Similarly, the cost of cultivation of leafy-vegetables in the Kalutara district amounted to Rs 226,697 compared to Rs 25,640 for rice cultivation. Nevertheless, per rupee average return was Rs 2.33 on cultivation of leafy-vegetables in rice land in the Kalutara district instead of Rs 0.53 of rice cultivation. This clearly indicates the need to divert the unprofitable rice lands into non-rice crops to enhance farm incomes and the best utilisation of the scarce resource of land.

Table 3: Costs and Returns of Cultivation of Competing Crops with Rice in 2005 Yala

Particulars	Value in Rupees per Acre					
	Maize	Chilli	Water Melon	Soya bean	Banana*	Leafy veg.
District	A'pura	P'naruwa	Badulla	K'gala	H'tota	Kalutara
A. Variable costs	(74.93)	(93.71)	(88.39)	(75.34)	(74.01)	(97.45)
Labour	12300	70700	38400	14100	43242	175000
Seed	880	1287	500	1000	6600	14322
Fertiliser	1392	11480	14480	900	49361	9034
PPC	1223	13215	5000	2360	4294	8215
Machine power	1800	4800	4000	2500	4000	4500
Interest on working capital ^a	424	3762	2273	765	19701	8044
Others	150	800	350	250	1148	1800
Sub total	18169	106544	64503	21875	128316	220915
B. Fixed costs	(25.07)	(6.29)	(11.61)	(24.66)	(25.99)	(2.55)
Rent on Land	5000	6000	7000	6000	42000	5000
Land revenue	50	50	50	50	132	50
Interest on fixed capital ^b	462	486	695	705	1081	80
Depreciation	568	612	725	705	1842	652
Sub total	6080	7148	8470	7160	45055	5782
Total cost (A+B)	24249	113692	72973	29035	173371	226697
Average yield (kg)	1843	2600 ^c 838 ^d	21712	950	23103	175900
Producer price (Rs/kg)	17.00	30.00 ^c 110.00 ^d	8.00	40.00	15.00	3.00
Gross revenue	31331	78000 ^c 92180 ^d	173696	38000	331094	527700
B-C ratio	1.29	1.50	2.38	1.31	1.91	2.33

Note: * Discounted costs and returns at 15 percent, crop duration is three years

a - 12% per annum & b- 8% per annum,

c - Green chillies, d - Dried chillies

Parentheses give the percentage to the total

As with rice, the labour cost was the highest among the cost items. For instance, the labour cost for cultivation of leafy vegetables was Rs 175,000 per acre, which accounted to be more than three-fourths of the total cost of cultivation. Even for maize where the labour cost was the lowest (Rs12,300/ac), the percentage of labour contribution to the total cost exceeded 50 percent. Nevertheless, the problem is not so burden to the farmers because family labour is widely used in the cultivation of non-rice crops as shown in Table 4. As could be seen in Table 4, though the leafy vegetables are highly labour intensive crops, 56 percent of the

total labour used comes from family. Another advantage is the use of female labour in the family. Unlike the rice cultivation, labour requirement is fairly spread during the cultivation period.

Table 4: Labour Use in Cultivation of Rice and Competing Crops during Yala Season, 2005 (per acre)

Crop	Family Labour	Hired Labour	Total	% of family labour
Rice	16	22	38	42.11
Maize	31	10	41	75.61
Chilli	112	90	202	55.45
Watermelon	80	48	128	62.50
Soya bean	27	20	47	57.47
Leafy vegetables	280	220	500	56.00

Overall results show that the returns to invest in rice farming are low and competing crops have higher returns. These findings are in conformity with those of Upasena & Wickramasinghe (2003) and Wijayaratna (1996). Abeywardena (2003) reported that studies done since the turn of the 20th century show rice cultivation as the least profitable of all farming activities in Sri Lanka. Nevertheless, the diversification of rice lands into other crops takes place slowly due to several constraints such as credit, quality inputs and assured market.

Conclusion and Policy Implication

Profitability analysis showed that the returns from rice farming are negative and competing crops have higher returns. Economists rationally suggest that the available resources should be exploited to get the maximum returns (Sanderatne, 2003). Hence, there is a need to develop an alternative sustainable and profitable cropping system to maximise the household income. The present study has found that all the crops considered, namely maize, chilli, soya bean, watermelon, banana and leafy vegetables are highly profitable crops. One can argue that diversifying land from rice into high value crops will lead to import of rice. But, the country imports rice while exporting high value crops. This strategy has been successfully implemented in countries like Chile, Israel and Italy, which export farm products (fruits, wine, and seeds) and import food. Another advantage is that since most of the high value crops are labour intensive, exporting high value crops to the developed world indirectly means exporting labour to the developed countries, which is not allowed directly.

Diversification of rice field into non-rice crops also has a big impact on the development of rural agrarian economy by creating employment opportunities,

increasing household income and diversifying food consumption. Further, the crop diversification maximises the use of square resources like land and water in the rural sector, which ensures the higher growth in the agriculture sector. The argument against diversification of rice field is that it hampers food security. There are two schools of thought: food security through self-sufficiency and food security through trade. Due to uncertainty in international trade, the best approach is to maintain self-sufficiency at optimal level, i.e. 80 or 90 percent. If government needs to maintain the full level of self-sufficiency, attention should be given to the highly efficient districts for paddy and other districts for non-rice crops where it is possible. Another option is increasing cropping intensity by introducing a new crop in between two paddy crops. Cultivation of only paddy in two seasons is inadequate to meet the family expenses, if there are no other income sources.

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