

Economics of Intercropping of Coconut Smallholders: Study of Puttalam District

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Abstract

Coconut is the largest plantation crop and contributes substantially to agricultural export earnings of Sri Lanka. In-depth investigations in the profitability of coconut based intercropping systems are rather limited. In light of this, the present study was carried out to determine the most common and profitable intercropping systems in the smallholding coconut sector in the Puttalam District. It further identifies the different factors contribute to increment in income of the coconut lands. Representing 16 Divisional Secretariat Divisions in the Puttalam district, fifty smallholding coconut land owners (1 to 4 ha) were selected using proportionate random sampling technique. Face to face interviews supported by a structured questionnaire were conducted to collect information pertaining to the land, including intercropping extents, types of crops, soil conservation measures, income and expenses, from January 2015 to January 2016. The analysis revealed that almost half of the smallholders do not practice any type of intercropping system. Banana was the most common crop of intercrop in Puttalam District. Out of the systems in practice, the 'Coconut, Banana and Guava' system produced the highest income and profit followed by 'Only Pineapple' and 'Banana' and 'Papaya' under coconut. A multiple regression analysis indicated a positive contribution of soil conservation measures contributed to the total income.

Keywords: Intercropping, Coconut, Smallholding

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Introduction

Low production and the decline of productivity of coconut lands are among the main problems in most of coconut growing areas of the country. Coconut has become a poor land user. Income of coconut farmers is poor when it is grown as a mono crop. There is an opportunity to increase the income of the farmers and maximize the land utilization by practicing intercropping. Coconut is grown in all the Districts of Sri Lanka, about 70 percent of the area under the crop is concentrated in the "Coconut Triangle" formed by the districts of Kurunegala, Puttalam, Gampaha and Colombo in the central west coast (Liyanage and Dissanayake, 2000). Intercropping in coconut lands produces more food and agricultural products and commodities (Magat, 2004). Growing other crops under coconut intensifies land use while giving an additional income, which can cushion the fluctuating income from coconut. It is estimated that most of the potential area suitable for intercropping are still unutilized (Mahindapala and Pinto, 1991).

A coconut + corn intercropping system in Phillipine has achieved 2 tons copra (8,000 nuts/ha) and 5 tons of corn grains (2croppings/yr), the annual total investment of PHP22,050 (US\$452.7), generated a net income of about PHP42,950 (US\$881.9), and a benefit-cost ratio (BCR) of 2:1 (Magat, 2004).

The present study was carried out to quantify the income and cost of the selected coconut

lands, to select the most profitable intercropping system and identify contribution of different factors towards increment in income of the coconut lands.

Materials and methods

Both primary and secondary data were used in this study. Primary data were collected using field survey (using detailed interview) and field observations. The list of the coconut farmers in the Puttalam district was taken from the Coconut Cultivation Board and D.S. office in Puttalam. There were nine hundred three small holding (1-4 ha) coconut growers in the Puttalam District. Field survey was conducted from January 2015 to January 2016. During this period 50 coconut land owners of 1-4 ha were interviewed. Farmers were selected by using proportionate random sampling techniques. Five percent from the population in each D.S. areas were taken as a sample. Puttalam district consists of sixteen D.S. areas. The highest numbers of coconut farmers (110) who own land between 1 to 4 ha were recorded from Kalpitiya D.S. area. The lowest (32) was recorded in the Wennappuwa area. In this study income was estimated by considering all the benefit of the coconut lands such as income from food crops, leafy vegetables and intercrops with coconut likes pineapple, guava, water melon, banana, chilli, vegetable etc. In addition, the data related to the cost such as management cost of coconut, land preparation cost of intercrops,

management and harvesting cost of intercrops were collected.

Coconut lands in the sample were categorized according to land type (flat, gentle slope, undulating, sloppy) fertilizer application, soil and moisture conservation (contour drains, trenches, cover crops, mulching, coir dust pit) and weed management. Ten different cropping systems were identified in selected farmers in Puttalam District.

Average income and average profit were calculated in different cropping systems. The average profit was expressed as a percentage of the average cost in different cropping system. As well as the additional intercropping income was calculated and expressed as a percentage of the monocropping profit by using following equation.

$$\left[\frac{\text{Avg. Profit of Intercropping (API)} - \text{Avg. Profit of Mono cropping (APM)}}{\text{Avg. Profit of Monocropping (APM)}} \right] \times 100$$

A regression analysis was carried out to examine relationship between intercropping benefits and some variables such as soil and moisture conservation, age of the plant, number of intercrops, type of land ((flat, gentle slope, undulating, sloppy) and extent of coconut land (1-4 ha).

Results and Discussion

Ten different cropping systems were identified in the study area. According to cropping system there was variation of the income and profit.

A multiple regression analysis was carried out to understand how the soil and moisture conservation, number of intercrops, age of the plants, type of land and land extend contribute to the total income.

Table 1: Expenditure and Income from Coconut Intercropping Systems in the Wet Zone in Sri Lanka (1982-1986)

System	Average Expenditure (Rs/ha/yr)	Average Income (Rs/ha/yr)	Net Returns Per Rupee
Coconut monoculture	15,625	46,462	1.97
Different intercropping system with coconut	49,333	224,281	3.54

Source: Liyanage and Dassanayake (1988)

The regression analysis indicated the positive contribution of soil conservation measures, number of intercrops and the extent of the land. MINITAB statistical package was used to analyze the result. The regression equation is

$$\text{Total income}_1 = -84987 - 1537 \text{ age}_1 - 41291 \text{ land type}_1 + 6382 \text{ soil conservation}_1 + 59939 \text{ no. of intercrops}_1 + 246560 \text{ land extent}_1$$

A half of the coconut farmers interviewed practices intercropping. Banana was the most common crop of intercrop in Puttalam district. Sixty percent of the intercropping farmers in the Puttalam District used banana as a component of the coconut based intercropping systems. Out of the systems in practice, the 'Coconut, Banana and Guava' system produced the highest income and profit followed by that with 'Only Pineapple', 'Banana and Papaya' and 'Only Banana' under coconut as the second, third and fourth respectively in Puttalam District. Profitability of the coconut land can be increased by adding of one or more intercrops under coconut, especially Guava, banana, papaya and pineapple (Table 2).

The highest Average Rate of Returns was reported in Coconut-Chilli intercropping system in Puttalam District followed by that with Coconut-Pineapple intercropping system. However, in these two cropping systems the Average costs were 31000Rs/ha/yr and 89725 Rs/ha/yr respectively (Table 2). The less amount of money was used for management practices of coconut in those lands when compared with the Average Cost of other coconut lands in the sample. But the Average Rate of Returns were high due to the less cost of production.

Few farmers used water melon as a component of intercropping in coconut lands in Puttalam District. The profit of those intercropping systems was less compared to monocropping system due to the over-aged coconut and poor management practices of coconut lands.

The highest profit over cost was recorded in the Coconut + Chilli intercropping system followed by Coconut + Pineapple intercropping system. But Coconut + Chilli intercropping system had

very less average income due to the poor management practices of coconut

However considerable amount of profit over cost are recorded in the cropping system of Coconut + Vegetable, Coconut + Banana + Papaya and Coconut + Banana.

resources. It is better to accommodate more than one intercrops under coconut. Banana, Guava, Papaya and Pineapple are the most profitable inter crops in the Puttalam District. A multiple regression analysis indicates the positive contribution of soil conservation measures, number of intercrops and the land type to the total income.

Table 2: Variation of Average Cost, Average Income, Average Profit and Average Rate of Return with cropping system

Code Number of cropping system	Cropping System (No of farmers)	Average Cost (Rs/ha/yr)	Average Income (Rs/ha/yr)	Average Profit (Rs/ha/yr)	Average Rate of Return	$\frac{\text{Avg. Profit}}{\text{Avg. Cost}} \times 100$	(API-APM)/APM × 100
1	Monocrop (25)	181097	272500	91402	1.5	50.47	-
2	Coconut + Banana (9)	288424	462031	173607	1.6	60.19	89.94
3	Coconut + Papaya (3)	354917	479917	125000	1.4	35.22	36.76
4	Coconut + Banana + Guava (2)	705042	963375	258333	1.4	36.64	182.63
5	Coconut + Watermelon (2)	91779	151250	59471	1.6	43	-34.93
6	Coconut + Banana + Papaya(1)	298000	483000	185000	1.6	62.08	102.4
7	Coconut + Vegetable(2)	218244	363244	145000	1.7	66.44	58.64
8	Coconut + Pineapple (2)	89725	277000	187275	3.1	98.1	104.89
9	Coconut + Banana + Vege. (3)	324211	486711	162500	1.5	50.12	77.79
10	Coconut + Chilli (1)	31000	123000	92000	3.9	296.77	0.65

When the past studies of economics of cropping system were compared with the present study, there was a considerable variation of the total expenditure and total income. In survey conducted by Liyanage and Dassanayake, (1988) total expenditure and total income 15,625 Rs/ha/yr and 46,462 Rs/ha/yr from mono cropping system of the coconut in the wet zone (Table 1). Today total average expenditure increased up to Rs. 181097 by about 1059%. But total income increased up to Rs. 272500 by only about 486%.

Results indicated that 50 percent of the smallholders do not practice intercropping in Puttalam District due to lack of knowledge and

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