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**IMPACT OF LAND SIZE ON PRODUCTIVITY, INCOME AND PROFITS  
FROM PEPPER CULTIVATION IN SRI LANKA**

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**ABSTRACT**

Pepper is an important spice crop grown in Matale District of Sri Lanka, for exports and domestic consumption. Varieties of pepper grown are Sri Lankan local variety and 'Panniyur'. Pepper production had shown variations over the years due to poor management and low productivity. This study analyzed and compared the production levels and costs, income and profitability of pepper cultivation among small and large scale pepper farmers. A stratified random sample of 120 farmers, consisting of 76 small famers (<5 acre farms) and 44 large farmers (>5 acre farms) were selected for study. A pre-tested questionnaire was used for data collection. Descriptive statistics and mean comparisons were performed. The average extent of land under pepper cultivation was significantly different ( $P<0.01$ ) with 3.49 acres for small farms and 8.85 acres for large farms, and 66% of lands were under local pepper varieties. Fertilizer was the only input applied by both group of farmers. The mean yield of pepper was 636 kgs and 560 kgs per acre for small and large farms respectively and did not differ significantly. Mean comparison showed that there was a significant difference ( $P<0.01$ ) in cost of production, income from pepper sales and profits from pepper between small and large farmers. There were no significant differences in farm gate prices received for raw and processed pepper by small and large scale farmers. It can be concluded that there is significant differences between small and large scale pepper farmers in the extent cultivated, incomes received, cost of production and profits earned, while there is no differences in the prices received for raw and processed pepper.

**Keywords:** *pepper, productivity, income, profits, Sri Lanka.*

**INTRODUCTION**

Pepper is the most widely used spice in the world and known as "King of the Spices". Pepper crop is native to South Asia and historical records reveal that pepper originated in South India. In Sri Lanka pepper growing is done under rainfed conditions. The Department of Export Agriculture (DEA) reported that in 2012 the total extent of pepper in Sri Lanka was 32,291 ha. Pepper is mainly concentrated in mid-country region of the country especially in Matale and Kandy districts, where approximately 38% of pepper is cultivated. Total extent of pepper

in Matale District is 6,433ha. Pepper export from Sri Lanka was about 12,218 Mt in 2012 (DEA, 2014). Sri Lankan pepper is an annual agricultural rainfed crop that has an intrinsic quality in terms of high oil and piperine contents. There is a possibility to increase export share through understanding the factors interrupting the pepper production and marketing. Malaysian farms yield 3,000 Kg per hectare, whereas the Sri Lankan average is less than 500 kg per hectare. Sri Lankan share in the global pepper market has varied from 2 to 3%. There is a possibility to increase export share further by highlighting intrinsic quality of Sri Lankan pepper in terms of high oil and piperine contents. Since the availability of land is a limitation for expansion of pepper area, the focus was placed on the improvement of the productivity of the existing pepper cultivations (Seneviratne, 2011).

Pepper cultivation takes place in home gardens with mixed cropping. Farmers often do not apply chemical fertilizer or agro chemicals. Pepper is harvested manually, dried in the sun and packed in jute and poly-sacks. In manufacturing value-added products, locally developed pepper threshers, graders and blanchers are the machinery used in industry (Rupasena, 2007). Smallholders play an important role in the spice sector in Sri Lanka; nearly 70% of spice production comes from units of less than 1 ha of land. There are many initiatives implemented by the Department of Export Agriculture to promote pepper industry in Sri Lanka, especially distributing planting materials, farming equipment and even loan facilities to prepare the farm lands. However, despite these initiatives small scale producers are struggling, many of them are moving out of the industry and some are diversifying the farm lands to other crops (Rodrigo, 2014). *Gliricidia* is the predominantly used support tree for pepper vines in Sri Lanka. Lopped parts of *Gliricidia* tree provide green manure. Experimental evidence support that half of the fertilizer requirement can be met by applying 10 kg of fresh *Gliricidia* leaf matter (Seneviratne, 2011). Pepper growers do not have the capacity to add value to the raw produce, they always sell the raw green pepper to the urban traders. Majority of them are price takers with little or no bargaining power over pepper prices. They are tied between formal and informal credit sources, and have not introduced innovation to their businesses and are caught up in the vicious cycle of poverty for a long time (Rodrigo, 2014). In some countries, such as India, Sri Lanka and parts of Indonesia, pepper is cultivated on live supports, under mixed cropping systems. In most of Sarawak, Malaysia and on Bangka Island in Indonesia, dead wood supports are used. In Vietnam, most pepper vines grown on concrete or brick supports. When pepper is grown on live supports, the number of plants per unit area, and sometimes yield per plant, are lower than for a pure crop raised on non-living supports. Productivity or yield varies according to the intensity of cultivation (George, 2005). Average pepper yields in Sri Lanka are in the region of 140 to 200 kg/acre with prices fluctuating between Rs.130–280/kg, giving a gross income between Rs.18,200 to Rs.56,000/acre (SEPC, 2010). For the pepper industry to remain competitive, the cost of production per unit output has to be reduced. Labor is the most expensive input in pepper cultivation. Other than during first year for planting, most labor is required for harvesting. There is need to

identify labor efficient operations in pepper production, including introduction of mechanical devices. Research should also be undertaken on the use of natural resources such as bio-fertilizers and bio-control agents to reduce dependence on synthetic fertilizers and chemicals for pest and disease control. This would have the advantage of lowering costs, while addressing issues related to chemical residues in pepper (George, 2005; Perera *et al*, 2013). There are enough policies to advocate and guide farmers on how to maximize production in the pepper industry, under the Department of Export Agriculture. Published documents exist to educate farmers on how to manage a pepper plantation, harvest and process (Rodrigo,2014). This study attempts to provide better understanding of pepper production, costs involved, income obtained and profitability for large and small scale pepper growers in Matale district, Sri Lanka.

### **MATERIALS AND METHODS**

Matale district was purposively selected for the study because it's the largest pepper producing district in Sri Lanka. Matale district with an extent of 1,993km<sup>2</sup> of total land and 141,179 families living has very conducive soils for pepper cultivation. Matale District is characterized by its natural diversity as it spreads across all major ecological regions of Sri Lanka. Climatically its variation from Dry zone, to wet zone, through a wide belt of intermediate conditions (Bandara, 1991). A random sample of 120 farmers, consisted of 76 small scale farmers (<5 acre farms) and 44 large scale farmers (>5 acre farms) was selected from highest pepper producing DS divisions Palapathwala, Ambanganga, Yatawatta and Pallepola for the study. The field survey was conducted using a pretested structured questionnaire for data collection. Data were collected on the years of experience, yield, processing activities, variable cost of the production, support services available, problems faced and suggestions. Secondary data were extracted from sources such as the Annual Reports of the Central Bank of Sri Lanka and DS office records. Data was analyzed by using descriptive statistical methods. Simple statistical analysis was performed to get frequency distribution, descriptive statistics and mean tests of variables. Descriptive statistics and mean comparisons were performed with SPSS software. For estimating cost the average expenditure on various inputs like fertilizer, planting material and human labor was worked out. The returns were calculated based on the actual price received by the growers. The returns over variable cost and net returns were calculated by deducting the respective cost from the gross returns. Gross income of pepper farmers was calculated by multiplying the pepper harvest per season by the price they received per kilogram of pepper sold. Profit from pepper cultivation was calculated by deducting Gross Income from the total cost involved in pepper cultivation per annum. Mean comparison between small and large scale pepper farmers was done by segregation based on the land extent owned into two groups as follows; Group 1- Small scale farmers cultivating less than 5 acres (<2 ha) of land. Group 2-Large scale farmers cultivating more than 5 acres (>2 ha) of land. Mean comparisons

were done for these groups of farmers on yield, land extent, profit per acre, income per acre, farm gate price for raw pepper, farm gate price for black pepper and total cost.

### RESULTS AND DISCUSSIONS

The results indicated that the average extent of land under pepper cultivation was significantly different ( $P < 0.01$ ) with 3.49 acres for small scale farms, while it was 8.85 acres for large scale farms, and 66% of these lands were under local pepper varieties. Fertilizer was the only input applied by both small and large scale farmers. Only 29% of them were applying fertilizer for pepper cultivation and 18% of them had used new planting materials to increase production. The rest 71% of pepper farmers were not applying artificial fertilizers to the pepper vines, they only use chopped parts of the support tree (*Gliricidia sepium* cuttings-leaves) as a source of nitrogen fertilizer. It was observed that the farm gate price for raw pepper (fresh green pepper beans) did not vary between the small and large scale farmers, whereas it varied for processed black pepper.

Table 1. Statistical comparison of large and small scale pepper farmers

Variables	Land category	N	Mean	Std. Deviation	Std. Error of Mean
Pepper income per acre (Rs.)	Small farmer	76	6.1257E4	42232.067	4844.350
	Large farmer	44	2.5766E4	16981.271	3466.287
Cost of Production per acre (Rs.)	Small farmer	76	1.2654E4	6710.189	769.711
	Large farmer	44	5.5439E3	3380.422	690.026
Profits per acre (Rs.)	Small farmer	76	4.8604E4	37123.612	4258.370
	Large farmer	44	2.0222E4	14626.971	2985.718
Yield per acre (Kgm)	Small farmer	76	636.18	319.958	36.702
	Large farmer	44	560.42	260.426	53.159
Extent of Pepper land (acs)	Small farmer	76	3.49	0.975	0.112
	Large farmer	44	8.85	8.930	1.823
Farm Gate price for raw pepper (Rs./kg)	Small farmer	76	304.21	12.571	1.442
	Large farmer	44	305.42	9.771	1.994
Farm Gate price for processed Black pepper (Rs./kg)	Small farmer	76	422.38	591.621	67.864
	Large farmer	44	541.67	604.991	123.493

\*1= Small scale farmers (<5 acres) and 2= Large scale farmers (>5 acres). N=120

\*Source: Author data analysis, 2015

The cost of production for small farmers was higher than large farmers due to the use of fertilizers to the pepper vines and also higher labor costs involved. The annual mean yield of pepper was 636 kgs and 560 kgs per acre for small and large scale farms respectively, which did not differ significantly, but were higher than the values estimated in an earlier study of SEPC (2010) but lower than yields in other countries (Seneviratne, 2011, George, 2005). Mean comparisons showed that there was a significant difference ( $P < 0.01$ ) in the income from pepper cultivation, cost of production of pepper and profits per acre between small scale and large scale farmers. There were no significant differences in the farm gate prices for raw and processed pepper and yield per between small scale and large scale pepper farmers.

Table 2. Independent Samples Test for Means between Large and Small Pepper farmers

Test Variables	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	T	df	Sig. (2-tailed)
Pepper income per acre land	3.556	0.062	4.005	98	0.000***
Cost per acre land	2.717	0.102	4.983	98	0.000***
Profit per acre land	4.104	0.046**	3.647	98	0.000***
Yield per acre (kg)	0.357	0.551	1.054	98	0.294
Extent of pepper Land (acres)	11.232	0.001***	-5.192	98	0.000***
Farm Gate price for raw pepper (Rs./kg)	0.064	0.801	-0.430	98	0.668
Farm Gate price for Black pepper (Rs./kg)	0.588	0.445	-0.857	98	0.394

Significance at \*\* $P < 0.05$  & \*\*\*  $P < 0.01$ ; N=120.

\*Source: Data analysis, 2015

It was also observed that there is a very low level (39% farmers) of processing and value addition activities performed by the pepper farmers for market sales, which was similar to findings of Seneviratne (2011) and Rodrigo (2014). The DEA has developed published materials for pepper farmers to manage production and

process pepper (Rodrigo, 2014) which farmers have to be made aware through better dissemination approaches.

### CONCLUSIONS

The average extent of land under pepper cultivation was significantly different between small scale and large scale farmers. Fertilizer was the only input applied by both group of farmers. The annual mean yield of pepper for small and large scale farms did not differ significantly. There was a significant difference in annual cost of production of pepper, income from pepper production and profits received between small scale and large scale farmers. There were no significant differences in the farm gate prices received for raw and processed by small and large scale pepper farmers. It can be concluded that there is significant differences between small and large scale pepper farmers in the extent cultivated, incomes received, cost of production and profits earned, while there is no differences in the prices received for raw and processed pepper. There is also a low level of value addition to pepper for market sales.

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