

# **Analysis of technical efficiency of pepper growers in Kandy district**

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## **Introduction**

Pepper is the second most important perennial spice crop, next to Cinnamon, in Sri Lankan economy, and the most important perennial spice for domestic consumption. The pepper growers have faced severe problems during the last decades. Some of these problems are prolonged fall in the production and productivity of pepper. Agricultural productivity refers to the output produced by a given level of input(s) in the agricultural sector of a given economy (Fulginiti and Perrin 1998). Technical efficiency reflects the ability of producers to maximize output for a given set of resource inputs (Chirwa 2003). The Department of Export Agriculture in Sri Lanka with the mandate of perennial spices launched several programmes to develop this sector, including subsidy schemes for new planting, replanting and infilling, fertilizer subsidy schemes and extension services. Despite such efforts, the performances of spice based agro-forestry systems are not **satisfactory**. The average yield of pepper is 350-500 kg per hectare, but target yield is 1000 kg per hectare (Department of Export Agriculture in Sri Lanka 2002). Farmers have less information on efficiency. In order to realize increased production and efficiency, farmers in Sri Lanka need to efficiently utilize the limited resources accessed for farm income generation. This research determined efficiency levels of pepper farmers and identified socio economic factors affecting efficiency levels.

## **Methodology**

The study was conducted in Kandy District in 2014. Kandy district comprises with 6,982.8 ha of cultivated land of pepper. The total sample size was hundred (100) respondents from six selected extension office ranges. Multi Stage sampling technique was used. Primary sample data was collected from farmers using a survey method involving a structured questionnaire which was administered to the selected pepper producing farmers in Kandy District. The analysis of Cobb-Douglas frontier production function was tested by ordinary least square (OLS) and maximum likelihood estimation (MLE). STATA version 11 was used for the summary statistics and estimate coefficient of stochastic frontier and measure technical efficiencies.

## **General model and variables**

In the model specification,

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Table 1: Production Function Variables

Variable	Parameter	Remarks
Yield of pepper		Kilograms ( kg)
Land extent		Acre
Family labour		Man days
Hired labour cost		Rupees (Rs:)
Fertilier utilization		Kilo grams (kg)
Dolomite utilization		Kilo grams (kg)
Number of pruning		Number
Weedicide cost		Rupees (Rs:)
Number of manual weeding		Number

Technical Inefficiency Function  
 In the model specification,

Table 2: Technical Inefficiency Function Variables

Variable	Parameter	Remarks
Age of farmer		Years
Gender		If Male= 1,Otherwise = 0
Field visits by Extension officer		Number
Subsidy received		If Received= 1, Otherwise=0
Experiance in pepper cultivation		Years
Plantation Age		Years
Education		Primary = 1 Below O/L =2 A/L= 3 Degree or Diploma= 4
Number of trainings attended		Number
Occupation dummy 1( Informal)		If Informal occupation= 1 ,Otherwise =0
Occupation dummy 2 (Formal)		If Formal occupation=1, Otherwise =0

### Results and Discussion

Table 3: Ordinary Least Square and Maximum Likelihood Estimates for the parameters of stochastic frontier

Variable	Co Efficient		Standard Error		P value	
	OLS	MLE	OLS	MLE	OLS	MLE
Land Extent	0.8255534***		0.1183377	0.104854	0.000	0.000
Family Labour	0.7491909***		0.0546958	0.0528619	0.023	0.015
Hired Labour Cost	-0.1266223**		0.0361036	0.0298858	0.066	0.002
Dolomite application	-0.1302913**	0.0429783	0.041237	0.0357624	0.050	0.229
Fertilizer applicaation	0.0671582*	0.0313447	0.0407722	0.0348231	0.366	0.372

Manual Weeding	-0.5796257**		0.2835348	0.2515604	0.044	0.026
	-0.5664492**					
Pruning	-0.0071533	0.0667656	0.3607513	0.3085742	0.984	0.830
Weedicide Cost	-0.1587041***		0.0579177	0.0458077	0.007	0.000
	-0.1759709***					
Constant	5.425643	5.741027	0.4920459		0.000	0.000
$\gamma$	0.740005					
$\sigma^2$	1.493149					

\* Significant at 10 % \*\* Significant at 5 % and \*\*\* Significant at 1 %

Estimates were done by using both OLS and MLE. According to the frontier output, land extent, family labour and hired labour were significant. As extent of Pepper land was increased by one percent, yield of Pepper was also increased by 0.82 percent on average when other variables remained constant.

The coefficient of hired labour cost was significant and had a positive sign for pepper farmers, indicating that pepper production is labor intensive, especially at weeding and harvesting stages. This implies that optimal use of labor will lead to increased output. Adebayo (2006) and Ogundele and Okoruwa (2006) inferred that hired labor contributed positively to farm productivity.

Table 4: Technical Efficiency Ranges of the Farmers

Technical Efficiency range	Farmer TE percentage of the sample
0-10	1
10-20	2
20-30	2
30-40	5
40-50	7
50-60	10
60-70	7
70-80	15
80-90	21
90-100	30

Table 5: Statistics of Technical Efficiency

Technical Mean	Std.Deviation	Minimum	Maximum	Efficiency
73.64	21.80	7.74	99.29	

Table 6: Determinants of Technical Inefficiency

Variable	Co efficient	Standard error	z	P> z
Age	0.206257 **	0.0945559	2.18	0.029
Gender	-0.8659193	0.9426061	-0.92	0.358
Field visit	-0.9265452	0.7164361	-1.29	0.196
Subsidy	2.198565	1.905281	1.15	0.249
Experience	-0.0546185	0.0448456	-1.22	0.223
Plantation age	-0.0269816	0.0508191	-0.53	0.595
Education	0.1609216	0.6826663	0.24	0.814
Training	-0.3276421	0.2541289	-1.29	0.197
dumy1	0.8216772	1.33086	0.62	0.537
dumy2	0.7006096	1.68	0.42	0.677
_cons	-11.54224	6.443964	-1.79	0.073

\* Significant at 10 % \*\* Significant at 5 % and \*\*\* Significant at 1 %

Analysis of the inefficiency model contained in above Table 3 pepper production shows the signs and significance of the estimated parameter coefficients in the inefficiency model have important implications on the technical efficiency of pepper producers in the study area. Coefficients of age were positive for the pepper farmers. The coefficient of age was significant and gender was not significant for farmers. These coefficients imply that relatively older in age experience lower technical efficiency.

### Conclusion

The research assessed technical efficiency of pepper production in Kandy District and determined the socio-economic factors affecting the pepper production. The research revealed mean value of the technical efficiency of the farmers in Kandy District was 73.64. The findings in this study showed that pepper farms were efficient where the mean of technical efficiency of pepper farms were high. The technical efficiency was ranged from 7.74 to 99.29 per cent. Majority of the farmers have technical efficiency between 90-100 per cent. There was a vast difference between technical efficiency levels of farmers even if they used the same level of inputs.

### References

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