

Economic Impacts of Fertilizer Subsidy on Small-scale Tea Growers in Southern Province of Sri Lanka

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ABSTRACT

In view of the growing competition in the world tea market, high cost of production will be an important determinant of future Sri Lankan tea industry. Even though smallholders play a significant role in tea industry; they are highly sensitive to high input prices and not able to stand against high fertilizer cost. Assistance such as fertilizer subsidy for smallholders may help to reduce cost of production and to obtain better crop by applying recommended quantities of fertilizers. Therefore, fertilizer subsidy to small-scale tea growers may directly contribute to rural development and cyclically to national economic development. Keeping the above crux in view, the study was conducted to examine the economic impacts of fertilizer subsidy on small-scale tea growers in southern province of Sri Lanka. Primary data were gathered from 335 growers through a field survey and required secondary data were also collected. Multiple linear regression analysis and paired t-test were employed to analyze the data.

Results of the paired t-test revealed that there was an improvement of income from tea per hectare in 2009 compared to 2008. Land extent, labour and subsidized fertilizer cost per hectare had a significant impact on the income from tea per hectare in 2009. It indicated that subsidized fertilizer cost was one of the important determinants for the increase income in 2009. The study also revealed that majority of small-scale tea growers are not satisfied with the quality of the NPK fertilizer mixture applied and they are affected by higher transportation cost.

Key words: Fertilizer subsidy, multiple linear regressions, paired t-test, small-scale tea growers, tea income per hectare

INTRODUCTION

In the point of economic view, subsidy is a government assistance that allows consumers to purchase goods and services at prices lower than those offered by a perfectly competitive private sector (Clements *et al.*, 1998). It is structured in a country by way of fiscal law relating to macro-economic management through the budgetary process.

Cost of production is highest in Sri Lanka in comparison to other competitive tea producing countries (*eg.* India, Kenya, Vietnam *etc.*). In view of the growing competition in the world tea market, high production cost will be an important determinant of future Sri Lankan tea industry. Tea growers are more sensitive to the changes of factors of production (capital, fertilizer, labour, *etc.*) due to low resistance for increasing cost. Even though smallholders play a significant role in tea industry by contributing 70% of the national tea production (Anon, 2010), they are highly sensitive to high input prices and not able to stand against high fertilizer cost. Fertilizer price changes adversely affect to the small-scale tea cultivation and they are unable to provide required quantities of fertilizers. Under these circumstances small tea growers claimed for fertilizer subsidy and therefore government commenced supplying fertilizer subsidy under the concept of 'Mahinda Chintana'.

Assistance such as fertilizer subsidy for smallholders may help to reduce cost of production and they can obtain better crop by applying recommended quantities of fertilizers (Sanjay, 2006). Therefore, fertilizer subsidy may give valuable point directly to rural economic development (Mauri, 1985) and cyclically to national economic development (Sharma and Thaker, 2009). Keeping the above crux in view, it is worthwhile to study economic impact of fertilizer subsidy for the small-scale tea growers. Yet, there is no any analysis that has been carried out in Sri Lanka targeting economic impact of fertilizer subsidy for small-scale tea growers. The objectives of the study were to evaluate significance of income from tea per hectare, to determine significant factors that contribute to income from tea per hectare and to identify constraints in fertilizer subsidy scheme.

METHODOLOGY

The present study was carried out in Galle and Matara districts in southern province and about 63 of the total tea smallholders are scattered in this area. There are eighteen and thirteen divisions in Galle and Matara districts, respectively. Five divisions from each district (Galle district-Thalawa, Imaduwa, Niyagama, Nagoda, Neluwa and Matara district-Akuressa, Athuraliya, Kotapola, Pasgoda, Pitabaddara) were selected by employing stratified sampling technique. Keeping the time and resource constraints in view, manageable sample of 157 households from Galle district and 178 households from Matara district were randomly chosen, making a total sample of 335 households.

Primary and secondary data were collected to achieve the objectives of the study. Personal and family information, tea production, income, labour involvement and subsidized fertilizer quantity and cost were collected through the questionnaire and secondary data were gathered from published and unpublished sources. Multiple linear regression and paired t- test were employed to analyze the data with the help of computer packages Excel and Minitab. Paired t-test was employed to determine whether there is a significant difference between income from tea per hectare in 2009 and 2008. A multiple regression analysis was employed to determine the 2nd objective. An empirical model used was,

$$Y = \beta_0 + \beta_1 (\text{EXT}) + \beta_2 (\text{L}) + \beta_3 (\text{EDU}) + \beta_4 (\text{OCU}) + \beta_5 (\text{EXP}) + \beta_6 (\text{FCOST}) + \epsilon_i$$

Where,

- Y = Income from tea per hectare (Rupees per hectare)
- EXT = Extent (Hectare)
- L = Labour (No of labour days per year)
- EDU = 1: if farmer accumulated at least 10 years of schooling
0: otherwise
- OCU = 1: if the small-scale tea growers' occupation is farming,
0: otherwise
- EXP = Experience (Years)
- FCOST = Subsidized fertilizer cost (Rs./ha)
- β_0 to β_6 = Coefficient
- ϵ_i = Error term

Descriptive statistics were used to achieve the 3rd specific objective which was to identify the weakness in fertilizer subsidy scheme.

RESULTS AND DISCUSSION

The paired t-test was used to compare the mean difference between 2008 and 2009 smallholders income from tea and it is noted that average price of 2009 & 2008 is more or less same. Paired t-test was allowed to test the below hypotheses,

- H_0 : 2009 income from tea per hectare equal to 2008 or $H_0 : \mu_{\text{difference}} \leq 0$,
- H_1 : 2009 income from tea per hectare greater than 2008 or $H_1 : \mu_{\text{difference}} > 0$

The null hypothesis is rejected, $\mu_{\text{difference}} > 0$ at $\alpha = 0.05$ level of significance as the P-value was less than 0.05. In fact, the evidence strongly suggests that income from tea in 2009 was higher than that of 2008. At 95% confidence interval the true mean difference in income per hectare was 35783 (Table 1 & Figure 1).

Table 1. Results of paired t-test for income

	N	Mean	St. Dev	SE Mean
2009 income per hectare	335	392608	194542	10629
2008 income per hectare	335	349433	174509	9534
Differences	335	3175	82020	4481
95% lower bound for mean difference: 35783				
T-Test of mean difference = 0 (vs. > 0):				
T-Value = 9.63 P-Value = 0.000*				
Notes: *: indicates significance at the 5% probability level				

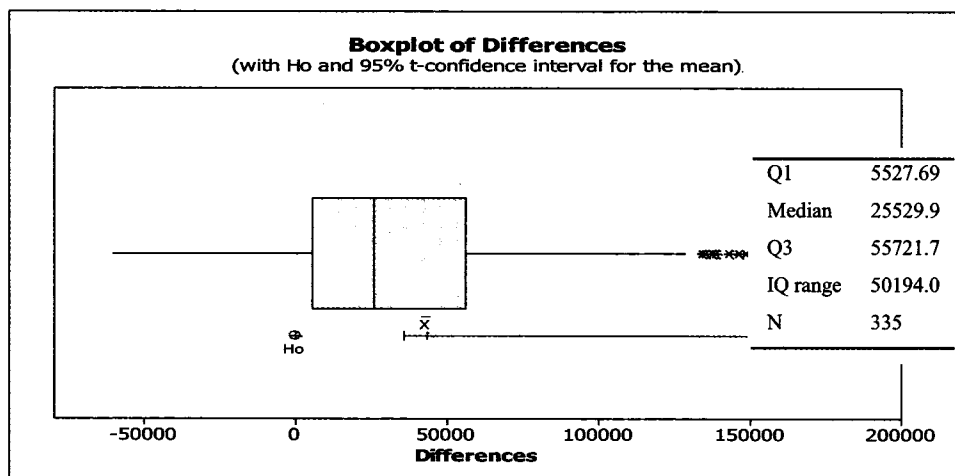


Figure 1. Box plot of differences in income of 2009 and 2008

In order to reach the 2nd objective, multiple regression analysis was employed. The significant coefficients of extent, labour and subsidized fertilizer cost indicated these variables have strongly impact on income from tea. Negative coefficient of extent may be due to poor management practices resulted low income from large extent of tea lands than small extent with better management practices. There was a positive significant relationship between income from tea and fertilizer cost when cost is subsidized. Fertilizer cost leads to increase income under the lower prices and application of sufficient quantities. Negative significant coefficient of labour explained efficient use of labour in increasing income. However, education, occupation and experiences had no significant impact on the income from tea (Table 2).

R-Sq of the model indicated that 37.6% of variation of independent variables is explained by the model. In order to obtain a more better and precise understanding on the model adjusted R-Sq was also investigated. Further, the variance can be analyzed with the ANOVA (Table 3). ANOVA table shows up to which extend independent variables have determined the income from tea per hectare. The model in the regression has explained 37.6% of variance as mentioned above. The F calculated value (32.97) is greater than F table value (2.12625) indicating that the most of the variation can be explained by this model. P-value (0.000) was lower than α value of 0.05 which has given the opportunity to draw the conclusion that the explained variation in the model is significant.

It can be concluded that test is highly significant and there is an overwhelming evidence to say that there was an impact of independent variables (*i.e.* extent, labour and fertilizer cost per hectare) on the income per hectare in southern province smallholders' tea cultivation.

According to the Table 4 majority of the sample smallholders (33%) expressed low quality of the fertilizer mixtures as the major constraints faced by them. Higher distance between factory and tea land and higher transportation cost were felt badly by 20% and 27% of the sample, respectively. Unavailability of fertilizer subsidy in appropriate time period was yet another problem perceived highly by the growers (13%). Few of small-scale tea growers were facing problems with availability of sufficient amount of subsidy as per their requirement (7%).

Table 2. Results of regression analysis

Variables	Coef.	SE Coef.	T	P
Constant	392163	35678	10.99	0.000*
Extent	-120480	34317	-3.51	0.001*
Labour	-360.3	181.0	-1.99	0.047*
Education	-10414	21887	-0.48	0.635
Occupation	27834	21911	1.27	0.205
Experience	1655	1828	0.91	0.366
Fertilizer cost	5.2928	0.6641	7.97	0.000*

S = 155047 R-Sq = 37.6% R-Sq(adj.) = 36.5%

Notes: *: indicates significance at the 5% level

Table 3. ANOVA Table

Source	DF	SS	MS	F	P
Regression	6	4.75569E+12	7.92615E+11	32.97	0.000*
Residual Error	328	7.88501E+12	24039663476		
Total	334	1.26407E+13			

Note: *: indicates significance at the 5% level

Table 4. Identified problems in fertilizer subsidy scheme

Problems	% of respondents
No sufficient amount of fertilizer subsidy available for the requirement	7
Unavailability of fertilizer subsidy in appropriate time	13
Higher distance between factory and tea land	20
Higher transportation cost	27
Low quality fertilizer mixtures	33

These problems made excessive burden in government sector and caused for wastages. Research findings also argued about subsidies that resulted in high financial costs and inefficient distribution. They comment appropriate subsidy system with input vouchers can be used to overcome existing distribution constraints and provide maximum benefits for farmers.

CONCLUSION

It was revealed that there was an improvement of income from tea per hectare in 2009 than 2008, when average tea prices were more or less same and quantity of rainfall received was higher in 2008 than 2009. It indicated that there was an impact of fertilizer subsidy on income of the growers. Extent, labour and subsidized fertilizer cost per hectare variables had a significant impact on income from tea per hectare in 2009. The model concluded that labour was a critical factor for production and extent (land) was also a production factor that must be maintained efficiently for the maximum income. Large extent with lower

management was caused the reduction of productivity in tea lands. Ultimately, fertilizer subsidy caused increase income from tea, making positive economic impact to small-scale tea growers.

The descriptive statistics showed a mean annual tea income per hectare was Rs. 392,608.00. Field survey revealed that low quality fertilizer mixtures, higher transportation cost and higher distance between factory and tea land are major problems in fertilizer subsidy scheme. This highlighted the need of government intervention to evaluate fertilizer quality and take effective action to increase quality of the NPK fertilizer mixture with providing incentives for transport fertilizer to the field.

Suggestions for future research work

This study was only focused on economic impact on fertilizer subsidy. However, social impact analysis under fertilizer subsidy is also necessary since it is hidden side yet not evaluated accurately by the past researchers. When designing the above possible studies variables such as gender, household size with family labour allocation can be used to estimate social impact of subsidy scheme.

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