

Economic Impact of Green Initiatives Implemented in Tea Estates in Sri Lanka – A Study Based on Renewable Energy Utilization & Organic Cultivation Practices

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Introduction

With the beginning of 21st century, the concept of “Green Economy” has floated-out in to main stream of policy discourse of almost all the governments in world (UNEP, 2011). Similarly by introducing Haritha Lanka Programme (HLP), Sri Lankan government has also taken the initiative to the process of greening the Sri Lankan economy. As far as tea cultivation has concerned as a key sector in Sri Lankan economy, several green initiatives (GI) have been taken through HLP to green the Sri Lankan tea industry, namely promotion off- grid renewable energy utilization in the manufacturing process through carbon offset projects, promotion of organic tea cultivation, introduction of ozone friendly pure Ceylon tea certification system and introduction of national green reporting system. Meanwhile renewable energy utilization in the manufacturing process and organic tea cultivation practices can be identified as more extensively diffused GIs in Sri Lankan tea industry, since other two initiatives have just introduced in middle of this year (2011). Infact positive environmental impact of these initiatives were proven, but still no significant study was carried out to find the economic impact after implemented situations. Therefore, this study was carried out to find out the economic impact of two major extensively diffused GIs, namely renewable energy utilization (GI₁) and organic tea cultivation practices (GI₂) in estate category of Sri Lankan tea industry.

Methodology

Since more than 75% of fully off – grid renewable energy (mini hydro power & bio thermal energy) utilizing tea factories and organically certified tea estates were included in up country tea estates which were managed by the public quoted companies; it was selected as the study area. Meanwhile easiness of acquiring data was also considered when selecting the study area.

All required data for the study was obtained from the annual reports of particular estates owned companies. When measuring the economic impact, influence of particular GI on both costs as well as the benefits were considered. Two sample t-test and Ordinary Least Square (OLS) technique of multiple liner regression were used to analyzed the data.

Two sample t-test was used to identify whether there is a significant impact or not on the expenditures (costs) and revenues due to the adaptation to particular green initiative (either GI₁ or GI₂) by comparing adopted sample mean value with non – adopted sample mean value.

If two sample t-test results were proven that two mean values were significantly different, then common gradient and different intercept type OLS multiple linear regression model has developed to quantify the impact of green initiative on particular variable (either costs

or revenues) by taking it as the dependent variable. In the OLS estimation, adaptation to particular GI was included as independent dummy variable where adaptation to GI = 1 and otherwise = 0. Since model was developed under common gradient and different intercept condition, value of the impact can be estimated by substituting relevant values (either adopted situation = 1 or non – adopted situation = 0) to estimated model. All the variables that have been used for OLS estimations were summarized in below Table 1.

Table 1: Description of variables used in OLS estimations

Notation	Variable	Remarks
ANIN_HA	Per hectare annual income from Tea estate	Rupees per hectare
COP	Cost of Production	Rupees per kilogram
GI ₁	Green initiative 1 (Dummy variable)	If entire energy requirement of manufacturing process obtained from off-grid renewable energy = 1, Otherwise = 0
GI ₂	Green initiative 2 (Dummy variable)	If posses organic certification = 1, O therwise = 0
YLD	Yield	Kilogram per acre
WFCE	Work force	No. workers
NSA	Net Sales Average	Rupees per kilogram
ELE	Elevation of factory	Meters
EXT	Crop harvesting extent	Hectare
YLD	Yield	Kilogram per acre
WFCE	Work force	No. workers
BGHTLF	Amount of bought leaf	Kilograms
ESTLF	Amount of estate leaf	Kilograms
ELE	Elevation of factory	Meters
EXT	Crop harvesting extent	Hectare

Results and discussion

Renewable energy utilization (GI₁)

Results of two sample t-test was proven that cost of production (COP) of GI₁ adopted tea estates has significantly less than the COP of non adopted tea estates. Further two sample t-test results for annual per hectare revenue for GI₁ adopted and non-adopted tea estates were not significant. Since significant difference only exists for the COP, OLS estimation was performed only for the COP. Estimated, fitted model is as follows.

$$\text{COP} = 250.24^{***} - 1.0496 \text{ EXT}^{**} + 16.75 \text{ GI}_2^{***} - 45.54 \text{ GI}_1^{***} + 0.070 \text{ ELE}^{**} + 0.021 * \text{BGHTLF} - 0.07^{**} \text{ ESTLF} + 2.064 * \text{WFCE}$$

$$R^2 (\text{adj}) = 64.8\% \quad P \text{ value} = 0.000 \quad N = 74$$

(Note: ***, Significant at the 0.01 level; **, at the 0.05 level; *, at the 0.10 level.)

According to the model coefficient of GI₁ (If using off grid renewable energy = 1, otherwise = 0) is significant at 0.01 level. Estimated coefficient of GI₁ has recorded as - 45.54. That means for any considered condition of other influencing factors, usage of renewable energy for manufacturing process has reduced the cost of producing 1 kg made tea by Rs.45.54 at the factory level. Further, model specified, Elevation of the factory,

extent, Workforce, Amount of estate leaf and adherence to organic cultivation practices as other significantly influencing factors for COP of tea estates.

Adherence to organic cultivation practices (GI₂)

Results of two sample t-test were proven that adherence to GI₂ has significant impact on both COP and per hectare annual revenue. Therefore, OLS estimations were performed to both COP & per hectare annual revenue (Estimated, fitted OLS model for COP of tea estates has already included in above under the GI₁).

In that model, coefficient of GI₂ has estimated as 16.75 and it significant at 0.01 level. Therefore, model specified that adherence to organic farming practices has increased the cost of production by Rs.16.75 for any given condition of other affecting factors for the cost of production of tea estate.

Results of OLS estimation to annual per hectare revenue has indicated below.

$$\text{ANIN_HA} = -415188^{**} + 290 \text{ EXT}^{*} + 253554 \text{ GI}_2^{***} + 1925 \text{ NSA}^{***} + 118 \text{ YLD}^{***}$$

$$R^2(\text{adj}) = 69.3\% \quad P \text{ value} = 0.000 \quad N = 74$$

(Note: ***, Significant at the 0.01 level; **, at the 0.05 level; *, at the 0.10 level)

OLS estimation has specified that GI₂ (If organic = 1, otherwise = 0) has significantly influenced on the revenue generation per hectare of tea estates. Calculated coefficient of cultivation method was significant in 0.01 level (p value = 0.000). Therefore adherence to organic farming practices has increased the annual revenue per hectare by Rs. 253554 for any considered condition of other factors that influence on the annual revenue obtained from a unit of cultivated land. Further model specified, extent, net sales average and yield as the other significantly influence factors on the per hectare annual revenue of the tea estates.

Conclusions

Adaptation to fully off-grid renewable energy based tea manufacturing process (GI₁) has significantly reduced the cost of production of the tea estates. Adaptation to fully off-grid renewable energy based tea manufacturing process (GI₁) has no significant impact on the annual revenue generation of tea estates. Adherence to organic cultivation practices (GI₂) has significantly increased the annual revenue generation of tea estates. Adherence to organic cultivation practices (GI₂) has significantly increased the cost of production of tea estates.

References

- UNEP 2011. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers, [e-book], UNEP, Geneva, Available online at: www.unep.org/greeneconomy [Accessed on the 10th April 2011]