COMPARISON OF PROFIT EFFICIENCY OF BLACK TEA PROCESSING IN COMPANY OWNED AND PRIVATELY OWNED FACTORIES

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Introduction

The tea sector plays a vital role in the Sri Lankan economy contributing around 68% of total agricultural export earnings (Central Bank of Sri Lanka, 2006). It occupies approximately one third of the total agricultural land and provides direct and indirect employment to more than 1.2 million people (Sri Lanka Tea Board, 2007). The Sri Lankan tea industry has the potential to face emerging trends in the global market in terms of resource endowment and climatic suitability to get the maximum profit. However due to inefficient planning and improper technological usage, a continuous slump in profits can be observed compared to other competing countries. Since a substantial amount of resources are already allocated to the industry, it may not be advisable and feasible to further assign resources in order to enhance production and profitability. Therefore, increasing efficiency is the first option to maximize profits at the given level of resources. Accordingly, there is a need to examine the possibility of improving efficiency by reallocating existing resources. Against this background, this study attempted to estimate and compare the profit efficiency of regional plantation company-owned tea factories (RPC) vs. privately-owned tea factories (PVT) in Sri Lanka using Data Envelopment Analysis (DEA).

Data and methods

The approach proposed by Farrell (1957) to measure efficiency was formulated in mathematical programming and named as Data Envelopment Analysis (Charnes et al. 1978). First it was assumed as constant returns to scale (CRS) and later it was extended to account for variable returns to scale assumption (VRS) (Banker et al.1984). The basic assumption in DEA is that if a given producer is capable of producing Y units of output with X inputs, then the other producers or firms in that particular industry should also be able to do a similar thing if they were to operate efficiently. DEA constructs a piecewise linear frontier over the data to compare the efficiency of the firms within an industry and compare each decision making unit against a peer or combination of peers. DEA measures the efficiency of decision making units in input-orientation where the firm tries to minimize input usage and in output-orientation where the firms try to maximize outputs. Profit efficiency is defined as the maximum achievable profit given the factor prices and the level of fixed factors of that firm (Berger et al.1993).

Data collected for the period from January 2006 to August 2006 pertaining to 240 tea processing factories from eight main tea cultivating districts of all three elevation regions were used for the analysis. The profit efficiencies were estimated using DEAP 2.1 version (Coelli 1996) by specifying the normalized profits as output and the factor prices (normalized prices of green leaf, normalized wage rate, normalized fuel wood price and normalized electricity cost) as inputs of each factory, i.e., decision-making units. The study used the assumption of variable returns to scale to concentrate on the scale of operation of each factory and the

profit efficiency scores were estimated for each factory separately.

Constant returns to scale (CRS) and variable returns to scale (VRS) profit efficiency scores and scale efficiency scores were obtained for all the factories for both input and output-oriented models with respect to the frontiers developed for each elevation region. Then the same scores were obtained with respect to the common frontier i.e., at national level. Output-oriented pure profit efficiency (variable returns to scale profit efficiency) measures were used for interpretation as producers (i.e., factory owners) are assumed to maximize their profit. In addition, a multiple regression model was fitted to identify the factors affecting the profit efficiency using factory full capacity (FFC), ratio of running capacity to full capacity (R/F), main grade percentage (MG%), having quality management certificate (QMC) and access to advisory services (AES) as explanatory variables.

Results and discussion

Table 1 depicts the mean comparison of the profit efficiency scores of RPC vs. privately-owned factories at zonal level. The mean profit efficiency of RPC owned factories were higher than the privately-owned factories in both up and mid countries. On the other hand, mean profit efficiency of privately-owned factories was higher than the RPC owned factories in low country.

The distribution of profit efficiencies with respect to the common frontier is given in table 2. Results revealed that RPC owned factories of both up and mid country in Sri Lanka were more profit efficient than the privately-owned factories. However, the privately-owned factories were more profit efficient than the RPC owned factories in the low country.

Among the five exogenous variables studied with respect to individual frontiers, main grade percentage and having quality management certificate had a significant and positive effect on upcountry RPC factories while ration of running capacity to full capacity and main grade percentage had a positive and significant effect on the privately-owned factories. Considering the mid country factories only ration of running capacity to full capacity was significant effect on profit efficiency of RPC factories. With respect to low country only ratio of running capacity to full capacity had a positive and significant effect on the profit efficiency of RPC factories. However ratio of running capacity to full capacity, main grade percentage and quality management certificate were significant for privately-owned factories. With regard to common frontier factory full capacity had a significant and positive effect on the profit efficiency of low country RPC factories. Ratio of running capacity to full capacity had a significant on up country privately-owned, mid country RPC and low country privately-owned factories. Main grade percentage was significant up country RPC and privately-owned and low country privately-owned factories. Profit efficiency of upcountry RPC and low country privately-owned factories was influenced by quality management certificate.

Conclusions

The RPC owned factories in up country and mid country were more profit efficient than the privately owned factories with the mean scores 0.89 and 0.73. In contrast, privately-owned factories were more profit efficient in the low country with a score of 0.65 with respect to the best-practiced units or factories at zonal level. This implies that there is a substantial scope of increasing the profits of both RPC owned and privately-owned tea factories in all three regions without incurring additional cost. The low country RPC owned factories have the highest potential (0.77) of improving the efficiency to operate on the frontier.

The study also found that the profit efficiencies are low when these are estimated with respect to the common frontier. The mean profit efficiencies were high in RPC owned factories in up (0.39) and in mid (0.62) country where as privately-owned factories

were more profit efficient in the low country (0.65). Privately-owned factories in up country have the highest potential of improving the profit efficiency (0.76) with respect to the common frontier.

Among the five exogenous variables studied, ratio of running capacity to full capacity, main grade percentage, quality management certificates and factory full capacity were found to have significant effect on the profit efficiency of both RPC owned and privately-owned tea factories in Sri Lanka. It is obvious that the efficiencies at factory level (both RPC and privately owned factories) can be increased significantly by improving the maintenance of machineries, increase the ratio of running capacity to full capacity, uphold maximum number of kilograms tea that a factory can process per day and adapting to quality management meta systems.

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Table 1. Profit Efficiency Estimations with Respect to Individual Frontiers

Assumption	Up country		Mid country		Low country	
vrspe	RPC	PVT	RPC	PVT	RPC	PVT
Input	**0.98**	0.93	**0.97**	0.94	0.92	**0.95**
Output	**0.89**	0.65	**0.73**	0.35	0.33	**0.65**

vrspe = profit efficiency from VRS-DEA

Table 2. Profit Efficiency Estimations with Respect to Common Frontier

Assumption	Up country		Mid country		Low country	
vrspe	RPC	PVT	RPC	PVT	RPC	PVT
Input	**0.96**	0.92	**0.94**	0.92	0.92	**0.95**
Output	**0.39**	0.24	**0.62**	0.31	0.33	**0.65**