A Silver Lining in the Dark Clouds: Stimulating Economic Growth by Promoting Tea-Based Radical Innovations in Sri Lanka

H.M.C.G. Pilapitiya[1&2] and Saliya De Silva[3]

[1]Tea Research Institute, Sri Lanka

[2]Graduate School of Science and Engineering, Saga University, Japan
[3]Faculty of Economics, Saga University, Japan

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Introduction

Scientific evidence has proved anti-viral, anti-carcinogenic and anti-diabetic properties in tea (*Camellia sinensis*) due to the presence of high levels of antioxidants (Modder *et.al*, 2002). However, the major tea producing countries including Sri Lanka paid less attention to such properties until the covid-19 pandemic hit the world boosting demand for black tea in Sri Lanka with a FOB price hike of 15%. In 2018, Sri Lanka was the third largest tea exporter in the world, accounting for 14.7% of total global tea exports. Nearly 60% of this tea was exported in primary processed bulk form. Bulk tea is sold at lower prices than value-added tea forms. For instance, in 2018, the average price of Sri Lankan bulk tea was 4.01 US$/kg, while the average prices for tea bags and tea packets were 8.18 US$/kg and 4.47 US$/kg respectively. During the last five years (2014-2018) Sri Lanka earned only 4.83 US$/kg, comparatively lower than non-tea producing countries such as Poland, which earned US$10.13/kg; Germany.US$9.55/kg; and the UK,US$7.18/kg). These developed nations were already capitalizing on producing tea-based innovations (e.g. confectionaries, tea wine, pharmaceuticals and cosmetics in Japan, Poland, Germany, and UK) using raw materials mostly imported from tea producing countries such as Sri Lanka (Koch *et al.*, 2019). We see this as a missed opportunity for tea producing countries. Product innovations based on tea can be categorized basically into two types: 1) incremental innovations (e.g. - flavoring, bagging, packeting) and 2) radical innovations (tea concentrate, tea cordial, tea-based confectionary).

Innovation has two basic dynamic impacts; 1) make upward shift in the production function, and 2) increase economic efficiency for the industry as a whole due to creative destruction (Baumor 2002; as cited by Sengupta, 2014). This study is based on resource-based view of innovation (Lockett *et al.*, 2001) and social cognitive factors of innovation (Wood *et al.*, 1989). Empirical findings on determinants of radical innovations in food and beverage industry are mostly based on the US and Europe limiting the practical implementation to an industry in developing countries. Therefore, this study aims to contribute to minimize this research gap.

Objectives

Under above background, the objectives of this study were 1) to identify the impact of producing tea-based radical innovations on firm performance and 2) to identify the determinants of producing tea-based radical innovations in Sri Lanka.

Methodology

Our study population was tea exporting firms involved in innovation in Sri Lanka in 2019 (N=180). We randomly selected 43 (24%) exporting firms based on their average annual export volume. We collected primary and secondary data through a questionnaire survey and interviews with all 43 CEOs and/or COOs in August-September, 2019.

To achieve the first objective, we divided all 43 firms into two groups:1) firms who had produced at least one tea-based new product (new to the firm) for commercial purposes within the last five years (2014-2018) 2) firms who had not produced tea-based innovations. The mean values of the sales gain for the two groups were tested by Mann-Whitney U test to examine if there was a significant difference in the sales gain due to producing radical innovations. To achieve the second objective, we conducted a binary logistic regression where our dependent variable was producing radical innovations (yes/no) vs. the independent variables: firm's age, number of executives (as a proxy for firm's size), number of food technologists, number of tea technology graduates, CIM/CIMA qualified officers, level of education of CEO, experience of CEO, Science and Technology qualification of CEO, having contacts with TRI, and the number of export destinations. We

observed significant correlations between these independent variables, and therefore followed a factor analysis to reduce the number of variables and to create a set of orthogonal variables.

Results and Discussion

Tea-based radical innovations, defined as products developed through intense change of the tea green leaf, produced by the sample firms for commercial purposes during 2014-2018 include the following two groups with the number of firms in brackets:

a. Oolong tea (4), Silver tips and golden tips (3), Hand crafted tea (3), Gold plated tea (1), Ceylon green tea (2), Ceylon matcha (2), Compressed tea (2)

b. Tea aroma (1), Tea concentrate (3), Matcha energy drink (2), Bubble tea (1), Ready to Drink tea (3), Tea biscuit (1), Tea cordial (1), Tea premix (2), Instant tea (3), Tea stick (1)

The average sales value of Rs. 1660.51/kg of firms producing radical innovations (n=19) was significantly higher than that of (average = Rs. 1066.94/kg) firms that did not produce any radical innovations (n=24) (Mann-Whitney U = 92; p = 0.001).

Table 1: Factor Analysis Matrix

Factor	Factor interpretation (% variance)	Loading	Variables included
1	Firm Strategy (40.84)	0.911	No. of executives
		0.903	No. of food technologists
		0.855	No. of destinations
		0.758	No. of CIM/CIMA qualified officers
2	Firm Resources (19.40)	0.825	Experience of the CEO
		0.718	Resources
		-0.704	Level of education of CEO
3	Tea Technology (11.62)	0.836	No. of tea technologists

Note: Kaiser-Meyer-Olkin measure (KMO=0.742) proves that factor analysis is appropriate to analyze the correlation matrix. Chi square for Bartlett's test of sphericity is 162.98 (p=0.000) at 36 degree of freedom.

The extracted three factors together explained 71.8% of the total variance. Factor analysis reduced eight variables to three main factors (Firm strategy, Firm resources, No of tea technology graduates) (Table 2).

The χ^2 for logistic regression (overall model) is significant over the intercept only model (null model), χ^2 (5) = 21.88 (p=0.001). The χ^2 (8) for Hosmer-Lemeshow test is insignificant (p=0.434) suggesting the model fit to the data (see Table 2).

Table 2: Determinants of Producing Tea-based Radical Innovations

Variable	Beta	S.E.	Wald	df	Sig.	Exp(B)
Firm Strategy	0.128	0.433	0.087	1	0.768	1.136
Firm Resources	1.137*	0.489	5.405	1	0.020	3.119
CEO's science and technology qualifications (yes)	2.316*	1.038	4.977	1	0.026	10.134
TRI contacts (yes)	-0.886	1.049	0.713	1	0.398	0.412
No. of tea technology graduates	0.998*	0.434	5.281	1	0.022	2.714
Constant	-1.267*	0.602	4.422	1	0.035*	0.282
Test			X^2		df	p
Overall model			21.88*		5	0.001
Score test			17.88*		5	0.003
Goodness of fit – Hosmer & Lemeshow test			7.99		8	0.434

Note: * represents variables are significant at 5% significance level.

Firm Resources, CEO's background in Science and technology and contribution of tea technology graduates are significant and positive towards producing radical innovations. Many radical innovations begin at the tea field (e.g. hand-crafted tea, oolong tea, Ceylon matcha, compressed tea etc.). However, there are only 12 firms (28%) that have integrated or at least have direct links with tea plantations or processing factories. In our sample, 10 CEOs (23%) are either Science/technology graduates or they had followed tea technology or processing course within their tenure. Although the contribution of tea technology graduates towards radical innovation is significant, we observed only 16 (37%) firms recruited tea technology graduates.

Conclusion

Our study revealed a statistically significant impact of producing radical innovations towards tea exporting firms' sales gains. Also, we found that cognitive factors of the CEO (education and experience), resource integration and contribution of tea technology graduates as significant determinants of producing radical innovations. In macro scale, we strongly recommend ceasing the motivations towards bulk tea exports and make innovation a priority. For that, we suggest the active contribution of well-experienced tea professionals (CEOs) in Sri Lanka. Establishing a strong link between universities and research institutes to provide scientific base for innovation would be beneficial. We recommend make more room to expose the tea technology and value addition graduates to industry during their undergraduate tenure and establish mechanism to link them directly to firms upon graduation.

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