



Original article

## Innovative Value Addition in Tea (*Camellia sinensis*): A Comparative Analysis between Sri Lanka and Japan

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### Abstract

Sri Lanka is the third largest tea exporter in the world, but nearly 60% of its total exports are comprised of bulk tea. Bulk tea secures the lowest prices in world tea market. Sri Lanka earned an average value of US\$4.83 per kilogram from 2014 to 2018 for its tea exports, compared to US\$24.24 per kilogram over the same five-year period in Japan, a highly innovative tea-producing country. The objective of this study is to examine the root causes of product innovation in Sri Lanka, as compared to Japan, by conducting a historical analysis followed by a survey and key informant discussions. Sri Lanka has mainly focused on incremental innovations in blending, flavoring and packaging than radical innovations. About 98% of the tea produced in Sri Lanka is black tea, produced mainly in large scale-processing factories. The focus on economies of scale and heavy dependence on traditional product baskets and market destinations have bottlenecked product innovation capabilities in Sri Lanka. In contrast, Japan produces a large number of innovative beverage and non-beverage products. Their main beverage type is sencha (58%), followed by many other beverages including *gyokuro*, *kabusecha*, *matcha*, *tamaryokucha*, black tea, oolong tea, fermented teas and white tea. The Japanese produce a variety of non-beverage products including confectionaries, snacks and cosmetics made from same tea plant that beverage tea is made from. Having a large number of processing factories (4698), Japan's product innovation capabilities are mainly attributed to firm-level factors and support services. This study recommends that Sri Lanka should link together farmer organizations, processing factories, research institutes and universities to make its tea industry more innovative and flexible and consequently more profitable and sustainable. Foreign direct investment and partnerships presumably would be instrumental in bringing in much needed funding, expertise and advanced technology to stimulate product innovation.

**Keywords:** Tea (*Camellia sinensis*), Product Innovation, Sri Lanka, Japan.

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## INTRODUCTION

Tea is the most consumed beverage in the world after bottled water and plays an important role in the economies of the countries that produce it. In 2018, 1.4 billion kilograms of green leaf tea was produced in Sri Lanka on 201,000 hectares of land, making it the second largest crop there after paddy rice. The tea industry in Sri Lanka generates 12% of the country's total export revenue and provides direct and indirect employment for about 10% of the total population in Sri Lanka (Central Bank of Sri Lanka, 2018). Though introduced and used for centuries to make a brewed beverage, the tea plant (*Camellia sinensis*) today is utilized to make many different forms of both beverage and non-beverage type products that change according to consumer preferences. Although Sri Lanka is the world's third largest black tea exporter (14.7% of the world tea exports), nearly 60% of the black tea is exported in bulk form (International Tea Committee, 2019; Sri Lanka Tea Board, 2018).

Bulk tea refers to tea sold in its primary processed form without any value addition. Thus, bulk tea fetches the lowest prices in the world market. For instance, the average price for bulk tea was US\$4.01 per kilogram in 2018, while prices for tea packets and tea bags were US\$4.47 per kilogram and US\$8.18 per kilogram respectively the same year. There are hardly any other products made from tea plant in Sri Lanka that are exported, resulting in lower returns from tea, compared to some other tea-producing and non-tea-producing countries that produce a wider range of value-added products.

International Tea Committee data from 2014 to 2018 show that Japan earned as much as US\$24.24 per kilogram, and even non tea-producing countries such as Poland, Germany, and the UK earned US\$10.13 per kilogram, US\$9.55 per kilogram and US\$7.18 per kilogram respectively by blending, flavoring or packaging bulk teas imported from producing countries like Sri Lanka. Another problem Sri Lanka has, in addition to depending heavily on bulk tea, is that about 50% of Sri Lankan tea is exported to only five countries: Iraq, Russia, Iran, Turkey and Libya, where there is high economic and political volatility. As UNCTAD (United Nations Conference on Trade and Development, 2016) points out high dependence on a limited tea product basket and market destinations is risky for any country as they are vulnerable to sector specific shocks (e.g. commodity price fluctuations) and country specific shocks (e.g. trade embargos, import duty).

Tea contains a range of soluble substances such as, caffeine, theanine, flavonoids, polyphenols, organic acids, and vitamins (Graham, 1992). During the last three decades, the health effects of tea have been documented in numerous scientific studies (Kuroda and Hara, 2004). Research and commercialization of tea-based foods, functional drinks and health and beauty/body-care formulas and products have been done, particularly in developed countries. Research by Koch *et.al*, (2019) shows that tea extract contains a large number of chemical compounds that are or have the potential to be particularly beneficial in the cosmetics industry. The researchers found more than 30 different cosmetics-related products such as peeling masks, face masks, shampoo, hair conditioner, eye

concentrate, firming cream and shower gel, produced in Japan, the U.S., Poland, the U.K. and Malaysia contained green, black and white tea extracts. These types of products and product innovations have the potential to boost the Sri Lankan tea industry, popularize Sri Lankan teas and create a Sri Lankan tea brand that can be profitably exploited through value-added products for new consumer groups and markets.

Japan is a tea producer and exporter. It produces various kind of innovative and profitable products using the *Camellia sinensis* tea plant and gains high value not only from its tea exports but also from its domestic market. Comparatively, Sri Lanka produces a larger volume of tea, but only a few value-added products for a smaller customer base. With this in mind, an analysis of tea-based product development in Japan could provide a model for Sri Lanka on how to make its tea industry more profitable and sustainable through innovative value addition and creating and exploiting new markets. Accordingly, we will address this topic by comparing and contrasting the current situation, and examining the historical background, of tea product innovation in Sri Lanka and Japan.

### **Theoretical Framework and Literature Review**

In this section we present literature related to product innovation with special emphasis on the food and beverage industry. Innovation has been defined in many ways in the literature. In general, product innovation refers to the degree of “novelty” embodied in a product (McKelvie and Wiklund; 2011 as cited by Deligianni *et.al*; 2014). The Oslo Manual (2005) states that product innovation is the introduction of new or improved good or service to the market that differs significantly from the firm’s previous goods or services. It also defines two dimensions of innovation: 1) Incremental; and, 2) Radical. A radical innovation is explained as a result of intense changes, and an incremental innovation is a result of continuous changes.

Since demarcation of the two dimensions is subjective, in explaining innovations in tea, we define incremental innovation as continuous changes to black tea production such as blending, flavoring, and packaging. Radical innovation is defined as significant change made by a black-tea-producing firm to make products such as green tea, oolong tea, tea-based cosmetics, tea wine and compressed tea. According to Kasmire *et.al*, (2012) radical innovations with completely new technical establishments are important for a firm to dominate rivals and retain competitiveness, while incremental innovations may increase the efficiency or the capabilities among other firms.

Schumpeter states that innovation is a must factor for a firm to gain profits and retain competitiveness (Schumpeter; 1934 as cited in Sledzik; 2013). He divides the process of innovation into four dimensions; invention, innovation, diffusion and imitation. Hence, potential entrepreneurs utilizing the discoveries of scientists and inventors create new opportunities for investment, growth and employment. When product innovation occurs, according to Schumpeter, shifting of the production

possibility frontier takes place either due to reallocation of resources and or advancement of the technology, not only within the firm but also other firms and related firms in the industry. Thereby, innovation contributes to increased efficiency and better linkages between suppliers, producers and customers. For instance, the technology of isolating the chemical constituents in tea leaves such as catechins, opens the same raw material (green leaves) to be utilized in different industries such as pharmaceuticals, cosmetics, etc. Hence, appropriate application of advanced technology creates pathways to approach to new markets such as non-tea drinking consumers as well.

Schumpeter also describes the contribution of innovation towards the growth of an economy in macro terms through a theory of economic development, where he introduces five assumptions of innovation: 1) the introduction of new products or qualitative change of an existing product; 2) the introduction of new process; 3) the opening of new market; 4) the development of new sources supplying raw materials or other inputs; and 5) the creation of new markets within an industry (Schumpeter; 1934 as cited in Rogers; 1998).

A review of the previous literature suggests that the majority of studies conducted so far on innovation are based on empirical analysis using time series and cross-sectional data in high-tech industries. Tea, coming under the food and beverage sector, has traditionally been considered a low-tech industry compared to other sectors, thus research on it in terms of innovation is limited (Christensen *et.al*, 1996; Martinez *et.al*, 2000). According to Martinez *et.al*, (2000), the use of technology for innovation in the food industry is comparatively low. Therefore, innovations in the food sector tend to be more incremental than radical (Capitanio *et.al*, 2010). According to Capitanio (2010), food firm developments tend to be oriented more towards process innovation than product innovation and the majority of process innovations are incremental. Schiemann (2008, as cited in Minarelli *et.al*; 2015) finds that the majority of food industries are small and medium enterprises (SMEs).

The innovation process is mainly explained using the resource-based view. According to this view, a firm's resource bundle (collection of assets or resources) is unique, and its heterogeneity of resources gives a firm a comparative advantage or disadvantage in developing new process or products (Lockett *et.al*, 2001). These literatures clearly highlight the existence of research and knowledge gap in the process and application of radical innovations, particularly in the food and beverage sector. This study attempts to partly fill in this knowledge gap.

## **Methodology**

In our study we conducted an analysis of the history of product innovation through published and un-published documents and a survey and key informant discussions to identify the root causes of product innovation in Japan and Sri Lanka. According to Wyche *et al.*, (2006) history is an account of some past event or combination of events. Thus, a historical analysis is a method of discovering what

happened in the past from records and accounts. In their study on using historical analysis Wyche *et.al*, (2006) recommend that lessons learned in the past can be appropriately used to design future actions.

In our research, we conducted a survey in Sri Lanka using a questionnaire that involved 43 major tea exporters of Sri Lanka, comprising more than 60% of Sri Lanka's total tea exports.

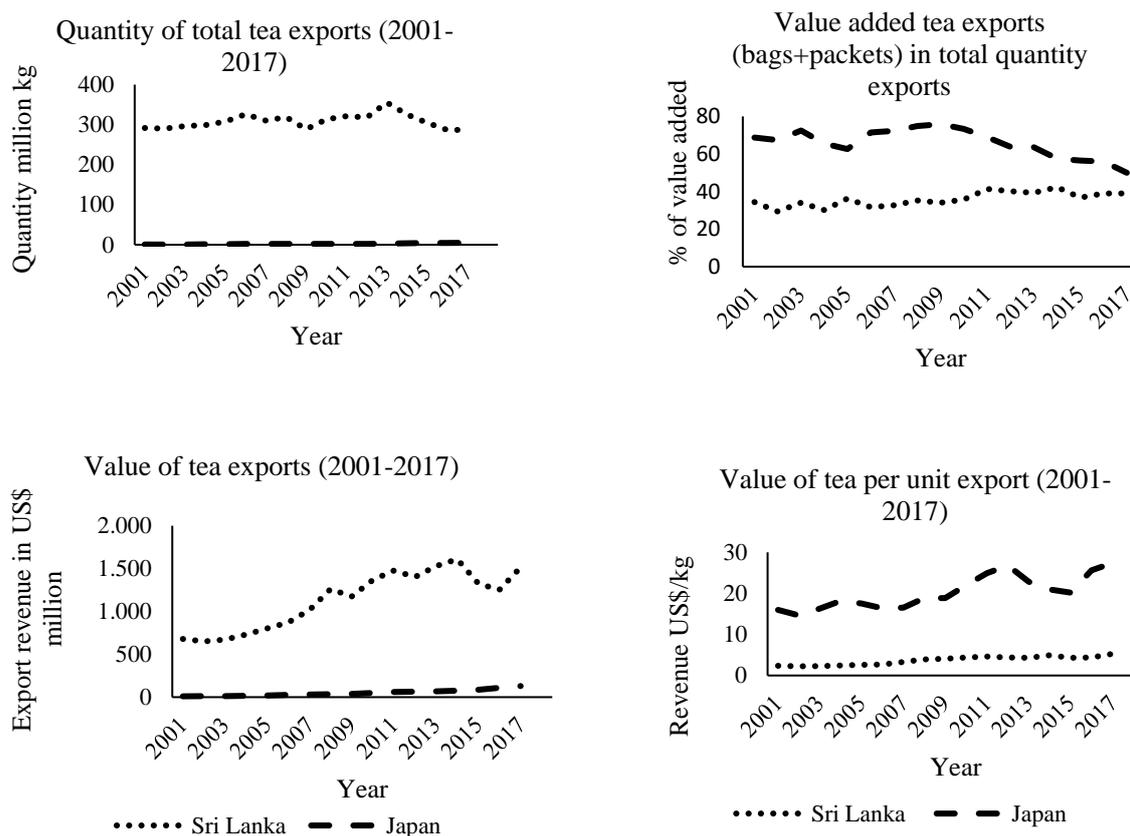
We basically conducted a secondary data analysis using published secondary data in Japan. In addition, in Saga Prefecture in Japan we conducted interviews and held key informant discussions with officials of the Tea Research Station of Ureshino, Saga Agricultural Cooperative, and two owners of family-managed tea processing firms in Ureshino. Key informant discussions are in-depth interviews of a selected (non-random) group of experts who are most knowledgeable of the organization or issue. Key informants were selected to represent three areas: 1) Tea cultivation (Owners of the family-managed tea processing firms) 2) Small-scale tea processing (owners of the family managed and 3) Facilitating institutes (The Tea Research Station of Ureshino, Saga Agricultural Cooperative). Insights of the key informants were used as supplements to elaborate published secondary data on Japanese tea industry. Tea is mainly produced as a smallholder family business in Ureshino. There are 228 tea farmer families and 90 processing factories within Ureshino. The volume of green leaf produced in Ureshino is comparatively low. Our data were analyzed descriptively. Ureshino is where the commercial cultivation of tea started in Japan, in 1191 (Brekell, 2018). Saga is well-known for innovative teas such as “*tamaryokucha*” and “*kamairicha*”. Ureshino is the major tea growing area in Saga prefecture where “*kamairicha*” tea was invented in the 16th century.

## **RESULTS and DISCUSSION**

In this section, we present our findings related to three major aspects: 1) first on the existing situation of production and exports; 2) second on innovative tea products; and, 3) third on historical background of product innovation in the two countries.

### **a) Current situation of tea industry in Sri Lanka and Japan**

In 2018, Sri Lanka contributed 5.1% (303 million kilograms) of the world tea production while Japan accounted for 1.3% (79 million kilograms) (International Tea Committee, 2019). Due to higher levels of domestic consumption (94%), the proportion of exports of total tea production in Japan is considerably lower than Sri Lanka. From 2001 to 2017, Sri Lanka exported 136 times more tea, in terms of quantity, than Japan, but the average revenue earned for Sri Lanka's exports was only 23 times larger than Japan's. Accordingly, the proportions of value-added tea exports and value addition are much higher in Japan compared to Sri Lanka. The value gained per unit export is about five times higher in Japan than Sri Lanka (Figure 1). This clearly shows the importance of product innovation for tea producing developing countries like Sri Lanka.



**Figure 1:** Comparison of tea exports between Sri Lanka and Japan, 2001-2017

Source: Graphs are based on the data from International Tea Committee Annual Reports (various issues) and Central Tea Association of Japan Annual Report (2018)

### b) New tea product and process innovation

In order to identify different types of products exported from Sri Lanka, we analyzed the export product basket of tea from 2011 to 2018. According to Table 1, Sri Lanka mostly exported black tea, green tea and instant tea. Black tea consisted of more than 98% of the total export quantity. This composition remained almost same over studied time period. The volume of instant tea exports increased slightly. This can be interpreted as indicating a higher demand for innovative value-added products. A decline of production volumes of 338 million kilograms in 2014 to 303 million kilograms in 2018 could have been a major reason for the gradual decline of the export volume (International Tea Committee, 2019).

**Table 1.** Type of teas exported from Sri Lanka, 2011-2018 (kilograms (%))

Year Tea type	2011	2012	2013	2014	2015	2016	2017	2018
Black tea*	296.2 (98.5)	301.9 (98.7)	306.3 (98.4)	312.2 (98.4)	294.3 (98.4)	276.3 (98.4)	273.6 (98.3)	266.8 (98.2)
Green tea	2.5 (0.7)	2.4 (0.7)	2.9 (0.6)	3.0 (0.6)	2.4 (0.7)	2.4 (0.7)	2.4 (0.7)	2.3 (0.7)
Instant tea	1.9 (0.7)	1.5 (0.7)	1.9 (0.6)	2.0 (0.6)	2.1 (0.7)	2.0 (0.7)	2.1 (0.7)	2.4 (0.7)
Total export	300.6	305.8	311.1	317.2	298.8	280.7	278.1	271.5

\* Disaggregated data for black tea exports is not available. (Source: Based on Sri Lanka Tea Board Annual Reports (various issues))

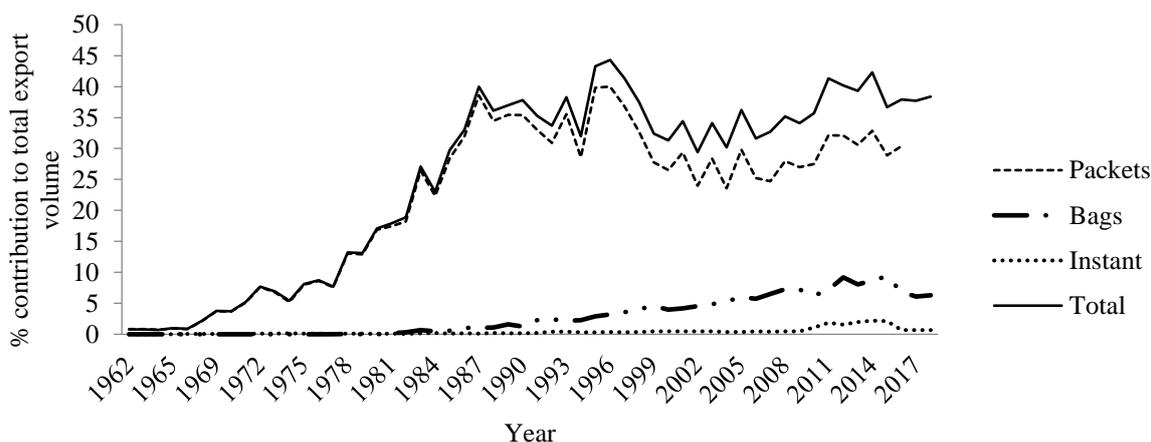
A number of tea cultivars (plant varieties that have been produced by selective breeding) have been developed in tea-producing countries from the common source *Camellia sinensis*. There are two main varieties of *Camellia sinensis*: 1) *Camellia sinensis* var. *sinensis* (China type) and 2) *Camellia sinensis* var. *assamica* (Assam type), which are used in commercial tea cultivation. The China type is regarded as more suitable for green tea production while the Assam type is regarded as more suitable for black tea production. In tea-producing countries, both types are grown. Since commercial cultivations in Sri Lanka consists of hybrids of the both types, these tea varieties can be viewed as a potential raw material base to produce both beverage and non-beverage products.

There are basically five types of beverage teas: 1) non-oxidized tea; 2) lightly oxidized tea; 3) semi-oxidized tea; 4) oxidized tea; and 5) fermented tea (Brekell, 2018). These are generally produced from the same tea plant using different processing methods. As stated above, tea exports from Sri Lanka essentially consists of one type of oxidized tea (black tea), non-oxidized tea (green tea) and a derivative of black tea (instant tea). As presented in Table 1, 98% of the tea produced in Sri Lanka is black tea. Out of this, 95% is “orthodox tea” (tea made or processed using traditional methods) while the remaining 3% is CTC (crush, tear and curl) tea. In orthodox tea production, the green leaves are processed through; withering, rolling, fermentation and firing. Green leaves undergo withering, cutting, fermenting, drying and sorting in the CTC manufacturing process. In CTC tea manufacturing process, green leaves undergo withering, cutting, fermenting, drying and sorting. Orthodox tea is usually brewed in teapots while CTC tea is used for tea bags (usually small porous sachets with four grams of tea in each one), which is more convenient to use.

In both processing methods, different types of tea grades are produced that vary according to the size, shape and cleanliness of the manufactured tea. By one count there are 40 different grades of orthodox tea, including Broken Orange Pekoe, Broken Orange Pekoe Fannings and Orange Pekoe (Tea Exporters Association of Sri Lanka, 2017). Out of these 40 grades, 16 are considered as main grades. In

Sri Lanka, tea is produced in different regions (e.g. Dimbula, Uva, Kandy,) are sold at the Colombo tea auction weekly. Taste, color and aroma of teas differ according to the region. Exporting firms buy teas from different regions at the Colombo auction and blend them according to buyer requirements. The uniformity, unchanging nature and heavy reliance on black tea in the export basket of Sri Lankan tea clearly shows that Sri Lanka is failing to innovate in terms of both products and processing.

As mentioned earlier, Sri Lanka has mainly engaged in incremental innovations in tea production, primarily in blending and flavoring. “Blending” generally refers to the mixing of teas from different origins to obtain a desired taste, color and aroma. “Flavoring” generally refers to the addition of flavors in the form of liquid or granules to tea. These teas are then packed in convenient size packs or containers (packaging). Instant tea is manufactured by extracting “tea brew” from tea leaves, tea waste or undried oxidized leaves. The extracted brew is concentrated under low pressure and dried to a powder by freeze drying, spray drying or vacuum drying. Apart from the production a small quantity of instant tea, all other types of innovations in the Sri Lankan tea sector blended teas, flavored teas, tea bags and tea in packets can be considered incremental innovations.



**Figure 2:** Contribution of incremental innovations to the total tea exports in Sri Lanka, 1962

(Source: Based on Annual Reports of Sri Lanka Tea Board (various issues))

According to Figure 2, Sri Lanka started exporting tea packets in 1962, when they accounted for only 0.8% of the total export quantity. This figure gradually increased to 36% in 1987 and then declined to 30% in 2017. Sri Lanka started instant tea export in 1963 and tea bag exports in 1976. Exports of tea bags and instant tea experienced slower growth compared to tea packets in the time period studied. The total contribution of incremental innovations determined on the data in Figure 2 on the export of tea packets, bags and instant tea has not shown noteworthy growth since 1996.

The initial positive trend of incremental product exports (tea packets and bags) could be explained by the policies adopted to promote value added tea exports under the export-oriented trade liberalization in Sri Lanka beginning in 1977 (Ariyawardana, 2001; Ganewatta *et.al*, 2005). Recognizing the importance and potential of tea bags and retail packets as an alternative to bulk tea export, the Sri Lankan government promoted value added exports through two main institutes: 1) the Sri Lanka Tea Board (SLTB); and 2) the Export Development Board of Sri Lanka (EDB). The EDB initiated the Custom Duty Rebate Scheme and Export Expansion Grant Scheme to promote incremental innovation in the 1980s. Under these two schemes, tax breaks and grants were provided that encouraged Sri Lankan exporters pursue export expansion through incremental innovation. At the same time, the SLTB initiated a promotional support scheme for tea bags and tea packet for exporters in 1991.

Under this initiative, tax breaks of 40% for tea bags and 20% for retail packets were granted to exporting firms (Ganewatte, 2005). In addition, the SLTB provided a 50% interest rate subsidy on loans for the purchase of tea bagging machines, which increased in number by 75% during 1995-1998 (Kelegama, 2003). Also, complete duty exceptions for tea bag packing machinery and color separators were offered. To encourage more tea bag and packet exports, cash grants were provided to exporters who had increased the volume and export price of processed teas over the previous year. The increases in exports of tea bags and retail packets clearly shows that Sri Lankan tea exporters positively responded to policy initiatives taken by the government to increase innovation.

The decline of value-added tea exports from 44% in 1996 to 31% in 2000, and then sluggish growth (37% in 2017), can be attributed to both domestic and international factors. Domestic factors include: 1) the failure to capture new customers and markets through incremental and radical innovations; and 2) an inability to come up with inputs such as machines and materials needed for bagging and packaging at the local level. Most these inputs were expensive and had to be imported. International factors include: 1) competition from other tea-producing countries particularly Kenya and Vietnam; and 2) import restrictions from buying countries and trade embargos. For example, the liberalization of the tea market in Russia, second largest importer of Sri Lankan tea during the early 1990s, had a profound impact on Sri Lanka. Up to that time Russia mainly imported packaged tea from Sri Lanka. However, to control tea packet and tea bag imports, Russia imposed a 10% import duty of bags and packets while imposing no duties on bulk tea. In 1997, the import duty on pre-packed tea and bulk tea was increased to 20% and 5% respectively. Although the import duties were reduced after the WTO discussions, Sri Lankan tea brands, with teas packaged in Sri Lanka, had to compete with teas packaged in Russia by Russian packers established during that time (Embassy of Sri Lanka in the Russian Federation, 2015).

Apart from the aforementioned incremental innovations in tea blending, flavoring, bagging and packaging, Sri Lanka has also tried some radical innovations. These include ready-to-drink teas, soluble

instant tea, tea concentrate, catechin mixture, carbonated tea, tea sherry, tea cordial, tea mock tail and tea capsules for espresso machines. While few products developed by the private sector, such as ready-to-drink teas and tea capsules are being exported in small quantities, and some developed by the Tea Research Institute of Sri Lanka are being tested for commercial purposes by the private sector, most other efforts have been discontinued at the experimental stage.

We believe Sri Lanka should not give up on such radical innovation efforts. Ariyawardana (2001) has pointed out that in the global tea trade there will be a significant role for incremental and radical innovations in tea because of the sophistication of tea consumption patterns. Future demand for tea is likely to be different from that of the past (orthodox black tea leaves brewed in teapots), and there could be more demand for convenience-oriented tea products. Growing dietary health and beauty concerns have increased the consumption of tea in various forms, as tea is considered to have many health benefits. Although there appears to be a strong demand for incremental and radical innovations in the tea consumption market, Sri Lanka has not stepped up to exploit it while Japan has.

We analyzed the tea product basket of Japan to assess to what kind of incremental and radical product innovation is taking place in the Japan tea industry. One major observation was that, unlike in Sri Lanka, tea is produced and consumed in many different beverage and non-beverage types in Japan. In contrast to Sri Lanka, which exports up to 90% of its tea production, Japan domestically consumes 96% of the tea it produces.

In Japan, the tea plant is exposed to many different types of processing methods, there are vast product and process variations and many different beverage and non-beverage products and types are produced. According to Table 2, green tea is the major tea type produced in Japan. Different types of green teas are produced using different processing methods. *Sencha*, the main green type produced, accounts for 58% of the total tea production, while *gyokuro*, *kabusecha*, *matcha* and *tamaryokucha* — other types of green tea — collectively account for 11% of tea production. The remaining 31% is made of a variety of green teas (*kyobancha*, *hojicha*, *kukicha*, *konacha*, *tencha*, etc.), black teas and oolong teas, fermented teas and white teas. There is also a wide price variation among the green teas produced using different processing techniques. Sri Lanka, on the other hand, grows much tea, produce much more green leaf output, but only produce two types of black teas (orthodox and CTC) and small quantities of green and white teas. Sri Lanka has not been able to come up with innovative processing techniques and has not been able to generate valued-added income by coming up products that cater to different consumer groups and tastes.

In Sri Lanka, there were 710 green leaf processing factories in 2016. Out of the total, 700 (99%) were managed by the private sector, while the rest (1%) were owned by the government. About 98% of the total production of these factories is sold at the Colombo Auction as primary product (bulk tea) and only 2% is sold through direct sales (Hemaratne, 2016). According to a recent report from the Tea

Factory Owners' Association, 62 of the 710 factories have either closed down or reduced their production due to lack of green leaf production (Ranasinghe, 2019). Some factories operate only two or three days per week. An emphasis on economies of scale to reduce cost of production of black tea, rather than developing methods to gain a competitive advantage such as product innovation appears to have hurt the tea industry in Sri Lanka.

**Table 2.** Major type of green teas produced in Japan

Sub type	Production share (%)	Price (Yen/kg)
<i>Sencha</i>	58.6	1,800
<i>Gyokuro</i>	0.3	5,462
<i>Kabusecha</i>	5.4	1,552
<i>Matcha /Tencha</i>	2.8	3,134
<i>Tamarykucha</i>	2.8	1,644

Source: Ministry of Agriculture, Forest and Fisheries, Japan, (2017)

Although the total production volume in Japan is about one third of Sri Lanka, there are 4,698 factories in Japan (Table 3). These factories basically fall into two groups: 1) factories producing primary output, and 2) factories producing finished products. A total of 892 factories (19% of all tea factories) produce finished products. Of these 74% are sole proprietorships. These small-scale tea processing factories are very common in Japan and they produce a number of innovative tea products. At a typical family-owned tea processing factory, about 70 tons of primarily processed tea is converted into 30 different types of tea beverages annually.

Apart from the beverage types, there are a vast range of non-beverage tea products produced in Japan (Table 4). These products can be considered as radical innovations in the tea industry. According to our observations and findings, many of these products are created and manufactured in small and medium scale enterprises (SMEs) and they are supported by the government institutes established in each prefecture for technical knowhow and production and testing facilities. As revealed at the interviews, some small-scale tea growers in Japan produce tea-based non-beverage type products in small-scale. Some of these products are sold under their own brand names, at their own sales outlets or regional supermarkets.

**Table 3.** Types of tea processing factories in Japan according to ownership

Ownership	Type of output			
	Primary product		Finished products	
	No. of factories	%	No. of factories	%
Sole proprietorships	2763	72	664	74
Farmer groups	363	10	58	7
Registered Agricultural Unions	118	3	29	3
Private companies	419	11	64	7
Agricultural cooperatives	140	4	72	8
Other	3	0	5	1
Total	3806		892	

Source: Based on the Annual Report of Central Tea Association in Japan, 2018

**Table 4.** Examples of non-beverage tea products in Japan.

Confectionary	Culinary products	Cosmetics	Product derivatives
Chocolate	Wasabi green tea	Soap	Food supplement
Ice cream	Green tea noodles	Face wash	
Pudding		Shampoo	
Cake		Creams	
Musket		Perfumes	
Cookies		Tea tree oil	

Source: Based on the survey conducted in Kyushu, Japan, 2019

Large-scale non-beverage type tea-product producers source their raw-materials (green leaves or intermediate products such as matcha) from their own tea plantations or from the suppliers. JA, the Japanese Agriculture cooperative also play a role in linking growers to producers. Although an actual count could not be taken, observations at large Japanese supermarkets show that there are hundreds of SMEs using tea as an ingredient to make thousands of different products in Japan. The tea-based confectionary industry is highly developed and is mainly comprised of small- and medium-size family businesses. An ice-cream named “Ceylon milk tea ice-cream” is available in Saga that generates income and jobs for Japanese not Sri Lankans.

Such efforts are hardly seen in Sri Lanka. The survey conducted with 43 tea manufactures in Sri Lanka revealed that innovation was something beyond their mandate. Of the 43 firms, 25 (58%) are large firms whose annual export quantity exceeds 1 million kilograms. Their main product portfolio is made up of blended, flavored and packed tea improved through incremental innovation. Some firms (30%) have tried radical innovations such as introducing tea concentrate, tea aroma, ready-to-drink (RTD) beverages, tea energy drinks, and tea cordial but had little success marketing them. Innovation output has been very low. Only seven products were invented in 2013-2018 time period and of them were the result of incremental innovations. None of the surveyed firms have tried to create products for local market and ideas that would be categorized as radical innovations are new and not pursued.

Although attempts have been made to make new beverages, there are hardly any tea-based non-beverage products in Sri Lanka.

### **c) History of tea innovations in Sri Lanka and Japan**

Tea was first introduced from China to Sri Lanka in 1824 by the British followed by tea plants brought from India in 1839. Commercial cultivation of tea in Sri Lanka was started by a Scotsman named James Taylor in 1867. Cultivation techniques and processing technology to make orthodox black tea and other teas were introduced by the British. There was a high demand for tea produced by the British in Ceylon in the world market owing to the unique climatic and soil conditions in Sri Lanka, which gave rise to a tea, many say, with superior taste, flavor and aroma. The British brought in Tamil workers from India to work in the tea plantations for relatively low wages making tea production and prices low. Sir Thomas Lipton started purchasing Ceylon tea and distributing it through Europe and the U.S. in the 1890s. After that tea production was very profitable in Sri Lanka and tea became the largest money-generating sector of the economy.

Although many things have changed in the tea industry - soil fertility and pH, socioeconomic conditions of the plantation workers - tea production and processing techniques have changed very little in Sri Lanka. Since independence from the British in 1948, there has not been a significant contribution from the Sri Lankan scientists or industrialist to the tea industry in terms of innovation, except for introducing some new tea cultivars and incremental innovations in blending, flavoring and packaging tea.

As for Japanese tea history, written records say that both tea drinking and the tea planting were introduced from China by Japanese monks in 805 (Brekell, 2018). By 1867, when commercial tea cultivation was just starting in Sri Lanka, Japan was already a major global tea exporter. At end of 19th century, Japan exported more than 70% of its total tea production of and only silk was a bigger export commodity (Sugiyama, 2012). At this time, the main product was pan-fried green tea, a tea type originally introduced from China, and the U.S. was the main export destination for Japanese tea. In 1738, “*Japanese sencha*” was invented. In 1835, using a new innovative process, Japanese developed “*Gyokuro*” tea, which even today fetches high prices in Japanese tea markets. The Japanese continued to build on this foundation of quality improvement and innovation laid in early stages in the Meiji era mainly by: 1) the establishment of quality standards; and 2) direct government intervention for trade fairs and skill development.

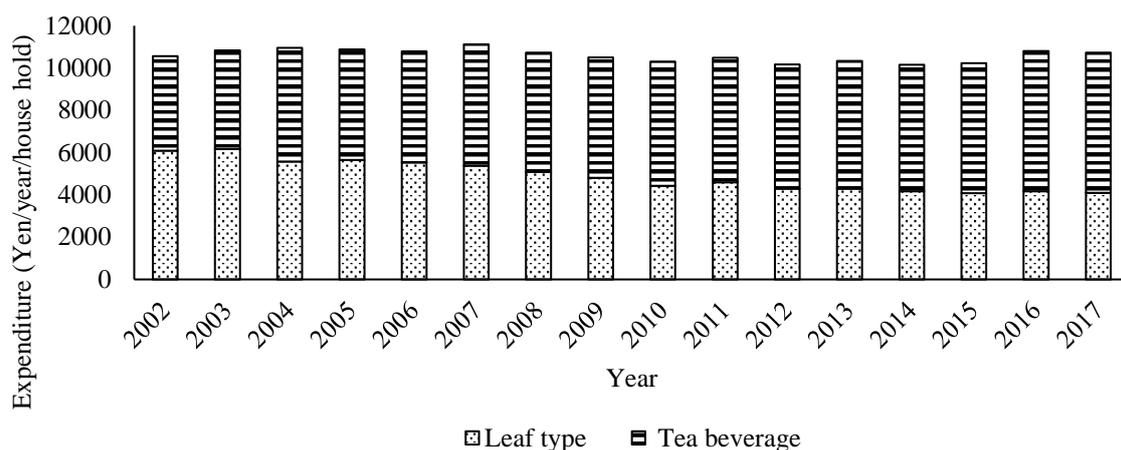
In the 20th century, the Japanese export tea market faced major challenges with innovations. The first challenge was cheap, good quality tea exports from countries such as India and Sri Lanka. Japanese tea exports declined from 23,142 tons in 1918 to 7,138 tons in 1921 and American tea drinkers began consuming black tea from India rather than green tea from Japan. To address the loss of markets, Japan

turned to product innovation and began pushing “steamed *sencha*”, a variation of the tea developed by the Japanese in 1738. Steamed *sencha* was upgraded and marketed in accordance with consumer preferences in the U.S. (Florent, 2012). As massive tea exports from India and Sri Lanka continued to flood traditional markets, Japan began looking for new markets. Attention was turned to countries in the Soviet Union and the Middle East a new innovative tea was invented *Mushi-sei tamaryoku-cha*, a steamed tea similar to the Chinese green tea favored in these places (Florent, 2012).

World War II (1940-1945) paralyzed international trade and the quantity of Japanese tea exports dropped to 1,500 tons by 1945. In Japan, it became increasingly difficult to maintain tea plantations and many were transformed into fields for growing vegetables to feed a starving population. In the post-World War II period, tea was chosen as one of the products that was to be exchanged for food and fuel, and this boosted plantations and factories (Florent, 2012).

After World War II. Japanese tea producers focused not only on export markets but also on domestic markets and had to deal with competition from emerging rivals such as Taiwan and a lack of labor on the tea plantations as rural people moved to the cities where wages were higher. This resulted in higher wages on the tea plantations which in turn increased the price of tea (Sugiyama, 2012). One way Japanese tea producers overcame these challenges was by introducing many new, innovative beverage and non-beverage products with higher added value. The rapid development of Japan increased the purchasing power of Japanese consumers, creating increased demand for more expensive Japanese tea.

To get a picture of what is happening in the Japanese tea market today, we analyzed recent consumption trends in the domestic tea market in Japan using household expenditure of tea. According to Figure 3, during most parts of the 2000s and 2010s, the average annual household expenditure for tea remained constant: — around 10,000 yen a year — but expenditure on leafy type tea declined by 32% while the expenditure for ready-to-drink (RDT) beverages increased by 48% during period between 2002 and 2017.



**Figure 3:** Household tea expenditure in Japan, 2002 – 2017

(Source: Based on the Annual Report of Central Tea Association in Japan, 2018)

This clearly shows that consumption patterns have changed, presumably due to the changes in the lifestyle of tea drinkers and a wide range of choices of styles, tastes and packaging of tea. These findings clearly show the impact of radical innovation on the tea industry of Japan (See Table 4). The packaging or RTD beverages have changed a great deal. Canned green tea was introduced in 1985, tea in PET bottles began in 1986, followed by milk tea and lemon tea in containers in 1990 (Japan Management Association, 2016). Table 5 shows RTD tea production for the domestic market in Japan based on container and tea types. According to this data, RTD tea in PET bottles is more popular than tea in other container types. This clearly shows a radical innovation transition from leafy type of tea to RTD tea, followed by incremental innovations in package types addressing consumer preferences for different kinds of packaging - such as aluminum cans, steel cans, glass bottles, PET bottles and paper packs - presumably chosen based on convenience. Through these adaptations, the Japanese tea industry has thrived in the face of changing consumer habits and increased competition from other beverages.

**Table 5.** Production share of RTD tea according to container type in 2017 (%)

Type of container	Green tea	Oolong tea	Black tea	Mugi tea	Blended tea	Other tea beverage	Total
Aluminum cans	0.2	0.3	2.9	0.1	0.7	0.7	0.7
Steel cans	1	0.7	2.9	0	0.9	0.4	1.1
Glass bottles	0	2.3	0	0	0	0	0.2
PET bottles	96.3	94.2	74.4	97.3	0	79.9	92.4
Paper pack	2.6	2.5	19.2	2.6	98.2	18.8	5.5
Other	0	0	0.6	0	0.1	0.1	0.1

Source: Based on the Annual Report of Central Tea Association in Japan, 2018

Japan has never stopped innovating and it seems likely that it will continue to do so to overcome new challenges facing the tea industry. A case study conducted by Takano and Kanama (2019) in

Sashima, Japan on an effort to develop a new black tea market sheds light on this. Here, researchers have conducted several trial and error experiments to improve black tea in Japan. As revealed in this study, Japanese farmers visited advancing farmers in Sri Lanka together with some experts from Japanese universities and research institutes. Afterwards, they came up with their own black tea processing method that suits for Japan. Japanese farmers learned technology from researchers and even farmers in Sri Lanka and this led to farmers in Japan coming up with new black tea processing techniques. We want to highlight the fact here that if Ceylon tea exporters in Sri Lanka want to radically innovate tea production in terms of packaging, there is already a wide variety of beverages in such packaging in international markets. Ironically, although there are many RTD beverages available in Sri Lankan market some of which are unhealthy because of high sugar content hardly any tea-based RTD beverage could be found Sri Lanka. Although it cannot be generalized, our own interviews with the Sri Lankan and foreign tea consumers in Sri Lanka indicate that there are no RTD tea beverages nor places that serve quality Ceylon tea in Sri Lanka.

### **Conclusions and Policy Implications**

The primary objective of this study was to compare and contrast the existing situation of the tea industries in Sri Lanka and Japan in relation to product innovation through historical analysis. In order to study existing situations of product innovation completely, we need to conduct full scale surveys in both Sri Lanka and in Japan. For our study in Sri Lanka, we surveyed one fourth of the nation's tea exporters selected by using stratified random sampling technique. In Japan, the majority of our findings came from data published by the Japanese government or tea-related organizations. Our major finding in terms of product innovation was that, in spite of its lower tea production volume compared to Sri Lanka, Japan has come up with a large number of innovative tea products through incremental and radical innovations. Many factors, both domestic and international, have contributed for these incremental and radical tea innovations.

To make the Sri Lankan tea industry more prosperous and sustainable, the Sri Lankan government and tea producers should come up with a more innovative strategy to develop new products and processes in the tea industry and figure out how to market them. Innovations could be promoted in small and medium scale processing factories, similar to a lot of innovations takes place in Japan. Large factories in Sri Lanka, which have been closed down or are running at a loss for not having enough green leaf to process, could easily be converted to innovative producers of beverages and non-beverage tea products and not have to rely on large quantities of raw green tea leaves to survive. Some factories have taken initiatives such as producing organic tea, hand crafted tea and wild teas, but they have been handicapped by a lack of technical support. Related industries such as food processors, beverage manufacturers and bottlers, cosmetic manufactures could be encouraged to come up with tea-based products and add more value to the available supply of green leaf. By establishing small and medium

scale processing centers in tea cultivation areas the farmers could benefit from positive externalities such as improved skills and knowledge and developed infrastructure. We believe that in Sri Lanka, there is a high potential to utilize existing institutions to promote innovative tea production.

In terms of research and development, already established institutes such as the Tea Research Institute, Industrial Technology Institute, Food Research Unit of the Agriculture Department and Food Science departments of the universities could contribute actively to innovating tea-based products and processes. A strong link between producers, manufactures, exporters and aforementioned institutes is an essential requirement to encourage product innovation. If technology is a limiting factor, Sri Lanka could promote Foreign Direct Investment in the tea sector and invite Japanese companies to produce innovative products for export purposes. This has the potential to be a WIN-WIN situation for Sri Lanka and Japan where Japanese companies could get cheaper raw materials and Sri Lankan companies earn foreign exchange while learning new technologies from Japan. To make product innovations sustainable, marketing and figuring out how to get Sri Lankan consumers to buy new products and develop export markets abroad is inevitable.

As many new product innovations fail Sri Lanka needs to develop a long-term strategy and successfully market products that find a market or niche. Sri Lanka is a top tourist destination and has had some success promoting tea-based tourism. Some plantations already sell new innovative products to tourists and perhaps these products could find global markets under the Sri Lanka or Ceylon brand.

In summary, as has already happened in Japan, incremental and radical innovation is imperative to having a sustainable and thriving tea industry in Sri Lanka. To do this established farmer networks, plantations, processing facilities, and research and development institutes have to be better informed and awakened to the need for such innovations and then be effectively oriented and utilized in the innovation process. Developing a passion may work best in promoting policies and support for innovations.

#### **List of Abbreviations**

WTO – World Trade Organization

RTD – Ready to Drink

PET – Polyethylene terephthalate

CTC – Crush, tear and curl

SLTB – Sri Lanka Tea Board

EDB – Export Development Board

SME – Small and Medium enterprises

WWII - Second World War

### **Declarations**

### **Competing interests**

The authors declare that there are no competing interests

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## **REFERENCES**

- Ariyawardana, A. (2001). Performance of Sri Lankan Value Added Tea Producers: An Integration of Resource and Strategy Perspectives. Unpublished Doctoral Dissertation. Palmerstone North, New Zealand: Massey University.
- Brekell, P.O., (2018) The Book of Japanese Tea, Japan. Tankosha Publishing Co. Ltd,
- Capitanio, F., Coppola, A. and Pascucci, S. (2010), “Product and Process Innovation in the Italian Food Industry”, *Agribusiness*, Vol. 26 (4), pp. 503-18, DOI 10.1002/agr
- Central Bank of Sri Lanka. (2018). *Annual Report of 2018*. Colombo, Sri Lanka.
- Central Tea Association in Japan. 2018. *Tea Related Documents*, Tokyo, Japan.
- Christensen, J.L, Rama, R., and Tunzelmann, V.N. (1996). “Innovation in the European Food Products and Beverages Industry”, European Innovation Monitoring System (35) Aalborg, Denmark available online at <http://aei.pitt.edu/50001/1/A9241.pdf>
- Ranasinghe, H., (2019 October 22<sup>nd</sup>). Tea Factory Owners Say Facing Continued Pressure to Cease. Daily Mirror, available online at, <http://www.dailymirror.lk/business-news/Tea-factory-owners-say-facing-continued-pressure-to-cease-operations/273-176535>
- Deligianni, I., Voudouris, I., Lioukas, S. (2014). “The Relationship between Innovation and Diversification in the Case of New Ventures: Unidirectional or Bidirectional”, *IEEE Transactions on Engineering Management*, Vol. 61 (3), pp 642-475, DOI: 10.1109/TEM.2014.2312732
- Embassy of Sri Lanka in the Russian Federation. (2015). Sri Lanka Exports to Russia. Retrieved dated 02/01/20120 from, <http://www.srilankaembassy.ru/en/sri-lanka-s-exports-to-russia>
- Florent, (2012). “When Japanese Tea Shone in the world: The Development and Export of Sencha (1853-1918)”. Japanese Tea Sommelier. Retrieved dated 02/01/2020 from, <https://japaneseteasommelier.wordpress.com/2012/04/14/when-japanese-tea-shone-in-the-world-the-development-and-export-of-sencha-1853-1918/>

- Ganewatte, G., Waschik, R., Jayasuriya, S., Edwards, G. (2005), "Moving up the Processing Ladder in Primary Product Exports: Sri Lanka's "Value-Added" Tea Industry", *Agricultural Economics*, Vol. 33 (3): 341-350, DOI: 10.1111/j.15740864.2005.00073.x
- Graham, H.N. (1992), "Green Tea Composition, Consumption, and Polyphenol Chemistry", *Preventive Medicine*, Vol. 21 (3), pp 334-350
- Hemaratne, H.D. (2016). "The Role of the Sri Lankan Tea Producers in Tea Value Chain". United Nations Conference on Trade and Development. Multi-year expert meeting on commodities and development. Geneva, 21-22 April 2016. Available online, [https://unctad.org/meetings/en/Presentation/CI\\_MEM2\\_2016\\_Hemaratne.pdf](https://unctad.org/meetings/en/Presentation/CI_MEM2_2016_Hemaratne.pdf)
- International Tea Committee. (2019). *Annual Bulletin of Statistics*. London. United Kingdom.
- Japan Management Association. (2016). "Black Tea Increases Its Presence as an Everyday Beverage". Foodex Japan 2017. Available online at, [https://www.jma.or.jp/foodex/en/img/trends/today/japan\\_today\\_coffee07.pdf](https://www.jma.or.jp/foodex/en/img/trends/today/japan_today_coffee07.pdf)
- Kasmire, J, Korhonen, J.M., Nikolic, I. (2012), "How Radical is a Radical Innovation? An Outline for a Computational Approach". *Energy procedia*, Vol.20 (2012), pp. 346 –353. DOI:10.1016/j.egypro.2012.03.034
- Kelegama, S. (2003). "Sri Lanka" in *Directions in Ingcó, M.D. Development: Agriculture, Trade and the WTO in South Asia*. Washington, D.C, World Bank. pp 114-127
- Koch, W., Zagorska, J., Marzec, Z., Kukula-Koch, W. (2019). "Applications of Tea (*Camellia sinensis*) and Its Active Constituents in Cosmetics", *Molecules*, Vol. 24 (23): 4277 available online at, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6930595/>
- Kuroda, Y., Hara, Y. (2004). "Food and Industrial Applications of Tea Catechins", *Health Effects of Tea and Its Catechins*. Boston, MA, Springer pp 93-98
- Lockett, A., Thompson, S. (2001). "The Resource Based View and Economics". *Journal of Management*, Vol. 27 (6). pp 723-754. <https://doi.org/10.1177/014920630102700608>
- Martinez, M.G, Briz, J. (2000), "Innovation in the Spanish Food & Drink Industry", *International Food and Agribusiness Management Review*, Vol. 3 (2000): 155–176 available online at <https://www.ifama.org/resources/Documents/v3i2/Martinez-Briz.pdf>
- Ministry of Agriculture, Forest and Fisheries. (2017). "Current outlook of Japanese Tea" Available online at, <https://www.maff.go.jp/e/policies/agri/attach/pdf/index-1.pdf>
- Minarelli, F., Raggi, M., Viaggi, D. (2015), "Innovation in European food SMEs: Determinants and Links between Types", *Bio-based and Applied Economics*, Vol. 4 (1): pp 33-53, DOI: 10.13128/BAE-14705
- Organization for Economic Co-operation and Development. (2005). Oslo Manual of 2005 Retrieved dated 15/01/2020, from, <http://www.oecd.org/science/inno/2367614.pdf>
- Rogers, M. (1998). "The Definition and Measurement of Innovation". Available online at, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.194.4269&rep=rep1&type=pdf>
- Sledzik, K. (2013). "Schumpeter's View on Innovation and Entrepreneurship". *SSRN Electronic journal*, available online at, [https://www.researchgate.net/publication/256060978\\_Schumpeter's\\_View\\_on\\_Innovation\\_and\\_Entrepreneurship](https://www.researchgate.net/publication/256060978_Schumpeter's_View_on_Innovation_and_Entrepreneurship)

- Sri Lanka Tea Board. (2012, 2014, 2016 & 2018). Tea Market Update of 2012, 2014, 2016 & 2018, Colombo. Sri Lanka.
- Sugiyama, S. (2012). "The Development of Tea Exports" in Japan's Industrialization in the World Economy 1859-1889. Export Trade and Overseas Competition. New York, USA. Bloomsbury academic publication, pp140-170.
- Takano, R., Kanama, D. (2019). "The growth of Japanese Black Tea Market: How Technological Innovation Affects the Development of a New Market". *Journal of Economic Structures*, Vol. 8, Article no. 13 available online at, <https://link.springer.com/article/10.1186/s40008-019-0143-5>
- Tea Exporters Association of Sri Lanka. (2017). Tea grade nomenclature. Available online at <http://teasilanka.org/tea-grade>
- United Nations Conference on Trade and Development. (2016). *TEA: An INFOCOMM Commodity Profile*. Retrieved dated 02/01/2020 from, [https://unctad.org/en/PublicationsLibrary/INFOCOMM\\_cp11\\_Tea\\_en.pdf](https://unctad.org/en/PublicationsLibrary/INFOCOMM_cp11_Tea_en.pdf)
- Wyche, S., Sengers, P., and Grinter, R. (2006). Historical Analysis: Using the Past to Design the Future. Retrieved dated 15/01/2020 from, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.92.7811&rep=rep1&type=pdf>