Transformation to Organic Production among the Small Tea Holders for Sustainability – Myth or Reality?

K. N. Selvaraj[1]* and R. Ganesh[2]

Abstract

The focus of the paper is to analyze the problems and issues in transformation to organic tea production, price benefits that can be accrued, present level of organic production and farmers' awareness and adoption using both the primary and secondary data collected from various published sources and personal interview of the sample of farmers. The sample of farmers comprises of 100 beneficiaries of Participatory Guarantee System of India (PGS-India), four Small Tea Growers Societies, Certified Organic Tea Estate sector and three organic large tea growers including Small Tea Farmers' Producer Company. Time series data on domestic prices, export prices for tea and organic tea, area under tea cultivation, productivity - before and after conversion were collected and analyzed. Though organic tea production is gaining momentum among the small tea growers, yield reduction after conversion is a major threat. Despite the fact that there is a yield reduction, our sample of organic tea growers were benefitted from higher remunerative price for their green tea leaves due to adoption of quality tea plucking practices with opinion that formal certification would help them to realize better prices due to market acceptance. As long as Small Tea Growers (STGs) could be able to realize premium market prices, they are ready for conversion. We also found from the soil sample analysis that there would be long term beneficial impact of organic tea cultivation on soil and productivity. Export price for organic tea is twice than that of normal tea but export share was minimal emphasizing the need for higher level of export for which formal certification is crucial since the organic tea exporters cannot source tea from uncertified STG organic farms. The awareness for certification is lacking though trainings and demonstration are being carried out by the various agencies. In this context of crisis of continuous price fall and loosing the export markets due to competitiveness, organic production is one of the alternatives among the STGs to have decent livelihood in the Nilgiris district of Tamil Nadu State of India. Creating awareness and resorting to formal certification to compete in the global market are warranted. The role of Primary Producers Societies (PPS) is critical in enforcing the quality for organic tea production and marketing.

Key word: Organic tea production, small tea growers, organic certification, export price, price volatility

[1] Professor (Ag. Econ), Tamil Nadu Agricultural University, Tamil Nadu, India
E.mail: knanjundiahs@gmail.com
[2] Environmental Researcher, The Earth Trust, The Nilgiris, Tamil Nadu
Email: sairganesh@yahoo.com
* Corresponding author

Rationale

The prolonged crisis in tea industries due to continuous sharp fall in tea prices since early 1999 led to livelihood tribulations among the small tea growers in India particularly in the Nilgiris district of Tamil Nadu State of India, where small tea holders are predominant. Though the primary price of Indian tea has increased in absolute terms, price tended to decline in real terms coupled with manifold increase in cost of production. The price received by Nilgiris tea growers per kg of tea in the year 1998 was Rs. 69 which drastically reduced to Rs. 57 and Rs. 38 per kg in the year 1999 and 2000, respectively. In the year 2002, the price received by the Nilgiris tea growers was Rs. 42. The green leaf tea prices for the last one decade hovering around Rs. 8 to 15 per kg which is less than the cost of production (The New Indian Express, February 15, 2016). According to a survey carried out by Indian Institute of Plantation Management (IIPM), Bangalore, the minimum cost of production of green leaf tea would be around Rs.17 and 50 percent of that would be added as social cost for the farmer, which means the minimum support price should be between Rs.25 to Rs.27 (http://timesofindia. indiatimes.com, 9th October, 2015). To overcome the crisis since 1999, various measures have been implemented to mitigate the crisis to sustain tea production and bring in the decent livelihood living to small holders. Among the several measures, production of organic tea is practiced for better price realization. The Tea Board of India is giving a big push to organic tea production in the country for the first time by providing 25 % more subsidy than the normal subsidy of 30 % and also 50% of the cost of certification will be paid as subsidy (The Telegraph, 4th June 2014). Further, the Government of India under Participatory Guarantee System (PGS) implemented the organic tea cultivation program in 100 acres of tea gardens comprising of 100 Small Tea Growers (STG) through Department of Horticulture. These initiatives are helping the farmers to practice organic tea cultivation in order to improve income by realizing premium price.

Objectives

The focus of the paper is to analyze the problems and issues in transformation to organic tea cultivation, price benefits that can be accrued, present level of organic production and farmers' awareness and adoption.

Methodology

Data were sourced from various published sources apart from personal interview with sample of farmers. Time series data on domestic prices, export prices for tea and organic tea, area under tea cultivation, productivity before and after conversion were collected. The set of questions relating to awareness, adoption and other related questions were administered to collect information from the sample of farmers on organic tea cultivation. The sample of farmers comprises of farmers- beneficiaries under Participatory Guarantee System of India (PGS-India), Small Tea Growers Societies, large tea growers practicing organic farming over

the period and Estate Tea Sector including Tea Farmers Producer Company. The survey was conducted during the month of October and November, 2016 with help of the co-author. PGS is a quality assurance initiative of the Department of Agriculture and Cooperation under Ministry of Agriculture and Farmers Welfare, Government of India which is decentralized organic farming certificate system emphasizing the participation of stakeholders, including producers and consumers and operates outside the frame of third party certification. Under PGS, 16 and 1619 certificates were issued during 2015 and 2016 respectively (www.pgsindia-ncof.gov.in). Details of farmers- beneficiaries under PGS are provided in Table 1.

With regard to support to small tea growers, Tea Board of India encourages the farmers to form groups with at least 30 members in each to avail the assistance. In South India, 130 groups have been formed in the last one-and-a-half years (The Hindu, September 20, 2015). The collectivization of small tea growers can be considered success to improve their overall livelihoods. Such collectivization as one of the coping strategies with support of Tea Board and UPASI by formation of SHGs and PPS are emerging in the Nigiris to overcome the price crisis (Table 2). In Nilgiris, the PPSs are federated at two levels. There are three Federations namely Federation of Small Tea Growers' Associations - Gudalur-Pandalur (FESTA-GR), Federation of Small Tea Growers' Associations - Ooty-Kundha (FESTA - OK) and Federation of Small Tea Growers' Associations Coonoor-Kothagiri (FESTA-CK) established at sub-regional levels. At district level Federation of Small Tea Growers' Associations - Nilgiris (FESTAN) was established. Such collectiveness helped in production of specialty tea like high-value black tea, certified organic tea, golden tips, silver tips, white teas, green teas, oolongs and winter teas, ISO-certified with HACCP. Establishing Mini and Micro tea factories also helps in establishing direct market linkages with export market for packed tea with a trade mark.

Four STGs were contacted and discussion was made with officials and members of the societies and the details are presented in Table 3. The Kundhai STG Society, which was registered during 2010, had 25 members and presently the society has 80 members due to its active functioning. The society is enforcing the quality parameters among the members including organic farming. The Eswarar Society is one of the prominent and awarded societies in the Nilgiris district, which is enforcing various quality parameters among the farmers for quality tea production. The members are supplied with soil health card to assess the status of the soil for optimum allocation of fertilizer inputs. Sivalinga and Sairam STG Societies were recently registered during January 2016 and purposefully contacted to assess the members' awareness on organic tea cultivation.

The sample of large tea growers, who have been practicing organic tea cultivation, are using the available organic inputs in their farms and sourcing organic inputs from the outlets, mostly from the Horticulture Research Station, Tamil Nadu Agricultural University, Udhagamandalam. Bio-fertilizers such as *Azospirillum, Azotobacter, Rhizobium, Phosphobacteria, VAM,* Panchagavya, Dasagavya, Earthworm and Vermi compost and biocontrol agents such as *Metarhizium anisophile, Paecilomyces lilaciuns, Beauveria bassiana, Verticillium lecanii, Trichoderma viride* and *Pseudomonas fluorescens are* produced by Horticulture Research Station and supplied to the farmers at a reasonable rate.

The United Nilgiri Tea Estates Company Limited was contacted and it is the first producer of organic tea in India since 1994. The company built certification guidelines for fair trade for tea plantation and is one of the first estates to be certified in the year 1994. The details of certified area and volume are presented in Table 5.

Further, the Moonlight Tea Farmers' Producer Company Limited of Jagathala village was also chosen to examine the members' awareness on organic tea cultivation and present status of organic tea production. The company was registered in December 2014 with 100 members enrolled. The size of holding of members ranges from 10 cents to 0.61 ha. Presently, the company produces yellow tea, green tea and white tea and enforcing quality parameters for organic tea cultivation. Among the 100 members, 35 members since 2015 are practicing organic tea cultivation.

Empirical Results

Cost Escalation, Price Volatility and Continuous Fall

Increasing cost of production of tea in STG tea sector coupled with fall in productivity due to climate change, low fertility status of the soil, age of the tea bush, poor agricultural practices is putting downward pressure on profitability and income as the market prices for tea have been falling. Among various costs, labor cost, which accounts for around half of the unit cost of production of which approximately 55 to 75 percent is the cost of plucking, is the major factor bringing down the profit margin (IIM Report, 2015). Our estimates indicate that the cost of labor constitutes 85% of the total cost of cultivation (Table 6). Non-availability of labor and inflated labor wages compelling the STGs to use machineries and tools for tea leaf harvesting. Use of machines is promoted by UPASI to save labor cost however farmers are of the opinion that there is a quality deterioration which is mainly due to mechanical injury. Field survey estimates based on the front line demonstration by KVK-UPASI (Ramamoorthy and Shanmugam, 2013) show that average harvesting cost with the single-man harvesting machine is Rs. 2.40/kg whereas for two-men harvesting machine it was Rs. 2.19/kg. Lowest cost of harvesting with single-man harvesting machine was Rs. 1.93/kg, while the highest cost was Rs. 2.19/kg. For two-men harvesting machine, the range of harvesting cost was between Rs.1.96 and Rs. 2.53 a kg. Two workers operating a mechanical harvester for a day can bring in equivalent of leaf of 15 farmers hand plucking tea. Studies found that over time mechanically harvested tea bested hand plucked tea.

We found that the farmer of Red Hill Tea Estate has been practicing organic tea cultivation for the last eight years in 30 acres of land is of the opinion that the Kisan Craft machines promoted by UPASI is not amenable for old and China plantation since there is a chance of oxidization process due to cutting the half of the leaves. The farmer has been using the battery operated harvesting machine namely Kawasaki, imported from China for his 130 years China plantation. This machine harvests 50 kg of green leaves per day of eight hours and

he could be able to take regular harvest in 12-15 days interval. However, he could not realize higher remunerative price despite the fact that he grows organically.

Further, hikes in every other essential input including fertilizer, herbicides and pest control chemicals are reducing earnings and holding back investments in quality at a time when only good quality teas are competitive. Almost 80 per cent of the costs of producing tea are fixed and labour constitutes 50 per cent of the cost of production. The hike in cost of labour in tea manufacturing industries has also have an negative impact on STG as it was estimated that an additional Rs.4.12 per kilo for manufactured tea in North Easter Region (RE) of India and Rs. 3.44 per kilo in South India had to be met in the last two decades resulting in downward impact on prices of green tea leaves (Pallavi and Liby, 2012).

Dramatic fall in prices of green leaf tea is one of the most significant causes of the crisis in the tea industry. The green leaf tea prices for the last one decade hovering around Rs. 8.00 to 15.00 per kg which is less than the cost of production (The New Indian Express, 2/15/16). The price for green leaf paid by the tea production factories to growers fell from Rs 18 a kg in 1998-99 to Rs 10.30 and further to Rs 7.7 by 2000 (Time of India, 8/9/2016). In the last decade, the price has fluctuated and now stands at Rs 12-18 per kg (www.teaboard.org).The prices realized for South and North Indian tea provided in Table 7 show that aberration in price of South India tea was higher compared to North Indian tea due to various factors particularly due to quality.

Growers complain that the factories systematically beat down prices. One such measure to provide a guaranteed price to STG is the Price Sharing Formula (PSF), which was introduced by the Tea Board of India during 2004 based on the Sri Lankan model. The price-sharing formula envisaged that the sale proceeds were to be shared between the smallholder and the manufacturer-processor in the ratio of 60:40 and later the Tea Board had unilaterally changed it to 65:35. It is of the view that the present formula has not yielded the desired results due the lack of transparency. In order to assess the enforcement of such policy, data were collected for the month of September 2015. It was found that during the month, out of 155 Bought Leaf Factories (BLF), 115 BLFs paid the price to the growers more than the Price Sharing Formula Price (PSF) and 40 BLFs paid less the PSF price consequently it had impacted the small tea growers income.

Among the blocks, number of BLFs paid less than PSF was higher in Coonoor and Gudaur. In Coonoor block, out of 34 BLFs, 20 paid more than PSF and 14 less than PSF. In Gudalur, out of 11, 3 BLFs paid more than PSF and 8 BLFs paid less than PSF. Out of 64 BLF in Kotagiri block, 58 BLF paid more than PSF, while in Ooty block out of 31 BLFs, 25 paid more than PSF. Tea Board has constituted a Committee to fix monthly minimum average price for green leaves based on the scientific formula. According to Section 30 of Tea Marketing Control Order 2003, the district average price for green leaf for the month of November 2016 has been fixed as Rs.15.50/kg. All Bought leaf factories in the Nilgiris district are instructed to adhere to this average green leaf price while buying green leaf from the farmers. All field officials of Tea Board shall ensure that no bought leaf factory in their jurisdiction pays lower

than this price. To assess this enforcement for the longer period the data for March 2016 were collected for Coonoor block alone and it was found that 37 BLFs paid greater than PSF (Price Sharing Formula Price) and 5 BLFs paid less than PSF during the month of March, 2016. It is also found that eight Estate Factories (EF) paid greater than PSF and eight EFs paid less than PSF.

Price fall and impact on area

Tea is grown in nearly 70 per cent of cultivated area and it was 20840 ha in the Nilgiris district of Tamil Nadu State of India during 1981. Area was expanded continuously and reached the maximum of 66156 ha during 2007 due to various measures of Tea Board and UPASI and State Department of Horticulture. Thereafter declined sharply and area under tea was 55421 ha during 2013-14 recording a fall of 19.37 per cent since 2007. Number of STG estates has increased from 6375 during 1971 to 55601 during 1999 and presently the figures say it is closure 50,000. Consequently area under STG has increased from 7237 ha during 1971 to 36774 ha during 1999 and presently it is closure to 40,000 ha (www.teaboard.org). However a little over 6,000 small tea gardens in the Nilgiris are registered with the Tea Board covering an area of 7,000 hectares against an all India figure of 12,000 with an area of nearly 13,000 hectares. A crippling fall in green leaf prices that started in the late 1990s has led to a more than 20% reduction in cultivation area (Times of India, 8th September 2016).

Fall in prices both domestically and internationally and increase in cost of production is most significant causes for poor maintenance of tea gardens. Literature says more than 30 percent of the tea grown areas being above the economic threshold age limit (Pallavi and Liby, 2012, Tea Board, 1980) leading to decline in productivity affecting the farmers' livelihood in the district, which contributes more than 30 per cent of total area and production in South India. Since small tea sector constitutes more than 50 per with production share of more than 60 per cent, the price shock has long term impact on their livelihood system including migration and the economy as well. Nilgiris tea which constitutes about 23 per cent of India's total tea production is characterized by small holdings. According to the United Planters Association of Southern India (UPAS1) report, 56 per cent of the tea produced in Nilgiris is consumed domestically and the surplus is exported to over 100 countries. CTC method of tea manufacturing is popular and about 88 per cent of the tea is produced using CTC method and 10 per cent is produced using orthodox method while the rest is green tea production. The small growers of the Nilgiris contribute 14 per cent of the total South Indian tea production while their percentage of contribution to all India tea production is around 3 per cent.

Soil Fertility Status in Nilgiri District Commanding Alternatives

Soil fertility has declined considerably in the Nilgiris district due to intensive and chemical farming consequently the soil organic matter content has declined from six per cent to mere one per cent and soil pH has declined from the 6 to 4. Restoration of soil fertility is equally assumes vital importance for increasing the productivity and production of crops in the

context of marginalization land holdings (89.81 per cent of the farm holdings are marginal, 14.82 per cent are small and medium and only 0.37 is large) and shrinkage of cultivable land. Thanks are due to Tamilnadu Agricultural University, Horticulture Research Station, Udhagamandalam for playing vital role in compensating the fall in the organic status of soils and made the farmers in realizing the benefits of application of organic inputs through demonstrations and trainings. So far more than 46,000 farmers were imparted trainings on production technologies and use pattern of organic inputs and area covered under the various organic inputs is path breaking (Table 8).

Organic Tea Cultivation – Issues and Challenges

There are 77 organic tea gardens in the country covering an area of 15726 ha with current annual production of 11.09 million kg, which is 45% increase over the last seven years as shown in Table 9. Farmers resorted to organic tea for better price realization since the consumption of organic tea growing annually by 10% globally. However, trading organic tea is very insignificant when compared to black tea in volume terms. This is due to lack of awareness among the farmers about the certification process. We found that the farmers were of the opinion that there is a premium market for organic tea that commands high prices and it is also a solution to restore and increase the continuous depleting tea productivity under the present chemical farming practices. In most of the tea gardens atleast 13 pesticides are commonly used and the residues from these pesticides are left in the processed tea. There are records of pesticides being found in packed tea. However, European Tea Committee has recently completed the surveillance data on analysis of pesticide residues in tea and found that there is a low incidence of residue in South Indian tea which is far below the MRL (Business Line, 19th September, 2016). This is a clear indication of farmers' awareness in use of organic inputs and transforming to organic tea cultivation as evident from the Table 10 that the willingness of the sample growers in organic tea cultivation. Since Tea Board has been imparting training on organic tea cultivation and provision of higher level of subsidies for organic production, even the conventional tea growers in Nilgiris district are aware of cultivating tea by selecting appropriate pesticides so that MRL of pesticides will be lower than that proposed by EU, USEPA, Japan and Codex.

The beneficiaries of PGS of Kaggula village are cultivating tea conventionally without any inorganic inputs due to lack of capital to purchase inorganic inputs. Their age of plantations varies between 40-100 years. Mostly the growers are in the clutches of the tea agents who act as a middle mnn in the tea supply chain leading to lower price realization. On an average, the growers realizing a productivity of 7410-8645 kg/ha per annum and received price varies between Rs. 17-19/kg of green leaf based on grades. Since the farmers are not aware of the organic farming practices, the farmers were trained on preparation of Panchagavya and compost making. However, none of the beneficiaries of this village are aware of the organic practices to be followed in organic tea production as evident from the results presented in the Table 11. Similar observations were also made among the beneficiaries of Yedakkadu village. The present productivity among the beneficiaries of Yedakkadu village varies between 9880

and 14820 kg/ha. None of the beneficiaries are aware of the package of practices to be followed in organic farming. However, Mr. Radhakrishnan, he is a Lead Resource Person (LRP) among the beneficiaries has been practicing organic cultivation of tea in his 10.1 ha of land over five years period and realized a price difference of Rs. 4/kg compared to his counterparts. He has been resorting to harvesting by machine and he says machines save five labors and pluck 800 kg/day. However, due to machine harvesting, though the quality of the leaf is superior the days of interval of next plucking is longer resulting in low production.

The members of the STG we contacted are of the opinion that though they are not aware of the full packages of practices of organic tea cultivation and indicated their willingness to resort to organic tea cultivation despite fall in productivity. A few members of the Eswarar STG society produce 10-20 kg of white tea per month and supply to UPASI at Rs. 3500/kg by following the quality parameters. Those members followed the proper agronomic practices harvested 31893 kg/annum of green tea leaves in 31 rounds of plucking. However, other members realized 14524 kg/annum of green tea leaves by not adopting the best management practices. As a result, the quality green leaves of the members fetched Rs. 22.75/kg, while other members realized only Rs. 17.25/kg. Similar situations we also observed among the other tea growers though there is a difference in productivity and price realization due to various endowment factors. The farmers are eager to adopt organic tea cultivation practices as long as they have been provided adequate capacity building programs and market linkages.

The farmer of Red Hill Estate has been practicing organic tea cultivation for the last eight years, indicates that the required organic tea practices have not been followed. As a result the productivity realized was only 6175 kg/ha and price received was Rs. 16/kg. The farmer expressed that formal organic certification of his estate is critical for market acceptance and premium price. The farmer is willing to certify his tea garden as organic as long as the cost of certification is minimal.

We also found from the field survey that the Large Estate Sector (UNITEA) also experienced productivity decline due to conversion. In this estate sector 50% of the area of THE plantation is 30-80 years old and remaining part of the area is 20-30 years old. It is informed that yield started decreasing after 5 years of conversion and reaches a plateau due to longer interval period of next plucking. Normal plucking interval in a month is 12-18 days in this estate, while in the case of organic cultivation it ranges from 18-22 days resulting in decline in production. The estate tea factory also procures leaves from the farmers produced leaves conventionally as long as the green leaves are 70-80% good quality meaning that the composition of buds, soft stalk and coarse leaf does not exceed 20%. Such leaves fetch higher prices by Rs. 7-8/kg. This estate sector is strictly adhering to the norms of organic farming both in production and processing. Since it is the first certified estate in India, the trust worthiness of the tea produced is sustained over the period of time in the overseas market. As long as the small tea growers are in the umbrella of formal certified organic farming with a strict adherence, the factory is willing to procure green leaves from those farmers implying that there would be chances of STGs realizing premium prices under the present price crisis situation.

Though organic tea production is gaining momentum among the small tea growers, yield reduction after conversion is a major threat and reduction was almost 42 per cent among the big tea gardens and estimated correlation coefficient reported in the Table 12 indicates that there is strong negative size productivity relationship signifying the importance of conversion to organic production by the small tea growers due to economies of scale. Crop loss is a major challenge- up to 40% reduction after conversion to organic and high cost of production mainly due to man days required when compared to non organic tea (more than 60%) were reported. Though farmers were of opinion that domestic price is not rewarding the additional effort put in and the consumers are not prepared to pay more than the regular tea price. The problems for gardens that wish to go organic are two-fold - yield drop and increase in cost of production. Sources say the average yield drop is 44 per cent over the conventional cultivation and over 65 per cent increase in the cost of production.

Our sample data also show that the farmers experienced reduction in productivity due to organic cultivation however premium price realization is a distant dream. On the other hand we found that there is a long term beneficial impact both interms of soil and crop productivity as evident from the soil sample analysis. We have collected soil samples and analyzed in the Soil Testing Laboratory of Ooty. We found that, the pH was 6.3 and organic content 2.05% in the case of Halakarai Organic Tea Farm, while the pH was 4.7 and organic content was 0.90% in the case of the beneficiary farm at Yedakkadu village. Further, the data depicted in the Figure1 show that the soil parameters of the members- beneficiaries of the PGS are below the parameters of a typical organic farm and there is large variation among the beneficiaries in Kaggula Village. This is a clear indication that the adoption of organic practices over a period of time will improve the soil and crop productivity particularly in the Nilgiris district as reported that the organic matter content in the district has declined from 6% to 1% and soil pH has decreased from 6 to 4. Literature evidences reported in the Table 13 also supported the long term beneficial impact of organic tea cultivation. Apart from long-term beneficial impact, the export prices reported in Table 14 evidently prove the higher price realization for organic tea. But organic tea export is minimal sharing hardly 2 per cent of total tea export emphasizing the need for bringing the small tea growers in to the umbrella of formal organic certification, who are now practicing and willing to practice organic tea cultivation.

At present, National standards for organic products have been formulated and Tea Board of India has been designated as the accreditation agency for tea. Development of technology and system of organic tea production by setting up model organic farms is under process. Financial assistance is also being provided by Tea Board for imparting training on organic methods of cultivation. Similarly other agencies both public institutions and NGOs are imparting trainings and conduct demonstrations on organic methods of tea cultivation. However there are no certified small tea growers in the Nilgiris district but the implementation of PGS-India is in the right direction for conservation of soil productivity and also benefitting the STGs by better price realization.

Conclusion and Recommendations

The focus of the paper is to analyze the problems and issues in transformation to organic tea production, price benefits that can be accrued, present level of organic production and farmers' awareness and adoption using the data using both the primary and secondary data collected from various published sources and personal interview of the sample of farmers. Though organic tea production is gaining momentum among the small tea growers, yield reduction after conversion is a major threat. Despite the fact that there is a yield reduction, our sample of organic tea growers were benefitted from higher remunerative price for their green tea leaves due to adoption of quality tea plucking practices with opinion that certification would help them to realize better prices due to market acceptance. As long as Small Tea Growers (STGs) could be able to realize premium market prices they are ready for conversion. We also found that there is a long term beneficial impacts both in-terms of soil and crop productivity as evident from the soil sample analysis we did. Export price for organic tea is twice than that of normal tea but export share was minimal emphasizing the need for higher level of export for which formal certification is crucial since the organic tea exporters cannot source tea from uncertified STG organic farms. The awareness for certification is lacking though trainings and demonstration are being carried out by the various agencies. In this context of crisis of continuous price fall and loosing the export markets due to competitiveness, organic production is one of the alternatives among the STGs to have decent livelihood in the Nilgiris district of Tamil Nadu State of India. Creating awareness and resorting to formal certification to compete in the global market are warranted. The role of Primary Producers Societies (PPS) is critical in enforcing the quality for organic tea production and marketing.

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Tables and Figures

Table 1 Number of sample farmers and the average size of holding under Participatory Guarantee System (PGS-India)

Area (ha)	Yedakadu Village		Kaggula Village	
	Number of farmers	Average size of holding (ha)	Number of farmers	Average size of holding (ha)
0.20 to 0.40	40	0.31	42	0.35
0.41 to 0.60	2	0.60	2	0.55
0.61 to 0.80	7	0.80	6	0.72
1.01 to 1.20	1	1.20	-	
Total	50	0.40 (20.24)	50.00	0.40 (20.24)

Source: Field Survey

Note: Figures in parentheses are total area

Table 2 Number of PPS – taluk-wise

Name of the Taluk	No	Name of the societies
Ooty	14	Easwar Small Tea Growers Society (T. Manihatty), Nanjkundaiah, Small Tea Growers Society(T. Manihatty), Kenthorai Small Tea Growers Society (Kenthorai), Hirodayya Sri Hari Small Tea Growers Society (Thuneri), Mahathma Gandhi Small Tea Growers Society (Kagguchi), Sri Mahalinga Small Tea Growers Society (Kundhachappai), Raja Rajeswar Small Tea Growers Society (Iduhatty), Sri Krishna Small Tea Growers Society (Kappachi), Hirodayya Small Tea Growers Society (Sholur), Muneeswarar Small Tea Growers Society (Baralatty), Seethala Devi Small Tea Growers Society (Thummanatty), Mahalingeswarar Small Tea Growers Society (Kambatty), Sree Meenambigai Small Tea Growers Society (Mynalai) and Swamy Vivekanandha Small Tea Growers Society (Honnathalai)
Kotagiri	2	Hirodayya Small Tea Growers Society (Milidhane) and Mahasakthi Small Tea Growers Society (Pethalla)
Gudalur	3	Navajothi Small Tea Growers Society (Celakkunna), Arottupparai Small Tea Growers Society (Arottupparai) and Sree Madurai Small Tea Growers Society (Sree Madurai)
Kundah	14	Sree Karpagavinayagar Small Tea Growers Society (Manjacombai), Mahalakshmi Small Tea Growers Society (Ithalar), Sree Krishna Small Tea Growers Society (Appukodu), Karigalvalai Small Tea Growers Society (Karigalvalai), Hosahatty Small Tea Growers Society (Melur Hosahatty), Ganga Small Tea Growers Society (Melur), Hirodayya Small Tea Growers Society (Denad), Sree Lakshmi Small Tea Growers Society (Denad), Saraswathy Small Tea Growers Society(Naihatty), Thenral Small Tea Growers Society (Melur), Kauveri Small Tea Growers Society (Melur), Bhavani Small Tea Growers Society(Melur), Yamuna Small Tea Growers Society (Melur) and Hethaiamman Small Tea Growers Society (Melur)
Coonoor	1	Sree Muthumariamman Small Tea Growers Society(Kilinjada)
Total	**34**	

Source: Compiled from various sources by authors

Table 3 List of Small Tea Growers Societies and enrollment

Name of the STG Society	Year of registration	Members	Average size of holding (ha)
Eswarar STG Society, T. Manihatty	2006	82	0.40 - 2.02
Kundhai STG Society, Kil Kundha	2010	80	0.20 – 2.02
Sivalinga STG Society, Dheenatty	2016	44	0.48
Sai Ram STG Society, Dheenatty	2016	50	0.42

Source: Field Survey

Table 4 Sample of large organic tea growers

Name of the large tea grower	Name of the tea garden	Area (in ha)	Number of years under organic cultivation
Nirmala Raman	Halakarai farm	4.04	3
Parabu	Vijayalakshmi Farm	8.10	10
Vishal	Red Hill Estate	12.15	8

Source: Field Survey

Table 5 Selected of Estate Sector

Name of the Estate Sector/Tea Producing Company	Total certified area (in ha)	Certified (IMO) volume for 2016, lakh kg	
		Green	Orthodox
The United Nilgiri Tea Estates Company Limited	846.81	5.62	7.68

Source: Field survey

Table 6 Cost of cultivation of established tea plantation per annum

Cost of Input		Cost of labor		Total Cost/ha
Input	Cost (Rs.)	Operation	Cost (Rs.)	
NK Mixture	14820 (58.3)	NK mixture application	14820 (9.9)	29640 (17.0)
Rock Phosphate	3705 (14.6)	Rock Phosphate application	988 (0.7)	4693 (2.7)
Zinc Sulphate	1235 (4.9)	Zinc Sulphate application	1976 (1.3)	3211 (1.8)
Herbicide	1976 (7.8)	Herbicide application	618 (0.4)	2594 (1.5)
Pesticide	1729 (6.8)	Pesticide application	618 (0.4)	2347 (1.3)
Fungicide	1976 (7.8)	Fungicide application	618 (0.4)	2594 (1.5)
-	-	Plucking	129675 (86.8)	129675 (74.2)
Total	25441 (100)		149312 (100)	174753 (100)

Source: Authors' estimates

Note: Figures in parentheses are percentages

Table 7 Average auction price realization for tea (INR/kg)

Year	South India	North India	Overall
2010-11	68.37	120.18	105.40
2011-12	70.26	117.01	103.94
2012-13	93.75	142.09	127.91
2013-14	95.82	137.61	126.12
2014-15	81.16	141.46	125.59
2015-16	85.64	142.91	127.62
CV	**13.98**	**8.81**	**9.61**

Source: Authors' Estimates

Table 8 Quantity of bio-control agents, bio-fertilizers and growth promoters supplied by the Tamil Nadu Agricultural University, Horticulture Research Station, Udhagamandalam.

Sl. No.	Organic inputs	Quantity supplied during the period 2004-05 to 2014-15 (kg)
	Bio-control agent	
1.	*Metarrizium anisophilae*	40322
2.	*Pseudomonas flourescens*	33612
3.	*Trichoderma viride*	37609
4.	*Paecilomyces lilacinus*	36000
5.	*Beauveria bassiana*	4051
6.	*Verticililum lecanii*	5002
	Bio-fertilizers and growth promoters	
7.	*Azospirillum*	78108
8.	*Phosphobacteria*	85638
9.	*Rhizobium*	3688
10.	*Azotobacter*	604
11.	*VAM*	9045
12.	*Panchagavya (litres)*	128719
13.	*Dasagavya (litres)*	108221
14.	*Vermicompost*	12502

Note: Recommended dose:
(1). 4 kg/ha; (2) 2.5 kg/ha; (3) 2.5 kg/ha; (4)10kg/ha); (5) 4 kg/ha; (6) 4 kg/ha; (7) 2 kg per ha; (8) 2 kg per ha; (9) 2 kg per ha; (10) 2 kg per ha; (11) 4kg per ha; (12) 30 lit per ha; (13) 30 lit per ha; (14) 2 t per ha

Table 9 Organic tea production trends

Year	No of organic tea gardens	Area under organic tea (ha)	Production (Mkg)
2007	53	10208	7.64
2013	77	15726	11.09
% growth	45.28	54.05	45.15

Source: The Telegraph 4th June, 2015

Table 10 Area under organic cultivation among sample growers

Particulars	Hectare
PGS – Kaggulla	20.24
PGS – Yedakkadu	20.24
Kundhai STG Society	-
Eswarar STG Society	-
Sivalinga STG Society	-
Sai Ram STG Society	-
Halakarai farm	4.04
Vijayalakshmi Farm	8.10
Red Hill Estate	12.15
The United Nilgiri Tea Estates Company Limited	846.81
Moonlight Tea Farmers' Producer Company Limited	-

Table 11 Packages of practices for organic tea cultivation – Farmers' awareness and adoption in the case of new and established plantations (A – Aware; U – Unaware; P – Practitioner)

Particulars	PGS - Farmers			STGs			Large tea growers			Estate Sectors		
	A	U	P	A	U	P	A	U	P	A	U	P
Nutrient Management												
New clearings and first year fields		✓			✓							✓
(i) Compost = 10 tons		✓			✓							✓
(ii) Neem cake = 2.5 tonnes		✓			✓							✓
(iii) Castor cake/ha/year = 2.5 tonnes												
For mature fields												
(i) Neem cake = 5 tonnes		✓			✓							✓
(ii) Castor cake/ha/year = 5 tonnes		✓			✓							✓
High yielding sections												
(i) Compost = 2 tonnes		✓			✓				✓			✓
(ii) Castor cake or Neem cake = 2.5 tonnes		✓			✓				✓			✓
Organic manures												
(i) To be applied in the staggered trenches		✓			✓				✓			✓
Trenches												
(i) Dimension of trench = 2 x 0.3 x 0.45 m		✓			✓		✓					✓
(ii) Distance between trenches = 2 m		✓			✓		✓					✓
(iii) Trenches across slope, every 2-3 rows		✓			✓		✓					✓
Organic dry matter												
Burial of pruning in staggered trenches		✓			✓		✓					✓
Phosphorus												
New clearings												
(i) Applied P = 90 kg/ha/year		✓			✓							✓

Particulars	PGS - Farmers			STGs			Large tea growers			Estate Sectors		
	A	U	P	A	U	P	A	U	P	A	U	P
(ii) To be applied at 10-22.5 cm depth on both sides of tea bushes		✓			✓							✓
(iii) Soil available P = 22 ppm or above *Established plantations* Applied P = 60 to 80 kg/ha (in 1st or 3rd year based on soil test)		✓			✓				✓			✓
Potassium (i) Wood ash = 500 kg/ha (ii) For potash deficiency; Patentkalli (natural potash fertilizer) = 200 kg/ha		✓ ✓			✓ ✓		✓ ✓					✓ ✓
Foliar application (i) Zinc sulphate (Two times/year) = 2 kg/ha		✓			✓		✓					✓
(ii) Cow urine (once a month between January to March) = 1 litre/10 litres of water		✓			✓		✓					✓
(iii) Weed extract (Plant materials - Erythrina, crotalaria and other weeds in water and matured for 3 to 4 months) = 20 litres in 200 litres of water/ ha)		✓			✓				✓			✓
(iv) Cow manure solution (One third of fresh cow dung and the rest of water, stored for 3 months and filtered) = 20 liters in 200 liters of water/ha		✓			✓				✓			✓
(v) Biodynamic formulation, B.D. 500 (to soil) = 75 g in 40 litres of water/ha		✓			✓				✓			✓
(vi) B.D. 501 (twice in a year over the canopy of bushes early in the morning) = 2.5 g in 40 litres of water		✓			✓				✓			✓
(vii) CPP manure (once every month during April, May and September to November) = 5 kg (in 100 litres of water)/ha		✓			✓				✓			✓
Soil reaction (i) In the mature tea fields, Soil pH = 5.0	✓				✓				✓			✓
(ii) Dolmite application based on pH	✓				✓				✓			✓
Bio-fertilizers (i) Acid tolerant biofertilizers (1 part of *Azospirillum* formulation with five parts of soil and applied by shallow placement method in root			✓			✓			✓			✓

Particulars	PGS - Farmers			STGs			Large tea growers			Estate Sectors		
	A	U	P	A	U	P	A	U	P	A	U	P
zone of the bushes) = 25 kg per ha.												
(ii) Phosphate solubilising biofertilizers (*Pseudomonas* and *Bacillus sp*.) = 25 kg/ha			✓			✓			✓			✓
Soil pests												
(i) Neem cake (for cockchafer grubs) = 250 g/pit		✓			✓				✓			✓
(ii) Neem products and regulation of shade (for stem borers)		✓			✓		✓					✓
(iii) Fungal pathogen *Beavaria bassiana* (for shot-hole borer) = 1.5 kg/ha		✓			✓		✓					✓
(iv) Manual removal of leaf feeders		✓			✓		✓					✓
(v) Neem formulations (for severe infestation of leaf feeders) 0.15% = 1000 ml/ha in 200 litres water		✓			✓				✓			✓
(vi) Neem formulations, Sulphur, Lime sulphur and paraffinic oil for eriophyid and tetranychid mites.		✓			✓		✓					✓
(vii) Verelac (for thrips) = 1.5 kg/ha												
Disease control												
(i) Use of resistant clones (for blister blight)		✓				✓			✓			✓
(ii) Copper-oxy-chloride (need based) = 6 kg/ha/year			✓			✓			✓			✓
(iii) Prune during August/September (if blister blight is severe in monsoon - between June and November)			✓			✓			✓			✓
(iv) Pruning during April (blister blight is pronounced only after September)			✓			✓			✓			✓
Root diseases												
For the control of black root disease												
(i) To avoid burial of pruning in the infested field		✓			✓		✓					✓
(ii) Trichoderma viridea or Gliocladium virens = 200 g/pit at the time of planting		✓			✓				✓			✓
For control of red, brown and root splitting diseases												
(i) Isolation of infected area		✓			✓		✓					✓
(ii) One circle of healthy bushes (for fomes infection)		✓			✓		✓					✓
(iii) Two circles of healthy bushes (for poria infection)		✓			✓		✓					✓

Particulars	PGS - Farmers			STGs			Large tea growers			Estate Sectors		
	A	U	P	A	U	P	A	U	P	A	U	P
(iv) Trenches of 1.3 m deep and 45 cm width		✓			✓		✓					✓
(iv) Put soil inside the infected patch		✓					✓					✓
(v) Uproot and burn the bushes in situ		✓			✓							✓
(vi) Rehabilitate soil with Guatemala grass		✓			✓		✓					✓
(vii) Use of bio- control agents (200 g per planting pit)		✓			✓		✓					✓
(viii)*Trichoderma harzianum* (Red root and Root splitting disease)		✓			✓		✓					✓
(ix) *T.viride* (Black root disease)		✓			✓		✓					✓
(x) *T.harzianum T.hamatum*: *T.viride, T.resei* and *T.koningii* (Brown root disease)		✓			✓		✓					✓
(xi) *Gliocladium virens* (Red, Brown and Root splitting diseases)		✓			✓							
Weed control												
(i) Hand pulling during dry periods and slashing during monsoon			✓			✓			✓			✓
(ii) Cultivation of green manure crops/cover crops/grain legume crops and mulching with weed slashings and shade tree litter		✓			✓				✓			✓
(iii) Closer planting (at a distance of 130 x 75 x 75 cm), correct pruning, tipping practices and infilling		✓			✓				✓			✓
(iv) Thatching, in the grass infested areas		✓			✓				✓			✓
Post-harvest and Manufacturing Practice												
Manufacturing practices												
(i) Mechanical and physical processes with natural fermentation.												✓
Isolation of manufacturing facility												
(i) Organic tea to be manufactured in a separate factory to eliminate contamination												✓
(ii) Organic tea in conversion and Organic tea to be manufactured on separate days												✓

Particulars	PGS - Farmers			STGs			Large tea growers			Estate Sectors		
	A	U	P	A	U	P	A	U	P	A	U	P
(iii) Proper cleaning and washing the factory after each production (organic tea/ organic tea in conversion)												
Storage and packing (i) Separate store for organic tea where no fumigants, insecticides or fungicides are used												✓ ✓
(ii) Organic tea to be packed in plywood chests or biodegradable packing materials on the same day of production												✓
(iii) Organic quality grade to be indicated on each chest or container												
Transportation and shipment (i) Chests of organic tea to be transported separately (ii) Before shipment to be stored away from the conventional tea												✓
Inspection and Certification *Soil Analysis* Soil analysis (0- 30 cm depth) every year, for macro, micronutrients and heavy metal status												
Leaf analysis (i) Pesticide and fungicide residues	✓			✓					✓			✓
(ii) Macro, micronutrients and heavy metals		✓			✓		✓					✓
Marketable tea analysis Analysis twice (pre-and post-monsoon) in a year for pesticide residues, flavour and quality.		✓			✓		✓					✓ ✓
Book-keeping (i) Bookkeeping for audit trail of inputs and marketable tea supplied to consumer	✓			✓					✓			✓
(ii) Invoice number to be mentioned on tea chests, in the factory book and in the documents												✓

Source: Field Survey

Table 12 Yield comparison before and after conversion (Yield kg/ha)

Sample Estates	Area in ha	Before conversion	After Conversion	% of reduction
A	245.36	2548	1312	48.5
B	245	2023	1318	34.8
C	143	2160	819	62.1
D	105.01	2486	1125	54.7
E	43.6	3226	2285	29.2
F	213	2297	1135	50.6
G	188	2507	1621	35.3
H	86	2025	1468	27.5
Mean	158.62	2409	1385.38	42.84
Correlation Coefficient		**-0.44**	**-0.45**	

Source: Authors' Estimates

Note: Data compiled from various sources

Table 13 Conventional and organic tea cultivation – comparative analysis

Location of the study	Manure applied		Soil parameters/Soil fertility		Tea leaf Productivity		Reference
	Conventional	Organic	Conventional	Organic	Conventional	Organic	
Tetulia Upazila, Panchagarh district, Bangladesh	Chemical fertilizers, pesticides, weedicides, herbicides, growth regulators	Compost, oilcake (neem, mustard and sesame),Plants (fruits, leaves, barks, roots, and whole plant), cow dung, cow urine, neem oil, straw, vermicompost and quick compost	Less floral diversity; pest resistant to the chemical pesticides.	Higher soil health, soil moisture conservation, sustainable drought management. Positive impacts to environment, soil, flora, fauna and to the human health.	Green leaf (GL) production per hectare = 5088 Cost of per kilogram green leaf in BDF = 47.09 Average cost of green leaf production cost in (BDT)/Kg = 54.9 Made tea production in kilogram per hectare = 1027.83 Auction price per kilogram = 186.05 Revenue (BDT)/HA = 191227.8	Green leaf (GL) production per hectare = 3651 Cost of per kilogram green leaf in BDF = 41.69 Average cost of green leaf production cost in (BDT)/Kg = 48.39 Made tea production in kilogram per hectare = 859.4 Auction price per kilogram = 252 Revenue (BDT)/HA = 216568.8	Islam et al., 2016
Panchagarh District, Bangladesh	Chemical fertilizers	Cow dung, farm yard manure, Poultry	pH = 4.6 Organic matter = 1.73%	pH = 5.1 Organic matter = 2.73% Total Nitrogen = 0.16%	Tea production = 180 ton/year Product value =	Tea production = 250 ton/year	Sultana et al., 2014

Location of the study	Manure applied		Soil parameters/Soil fertility		Tea leaf Productivity		Reference
	Conventional	Organic	Conventional	Organic	Conventional	Organic	
		manure, Compost	Total Nitrogen = 0.09% Phosphorus = 22.8 µg/g Potassium = 0.2 meq/100g	Phosphorus = 22.8 µg/g Potassium = 0.32 meq/100g	Tk.63 million	Product value = Tk. 87.5 million	
Fujian Province, China	-	-	Top soil bulk density = 1.37 g/cm^3 Top soil Porosity = 48.7 % Top soil relative water content = 84.4% Top soil organic matter = 1.14% Top soil N content = 0.057% Top soil P content = 0.80%	Top soil bulk density = 1.2 g/cm^3 Top soil Porosity = 54.4 % Top soil relative water content = 88.5% Top soil organic matter = 5.9% Top soil N content = 0.256% Top soil P content = 0.27%	-	Soil organic matter, total nitrogen and total phosphorus in organic tea gardens were relatively rich, reaching the soil standard of tea gardens with high yield and good quality.	Ping et al., 2014
Silcoorie Tea Estate, Assam, India	-	-	Physical properties (Soil type, moisture content, bulk density and water holding capacity) and chemical properties (pH, Conductivity, organic carbon, organic matter, N, P, K) of top soil and subsoil were studied. Soil pH had a strong and positive correlation with soil	-	Organic base fertilizer for maintaining the active acidity level, proper nutrient management practices like retention of pruning litters, shade tree droppings and weed mass, use of bio-fertilizers recommended to achieve sustainable productivity.	-	Haorongbam et al., 2014

Location of the study	Manure applied		Soil parameters/Soil fertility		Tea leaf Productivity		Reference
	Conventional	Organic	Conventional	Organic	Conventional	Organic	
			organic carbon				
Tocklai experimental field, Assam, India	Standard pesticides, fungicides and herbicides	Vermicompost, Neem oil, Farm yard manure (FYM), Mulch, Cattle manure, Vermi wash, Azospirilum, Azoto bacter	i. Organic carbon maintained around 0.92%. ii. pH was around 4.82 iii. Soil potash was 16 ppm iv. Cation exchange capacity was 4.54 cmol (p+)/kg	i. After three years of conversion period, organic carbon increased from 0.91% to 1.09%. ii. pH was between 4.72 and 4.87 iii. Soil potash was 17-22 ppm iv. Cation exchange capacity was 4.62-4.82 cmol (p+)/kg	Yield was 1422 Kmth in the first year and was higher in the second year (1812 Kmth)	Yield was between 1310-1386 Kmth after one year of conversion period. In the second year yield was between 1418- 1670 Kmth.	Baruah et al., 2011
Sabah Tea Plantation, Malaysia	-	-	pH = 3.38 Soil Ammonium = 332.4 kg/ha Soil Nitrate = 39.0 kg/ha	pH = 4.14 Soil Ammonium = 45.2 kg/ha Soil nitrate = 19.2 kg/ha	Leaf length = 13.19 cm Leaf width = 5.58 cm Major polyphenol content = 107.03 mg/g	Leaf length = 15.14 cm Leaf width = 7.33 cm Major polyphenol content = 172.42 mg/g	Chin et al., 2010
Ibadan, Nigeria	NPK (5:1:1)	Enriched manures (cocoa husk, cow dung, poultry droppings, tea fluff and siam weed - *Chromolaena odorata*)	After 12 months, Soil parameters: N content = 1.3 g/kg P content = 5.5 mg/kg Organic C = 11.9 g/kg	After 12 months, Soil parameters: N content = 1.4 – 2.4 g/kg P content = 3.4 – 6.3 mg/kg Organic C = 11.9 – 14.6 g/kg	-	(i) Higher plant height, girth, number of leaves and leaf area. (ii) Higher pruned dry matter yield (PDMY)	Ipinmoroti et al. 2008
Parry Agro Industries Ltd., Tamil Nadu, India	Conventional fertilizers	Commercial fertilizer derived from composted urban organic wastes and tea prunings	-	(i) Application of organic matter also helped raise soil faunal populations, particularly those of earthworms and other arthropods. (ii) Improvements in macroaggregat	-	Higher yield than conventional farming by 16, 17 and 13% in the first 3 years and 9% over the whole experiment (6 years).	Senapati et al., 2002

Location of the study	Manure applied		Soil parameters/Soil fertility		Tea leaf Productivity		Reference
	Conventional	Organic	Conventional	Organic	Conventional	Organic	
				e status and soil available P contents were observed			

Source: Compiled from various studies

Table 14Export price comparison for organic and normal tea (Rs/kg)

Month	2014 Tea	Organic tea	Diff	2015 Tea	Organic tea	Diff	2016 Tea	Organic tea	Diff
January	164.83	331.75	166.92	143.92	284.7	140.78	162.79	303.07	140.28
February	122.36	364.1	241.74	103.82	216.02	112.2	162.66	160.63	-2.03
March	127.2	259.02	131.82	126.37	191.82	65.45	11.8	183.65	171.85
April	111.54	246.67	135.13	131.93	280.37	148.44	128.79	398.06	269.27
May	131	405.01	274.01	156.88	359.88	203	162.78	291.36	128.58
June	151.88	322.35	170.47	151.44	423.06	271.62	158.28	226.37	68.09
July	151.65	469.22	317.57	165.14	518.76	353.62	158.63	365.39	206.76
August	151.98	383.7	231.72	175.66	421.53	245.87	166.7	356.75	190.05
September	151.77	456.49	304.72	186.68	413.26	226.58	139.05	285.66	146.61
October	112.4	356.9	244.5	143.02	372.32	229.3	-	-	-
November	150.81	309.63	158.82	49.94	307.75	257.81	-	-	-
December	142	353.65	211.65	55.81	345.15	289.34	-	-	-
Mean	139.12	354.87	215.76	132.55	344.55	212.01			
CV	**12.66**	**19.26**		**32.66**	**27.26**		**37.96**	**30.73**	

(Source: Authors' Estimates. Data compiled from various sources)

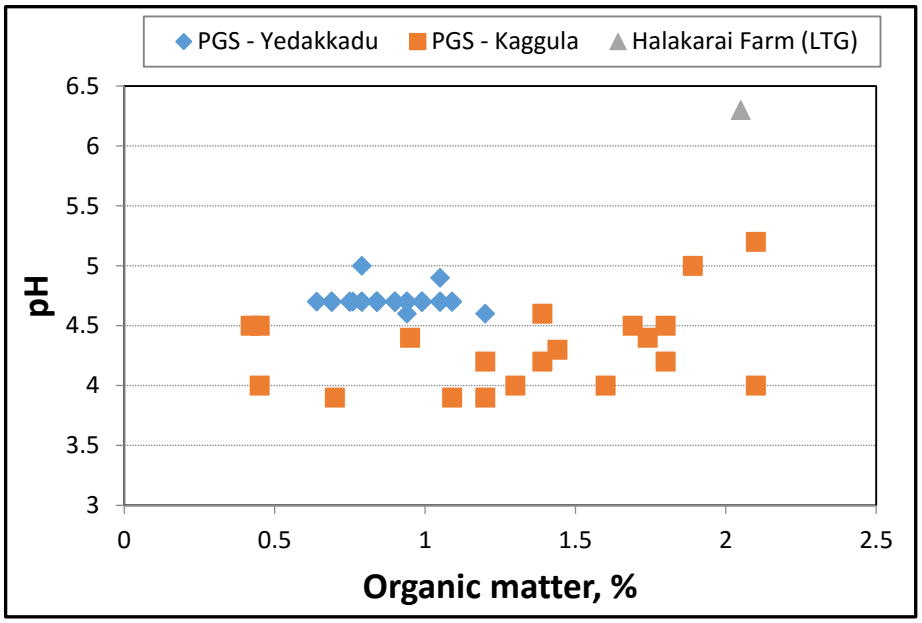

Figure 1. Soil parameters comparison – Organic Vs Conventional tea cultivation