Resilient Roots

Strengthening Climate Resilience in Sri Lanka's Tea Smallholdings

A collection of independently authored technical contributions



Tea Small Holdings Development Authority
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தேயிலை சிறு பற்று நிலங்கள் அபிவிருத்தி அதிகாரசபை

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Tea Smallholdings Development Authority – TSHDA is Sri Lanka's statutory body dedicated to the advancement of the tea smallholder sector. With a focus on extension services, land development support, and social empowerment, TSHDA works through a network of field officers and grassroots societies to improve productivity, sustainability, and livelihoods. TSHDA champions rehabilitation, training, and organizational resilience ensuring smallholders can thrive in an evolving tea industry.

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*Dedicated to the **Tea Smallholders of Sri Lanka**, whose resilience, commitment, and unwavering determination sustain the heart of the nation's tea industry…*



Message from Solidaridad Asia

Sri Lanka's tea smallholding sector stands at a pivotal moment. Once the pride of Ceylon and a global benchmark, it now confronts soil fatigue, climate volatility and rising input costs that are eroding both yield and quality.

The transition from conventional methods to regenerative models is not a luxury, but a strategic necessity. Through practices such as rebuilding soil organic matter, increasing biodiversity, integrating agroforestry and leveraging the global certification framework of Regenagri, our smallholding sector can reposition itself as a climate-resilient, premium quality, future-oriented production system.

This collection of papers outlines from multiple perspectives the diagnosis of root causes, the emphasis on farmer empowerment and the pathways for innovation and organization that together reflect a holistic, systems-based approach to regenerative agriculture. Taken together, these contributions offer far more than incremental change; they point toward a transformation in how we grow, how we value the land, how we engage markets and how we support smallholders.

For smallholders, the promise is compelling: lower input costs, improved resilience to climate shocks, enhanced soil health, and access to premium, value-added markets. For the nation, it means safeguarding the heritage and reputation of Ceylon Tea, maintaining relevance in a world where buyers increasingly demand traceability, low carbon footprints and ecological integrity.

However, such transformation cannot rest on farmers alone. It demands aligned policy, dedicated extension support, fair financing, and market mechanisms that reward quality, sustainability and innovation. The papers in this volume collectively underscore these enablers, the levers that will ensure the vision becomes real.

I offer this message in support of the collective effort that this compilation represents. May it act as a catalyst, lifting the dialogue from the urgent diagnosis of problems to concrete, coordinated action. May it inspire every stakeholder, from smallholder to policymaker, to place soil health, farmer dignity and long-term viability at the centre of our decisions.

Dr Shatadru Chattopadhayay
Managing Director, Solidaridad Asia
Founding Member, Solidaridad Global Executive Board
New Delhi, May 2026



Message from Tea Small Holdings Development Authority (TSHDA)

Sri Lanka's tea smallholders have long been the foundation of our nation's tea industry, consistently contributing around 75 percent of total production. Their labour, commitment, and extensive experience are central to the continued prominence of Ceylon Tea worldwide. Yet, the sector is now at crossroads; declining yields, deteriorating soil health, and lukewarm attitude toward good agricultural practices, ever shrinking workforce have weakened the sector over time. Without decisive interventions, the long-term sustainability of smallholdings and the livelihoods they support will be under threat.

The Tea Small Holdings Development Authority (TSHDA) carries a profound responsibility in safeguarding the future of this sector. Our mandate to achieve 300 million kilograms of smallholder tea by 2030 is not simply a production target; it is an affirmation of our commitment to farmer and rural development, global market competitiveness, and the preservation of a globally respected industry.

This collection of papers is an essential contribution toward that vision. It synthesizes sector-wide consultations, research insights, and practical experiences to identify root causes and propose actionable solutions. It underscores the need to return to disciplined, foundational practices such as proper plucking and soil management, while also embracing regenerative agriculture, youth engagement, entrepreneurship, and innovation.

The TSHDA's *Pivithuru* concept provides a strong platform for this transformation promoting sustainable cultivation, collective organization, and smallholder empowerment. When combined with supportive policies, improved pricing mechanisms, and stronger institutional partnerships, it offers a realistic pathway to rebuilding resilience and competitiveness.

I wish to express my sincere appreciation to Solidaridad Asia, the Nucleus Foundation, and all stakeholders who contributed to this process. Let this compilation serve as a roadmap and a call to action. Together, by prioritizing quality, sustainability, and farmer empowerment, we can secure the future of Sri Lanka's tea smallholdings and uphold the proud legacy of Ceylon Tea.

Nimal Udugampola
Chairman
Tea Small Holdings Development Authority
Colombo, May 2026



Foreword

“The infallible and resilient small tea growers of Sri Lanka”. Through decades of Sri Lankan highs and lows, the small tea growers have stood steadfast with the nation with a contribution of nearly 2% of the country’s GDP. This percentage might appear small, but the dimensions change when seen from the perspective of net foreign exchange earnings. Reports suggests that in 2025, the overall tea industry contributed approximately USD 1.5 billion USD in foreign exchange earnings. Now fathom this! With more than 75% of the total production generated by the small tea growers, their foreign exchange earnings to the nation would be around USD 1.13 billion. This comes at a time of severe climate vagaries, reduction in yields, overall soil carbon reduction, thus impacting the lives and livelihood of nearly half a million small tea grower families.

“Resilient Roots”, a compilation of papers from the doyens of the Tea Industry is a timely intervention. It emerges at a time when Sri Lanka’s tea smallholding sector is undergoing not only environmental and economic pressures, but also an important shift in how knowledge is generated, shared, and applied. Increasingly, the future of the sector depends on the ability of diverse stakeholders to learn from one another, test new ideas, and translate evidence into practical action. In this context, a compilation of papers that bring together research, field experience, and stakeholder perspectives play a critical role.

The compilation of papers indicates that the fulcrum of change is anchored around **‘Regenerative Tea Production Systems**”, with a firm focus on soil health improvement, biodiversity enhancement, water use efficiency, the small tea growers can reposition themselves as climate champions alongside the foreign exchange earners.

The papers presented in this volume capture insights drawn from practitioners, policymakers and researchers reflecting the complexity of the challenges facing the sector today. Rather than offering a single narrative or solution, the compilation presents a range of analyses and experiences that collectively deepen our understanding of the systemic changes required to support smallholders in a rapidly evolving landscape.

A distinctive strength of this collection lies in its emphasis on grounded realities. The contributions highlight the day-to-day constraints faced by smallholders, the institutional and market conditions that shape their decisions, and the opportunities that emerge when innovation is supported through collaboration. By documenting both challenges and emerging responses, the papers provide valuable guidance for those engaged in designing policies, programmes, and investments.

Equally important is the forward-looking perspective embedded throughout the volume. The discussions point to the need for stronger partnerships, improved knowledge exchange, and sustained attention to the social and economic dimensions of agricultural transformation.

They remind us that long-term progress depends not only on technical solutions, but also on inclusive processes that enable farmers, institutions, and markets to evolve together.

I am convinced that this publication will serve as a reference point for continued dialogue and learning. By bringing together diverse viewpoints and practical experiences, it contributes to a shared foundation of knowledge that can inform future initiatives and strengthen collective action across the tea smallholding sector.

Nitin Rao
Head of Planning and Innovation
Solidaridad Asia
New Delhi, May 2026



Preface

Sri Lanka's tea smallholder sector is entering a pivotal phase, one that demands renewed vision, evidence-based policymaking, and collective commitment. While smallholders continue to contribute more than two-thirds of national tea production, the sector's resilience is increasingly tested by climate impacts, rising input costs, land degradation, and market volatility. Addressing these challenges requires not only strong institutions but also an inclusive process through which the voices of smallholders can meaningfully inform and shape the way forward.

The Nucleus Foundation is privileged to have collaborated with Solidaridad Asia and the Tea Small Holdings Development Authority (TSHDA) in convening a series of capacity-building activities and stakeholder consultations under the initiative *Strengthening Climate Resilience in Sri Lanka's Tea Smallholdings*. These efforts culminated in a comprehensive workshop held in August 2025, bringing together smallholders, government agencies, researchers, financial institutions, and private sector actors to validate priority issues and co-create solutions.

This compilation reflects the outcome of these dialogues and the collective insights gathered. It also draws on global experiences from India, Kenya, Vietnam, and China highlighting proven approaches in smallholder empowerment, value chain strengthening, and climate-smart agriculture. These comparative lessons, combined with local realities, form the basis of practical recommendations designed to support transformation within Sri Lanka's tea smallholding sector.

Our intent is to present a resource that is both analytical and action-oriented. We hope it will guide policymakers, development partners, and industry actors, while also serving as a practical reference for smallholder institutions seeking to strengthen their resilience and improve their livelihoods.

We gratefully acknowledge all who contributed to this endeavour and reaffirm our commitment to supporting a sustainable and equitable future for Sri Lanka's tea smallholders.

Dave Maurice
Director
Nucleus Foundation
Colombo, May 2026

Acknowledgments

The development of this compilation has been a truly collaborative effort, made possible through the generous contributions, commitment, and insights of a wide range of stakeholders across Sri Lanka's tea sector and beyond.

We extend our sincere appreciation to the smallholders who shared their experiences, challenges, and aspirations during consultations and discussions. Their lived realities form the foundation of this collection and its recommendations.

Our gratitude goes to the Tea Small Holdings Development Authority (TSHDA) for its guidance and partnership throughout this process. We especially acknowledge the leadership of the Chairman, Deputy General Manager (Extension) and the dedicated officers of the TSHDA at national and regional levels whose support, coordination, and sectoral expertise were invaluable.

We thank the industry stakeholders, researchers, extension officers, financial institutions, private sector actors, and development partners who contributed data, regional documents, and secondary information that strengthened the evidence base of this publication. We recognize the contributions of all participants in the stakeholder workshops and consultations, from government agencies and academics to factory owners, CSOs, and youth representatives, whose ideas and insights informed the direction and depth of this the papers in this compilation. Their perspectives helped broaden the analytical scope and enrich the recommendations presented here.

Special appreciation is extended to the authors and research teams whose work underpins the technical rigour of this collection. Their commitment to accuracy, clarity, and policy relevance has helped shape a compilation that is both grounded and forward-looking.

We gratefully acknowledge the support of our funding partner Solidaridad Asia, whose investment made it possible to conduct consultations, gather data, and facilitate stakeholder dialogue. Their commitment to strengthening climate resilience and the smallholder economy has been central to this initiative.

This compilation is the result of collective effort. To each person and institution that contributed time, knowledge, or resources, we offer our sincere thanks. Your commitment has helped shape a roadmap that we hope will support a stronger, more resilient, and sustainable future for Sri Lanka's tea smallholders.

About This Compilation

This compilation brings together a series of independently developed working papers that were originally conceived as part of a broader white paper process. Over time, through extensive consultation, dialogue, and collaborative engagement, the work evolved into a collection of contributions prepared by a diverse group of stakeholders, practitioners, and subject-matter specialists across Sri Lanka's tea sector and beyond. Each paper reflects the perspective, expertise, and analytical focus of its respective contributors.

As these papers were developed separately rather than as a single continuous publication, readers may notice areas of thematic overlap, repetition of key concepts, or differing analytical emphases. Such intersections are an inherent feature of multi-author working papers and reflect the richness of viewpoints and the breadth of expertise that informed this body of work.

Collectively, the papers explore multiple dimensions of Sri Lanka's tea smallholding sector and its wider ecosystem. They examine the sector's background and evolution, outline methodological approaches and consultative processes, and situate Sri Lanka within global and regional tea sector dynamics. Several papers draw insights from international experiences, emerging sustainability trends, regenerative agricultural practices, and innovative value-addition models relevant to smallholder development.

The compilation also includes analyses of the national context, covering production patterns, value-chain competitiveness, and the central role of smallholders in the industry. These are complemented by papers that diagnose key economic, social, environmental, and institutional challenges, drawing on stakeholder consultations and evidence-based assessments of underlying constraints.

In addition, the working papers address cross-cutting themes considered critical to sector transformation, including gender equality, youth engagement, climate resilience, digital solutions in agriculture, and behaviour-change communication. Several contributions propose practical options and pathways for implementation, such as improvements in agronomic practices, regenerative and climate-smart approaches, replanting and rehabilitation strategies, micro-enterprise development opportunities, carbon finance prospects, and strengthened market linkages.

The institutional and policy landscape is also examined across the papers, highlighting the roles and mandates of government agencies, industry stakeholders, development partners, and smallholder organisations, while identifying opportunities for enhanced coordination, inclusive financing, and collaborative partnerships.

Taken together, these independent working papers provide a broad, evidence-informed knowledge base intended to support ongoing policy dialogue, strategic planning, and sector reform efforts. Rather than presenting a single unified narrative, this compilation offers a diverse yet complementary set of insights to inform the sustainable development and future transformation of Sri Lanka's tea smallholding sector.

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1. Global and National Context of the Tea Industry

By Dr. M. T. Ziyad Mohamed

Abstract

Tea (*Camellia sinensis* L.) is among the most widely consumed beverages in the world and supports the livelihoods of millions of farmers, particularly smallholders who account for more than half of global production. The global tea industry is characterised by diverse production models, including estate-based systems, independent smallholder networks, cooperative structures, and contract farming arrangements. These systems operate under varying agro-climatic conditions and institutional frameworks across major tea-producing countries. This paper reviews global tea production trends and examines the role of smallholders in sustaining supply chains and rural economies. It also explores emerging challenges such as climate variability, labour shortages, and increasing production costs. By situating Sri Lanka's tea industry within this global context, the paper highlights structural factors shaping the sector's competitiveness and underscores the need for sustainable production practices, stronger institutional support, and innovation-driven development pathways.

Keywords: Tea smallholders, Global tea industry, Tea production systems, Smallholder agriculture, Tea value chains, Agricultural sustainability, Rural livelihoods

Current Global Tea Models with Special Reference to Smallholders

Tea (*Camellia sinensis* L.) is deeply integrated into cultural traditions and global consumption patterns, ranking as the most widely consumed beverage after water. Globally, farmers cultivating less than 2 hectares of land are classified as smallholders. These smallholder farmers, who typically rely on family labour, account for approximately 80% of all farms worldwide. In the tea sector, smallholders constitute the backbone of production, accounting for over 60% of global output. It is estimated that between 6 and 8 million smallholder tea farmers are directly dependent on tea cultivation for their livelihoods (Committee on Commodity Problems, FAO, 2023).

Beyond primary production, tea smallholders play a critical role in sustaining rural economies by generating export income, empowering women, and supporting community development. Their contribution extends beyond agricultural productivity, serving as key drivers of economic growth, social stability, and sustainable development in tea-producing regions. Consequently, tea functions not only as a significant commercial crop but also as a socio-cultural and environmental asset within the global economy.

Despite their significance, tea smallholders face multiple challenges that constrain productivity and profitability. Many of these challenges are context-specific and vary among tea-producing countries; hence, they are best understood within regional frameworks.

Agro-climatic Requirements and Environmental Sensitivity of Tea

Tea is primarily a rain-fed perennial crop, susceptible to variations in climatic parameters such as solar radiation, rainfall, temperature, duration of sunlight, vapour pressure deficit (VPD), and wind (Jayasinghe & Kumar, 2019). Optimal growth is achieved with annual rainfall between 2500 and 3000 mm and ideal ambient temperatures between 18°C and 25°C. Seasonal temperature limits typically range from 13°C (lower) to 30°C (upper), while tea can tolerate a mean annual temperature between 13°C and 28°C, with an absolute upper

threshold of approximately 40°C (Watson, 1986). The optimal diurnal temperature difference for tea growth is reported to be between 5.0°C and 9.5°C. Additionally, tea requires high annual precipitation, typically 2000–5000 mm (Watson, 1986).

Climate change poses emerging risks to tea production. Elevated atmospheric CO_2 concentrations, projected to reach 600–700 ppm by 2100 (Wijeratne *et al.*, 2007), are expected to alter temperature and precipitation regimes, thereby impacting tea physiology, yield, and quality.

Processing and Marketing Constraints Among Smallholders

In most tea-producing regions, smallholders cultivate and harvest green leaf, which is then supplied to factories for processing into various types of "made tea," such as black, green, or oolong tea, depending on the processing techniques used. Processed teas are typically marketed through public auction systems. The price paid to smallholders for their green leaf is derived from the average auction price of made tea, calculated according to established payment formulas.

Tea quality, and consequently price, depend not only on the quality of the green leaf but also on the precision and consistency of manufacturing processes. Due to limitations on capital investment and the scale of operations, smallholders in Sri Lanka and many other producing countries are unable to establish their own processing facilities. As a result, they remain dependent on factories for processing and marketing, leaving them with little control over final product pricing. Furthermore, lapses in manufacturing practices can compromise the quality of the tea made, even when smallholders supply high-quality green leaf.

Global Models of Smallholder Tea Production

Globally, smallholder participation in the tea industry functions under diverse organisational and contractual frameworks**,** reflecting variations in institutional arrangements, policy environments, and market structures across producing countries. These frameworks determine how smallholders engage in production, processing, and marketing within the tea value chain. The predominant smallholder tea production models can be classified into four main categories:

i. Outgrower / Contract Farming Model

The outgrower, or contract farming model**,** is one of the most prevalent systems in tea-producing regions worldwide. Under this arrangement, smallholders cultivate tea on their own land and supply green leaf either directly to processing factories, through intermediaries (commonly referred to as *leaf collectors*), or via organised farmer societies. Contracting factories or estates typically provide agricultural inputs, such as planting material, fertiliser, and technical advisory services, and guarantee the purchase of harvested green leaf. Payments are usually calculated based on a formula determined by regulatory authorities, linked to the average sale price obtained for processed tea by the respective factory. In some instances, contractual obligations require smallholders to sell their produce exclusively to the designated factory, ensuring consistent supply volumes and maintaining product quality standards (FAO, 2023; Willson & Clifford, 1992).

ii. Cooperative / Smallholder Association Model

In this model, farmers collectively organise into cooperatives or producer associations to coordinate production, processing, and marketing functions. Green leaves collected from member farms may be processed in factories owned or jointly managed by the cooperative. Where processing facilities are unavailable, the cooperative negotiates supply agreements with private factories under mutually agreed terms. Cooperative structures enhance smallholders' bargaining power, facilitate access to financial services, inputs, and extension support, and enable collective quality management and market access. This model has been particularly successful in Kenya, where the Kenya Tea Development Agency (KTDA) oversees

one of the most extensive and efficient cooperative systems globally, encompassing the majority of smallholder tea farmers (KTDA Updates, 2023).

In contrast, cooperative-managed factories are relatively few in Sri Lanka, whereas India has numerous societies engaged in green leaf collection and supply (Mahindapala, 2020). In Vietnam, many smallholder groups are integrated into cooperatives or state enterprises, reflecting localised institutional frameworks (ETP, 2023).

iii. Independent Supplier Model

Where formal institutional arrangements are absent, some smallholders operate as independent suppliers**,** marketing their green leaf directly to multiple factories or intermediaries. This model provides greater autonomy and flexibility in marketing decisions; however, it is often associated with price instability, weak supply coordination, and inconsistent quality control. The absence of formal contracts and technical support can negatively affect both income security and the sector's overall competitiveness (FAO, 2023).

iv. Nucleus Estate–Smallholder Model

The nucleus estate–smallholder model integrates large tea estates or factories (the *nucleus*) with surrounding smallholder farms. The nucleus estate maintains its own plantations while sourcing additional green leaf from affiliated smallholders. This system offers mutual benefits: the factory secures a stable and reliable leaf supply, while smallholders gain access to estate infrastructure, agricultural inputs, and technical guidance. The model has been successfully implemented in Sri Lanka and other producing countries, contributing to improved coordination, quality assurance, and production sustainability within the smallholder subsector (*Contract farming model for the tea sector in Sri Lanka,* International Labour Organisation 2023).

Key Challenges in Smallholder Tea Systems

Despite their pivotal contribution to global tea production, smallholder farmers face persistent structural and institutional constraints that limit productivity, profitability, and long-term sustainability. The significant challenges can be summarised as follows:

- **Low yields and productivity gaps:** Many smallholder plantations exhibit yield levels significantly below their genetic and agronomic potential due to limited access to improved cultivars, inadequate crop management practices, and declining soil fertility.
- **High costs of production:** Escalating prices of inputs such as fertiliser, energy, and labour have eroded profit margins, particularly in regions where farm-gate prices remain stagnant or are subject to market fluctuations.
- **Restricted access to essential inputs and services:** Smallholders frequently lack affordable credit, timely fertiliser supply, and access to extension or mechanisation services, constraining their capacity to adopt modern technologies.
- **Price volatility and market uncertainty:** Fluctuating international tea prices and delayed payment systems expose smallholders to significant income instability.
- **Adverse impacts of climate change:** Increasing temperature extremes, erratic rainfall patterns, and soil degradation have intensified production risks, especially in marginal tea-growing zones.
- **Weak bargaining power in the value chain:** Fragmented production systems and limited collective organisation reduce smallholders' influence in price negotiations and market access, often resulting in unequal value distribution.

Emerging Trends and Policy Responses

In response to these multifaceted challenges, the smallholder tea sector is undergoing a gradual transformation through targeted policy interventions, institutional innovations, and market-driven adaptations. Key emerging trends and responses include:

- **Adoption of sustainability certifications:** Schemes such as Fairtrade, Rainforest Alliance, UTZ, and Organic certification are increasingly being adopted to enhance environmental compliance, product traceability, and market differentiation.
- **Public–private partnerships (PPPs):** Collaborative initiatives between governments, private processors, and development agencies are facilitating improved smallholder inclusion in value chains through input supply schemes, capacity building, and infrastructure support.
- **Digitalisation and traceability systems:** The introduction of digital platforms for leaf collection, payment systems, and supply chain monitoring is enhancing transparency, efficiency, and accountability in transactions between growers and factories.
- **Government policy support:** National strategies in several producing countries now emphasise improved access to affordable credit, input subsidies, replanting programs, and technology dissemination to strengthen smallholder resilience.
- **Diversification into speciality and value-added teas:** Growing consumer demand for premium, organic, and origin-specific teas presents opportunities for income enhancement and market diversification, particularly among organised smallholder groups.

Comparison of Smallholder Tea Models in Sri Lanka with Special Reference to Experiences from India, Kenya, Vietnam and China

Tea production and marketing in Sri Lanka:

Sri Lanka is among the oldest tea-producing countries in the world, with the industry historically serving as a cornerstone of the national economy. The tea sector contributes approximately 2 % of the country's gross domestic product (GDP) (EDB, 2024). Favourable climatic conditions support tea cultivation primarily in the central highlands and southern inland regions, where temperature, rainfall, and altitude provide optimal growing conditions (Sri Lanka Tea Board, Annual Reports).

During the first two decades of the twenty-first century, Sri Lanka consistently produced over 300 million kilograms of tea annually and was the largest exporter of black tea until 2004. Subsequently, Kenya surpassed Sri Lanka in both production and export of black tea, increasing output from approximately 287 million kg in 2002 to 598 million kg at present, with India ranking second in black tea exports (Committee on Commodity Problems, FAO, 2023).

Expansion of Smallholder Tea Cultivation in Sri Lanka after the 1980s

The post-1980s period witnessed a significant expansion of smallholder tea cultivation in Sri Lanka, driven by a combination of economic, policy, and market factors. Following the liberalisation of the tea sector and the global rise in tea prices during the late 1980s and 1990s, smallholders were increasingly incentivised to cultivate tea as a cash crop. Many farmers opted to replace traditional crops such as rubber, cinnamon, and subsistence crops with tea, attracted by its relatively higher profitability and stable demand in export markets (Tea Board of Sri Lanka, Annual Report 1997; Committee on Commodity Problems, FAO, 2001).

The expansion was particularly pronounced in low-country regions, where small parcels of land were converted to tea plantations, often in areas previously considered marginal for agriculture. Policy measures, including support for smallholders through access to credit, seedlings, fertiliser, and extension services, facilitated this growth. Furthermore, organised frameworks such as the nucleus estate–smallholder model and cooperative societies enabled

smallholders to participate effectively in the commercial tea value chain, ensuring both supply security and technical support

As a result of these economic incentives and institutional supports, the area under smallholder tea cultivation more than doubled, increasing from approximately 75,769 ha in 1983 to 158,021 ha by 2024. Concurrently, the number of smallholdings expanded from around 160,000 to 420,000, and smallholders now contribute nearly 75 % of the total national tea production (Annual Report, TSHDA 2023). This structural transformation highlights the central role of smallholders in sustaining Sri Lanka's tea industry and meeting global demand.

	1983		1994		2005		2020	
District	**Holdings**	**Extent (Ha)**	**Holdings**	**Extent (Ha)**	**Holdings**	**Extent (Ha)**	**Holdings**	**Extent (Ha)**
Kandy	40388	19269	14198	9733	30747	12486	28851	11312
Matale	1631	1694	705	1305	1408	1190	1551	739
Nuwaraeliya	13763	6559	10892	7053	17547	5971	16648	5808
Badulla	13171	7030	15287	6899	29679	7863	30150	9446
Low grown								
Colombo			13	14	491	236	1223	404
Gampaha					9	2	277	100
Moneragala			77	25	637	67	572	293
Kurunegala	224	124	77	42	151	99	0	0
Hambantota	609	207	1186	306	2533	492	2542	1004
Kalutara	1843	881	8494	2566	38263	7587	43960	17071
Galle	36479	13603	56547	17855	90524	25325	85185	30145
Matara	27964	13342	44051	16886	67613	22971	65230	25715
Ratnapura	17713	9818	49161	17789	97984	28232	108471	43056
Kegalle	6080	3242	5906	2446	19637	5753	33668	12818
Total	159865	75769	206652	82919	397223	118274	418328	157910

Table 1: Increase in the number of tea smallholders and extent (1983 - 2020)
(Source: Statistical Information on Plantation Crops, Ministry of Plantation Industries 2023).

Analysis of recent cultivation data indicates notable spatial changes in tea-growing areas across different elevation zones. Specifically:

There has been a substantial expansion of tea cultivation in low-elevation regions, particularly in the districts of Ratnapura, Kalutara, Matara, Galle, and Kegalle. This trend reflects the increasing preference for smallholder plantations in accessible lowland areas and the conversion of marginal or previously uncultivated land to tea.

Conversely, a significant reduction in tea-growing extent has been observed in mid- and high-elevation zones, notably in Kandy, Matale, Badulla and Nuwara Eliya. Factors contributing to this decline include land-use changes, crop replacement with other high-value or subsistence crops, and the relocation of smallholders to more profitable lowland areas.

These patterns demonstrate a clear elevation-dependent shift in tea cultivation, with potential implications for yield distribution, quality characteristics, and regional economic benefits within the national tea sector.

Description	2020	2021	2022	2023	2024
National Production (Mn Kg)	278	299	251	256	262
Production of Tea Small Holdings sector (Mn Kg)	205	223	189	190	195
Percentage contribution	74%	75%	75%	74%	74.4%

Table 2: Smallholder contribution towards national production, TSHDA Annual Report 2023

Decline in Tea Production and Productivity in Sri Lanka

At the national level, both tea production and productivity have declined significantly**,** reaching approximately 256 million kg and 955 kg/ha, respectively, by 2023. Concurrently, the average production cost increased to Rs 964 per kg of manufactured tea (Statistical Information on Plantation Crops, Ministry of Plantation Industries, 2023). This trend raises serious concerns regarding the viability and long-term sustainability of tea cultivation in Sri Lanka.

Given that smallholders account for nearly 75 % of total tea production (Table 2), these declines pose substantial risks to rural livelihoods and may exacerbate socio-economic challenges, including unemployment. The situation is particularly acute in low-country regions**,** where smallholders are concentrated and where production and productivity reductions have reached alarming levels (Munasinghe & Wanigasundara, 2019; Mahindapala, 2020).

The corporate sector has also experienced a decline, now contributing less than 25 % of total national production. The extent of land under tea cultivation, along with production and productivity in the corporate sector, has been decreasing steadily, with current productivity estimated at less than 1,000 kg/ha (Statistical Information on Plantation Crops, Ministry of Plantation Industries 2023) (Table 3). Collectively, declines across both smallholder and corporate sectors have led to a significant reduction in overall national tea output (Figure 1).



Figure 1: Drop in national production (2012 – 2023)

Year	Estate Sector	Medium Sector	Small Holding Sector	Total
2011	85,440		120,664	206,104
2012	82,065		.120,955	203,020
2013	81,141		121,267	202,408
2014	81,684		121,429	203,113
2015	81,099		121,740	202,839

Year	Estate Sector	Medium Sector	Small Holding Sector	Total
2016	80,055		121,967	202,022
2017	78,968		122,169	201,137
2018	77,553		122,448	200,001
2019	76,231		158,770	235,001
2020	70,447	37,393	157,910	265,750
2021	70,453	38,246	157,907	266,606
2022	70,547	38,325	158,315	267,187
2023	71,341	39,461	158,027	268,829

Table 3: Tea Extent by Ownership (ha)
(Source: Statistical Information on Plantation Crops, Ministry of Plantation Industries 2023).

Decline in Corporate Sector Tea Cultivation

The total area under tea cultivation in the corporate sector has declined by approximately 16 %**,** decreasing from 85,440 ha to 71,341 ha over 13 years. Despite the removal of marginal lands from production, productivity in corporate estates, particularly in the low-country regions, has continued to decline, mirroring trends observed in smallholder plantations.

Empirical studies indicate that tea production in the Matara and Galle districts has decreased by 32 % and 45 %, respectively, while average yields have declined by 26 % and 7 %, respectively (Mahindapala et al., 2018).

Considering these trends, the overall performance of the Sri Lankan tea sector can be summarised as follows:

Item	Unit	2018	2019	2020	2021	2022	2023
1. Production	kg Mn	303.94	300.12	278.85	299.49	251.84	256.09
1.1 High grown	kg Mn	64.97	63.05	62.23	63.49	56.95	53.02
1.2 Medium grown	kg Mn	47.13	47.17	46.73	50.39	39.72	42.34
1.3 Low grown	kg Mn	191.84	189	169.88	185.61	155.16	160.73
2. Extent – Total	ha '000	200	235	265.8	266.6	267.2	268.80
Extent in bearing	ha '000	190.6	202.5	202.7	205.2	267.1	268.20
3. Yield	kg/ha	1594.4	1481.8	1376.8	1487.0	1478.5	954.70
4. Replanting	ha	1282	936	1186.5	1181	1238.9	626.20
5. New Planting	ha	453.68	307	525	782	476.1	99.30
6. Prices	Rs/kg	580.71	543.83	628.21	615.44	1234.24	1171.29
6.1 Colombo Auction	Rs/kg	580.71	543.83	628.21	615.44	1234.24	1171.29
6.2 Export FOB*	Rs/kg	820.75	822.58	867.7	921.01	1603.97	1704.7
7. Cost of Production	Rs/kg	483.79	546.53	618.49	638.99	850.12	963.83
8. Exports*	kg Mn	282.36	292.66	266.57	285.87	257.07	241.91
9. Export Earnings*	Rs Mn	231750	240637	230770	263353	411055	428292
Export Earnings*	US$ Mn	1425.8	1346.01	1240.65	1324.17	1258.7	1309.89

Table 4: Performance of the tea industry in Sri Lanka (2018 - 2023)
(Source: Statistical Information on Plantation Crops, Ministry of Plantation Industries 2023).

Tea Production, Fertiliser Use, and Smallholder Challenges in Sri Lanka

A detailed analysis indicates that the 33 % decline in national tea yield after 2022 was primarily attributable to a policy decision to convert all tea cultivation to organic systems overnight, combined with the non-application of fertilisers due to price escalations amid the ongoing economic crisis. Fertiliser application in 2022 fell by nearly 66 % compared to 2020 (Table 5). Although usage recovered slightly in 2023, it remained well below 2020 levels, as fertiliser prices increased approximately sixfold due to both global market pressures and the removal of government subsidies. For instance, the price of a 50 kg fertiliser bag, previously subsidised at Rs 1,500, escalated to Rs 8,500 by 2024.

Year	2020	2021	2022	2023
Fertiliser Quantity (Mt)	181,057	134,837	65,461	106,029

Table 5: Fertiliser Usage in the Tea Sector (Metric Tons)

Approximately 90 % of tea produced in Sri Lanka is exported, and Ceylon tea contributes around 2 % of GDP (US$1.2–1.5 billion) (Export Development Board, 2024). The Free on Board (FOB) price of Ceylon tea has consistently been among the highest globally (> US$5 /kg), driven by strong auction averages and substantial value addition (~60 %) by exporters. However, value addition occurs primarily in Colombo-based exporter warehouses, limiting the economic benefits that reach smallholders. Indeed, despite supplying almost 75 % of exported tea, smallholders accounted for only 10.9 % of export earnings in 2023 (TSHDA Annual Report, 2023).

Smallholders, who are the most significant contributors to national tea production, rely on support from the Tea Small Holdings Development Authority (TSHDA) and the Sri Lanka Federation of Tea Smallholders (SFTS)**.** Nevertheless, access to these resources is uneven, and farmers in remote or rugged regions often receive minimal support (Perera, 2014). Case studies indicate that many smallholders lack essential training in cultivation techniques, harvesting practices, and sustainable agriculture, resulting in low productivity, high leaf rejection rates, reduced profitability, occupational hazards, and environmental degradation.

Extension services remain critical, with surveys indicating that the TSHDA is the most reliable and accessible source of technical guidance for smallholders. In contrast, services from the Tea Research Institute (TRI) and factories are less frequently accessed (Perera, 2014). Standard extension methods include individual contact, group contact, and mass media approaches (Bandula & Sandika, 2017).

Sri Lankan tea plantations are recognised as carbon-negative or climate-positive systems (Wijeratne, 2018; Nijamdeen et al., 2018). Proper establishment and management of high- and medium-shade trees not only improve tea physiology and yield but also contribute to carbon sequestration and environmental sustainability (Wijeratne, 2018).

Nevertheless, tea production in Sri Lanka remains vulnerable to climate-related stresses, including rising temperatures, erratic rainfall, and pest and disease outbreaks, which compound challenges already intensified by economic crises, labour shortages, and increasing wages (Edirisinghe et al., 2024; Millet, 2021). Climate suitability projections indicate that by 2050, tea-growing regions will experience reductions in optimal suitability by 14 % in Sri Lanka, 26.2 % in Kenya, and 4.7 % in China**,** while India may see gains of 15 % (Jayasinghe & Kumar, 2020). By 2070, the projected changes are a 28.6 % loss for Sri Lanka and **a** 25 % gain for India.

Amid these challenges, sustainable practices and voluntary sustainability standards (VSSs) are emerging as crucial tools for adaptation. When combined with governmental and institutional support, these approaches can help smallholders maintain productivity, reduce

environmental impacts, and enhance economic resilience (Millet, 2021). Identifying and promoting such practices is central to long-term sustainability initiatives in the Sri Lankan tea sector.

Contribution by small holders from other countries

Typical smallholder farm characteristics from Sri Lanka against other competing countries could be summarised as follows;

Aspect	Sri Lanka	Kenya	India	Vietnam	China
Total area under Tea (smallholders)	Total - 269,000ha; small holders -66%	~228,000 ha> 80% under small holdings	213,904 ha under small holdings (~1/3 of the total 635,365) North ~60%, South ~40%	128000 ha total- 80% small holders	Not specified; 80% from small holders
SH Contribution to National Production	75% of total	>60% of total	55% of total	80%	Not specified
Yield (kg/ha)	1205/ha - small Holders) 963 kg/ha - corporate sector	1,800–2,300 kg/ha Estates: 2,900–3,300 kg/ha	North 1300 - 1800 kg/ha South 12200 - 2200 kg/ha	1672 kg/ha	Data limited; Moderate yields
Main tea types produced	Pure orthodox (-90%)	Mostly CTC; Focus on orthodox	Mostly CTC, Focus on Orthodox and Green tea	Mostly green tea, black CTC tea, Oolong and scented tea	Mostly green tea, black tea, and oolong tea White tea, dark tea and yellow tea
Employment supported	420,000 smallholders, 1.5–1.6 million dependents;	600000 smallholders, 3 million rely on tea (10% population)	Not specified - significant employment in Assam, West Bengal, Tamil Nadu, Kerala	400000 small holders, a Total of 15million people are employed	Not specified
Extension/support systems	TSHDA/Tea Inspectors/TRI Public-Private Partnership	Farmer field schools (KTDA)	Through KVK - > 700 centres	Government/ Private (PPP) NGOs / Donors	Govt-led incentives, subsidies, credit access, Extension support - details limited
Marketing/leaf collection	Mainly sold to private factories through collectors or societies	Mostly through KTDA	State/ Private /Coop factories	Collectors/tea traders	Market mechanisms are not well-documented

Aspect	Sri Lanka	Kenya	India	Vietnam	China
Key Challenges	Declining productivity, labour shortage, ageing bushes, low adoption of GAPs, and rising input costs	Low productivity compared to Estates' rising costs/limited value addition	Low productivity in South/ rising costs/limited extension services Low adoption of GAPs	Climate change / Water stress: Low tech. Efficiency/ price Volatility Limited traceability	Climate change impacts, deforestation, and Sustainability challenges. Data is lacking
Certifications /	Regenagri emerging, GAP promotion	Rainforest Alliance, Fairtrade;	GAP training via KVK	RA / UTZ/ Organic/ VietGap	Sustainable practices, IPM, Organic inputs
sustainability practices	Carbon negative potential with shade trees	promoting sustainable practices			agroforestry, climate mitigation

Table 6: Distribution of smallholdings and their contribution

Smallholder Tea Systems in Selected Countries

In Sri Lanka, Kenya, and Vietnam, farmers with landholdings of less than 2 ha are generally classified as smallholders. In contrast, in India, farmers with holdings of up to 10 ha (25 acres) are considered smallholders. However, the distribution of land sizes and production capacities varies across countries, reflecting differences in land tenure, agro-climatic conditions, and institutional frameworks.

In India, the contribution of smallholders to tea production and productivity has increased markedly, rising to approximately 53 % in 2023, up from about 30 % in 2005. Average productivity has improved to nearly 3,350 kg/ha, mainly driven by new planting and replanting over the past two decades (Tea Board of India, Annual Report, 2023).

In Kenya, smallholders occupy nearly 60 % of the tea-cultivated land, yet their contribution to total production remains lower than that of large estates. Average yields in smallholder plots are approximately 1,917 kg/ha, compared with 2,600 kg/ha in corporate or estate plantations (Owour et al, 2007).

In Vietnam, smallholders account for the majority of tea production (about 70 %) from a total of 170 million kg, with reported yields averaging 1,478 kg/ha. In 2023, official tea exports reached 121,000 metric tons, comprising 46 % black tea, 53 % green tea, and 1 % other types, at an average price of US$1.74/kg. Significant yield improvements, from approximately 3000 kg/ha in the 1990s to 6000–8000 kg /ha in some regions, have been attributed to research and extension support provided by the Vietnam Tea Research Institute (Van Bec et al., 2017). Nearly 90 % of smallholders participate in cooperatives or societies**,** enhancing collective benefits and access to technical support (Lan Anh et al., 2017). State-led VietGAP programs have also contributed to improved quality and occupational health among smallholder farmers.

Problem Statement and Rationale: Sri Lanka

In 2005, the average yield from smallholder tea plots in Sri Lanka was approximately 1,776 kg/ha**,** as documented in an island-wide survey (Census of Tea Small Holdings, 2005). These relatively high yields were primarily due to:

- The prevalence of younger tea fields within the smallholder sector.

- Regular and timely fertiliser application.
- Better plucking standards.
- Higher overall intensity of field management and care.

However, productivity in Sri Lankan smallholder plantations has declined significantly in recent years, with the average yield falling to 1,205 kg/ha in 2023 (Annual Report, TSHDA, 2023) (Table 7). This decline highlights urgent challenges in sustaining smallholder contributions to national tea production and the need for targeted interventions.

	2005		2023		
District	**Number of Tea Smallholders***	**Hectares***	**Number of Tea Smallholders****	**Hectares****	**Yield (kg/ha)**
Colombo	1,345	246	1,236	404	3,053
Gampaha	319	2	278	100	591
Kalutara	48,752	7,823	43,984	17,092	913
Kegalle	37,842	6,093	33,861	12,891	591
Kandy	31,635	16,058	29,039	11,388	2,079
Matale	1,656	1,672	1,551	740	2,072
Nuwara Eliya	19,361	7,205	16,801	5,857	2,419
Badulla	33,093	9,020	30,151	9,449	1,082
Galle	92,578	27,427	85,210	30,193	1,249
Matara	73,907	25,417	65,238	25,733	1,099
Hambantota	2,833	546	2,542	1,004	82
Ratnapura	118,444	30,441	108,475	43,077	1,165
Monaragala	600	199	572	293	1,082
Total	**462,365**	**132,329**	**418,938**	**158,221**	**1,205**

Table 7: Number of smallholders and the extent occupied and yield levels in the year 2023 (Source: TSHDA Annual Report, 2023)

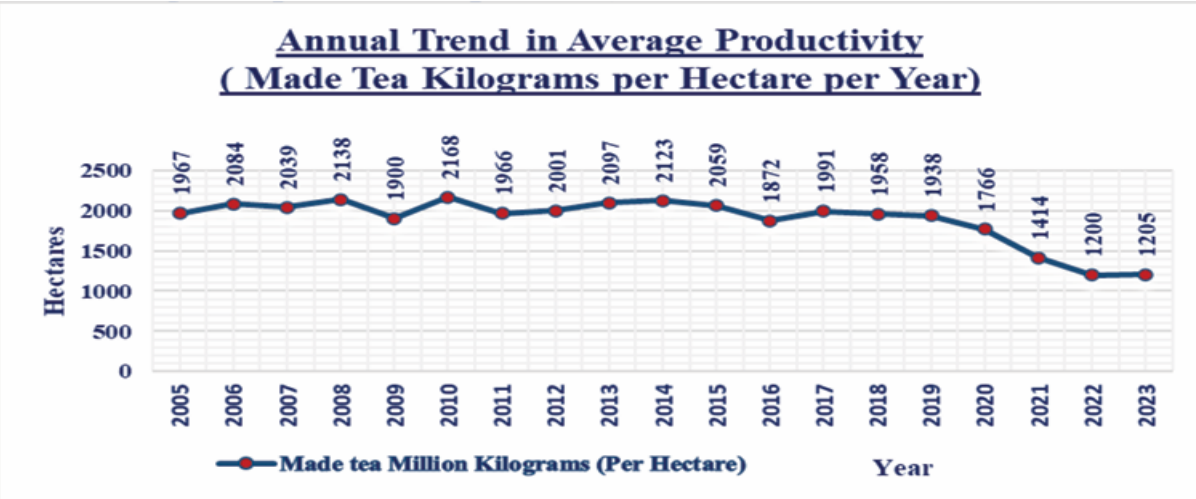


Figure 2: Annual yield figures in small holdings from 2005 – 2023 (TSHDA Annual Report, 2023)

Declining Yields in Smallholder Tea Plantations in Sri Lanka

Over the past five years, yields in smallholder tea plantations in Sri Lanka have been declining, particularly in low-elevation areas, which account for more than 80 % of smallholder holdings. In contrast, mid- and high-elevation holdings have largely maintained stable yields over the same period. This differential trend is likely due, in part, to the removal of marginal lands from production, as evidenced by the significant reduction in cultivated area in low-country regions. Recent sample surveys have identified multiple factors contributing to the decline in yields in the low country (Sidhakaran et al, 2022; Samaraweera & Samansiri, 2025; Shyamalie et al., 2020), which could be summarised as follows:

1. **Senility:** Tea bushes exceeding their productive lifespan of ~30 years, particularly in the low country.
2. **Lack of replanting and infilling.**
3. **Low adoption of Good Agricultural Practices (GAPs).**
4. **Labour shortages.**
5. **Global warming and climate variability**, resulting in:
    - Increased temperatures and erratic weather are causing bush wilting and casualties.
    - Depletion of soil carbon, especially in low elevations.
    - Outbreaks of pests and diseases.
6. **Policy and input constraints:** Non-application of adequate fertiliser due to cost escalation following the 2022 economic crisis. Fertiliser price trends for a 50 kg bag are as follows (CIC Agribusinesses Pvt Ltd.):

Year	Price (Rs)
2018	1,800
2022	30,000
2023	18,000
Jan 2024	12,800
Aug 2024	9,500

Collectively, these factors highlight the need for targeted interventions in low-elevation smallholder plantations, including replanting, improved fertiliser management, and enhanced adoption of GAPs, to restore productivity and ensure the sustainability of Sri Lanka's tea sector.

Climate Change, Yield Decline, and Adaptation Strategies in Smallholder Tea Systems

Over the past three decades (1990–2020), Sri Lanka's smallholder tea sector experienced a boom, with average yields ranging from 1,900 to 2,000 kg/ha**.** During this time, smallholders were key beneficiaries of the sector's growth. However, the smallholder sector is now at a critical juncture, with average yields declining to 1,205 kg/ha by 2023. Comparative analysis across elevation zones indicates that low-elevation areas have been disproportionately affected, suggesting that the impacts of global warming are more severe in these regions than in mid or high elevation tea plantations. This underscores the urgent need to address climate change impacts on agriculture, and specifically on tea cultivation.

Several climate adaptation and sustainability initiatives have been implemented to support smallholders. Certification schemes, such as the Rainforest Alliance, promote climate-smart

agricultural practices, including maintaining tree cover and reducing synthetic pesticide use, which benefit both the environment and farm profitability (Rainforest Alliance, 2018). The Regenagri (regenerative agriculture) programs, initiated by Solidaridad Network Asia in collaboration with Control Union Inspections (Pvt) Ltd., Nucleus Foundation, and the TSHDA, are gaining popularity. These programs also involve selected private estates, such as Kelani Valley Plantations and Lumbini Tea Estate/Factory**,** to improve sustainability and climate resilience.

Additional measures to mitigate climate impacts on tea production include introducing drought-tolerant cultivars**,** implementing good agricultural practices (GAPs), and establishing climate communication systems to relay real-time information to farmers via mobile and internet platforms. Notably, Sri Lanka has developed a National Action Plan for Climate Change Adaptation in Agriculture (2016–2025), aimed at:

1. Enhancing the adaptive capacity of individuals, communities, and society to cope with climate impacts effectively;
2. Reducing vulnerability by improving the resilience of ecosystems and communities; and
3. Capturing opportunities arising from climate-related changes for maximum societal benefit.

Evidence from other countries demonstrates that collective farmer organisations provide numerous benefits, including access to production support, processing, financing, extension services, welfare programs, and marketing. In Sri Lanka, the government established Tea Small Holding Development Societies (TSDS) to provide similar support, focusing on agricultural development, marketing, welfare, and credit provision. Nevertheless, low productivity, limited technology adoption, small landholdings, senile tea bushes, weak infrastructure, labour challenges, and low green-leaf prices continue to constrain smallholder performance. Studies indicate that TSDSs have not fully achieved their intended objectives (Mahindapala, 2020).

International Comparisons

In Kenya, smallholder yields average 1,917 kg/ha (range: 1,500–2,075 kg/ha), which is lower than the 2,600 kg/ha achieved on large estates. Contributing factors include smaller, fragmented plots, limited access to inputs and expertise, inconsistent management, and weaker production and processing infrastructure (Owour et al., 2007). In contrast, large estates benefit from scale, capital, mechanisation, and professional management**,** including robust research and breeding programs. Nonetheless, smallholders gain from the Kenya Tea Development Agency (KTDA) model, as leaf is processed in KTDA factories, providing favourable market conditions and protection from intermediaries.

In India, smallholders currently produce 53 % of total tea output, with average yields exceeding 3,000 kg/ha, while large estates achieve 1,400–1,500 kg/ha. The contribution of smallholders has increased from approximately 30 % in 2000, mainly due to replanting and new planting of young tea fields, particularly in North and South India (Hannan, 2019; Govindarajulu, Country Report). There remains significant potential to double smallholder yields through improved extension services and adoption of advanced techniques, including artificial intelligence tools. However, critics highlight limited intervention by state agencies, such as the Tea Board of India, in regulating green-leaf prices and controlling middlemen (Hannan, 2019).

Impact of Cultivation Practices on Yield Decline in Tea

i. Soil Organic Matter

Soil conservation and management practices in Kenya (Soil conservation manual, Tea Board of Kenya) and India are generally more advanced compared to those in Sri Lanka, contributing

significantly to higher productivity. These practices have increased soil carbon levels and improved topsoil quality. In contrast, in Sri Lanka's low-country smallholder sector, soil carbon levels are relatively low to moderate, ranging between **1–3 %** (Wanniarachchi et al, 2004)**.** Beyond climatic factors, soil fertility status critically influences tea yields, and declining soil fertility may exacerbate the adverse effects of climate change on productivity (Wijeratne et al., 2018).

Recommendation: Increasing soil organic carbon through mulching, composting, and other organic amendments should be an integral component of Regenagri programs**.**

ii. Planting Material

Genetic Potential: Yield comparisons between large estates and smallholders underscore the importance of genetic material**.** Under ideal conditions, high-performing cultivars can yield up to 10,000 kg/ha (e.g., TRF 1 in India) (Radhakrishnan et al, 2019). In Kenya, advanced plant-breeding programs have produced cultivars capable of >5,000 kg/ha (Muoki et al., 2020), explaining why large estates achieve average yields of approximately 2,600 kg/ha**.** Both countries maintain robust gene banks, facilitating continuous improvement in breeding programs.

In contrast, Sri Lanka has a narrow genetic base, with many popular cultivars released (TRI 2000, 3000, 4000, and 5000 series) derived from the same parent material (ASM 4/10, from Assam). Limitations in adopting genetic engineering for cultivar improvement, due to overseas market preferences, further restrict yield potential.

Plant Health: Successful cultivation requires healthy nursery plants derived from selected cultivars. In Sri Lanka, many smallholders rely on commercial nurseries, which prioritise cost reduction over plant quality. Production methods, such as "bed plants" rather than nursery bag-grown plants, often produce weak plants that are vulnerable to environmental stress, limiting long-term yield potential (Daily Mirror 31 October 2023).

iii. Frame Development and Bearing

Proper frame development, including branch structure, pruning height, and canopy shape, is essential for sustaining productivity and the longevity of tea bushes. A well-developed frame allows the plant to endure repeated plucking, pruning, and environmental stress over decades. In smallholder holdings, premature plucking or poor pruning practices compromise frame development, resulting in weak, woody, and unproductive bushes, particularly under harsh climatic conditions (Wijeratne, 1996).

iv. Harvesting, Handling, and Sale of Green Leaf

Harvesting practices directly influence both yield and leaf quality. In Sri Lanka, smallholders primarily rely on hired labour, especially in larger holdings, for plucking and other cultural operations. Misalignment between leaf availability and factory capacity creates an unhealthy competitive environment, encouraging smallholders to prioritise volume over quality. As a result, good-quality leaf has declined from ~85 % three decades ago to about 50% today**.**

Evidence indicates that improving plucking standards can substantially enhance smallholder productivity (Wijeratne, 2023). While harvesting only optimal leaves may reduce per-round intake, it can increase the number of plucking rounds**,** ultimately boosting overall yield. Implementation must account for field conditions and production costs, as harvesting represents the most significant component of production costs. Cost pressures often drive smallholders and estates to pluck mature leaves prematurely. Leaf collectors encouraging more volumes at the expense of quality leaf further aggravates the situation. In this regard, the latest program ("*Dallakin wenasak*") introduced in the small holdings by the TSHDA should be commended.

Labour Constraints and Mechanisation: The tea sector faces persistent worker shortages, leading to gradual mechanisation of field operations**.** Mechanised harvesting may improve

efficiency and compensate for labour deficits but requires careful planning to maintain leaf quality (Pathiranage et al, 2019).

Green Leaf Collection, Processing, and Extension Services in Smallholder Tea Systems

1. Green Leaf Collection and Marketing

Smallholders produce green leaf, which is subsequently processed in factories and marketed. In Sri Lanka, smallholders sell leaf either directly to factories or through leaf collectors and societies. The majority of smallholders rely heavily on leaf collectors, while a smaller fraction supplies leaf via factory-operated collection lorries or societies. Overdependence on leaf collectors has historically led to exploitation and malpractices, contributing to the decline of the smallholder sector.

Leaf is also collected by private and cooperative-owned factories through collection points in nearby villages, with only a negligible proportion of smallholders delivering leaf directly to factories. At collection centres, leaves are typically weighed without rigorous quality checks. Payment is often made monthly, with advances provided as incentives to encourage higher supply. However, smallholders frequently deliver mixed-quality leaf, reducing consistency, and in some cases, collectors adulterate the leaf by adding water, further lowering quality. Poor rural road conditions exacerbate problems by causing overheating and premature fermentation during transport. Ideally, leaves from a given district should be processed within that district to minimise transport-related losses and costs.

In contrast, Kenya's KTDA system provides well-organised leaf collection and input supply through dedicated collection centres. Attempts to replicate a similar model in Sri Lanka, including state-funded factory establishments under the Thea Shakthi Fund, were unsuccessful due to mismanagement (Thea Shakthi Fund, Annual Report 2014).

In Sri Lanka, India, and Vietnam, smallholders primarily rely on bought-leaf processing factories and societies for agricultural inputs such as fertilisers and agrochemicals.

Recommendation: The KTDA model represents an ideal framework for Sri Lanka, and renewed efforts should focus on implementing this system with adequate checks and balances.

2. Benefits of Organised Leaf Collection

The efficiency of leaf disposal depends on available infrastructure and collection mechanisms. Smallholders typically transport leaf to main roads by bicycle, motorcycle, or other local means. Green-leaf pricing is often based on the factory's net sale average price. If smallholders have access to price information, they can sell preferentially to factories that offer higher rates. Factories display the previous month's green-leaf prices on collection lorries to attract supply.

3. Extension Services

In Sri Lanka, the majority of smallholders rely on the Tea Small Holdings Development Authority (TSHDA), established under Parliament Act No. 35 of 1975, for financial, technical, and infrastructural support. TSHDA manages extension services and subsidy disbursement through Tea Inspectors (TIs), who also serve as advisors. The current ratio of TI to smallholders is approximately 1:3000 (TSHDA).

TRI substations in tea-growing districts provide additional extension support on request, although coverage is limited compared to TSHDA services. Extension effectiveness could be improved via Public-Private Partnerships (PPPs) (Amaratunge & Jayasinghe, 2024). Some factories employ extension officers to provide free advisory services to attract more leaf supply. Competent personnel are critical for maximising the benefits of these services.

In India, extension services are primarily delivered by Krishi Vigyan Kendras (KVK) and Departments of Agriculture and Rural Development (DARDs). External funding organisations, such as certification bodies (e.g., Rainforest Alliance), also support training under PPP models.

In Kenya, KTDA has strengthened extension systems by establishing Farmer Field Schools (FFS) across tea-growing areas.

In Vietnam, the government is actively promoting VietGAP-compliant tea production in regions where tea significantly contributes to household income. State interventions address challenges such as small farm size and irrigation requirements, and mechanisation options are introduced to incentivise farmers to allocate more land to VietGAP production (Van Bac et al., 2017).

Financial Efficiency

Financial efficiency is a critical determinant of the sustainability of smallholder tea cultivation. Historically, smallholders in Sri Lanka enjoyed favourable returns. However, profit margins have significantly eroded over the past five years due to declining yields and currency depreciation associated with the economic crisis (Table 8). This declining profitability threatens the viability of smallholdings, prompting some farmers to abandon or transition away from tea cultivation.

In Kenya, smallholders benefit from the KTDA cooperative system, which provides access to inputs, extension services, and collective marketing. These mechanisms enhance financial efficiency, enabling smallholders to secure stable returns despite smaller plot sizes and fragmented landholdings. Average smallholder yields of ~1,917 kg/ha, coupled with organised processing and marketing, support a viable income stream relative to production costs.

In India, smallholders produce approximately 53 % of total tea output with average yields exceeding 3,000 kg/ha, benefiting from new planting, replanting, and government-supported extension services. Strong access to inputs and organised marketing ensures that profit margins remain competitive, promoting long-term sustainability.

In Vietnam, smallholders account for about 70 % of production, with average yields around 1,478 kg/ha. Financial efficiency is improved through VietGAP-compliant practices, state-supported irrigation, mechanisation, and farmer collectives. These measures help reduce input costs, improve quality, and provide access to higher-value markets, thereby enhancing profitability and sustainability.

Overall, the comparative evidence highlights that financial efficiency in smallholder systems is closely linked to institutional support, access to inputs, effective extension services, and organised marketing mechanisms. In Sri Lanka, strengthening these areas—potentially through adoption of models similar to KTDA or VietGAP frameworks—could stabilise incomes and sustain smallholder tea cultivation.

Year	Average GL Price (Rs/Kg)	Average Production Cost (Rs/Kg)	Profit	
			(Rs/Kg)	% of COP
2006	29.18	21.87	7.31	33.42
2007	40.88	30.64	10.24	33.42
2008	45.45	36.24	9.21	25.41
2009	52.71	37.24	15.47	41.54

Year	Average GL Price (Rs/Kg)	Average Production Cost (Rs/Kg)	Profit	
			(Rs/Kg)	% of COP
2010	54.11	38.56	15.55	40.33
2011	52.63	44.43	8.20	18.46
2012	57.27	49.50	7.77	15.70
2013	64.99	51.40	13.59	26.44
2014	67.54	54.54	13.00	23.84
2015	58.80	55.08	3.72	6.75
2016	68.53	64.52	4.01	6.22
2017	90.69	71.65	19.04	26.57
2018	85.48	71.86	13.62	18.95
2019	80.15	56.28	23.87	42.41
2020	92.55	59.94	32.61	54.40
2021	90.57	65.20	25.37	38.91
2022	182.07	136.33	45.74	33.55
2023	162.66	136.09	26.57	19.52

Table 8: Green leaf price, cost of production and profit margins (TSHDA Annual Report 2023)

Extension and Efficiency in Smallholder Tea Systems

To attract higher volumes of green leaf, many tea factories employ extension officers to provide advisory services to smallholders on good agricultural practices (GAP). These services are typically offered free of charge and serve a dual purpose: enhancing productivity and securing a consistent supply of green leaf. The benefits of such extension services generally outweigh their operational costs, particularly when implemented by competent and technically qualified personnel.

In Vietnam, tea cultivation has demonstrated strong financial performance, with an estimated return on investment of 48.97%. Chinh et al. (2020) identified five production-stage factors influencing financial efficiency: productivity, access to credit, and extension services positively affect returns, whereas total tea area and production risk negatively affect returns. Recommended strategies for improving financial efficiency include increasing yields, reducing input costs, strengthening cooperative structures, sustaining farmer training programs, and ensuring easy access to agricultural credit.

Innovations and Sustainability Practices in Smallholder Tea Systems

In recent years, the global tea industry has increasingly adopted certification schemes to ensure long-term sustainability and ethical production. Given that smallholders produce a significant share of raw tea leaves, traceability has become a critical requirement to verify both product safety and social compliance across the value chain, from cultivation to processing. Consequently, many Sri Lankan factories have obtained certifications under standards such as ISO 22000:2018**,** HACCP**,** Rainforest Alliance (RA)**,** UTZ**,** and Organic certification systems.

These certifications provide assurance that tea products are produced and traded in accordance with recognised ethical, environmental, and social standards. The principal certification systems include:

1. **Organic Certification** – Ensures cultivation under natural conditions, prohibiting the use of synthetic fertilisers and agrochemicals. Compliance is verified through regular audits and documentation.
2. **Fairtrade Certification** – Guarantees that producers receive a minimum price covering the cost of sustainable production, along with community development premiums for initiatives in education, health, infrastructure, and environmental management.
3. **Rainforest Alliance Certification** – Promotes climate-smart agriculture, conservation of forests, biodiversity protection, and prohibition of forced or child labour, while ensuring fair working conditions and community well-being.
4. **UTZ Certification** – Now integrated with RA standards, emphasising sustainable farming practices and social responsibility.
5. **Regenagri Certification** – Encourages regenerative agricultural practices that enhance soil health, increase soil carbon, promote biodiversity, and reduce greenhouse gas (GHG) emissions while improving water and energy efficiency.
6. **Carbon Neutral Certification** – Focuses on the quantification, reduction, and offsetting of GHG emissions throughout the product life cycle, following international standards such as **ISO 14064, PAS 2060,** or the **GHG Protocol.**

Beyond certification, several programs in India have demonstrated the potential of integrated approaches to improve smallholder viability, combining technical support, financial facilitation, and institutional strengthening.

Case Studies of Smallholder Interventions

Trinitea Smallholder Initiative (West Bengal, India): The *Trinitea* program, launched by Solidaridad Asia in partnership with the Indian Tea Association, targets small tea growers in West Bengal. Its objective is to enhance tea quality and price realisation through the use of digital tools, self-assessment frameworks, and traceability mechanisms. The initiative has reached more than 100,000 smallholders across over 2,300 villages, demonstrating its scalability and potential for wide-reaching impact on rural livelihoods (Solidaridad Asia & Indian Tea Association, 2023).

Small Tea Growers Sustainability Platform (STGSP): The *STGSP* is a multi-stakeholder platform that includes government agencies, private-sector representatives, and NGOs. Its primary goal is to enhance smallholder livelihoods by narrowing the “living income” gap and reducing the environmental footprint of tea cultivation. A notable feature of the platform is the **Agri-Entrepreneur (AE) model**, which develops trained intermediaries to deliver inputs, technical advice, post-harvest support, and market linkages, thereby strengthening the entire smallholder value chain.

Regenagri Certification Initiative (Assam and Darjeeling, India): As part of broader sustainability efforts, *Solidaridad* and the *Indian Tea Association* have initiated Regenagri certification in selected tea estates in Assam and Darjeeling, including the Luxmi and Rossell Tea Gardens. The pilot phase aims to certify approximately 100,000 hectares within three years, with expansion to 400,000 hectares by 2030. The program is projected to generate more than INR 200 crore annually in carbon credits, providing a significant financial incentive to support an industry facing persistent economic constraints (Solidaridad Asia & Indian Tea Association. (2023).

Trends in Smallholder Farming

Tea Smallholders in Sri Lanka

Extent, Production, and Contribution

Globally, smallholders are increasingly contributing to agricultural production, and in Sri Lanka, tea has historically been a critical crop, generating foreign exchange and providing employment to nearly 10% of the population. In 1989, smallholders contributed only ~33% of national tea production, but with the tea price boom in the 1990s, more smallholders entered cultivation, and their share now accounts for approximately 75% of total production, covering ~66% of the total land under tea. Although smallholders enjoyed substantial returns from 1990 to 2020, recent trends indicate declining yields, raising concerns about the long-term sustainability of both the smallholder and corporate sectors.

Labour and Socioeconomic Dimensions

The smallholder sector comprises approximately 420,000 farm owners, many of whom support 1.5–1.6 million dependents. When combined with estate workers, the tea sector sustains over 2.5 million people in Sri Lanka (ILO, 2024). Tea cultivation is labour-intensive, yet the sector faces significant labour shortages, with compound annual labour declines of 2.94%, 4.87%, 4.22%, and 5.06% in Up, Mid, Uva, and Low Country, respectively (Shyamalie et al., 2018). Smallholders primarily rely on family labour, supplemented by hired labour for specialised tasks such as pruning or harvesting. In areas of acute labour shortage, mechanisation is being adopted, although its implementation at the smallholder scale is limited and may result in yield losses if improperly managed (Pathiranage et al., 2019). Strengthening extension services is therefore critical to mitigate risks associated with mechanisation and labour constraints.

Economic and Market Linkages

Green leaf harvested by smallholders is mainly processed in privately owned leaf factories, making market linkages essential for economic viability. Access to real-time auction price information enables smallholders to deliver leaf to factories, offering maximum returns strategically. In addition, credit access, input availability, and financing from banks, cooperatives, or leaf buyers influence the choice of factory. Effective market linkages are, therefore, a key determinant of smallholder profitability.

Extension Systems & Institutional Support

Smallholders face new challenges, including climate change, yield decline, and labour shortages. Effective use of extension services, technological information, and market intelligence is critical to maintaining livelihoods.

The Tea Small Holdings Development Authority (TSHDA) and the Sri Lanka Federation of Tea Smallholders (SFTS) provide technical, financial, and infrastructural support. TSHDA's Tea Inspectors also manage subsidy disbursement for fertilisers and other cultural practices. Case studies indicate that smallholders lack basic training in tea cultivation, harvesting, and sustainable practices, resulting in low productivity, leaf rejection, and occupational hazards (Perera, 2014; Bandula & Sandika, 2017). The sector's performance heavily depends on competent extension delivery.

Institutional & Organisational Models

The government of Sri Lanka established the Tea Smallholding Development Societies (TSHDS) and the Farmer Organisations (FOs) in the tea sector through a legislative act to facilitate the development, marketing, welfare, and financing of smallholders. Several FOs operate across all the central tea smallholding districts in Sri Lanka. Data were collected from

key officials and members of TSHDS using structured questionnaires. Tangible and intangible economic benefits generated within the entity act as incentives and, in a virtuous cycle, promote members' collective action. The commercialisation of FOs leads to enhanced voluntary cooperation in the TSHDS (Mahindapala et al, 2020).

These societies not only facilitate economies of scale but also provide technical and financial support to members. Currently, there are approximately 1,500 societies, encompassing more than 300,000 smallholders and covering ~75% of the smallholder population (Table 9). While this represents significant progress, about 25% of smallholders remain outside these organisational structures**,** highlighting the need for further inclusion and support (TSHDA Annual Report 2023).

Among the cooperative societies operating in Sri Lanka, a few have successfully integrated processing facilitie**s**, enabling them to maintain a continuous, guaranteed supply of green leaf to their factories and thereby enhancing operational viability. The Morawakkorale Tea Producers' Co-operative Society (MKTPCS), located in Deniyaya in the South, serves as a notable example (Mahindapala et al., 2020). Established under the Co-operative Societies Act No. 5 of 1972 and subsequent amendments, MKTPCS is an agricultural/tea smallholder cooperative aimed at supporting small tea growers in the Morawakkorale/Kotapola area. Its members supply green leaf to the cooperative, which processes it in facilities such as the Kotapola Factory, Allan Valley Factory, and the "Coop-Cola" Factory.

Regional Office	No. of Societies		No. of Members	
	2022	**2023**	**2022**	**2023**
Galle	217	219	49,230	43,714
Matara and Hambantota	192	192	53,978	54,263
Kalutara	116	119	23,217	23,464
Kegalle	148	150	28,903	29,589
Kandy and Matale	227	227	22,231	22,306
Nuwara Eliya	127	127	14,837	14,137
Rathnapura	291	291	88,893	88,893
Badulla and Monaragala	166	167	24,447	24,340
Total	**1,484**	**1,492**	**305,736**	**300,706**

Table 9: Number of smallholder societies and the membership in the year 2022 & 2023 (TSHDA Annual Report, 2023)

A leading example is the Morawakkorale Tea Producers' Co-operative Society (MKTPCS) in Deniyaya, operating under the Co-operative Societies Act No. 5 of 1972. MKTPCS manages factories, ensures leaf supply, provides inputs and credit, shares profits, and offers welfare services to its 3,500 members (Mahindapala, 2020).

Strengths and benefits of MKTPCS include:

- Provision of fair prices and a marketing channel, reducing exploitation of smallholders.
- Profit sharing, which enhances member income.
- Timely access to inputs and credit, supporting sustained production.
- Extension services that improve leaf quality and potentially yield.
- Diversification into non-tea activities (e.g., retail shops), stabilising income and strengthening financial reserves.

Challenges and limitations include:

- Inconsistent or delayed **extension/field services** to members.
- Limited **value addition** beyond bulk tea production.
- Regulatory constraints under the **Cooperative Societies Act** restrict operational flexibility.
- Weak **market linkages**, including auctions, direct exports, and domestic processing channels (Mahindapala, 2020).

MKTPCS has the potential to expand operations and emulate KTDA's success, provided it implements sound management practices. Challenges include inconsistent delivery of extension services, limited value-addition beyond bulk tea, regulatory constraints, and weak market linkages. Lessons from past initiatives, such as the ***"Thea Shakthi Fund"***, and recognition of inherent operational weaknesses, must inform gradual, sustainable growth to avoid failure.

Environmental Dimensions

Tea plantations can be carbon-negative with proper shade-tree management, enhancing yields while contributing to environmental sustainability (Wijeratne, 2018). Smallholders have historically neglected shade management, but Regenagri programs now aim to improve soil carbon by using nitrogen-fixing short-rotation coppicing species (e.g., gliricidia) as medium shade trees, which reduce fertiliser costs and provide additional income (Gunasena, 1997).

Challenges & Productivity Decline

Smallholder productivity peaked at 2,168 kg/ha in 2010 but has declined sharply to 1,205 kg/ha in 2023, a 40% drop over the last five years (Sidhakaran et al., 2022). Factors include:

- Senile tea bushes surpassing productive lifespan
- Lack of replanting and infilling
- Poor adoption of GAPs
- Labour shortages
- Climate change: higher temperatures, erratic weather, pest/disease outbreaks, soil carbon depletion
- Policy changes: reduced fertiliser subsidies and escalating input costs (CIC Agribusinesses Pvt Ltd.)

Despite economic pressures, most smallholders continue to cultivate tea for a steady monthly income. A recent survey indicated that 44% of the population tested consider shifting crops if labour or resources are unavailable (Samaraweera & Samansiri, 2025).

Strategic Initiatives & Recommendations

Revitalisation requires:

- Large-scale replanting and new planting, starting with healthy planting material and proper nursery practices
- Improved extension services to enforce GAP adoption
- Adoption of regenerative agriculture (Regenagri) to maintain soil fertility, improve yields, and ensure long-term sustainability

Decades of absence of a national action plan have contributed to declining productivity (Samaraweera & Samansiri, 2005). Encouragingly, the Ministry of Plantation Industries and

Estate Infrastructure has drawn up a five-year strategic plan (2025–2029) for the sector, emphasising **Regenagri**, providing a framework to prevent past failures.

Tea Smallholders in India

In India, smallholders are defined as farmers managing tea estates of up to 10 hectares (25 acres), although landholdings vary regionally. Over the last two decades, the contribution of smallholders to national tea production has increased from approximately **30% in 2005 to** 53% in 2023 (Tea Board of India, 2023). Average productivity in smallholder holdings has improved to ~3,350 kg/ha, primarily due to replanting, introduction of improved cultivars, and adoption of modern agronomic practices.

Smallholders rely on family labour, with hired labour employed during peak operations such as pruning and plucking. Extension services are provided primarily through Krishi Vigyan Kendras (KVKs) and Departments of Agriculture and Rural Development (DARDs), with additional support from public–private partnerships, such as certification initiatives (e.g., Rainforest Alliance). While yields in smallholder estates are generally higher than in corporate plantations in India, there remain spatial variations in productivity, influenced by soil fertility, cultivar choice, and access to inputs (Hannan, 2019; Govindarajulu, Country Report).

Tea Smallholders in Kenya

In Kenya, smallholders are defined as farmers cultivating less than 2 hectares. They account for nearly 60% of the tea-growing land. However, their average yields (~1,917 kg/ha) remain lower than those of large estates (~2,600 kg/ha), despite both sectors having planted tea around the same period (Owour et al., 2007). Lower productivity in smallholder plots is attributed to fragmented holdings, limited access to inputs, weaker farm management practices, and insufficient infrastructure for processing and marketing.

Smallholders in Kenya benefit from the Kenya Tea Development Agency (KTDA) system, which organises leaf collection, provides agricultural inputs, and offers extension services through Farmer Field Schools (FFS). This cooperative-style model enhances market access, reduces exploitation by intermediaries, and ensures that smallholders capture a fair share of economic returns. The structured support system contributes significantly to the financial sustainability and resilience of smallholder tea farmers.

Tea Smallholders in Vietnam

In Vietnam, smallholders are typically defined as farmers managing less than 2 hectares, with the majority of tea production (~70% of the total 170 million kg) originating from smallholder plots. Reported yields average around 1,478 kg/ha, although certain regions have achieved 6–8 tons/ha due to improved cultivars and better agronomic practices, supported by the Vietnam Tea Research Institute (Van Bec et al., 2017).

Smallholders commonly operate within farmer cooperatives and benefit from government programs such as VietGAP certification, which promotes good agricultural practices, sustainable production, and improved quality. Interventions include mechanisation options, irrigation systems, and training programs, aimed at enhancing productivity, profitability, and environmental compliance (Lan Anh et al., 2017). Collective action through societies has also facilitated access to inputs, technical advice, and market linkages, demonstrating the importance of organised structures in maintaining smallholder livelihoods.

India and Vietnam follow a system similar to that adopted in Sri Lanka for leaf handling and transportation, but the societies seem better organised in Vietnam, with government intervention (Huong et al., 2021).

Tea Smallholders in Sri Lanka

Role of Tea Small Holdings Development Authority (TSHDA)

Smallholders are the most significant contributors to Sri Lanka's tea production. They have access to support from the Tea Small Holdings Development Authority (TSHDA) and the Sri Lanka Federation of Tea Smallholders (SFTS). However, despite state-sponsored and independent support, smallholders in remote or rugged regions have limited access to these resources, which are unevenly distributed (Perera, 2014). Case studies indicate that many smallholders lack basic training in tea cultivation, harvesting, and sustainable agriculture, resulting in low productivity, leaf rejection, financial losses, occupational hazards, and environmental damage.

Survey results show that the majority of respondents identify TSHDA as the most available and reliable source of information and advice. The standard extension methods employed include individual contact, group contact, and mass communication, as part of agricultural extension or Training-of-Trainers (ToT) programs (Bandula & Sandika, 2017). Ultimately, the effectiveness of extension delivery using competent staff is the single most critical factor determining smallholder performance.

TSHDA also participates in policy-making discussions on behalf of smallholders, for example, regarding amendments to the reasonable price formula for green leaf. Tea Inspectors attached to TSHDA are responsible for disbursing subsidy funds for fertiliser and other cultural operations.

Environmental Dimensions

Tea plantations have been reported to be carbon-negative or climate-positive. Proper establishment and management of high- and medium-shade trees enhance tea plant physiology, increase yield, and contribute to a negative carbon balance (Wijeratne, 2018). Unfortunately, shade management is often neglected in smallholdings. Under the Regenagri program, nitrogen-fixing short-rotation coppicing (SRC) species could serve as a medium shade in low-elevation areas, reducing fertiliser costs. Leaves from SRC species branches can be used as green manure, while stems can generate additional income (Gunasena, 1997).

Key Issues Facing Smallholders

Despite their historical contributions, smallholders face significant challenges, primarily declining productivity. In 2010, smallholdings recorded an average yield of 2,168 kg/ha, but over the last five years, productivity has fallen from 1,938 kg/ha in 2019 **to** 1,205 kg/ha in 2023, representing a 40% decline. This decline is more pronounced in low elevations, while mid- and upcountry yields remain around 2,000 kg/ha, consistent with the factors discussed earlier.

The declining yields threaten the economic viability of smallholdings. A recent survey found that 44% of smallholders consider switching to alternative crops. However, many prefer to continue tea cultivation for its steady monthly income, suggesting that crop abandonment is more likely due to manpower shortages than profitability concerns (Samaraweera & Samansiri, 2025).

Revitalising the Tea Smallholder Sector

Given the observed yield decline and ageing tea stands in Sri Lanka, the revitalisation of the smallholder tea sector requires a comprehensive program of replanting and new planting, contingent on the availability of suitable land. Replanting with high-yielding, stress-tolerant cultivars is essential to restore productivity, enhance resilience to climate variability, and ensure the long-term sustainability of the industry.

To achieve this, the following measures are imperative:

- **Establishment of a robust nursery system:** The development of a scientifically managed nursery network is vital to guarantee the consistent supply of healthy, disease-free, and genetically superior planting material. The use of certified clones and improved propagation techniques will contribute to uniformity and higher field establishment rates.
- **Implementation of replanting programs adhering to best practices:** Replanting must be conducted systematically, without compromises in soil rehabilitation, land preparation, and shade management. Shortcuts in these processes may provide temporary cost savings but can severely undermine long-term soil health and productivity.
- **Enhanced institutional support by the Tea Small Holdings Development Authority (TSHDA):** The TSHDA should play a central role in financing, technical guidance, and monitoring of replanting activities. Strengthened extension services, field demonstrations, and continuous capacity building are necessary to ensure adherence to recommended practices.
- **Adoption of Good Agricultural Practices (GAPs):** Full adoption of GAPs, covering soil fertility management, pest and disease control, pruning, and water conservation, is crucial to maximise the returns on replanting investments and to sustain productivity improvements over time.

Replanting, when executed under these scientifically guided and institutionally supported conditions, can serve as a cornerstone for revitalising Sri Lanka's tea smallholder sector, contributing to national production stability, export competitiveness, and environmental sustainability.

Samaraweera and Samansiri (2005) concluded that decades of absence of a national action plan for smallholder sustainability were a significant factor in declining productivity. However, it is encouraging that the Ministry of Plantation Industries and Estate Infrastructure has formulated a five-year strategic plan (2025–2029)**,** with an increased focus on regenerative agriculture (Regenagri) to avoid/minimise the shortcomings of past initiatives (Ref: Tea Small Holdings Development Authority, Action Plan for 5 Years).

Tea Smallholders in Kenya

The tea plant was first introduced to Kenya in the Kiambu and Kericho districts around 1907. Since then, it has expanded steadily and become an important part of the country's economy. Currently, nearly 228,000 ha are under tea cultivation on both sides of the Rift Valley. Tea contributes approximately 4% of Kenya's GDP, and around 3 million people, or one-tenth of the population, rely on the tea industry for employment. The sector comprises large estates, owned mainly by multinationals, and smallholder growers.

Tea cultivation in Kenya predominantly occurs in the highlands, which benefit from well-distributed, reliable rainfall throughout the year. Average temperatures range between 15 and 24°C, ideal for tea growth. The rich volcanic soils are deep, well-drained, and slightly acidic (pH 4.0–5.0), further supporting high yields.

Currently, the smallholder tea sector, managed mainly by the Kenya Tea Development Agency Ltd. (KTDA), controls over 80% of the land under tea and produces more than 60% of Kenya's tea. Prime tea lands in Kenya can produce over 6,000 kg/ha/year under optimal conditions (Owour et al., 2007). However, smallholders typically achieve less than 2,000 kg/ha/year, due to suboptimal agronomic practices, low adoption of research-based technologies, and other management constraints. Average yields are reported at 1,800–2,300

kg/ha for smallholders, compared to 2,900–3,300 kg/ha in large estates (Tea & Coffee Industry in Kenya, 2005).

The tea sector provides an estimated 5 million direct and indirect jobs, meaning 10% of Kenyans rely on tea for their livelihoods, including approximately 600,000 smallholder farmers. Kenya is also a leading tea exporter, with an export value of USD 1.2 billion in 2019, and nearly all production complies with voluntary sustainability standards (VSSs) such as Rainforest Alliance and Fairtrade.

Key Requirements for Smallholder Sustainability in Kenya

Current constraints include low-yielding cultivars, vacant tea fields, and incomplete adoption of Good Agricultural Practices (GAPs) (Owour et al., 2007). Improved extension services, combined with credit facilities for inputs, are critical - rising production costs, particularly for labour and energy, further challenge smallholders. Strengthening tea marketing, conducting market research, and diversifying products are recommended.

For a sustainable smallholder tea sector, the effective dissemination and adoption of research-based production technologies are essential. To enhance yields in smallholdings, the following approaches have been identified as particularly important under the Kenyan context (Owour et al, 2007):

- Cultivation of elite varieties with high yield and quality potential.
- Adoption of appropriate spacing and planting practices.
- Implementation of pruning at suitable heights using proper tools.

Issues in the Kenyan Smallholder Tea Sector

1. **Inadequate Product Diversification / Value Addition**

   KTDA has the primary responsibility for buying raw tea leaves from farmers (KTDA, 2014). Global warming impacts and climate change further strain the system. While some households have made minor adaptations (e.g., changing planting decisions), few have invested in costly measures such as agroforestry or irrigation, highlighting the need for increased investment in rural and agricultural development (Bryan et al., 2013).

2. **Contract Farming and Employment**

   Contract farmers and households employed on farms represent a small fraction of all smallholders. Employment on commercial farms is often a coping strategy for younger households or during times of need. Contract farmers generally have better access to irrigation and livestock, providing an economic advantage (Biggs, 2018).

3. **Low Tea Prices and Farmer Income**

   Smallholders have historically reported low prices from KTDA. Tea leaf prices dropped from Ksh 40/kg in 2010 to Ksh 15/kg in 2019 (Mbui, Namusonge, & Mugambi, 2016), causing some farmers to abandon tea due to unprofitability.

4. **Differential Yields and Production Inefficiencies**

   Smallholder yields average 1,917 kg/ha, while large estates achieve around 2,600 kg/ha (Tea Board of Kenya, Annual Reports). Soils in higher elevation smallholdings are rich in

carbon, and the impact of global warming is minimal above 1,200 m. Yield gaps indicate production inefficiencies and the potential to improve farmer incomes. Factors influencing productivity include:

- Farm size and heterogeneity
- Family labour intensity
- Access to extension services (e.g., Farmer Field Schools)
- Credit utilisation
- Tea marketing arrangements (Onono, n.d.)

Poor varieties, ageing plants, suboptimal agronomic practices, limited fertiliser use, labour constraints, and the lack of economies of scale all contribute to low productivity (Owour et al., 2007).

5. **Technical Efficiency and Input Savings**

   Small-scale processors can improve earnings by enhancing technical efficiency, potentially saving up to 24% on **input costs** while paying farmers better, despite global price fluctuations (Gatimbu & Ogada, 2020).

6. **Limited Value Addition and Diversification**

   Historically, Kenya focused heavily on CTC teas, neglecting value addition. Recently, efforts have been made to diversify into orthodox and green teas, though production remains minimal (~1% of total tea). In September 2025, Kenya held its first auction for orthodox teas (Tea Board of Kenya).

KTDA and Smallholder Support

The Kenya Tea Development Agency (KTDA) plays a central role in supporting smallholders, managing input supply, extension services, and marketing. KTDA's initiatives include:

- **Farmer Field Schools (FFS):** FFS programs improve plucking efficiency, GAP adoption, and overall farm management. Results include:
  - 8% increase in gross margin per hectare from improved plucking efficiency.
  - 5% expected additional gains as long-term GAP adoption takes effect.
  - Improved green leaf quality at KTDA factories.
  - Higher likelihood of maintaining native trees and sustainability scores**.**
  - Positive impact on household livelihoods**.**
- **Diversification:** KTDA has expanded into non-tea businesses such as insurance and power**,** using profits to stabilise smallholder support.
- **Financial Performance:** In 2023, KTDA reported a 7.6% increase in total payments to smallholders and a 17.6% rise in earnings per kg of tea, despite a slight drop in leaf collection compared to the previous year.

(Source: KTDA Annual Report 2023)

The Tea Board of Kenya, along with KTDA, had made the following recommendations to ensure the sustainability of the tea small holder sector in Kenya:

1. Strengthen extension services and ensure farmers receive training on elite cultivars, GAPs, and proper agronomic practices.

2. Enhance credit access and input supply to enable adoption of best practices.
3. Promote product diversification and value addition, including orthodox and green teas, to reduce dependence on CTC.
4. Encourage climate-resilient practices, including agroforestry, soil management, and irrigation.
5. Maintain and expand Farmer Field Schools, ensuring competent trainers to maximise adoption and livelihood improvements.

Overall, while smallholder productivity in Kenya remains lower than that of large estates, KTDA has demonstrated strong institutional effectiveness**,** helping farmers improve earnings, adopt sustainable practices, diversify income sources, and reduce exploitation of intermediaries. Continued investment in extension, technical efficiency, cultivar improvement, and value addition will be key to sustaining the smallholder tea sector (KTDA Annual Report 2023).

Tea Smallholders in India

In India, out of a total tea cultivation area of 635,365 ha, approximately one-third (213,904 ha) is under smallholdings. The majority of these smallholdings are concentrated in Assam, which accounts for nearly 60% of the smallholder area, while the remaining 40% is in the South, predominantly in Tamil Nadu, where almost 90% of the southern smallholders are located (Tea Board of India).

In terms of production, smallholders contribute about 55% of India's total tea output, while large estates account for the remaining 45%. Tea is cultivated across 15 states, with Assam, West Bengal, Tamil Nadu, and Kerala as the major producing regions, collectively accounting for 97% of the national output.

During 2023–24, India's total tea production reached approximately 1,382 million kg, an increase of 7 million kg compared to 2022–23. India remains the third-largest tea exporter globally, following Kenya and China, with a market share of about 13.63% in 2024.

The performance of the tea sector in North and South India can be summarised as follows:

2024		North	South	Total
Total extent	ha	421461	213904	635365
	%	66	34	
Production	Mn kg	1090	225	1315
	%	83	17	
Average yield	kg/ha	2586	1052	2070
Number of small holdings		122,000	55,000	177,000
Smallholder Extent	ha	172063	41841	213904
Smallholder Production	Mn kg	523	98	718
Auction Price	Ind Rs/kg	224.51	128.73	

Table 10: Performance of the tea sector in North and South India, Tea Board of India

Regrettably, the average productivity of tea smallholdings in southern India remains significantly lower, less than 50%, compared to that of the northern regions. Estimated yields

in the smallholder sector range from 1,300 to 1,800 kg/ha in the North and 1,200 to 2,200 kg/ha in the South (Manoj, 2023). Smallholders collectively contribute approximately 55% of India's total tea production, while large estates account for the remaining 45%.

Within the smallholder segment, Assam is the dominant contributor, accounting for around 49% of smallholder output, followed by West Bengal (31%), Tamil Nadu (12%), and Kerala (6.4%) (India Data Map, 2025). India ranks third globally as a tea exporter, accounting for approximately 13.1% of world exports. However, it is also one of the largest domestic consumers, with annual national consumption estimated at 1,154 million kg. Owing to this strong domestic demand, the volume of tea traded through public auctions fluctuates considerably, typically representing around 40% of total production, with the remainder marketed through direct sales and private channels (Committee on Commodity Problems, FAO, 2023)

Green Leaf Processing

Similar to Sri Lanka, smallholder tea leaves in India are processed through:

- State-established factories
- Private bought-leaf factories
- Cooperative-operated factories
- Large estates alongside their own leaf

Average Price of Green Leaf

The Tea Board of India has implemented a green leaf price formula based on average selling price and the outturn (made tea to green leaf) percentage, similar to the system in Sri Lanka. Regulations governing the handling and transport of green leaves have also been introduced.

Like smallholders worldwide, Indian smallholders often lack technical knowledge and skills. Authorities place increasing emphasis on training and extension activities to enhance earnings and livelihoods.

Issues Faced by Smallholders in India

Extension services are primarily delivered through the Krishi Vigyan Kendra (KVK) network, established by the Indian Council of Agricultural Research (ICAR) to bridge the gap between agricultural research and practical applications. KVKs provide localised training, technology assessment, demonstrations, and advisory services for all crops, including tea.

As of early 2025, over 700 KVKs are operational across India. Their main functions include:

- Technology dissemination and on-farm testing
- Capacity building through training programs for farmers and rural youth
- Providing high-quality seeds, planting materials, and other inputs
- Acting as knowledge hubs linking the National Agricultural Research System (NARS) to local farmers

Tea Smallholders in China

China produces approximately 40–45% of the world's tea, with smallholders accounting for nearly 80% of production. Tea types include green, black, oolong, white, dark, and yellow teas. China is the world's second-largest tea exporter, accounting for around 19% of global exports and exporting 400,000–450,000 metric tons annually, with green tea dominating. However, black tea and Pu'erh are growing in demand. Major importers include Morocco, Uzbekistan, Russia, Japan, the USA, and Europe (Committee on Commodity Problems, FAO, 2024).

Globally, agriculture faces sustainability challenges, including excessive use of chemical fertilisers and pesticides, deforestation, and biodiversity loss. China faces similar challenges, compounded by climate change, including shifts in rainfall patterns and excessive heat (Yang & Sang, 2020).

Emerging countries provide smallholders with incentives such as subsidies, credit access, and extension services to promote sustainable practices. Policies encourage integrated pest management, improved nutrient management, agroforestry, crop rotation, no-till farming, the use of organic manure, sustainable technologies, and innovation. Such measures can make sustainable farming economically and environmentally beneficial for farmers.

China's tea sector has significant potential to reduce greenhouse gas emissions. Switching from coal to biomass in tea factories could lower emissions by up to 58% (Liang et al., 2021). Deforestation for tea cultivation and energy production must be reversed. Restoring forests on tea plantations can mitigate climate change through carbon sequestration while improving resilience by providing shade and retaining soil moisture. To remain viable in the long term, the tea sector must reduce its carbon footprint (Ethical Tea Partnership, 2021).

However, detailed data on the distribution of smallholdings, productivity, and livelihoods in China are limited in the literature.

Tea Smallholders in Vietnam

The first tea plantation in Vietnam was established in 1890 in Phu Tho by the French. Following the economic reforms under *Doi Moi* and the government's focus on tea as a strategic commodity, tea production has grown significantly. Cultivation is encouraged in 34 provinces, covering approximately 125,000 ha. Tea plays a vital role in income generation and poverty alleviation, especially in the Northern Uplands and Northeast regions. Vietnam is also a major tea exporter, though export prices are relatively low compared to those of leading producers such as Sri Lanka, Kenya, and India.

Vietnamese tea cultivation has a history spanning over 3,000 years, and tea contributes significantly to rural livelihoods. About 80% of annual production is exported, reaching over 100 countries, with an export value of approximately USD 200 million. The total area under tea is around 123,000 ha, producing ~170 million kg of made tea at an average yield of 1,400 kg/ha (Van Hung et al., 2021). Exports account for ~121 million kg, averaging USD 1.737 per kg, with limited value addition. Domestic sales contribute about USD 537 million, while exports add USD 210 million, comprising ~53% green tea and 46% black tea, mostly in bulk form (Annual Bulletin of Statistics, International Tea Committee, 2024).

According to the 2003 Agricultural Census (GSO), Vietnam has nearly 400,000 tea-growing households. The majority (~65%) are in the Northeast, with other contributions from the Northwest (8%), North Central (9%), and Central Highlands (8%). Between 2005 and 2011, production grew at an average of 8.5% per year, with area and yield increasing by 2.5% and 3.1%, respectively. The low export prices are mainly due to limited value addition, as most

black tea is exported in bulk (Van Hung et al., 2021). Export volumes grew from 20.8 thousand tons in 1996 to 138 thousand tons in 2010, at an average annual increase of 14.1%.

The Vietnamese tea industry faces several challenges, including high fragmentation, small-scale operations, and weak linkages across the value chain. Smallholder farmers can be categorised into four groups:

- **Independent (unlinked) farmers:** cultivate and sell tea directly to traders or processors.
- **Contract farmers:** own land but sell part or all of their output under contractual agreements with companies.
- **Cooperative farmers:** members of cooperatives that collectively produce and market tea.
- **Worker farmers:** plantation employees allocated land for up to 50 years, conditional on selling tea leaves to the company, analogous to the out-grower model observed in Sri Lanka.

Tea processing in Vietnam remains largely small-scale and resembles the cottage industry model in China. The country has over 600 small processing factories with daily capacities of 3–7 tons of fresh tea (0.75–2 kg made tea) and more than 10,000 traditional processing households (Viet Khoi, 2015). While many factories are privately operated, smallholders also maintain small-scale processing units.

Profitability and Efficiency: Vietnamese smallholder tea farmers frequently rely on family labour, which is often excluded from profitability assessments. When the cost of family labour is taken into account, total production costs often exceed the market value of harvested tea leaves. Reported technical efficiency (TE) among tea farms ranges from 27.27% to 95.45%, with a mean of 73.11% (Huong et al., 2021). The predominance of the *Trung Du* cultivar is associated with low yield potential and suboptimal tea quality.

To enhance profitability and sustainability, it is recommended to: improve cultivation practices to increase yields and quality; strengthen contract farming arrangements; facilitate access to inputs and resources; implement market demand forecasting; provide targeted technical training; and adopt advanced production technologies. Adherence to quality standards such as VietGAP and GlobalGAP, combined with improved integration of value chain actors, is critical for optimising farm-level performance and ensuring long-term sector sustainability (Van Bac et al., 2017).

Climate Change and Its Implications for Tea Cultivation in Sri Lanka

Sri Lanka has experienced a steady rise in ambient temperature, attributed to global warming. Long-term observations indicate an increase of approximately 0.016 °C per year (~1.6 °C per century) in mean daytime temperature. In Nuwara Eliya, the Land Surface Temperature (LST) increased by 2.1°C between 1996 and 2017 **(**Ranagalage et al., 2019).

Historically, Sri Lanka received evenly distributed rainfall throughout the year, with about 3,000 mm annually**,** which was adequate for tea cultivation. However, climate change has led to short-duration, high-intensity rainfall and extended dry periods, both of which adversely affect yields. High-intensity rainfall also accelerates soil erosion, particularly in hilly tea-growing regions.

Interestingly, rising temperatures in the mid- and up-country areas appear to have enhanced yields**,** as the thermal conditions have shifted toward optimal levels for tea growth. This observation is supported by Naveendrakumar et al. (2018)**,** who reported increases in annual average Tmin (70%) and Tmax (55%) across fifteen meteorological stations in Sri Lanka.

To enhance resilience, regenerative agriculture must be adopted. This holistic approach focuses on restoring soil health, enhancing biodiversity, and improving water cycles. Regenerative systems can increase nutrient density, sequester atmospheric carbon, improve water quality, and strengthen the sustainability and profitability of tea cultivation under changing climatic conditions.

Core principles and practices under Regenagri:

- **Reduce Soil Disturbance:**
  Minimising or eliminating tillage protects soil structure, conserves organic matter, and supports healthy soil microbial communities.
- **Maintain Soil Cover:**
  Keeping the soil covered with plants or organic mulch prevents erosion, improves water infiltration, and provides food for soil life.
- **Increase Biodiversity:** Diversifying crops, integrating livestock, and incorporating cover crops enhances ecosystem complexity, soil health, and pest resistance.
- **Keep Living Roots in the Soil:**
  A continuous living root system, supported by permanent plant cover, fuels soil microbes, builds soil structure, and sequesters carbon.
  Benefits of Regenerative Agriculture:
- **Improved Soil Health:** Regenerative practices increase soil organic matter, enhance soil structure, and foster a thriving soil ecosystem.
- **Climate Change Mitigation:** Healthy soils sequester large amounts of carbon from the atmosphere, helping to combat climate change.
- **Enhanced Biodiversity:** By restoring habitats and increasing complexity, these systems boost the variety of plants, insects, and soil organisms.
- **Improved Water Quality:** Reduced erosion and runoff from healthy soils lead to cleaner water.
- **Increased Farm Resilience:** Regenerative farms are better equipped to withstand environmental challenges like drought and extreme weather events.
- **More Nutrient-Dense Food:** Healthy soils produce crops with higher levels of essential nutrients.
- **Economic Viability:** By reducing reliance on expensive inputs like inorganic fertilisers and pesticides, and by creating more resilient systems, regenerative agriculture can improve farm profitability.
- **Livelihoods Funds**: Could help build more resilient rural livelihoods by reducing exposure to environmental risks

Research, Extension, and Knowledge Transfer Systems in the Tea Sector of Sri Lanka

In agricultural production, the effective transfer of research and development (R&D) outputs to producers is critical for sustained productivity. In Sri Lanka, this function is primarily carried out by the Tea Research Institute (TRI), established in 1925 with the mandate to conduct research and disseminate findings to the plantation sector through its Advisory and Extension Services**.** Initially, TRI served the entire tea industry; however, following the establishment of the Tea Small Holdings Development Authority (TSHDA) **in** 1977, TRI's focus shifted predominantly toward the corporate estate sector, while TSHDA assumed responsibility for the extension services provided to smallholders.

The TRI disseminated its research outputs primarily through English-language publications and the biannual Experiments and Extension Fora, which served as key platforms for stakeholder engagement. To strengthen regional coverage, TRI established regional research stations in all central tea-growing districts, including Ratnapura, Kandy, Galle, Passara, Deniyaya, and Kalutara, to conduct localised research and provide field-level technical guidance.

With the expansion of the smallholder sector after the 1990s, TRI increasingly directed its efforts toward this segment. The Institute began publishing technical materials in Sinhala and Tamil and initiated localised Experiments and Extension Fora for smallholders. With support from the Asian Development Bank (ADB), TRI expanded its Low Country station, established certified mother bush nurseries, and strengthened collaboration with TSHDA for nursery certification and input distribution.

To address capacity-building needs, TRI designed Training of Trainers (TOT) programs for Tea Inspectors (TIs) of TSHDA, who, in turn, provided advisory support to smallholders. Given the scale of the sector—approximately 420,000 smallholders—the Tea Inspectors' extension ratio to smallholders remains low (1:3,000), constraining personalised field visits. Consequently, large-scale seminars and community meetings became the primary mode of outreach.

Recognising the difficulty smallholders faced in accessing TRI facilities, the Institute introduced “Crop Clinics”, a participatory extension model where senior scientists visited localities (e.g., schools, temples, or community centres) for two-day diagnostic sessions. Farmers could directly consult specialists on field-specific issues, supported by on-site analytical tools (TRI Annual Report 2004).

Despite these efforts, knowledge gaps among smallholders remain a significant constraint. Inadequate technical understanding has led to unsustainable practices, resulting in a ~40% decline in yield between 2020 and 2024. To address this, TRI established “Demonstration Blocks” across regional stations to visually compare the impact of correct and incorrect agronomic practices, enhancing farmer learning through observation (TRI Annual Report 2004).

Recent data suggest that average yields from mid- and up-country smallholders now surpass those of the low-country sector, a reversal from the 1990–2020 “boom period.” Much of the low-country tea was planted in the early 1990s, indicating that these bushes may have exceeded their prime productive lifespan. Although tea is a perennial crop capable of remaining productive for over 50 years under proper management, poor agronomic practices have likely contributed to yield decline.

Acknowledging the strategic contribution of smallholders, several universities have integrated tea-related programs into their curricula, such as Uva Wellassa University’s BSc degree program in Tea Technology**,** as well as specialised courses at the Universities of Peradeniya, Wayamba, and Ruhuna**.** These initiatives aim to build a new generation of professionals for the tea sector.

Globally, multiple extension models are practised to support smallholder agriculture. For Sri Lanka, it is essential to identify the most context-appropriate approach. With 29.3 million mobile phone users**,** of whom 47% use smartphones in Sri Lanka (Datareportal; Digital 2025: Sri Lanka)**,** digital extension platforms offer a promising avenue.

In this regard, TRI developed a trilingual mobile-based software, “Tea Advisor,**”** designed to deliver comprehensive guidance on tea cultivation. The platform includes visual tools such as videos and images of pest and nutrient deficiency symptoms, covering Good Agricultural Practices (GAPs), cultivar selection, fertiliser recommendations, and pest management. The system minimises the need for field visits, saving both time and cost for smallholders.

Comparable digital initiatives exist internationally, such as India's **"**mKRISHI**"** and Kenya's "iShamba"**,** which demonstrate the transformative potential of ICT-based extension. Additionally, integrating blockchain technologies could enhance transparency, traceability, and trust across the value chain.

Complementary use of SMS and WhatsApp-based advisory services**,** including localised weather forecasts, pest alerts, agronomic tips, and real-time auction price updates, can further empower smallholders and improve their decision-making capacity. For instance**,** monthly factory ranking data based on auction performance can help smallholders select optimal buyers for their green leaf supply, improving overall economic returns.

Current Trends in Standards and Certifications for Tea Smallholders

The growing consumer awareness regarding food safety, ethical production, and environmental sustainability has made standards and certifications an integral part of modern agriculture. Although producers often perceive certification processes as burdensome, they provide significant direct and indirect benefits by reinforcing long-term sustainability across the value chain.

Sustainability as a Baseline and Shift Toward Stronger Environmental Standards

Modern certification schemes increasingly move beyond basic compliance to require active environmental stewardship. These include measures to promote biodiversity conservation, improve soil health, implement integrated pest management, and adopt regenerative agricultural practices. A growing emphasis is also placed on achieving climate-neutral or carbon-positive production. For example, Bogawantalawa Plantations PLC in Sri Lanka recently achieved both Climate Neutral and Climate Positive Certifications (Lanka Business News, March 2022).

Shared Responsibility and Cost Burden Awareness

Certification costs, covering audits, compliance activities, and administrative requirements, often impose significant burdens on smallholders. Consequently, there is a global shift toward shared responsibility among stakeholders, with buyers and downstream actors contributing to certification costs or providing "sustainability differentials" in payments. For instance, several buyers now prefer certified teas for export markets, which are fetching higher auction prices. In some cases, government interventions have occurred, such as in Kenya, where authorities instructed factories to reconsider their association with Rainforest Alliance due to the excessive costs transferred to farmers (The Star 2024).

Regenerative Agriculture and Local Standards

In both corporate and smallholder sectors, past negligence and short-term profit motives have led to soil degradation and ecosystem damage. There is now a paradigm shift from "sustainable" to "regenerative" agriculture, which emphasises restoring soil fertility, enhancing carbon sequestration, and strengthening ecosystem and water cycle functions. Standards incorporating regenerative principles are gaining prominence. Sri Lanka, for example, is currently developing the *Code for Ceylon Tea* with a focus on regenerative agricultural practices. Moreover, the development of context-specific local or national standards is increasingly encouraged to enhance relevance and reduce certification costs (Lanka News Web, July 2024).

Traceability, Transparency, and Chain of Custody

Consumers and buyers now demand comprehensive information regarding production sources, cultivation practices, and social conditions. Consequently, certifications emphasise traceability, documentation, and audit trails throughout the value chain. Emerging

technologies such as blockchain are being integrated to ensure data transparency and reliability, though their adoption remains limited due to associated costs and technical complexity (Mangla et al, 2022).

Social Dimensions: Living Wages, Gender, and Labour Conditions

Certification systems increasingly extend beyond environmental criteria to address social welfare. Requirements now include the provision of living wages, decent working conditions, and equitable treatment of workers, including those employed by smallholders (Solidaridad Network, 2023). Gender inclusivity has also become a focus, recognising that women contribute substantially to tea production but often lack recognition and ownership rights. Several programmes have been implemented to enhance the welfare and empowerment of women in the sector.

Harmonisation and Consolidation of Standards

The proliferation of overlapping certification systems (e.g., Rainforest Alliance, Fairtrade, UTZ, Organic) has led to redundancy and increased costs for producers. To address this, the industry is moving toward harmonisation, simplification, and mutual recognition of standards. Updated standards, such as the Rainforest Alliance 2020 version, now adopt a more holistic approach encompassing environmental, economic, and social sustainability.

Consumer Demand and Market Pull

Rising consumer demand for sustainably and ethically sourced products has compelled tea brands to strengthen certification requirements across their supply chains. Premium markets increasingly value traceability, provenance, and unique product stories linked to origin. Geographic Indication (GI) certification is one such mechanism, with Sri Lanka currently pursuing GI registration for *Ceylon Tea* in the European Union.

Food Safety, Quality, and Hygiene Standards

In addition to environmental and social criteria, food safety standards have become increasingly stringent. Certifications such as ISO 22000:2018 and other Food Safety Management Systems (FSMS) are now required to ensure product quality and traceability. Compliance with Maximum Residue Levels (MRLs) of pesticides has also become a critical trade requirement, often acting as a non-tariff barrier in international tea markets.

Programmes Beyond Certification

Certification alone does not resolve challenges related to low income, climate risks, or market volatility. Consequently, several initiatives now integrate certification with broader support mechanisms, including capacity-building, technical assistance, infrastructure improvements, and social welfare programmes. For instance, Solidaridad, in collaboration with the Douwe Egberts Foundation, implemented a three-year programme (2014–2017) in Sri Lanka to support UTZ certification while enhancing working and living conditions of women workers.

Integration with Local Government and Regulatory Frameworks

National governments and regulatory bodies are increasingly embedding sustainability and certification requirements into agricultural policy frameworks. In Sri Lanka, the tea industry is actively pursuing alignment with sustainability codes while seeking GI recognition for *Ceylon Tea*. By 2025, full GI certification is expected. The introduction of a regenerative agriculture–based national standard aims to improve product quality, rejuvenate degraded soils, and ensure long-term industry resilience.

Challenges and Trade-offs

Despite these positive developments, several challenges persist:

- **High certification and audit costs:** Smallholders face significant financial constraints in meeting certification and traceability requirements. Record keeping, data management, and compliance documentation require both training and additional resources.
- **Limited access to premium markets:** Certified producers do not always receive price premiums due to weak bargaining power and their role as raw material suppliers rather than value-added processors.
- **Audit integrity and compliance fatigue:** Concerns exist regarding the reliability of audits and whether the intended social and economic benefits of certification are realised in practice.
- **Market volatility:** Certification does not insulate producers from external shocks such as fluctuating input costs, climate variability, or global tea price instability.

Implications for Smallholders

Participation in internationally recognised certification schemes such as Rainforest Alliance, Fairtrade, Organic, or Regenagri can provide smallholders with significant advantages, particularly access to premium markets and improved bargaining power. In the Sri Lankan context, where numerous buyers participate in the Colombo Tea Auction and many overseas buyers demand certified teas, such certifications are of considerable importance. For example, several major buyers now exclusively procure Rainforest Alliance–certified teas.

However, certification alone is insufficient. To ensure success, certification initiatives must be complemented by technical support, training, and cost-sharing mechanisms. Collaborative approaches, such as farmer cooperatives or producer groups, can reduce per-farmer compliance costs through shared audits, pooled resources, and collective capacity-building. Furthermore, adopting regenerative and climate-smart agricultural practices can deliver benefits beyond market access, including reduced input costs, improved soil health, and enhanced resilience to climate variability.

Adapting Global Innovations to the Sri Lankan Context

Global innovations in the tea sector must be **localised, affordable, and scalable** to strengthen smallholder livelihoods without increasing dependency or inequality. The following strategies are proposed for adaptation in Sri Lanka:

i. Development of a National Tea Policy through Multi-Stakeholder Collaboration

A comprehensive national tea policy should be developed through consultation with all value-chain actors. Such a policy should articulate a shared vision for the industry, define implementation mechanisms, identify relevant policy instruments, and allocate adequate resources to execute it. Strengthening the national research infrastructure, notably the Tea Research Institute (TRI), is essential, as the future of the tea industry depends heavily on sustained investment in research and development (R&D).

ii. Enhancing Yield Potential through Genetic Improvement

Popular cultivars developed by the Tea Research Institute (TRI) of Sri Lanka currently produce approximately 3,000–4,000 kg of made tea per hectare under optimal commercial conditions. In contrast, competing countries report yields exceeding 8,000 kg/ha. More recently, the TRI has released several high-performing cultivars in the “TRI 5000 series”, which are claimed to

exhibit superior yield potential and improved tolerance to selected pests and diseases, particularly in the low-country tea-growing regions (Piyasundare et al., 2025).

A major constraint to further yield enhancement in Sri Lanka is the narrow genetic base of existing cultivars, most of which are derived from the parental line ASM 4/10. Despite advances in modern breeding techniques, including mutation breeding, the genetic potential for yield improvement remains largely exhausted. As previously suggested by Gunawardena et al. (1995), substantial productivity gains may only be achieved through the introduction and exchange of germplasm from other tea-producing countries, provided that suitable agroecological conditions are maintained.

Comparatively favourable soil conditions in competitor countries, indicated by a nitrogen replacement ratio of 1:20 (1 kg nitrogen per 20 kg made tea) versus Sri Lanka's 1:12 ratio, reflect greater fertiliser-use efficiency abroad. This disparity suggests that excessive fertiliser application in Sri Lankan tea systems contributes to environmental degradation without corresponding gains in productivity.

iii. Strengthening Cooperative Structures

Establishing cooperative models similar to the Kenya Tea Development Agency (KTDA) could enhance extension support, input supply, and marketing efficiency for smallholders. Such models have significantly improved productivity and farmer income in Kenya. Sri Lanka's earlier initiatives, such as the Tea Shakthi Fund and Tea Smallholder Factories Ltd. (TSFL), offer valuable lessons; identifying and addressing operational gaps from these experiences is critical to ensure success in future cooperative efforts.

iv. Strengthening Extension and Capacity-Building Programs

Farmer training is crucial for the adoption of sustainable practices and livelihood diversification. A comprehensive evaluation of existing extension programs should be undertaken to identify weaknesses and improve delivery mechanisms. Lessons can be drawn from successful approaches such as Kenya's *Farmer Field Schools*. Digital extension tools should also be scaled up. The "Tea Advisor" platform developed by TRI provides a strong foundation for delivering location-specific recommendations. Similar to the *Farmer Chat* platform, which utilises generative AI to provide localised advice, integrating videos and visual aids could increase learning effectiveness. Programs like *Digital Green* demonstrate that such cost-effective digital systems can achieve high adoption rates and measurable productivity gains.

v. Developing Cost-Effective Certification Models

Affordable certification schemes, such as **group certification**, should be designed to improve market access without imposing prohibitive costs. Collective participation through societies or cooperatives can reduce audit and compliance expenses while maintaining credibility in global markets (Bakkar, 2014).

vi. Introducing Efficient Payment Systems

Currently, many factories pay smallholders through intermediaries, causing delays and additional costs. Implementing mobile or digital payment systems such as Kenya's *M-Pesa*, or issuing individual ATM cards for direct bank access, could streamline payments. Some Sri Lankan factories have already adopted such systems, and wider implementation would improve efficiency and financial inclusion, especially given that over 47% of the population owns smartphones.

vii. Climate Change Adaptation Strategies

Climate adaptation requires timely agricultural interventions supported by predictive climate models. Early warnings can help farmers adjust management practices to reduce risks. Adaptation measures, such as crop diversification, intercropping, soil conservation, and adoption of climate-resilient tea cultivars**,** should be prioritised (TRI Guideline 01 -2019). Linking these interventions with access to credit and cooperative networks would enhance smallholder adaptive capacity.

viii. Adoption of Voluntary Sustainability Standards (VSS)

Experience from Kenya, India, and Sri Lanka indicates that Voluntary Sustainability Standards (e.g., Rainforest Alliance) can improve environmental performance and provide access to premium markets (FAO, 2013). However, certification costs remain a concern. Introducing simplified or group-based VSS models could make participation more feasible for Sri Lankan smallholders.

ix. Introduction of Crop Insurance Schemes

Smallholders are highly vulnerable to yield losses caused by drought, pests, or diseases. Establishing a crop insurance scheme, preferably through cooperative societies to pool risk, could mitigate financial losses and stabilise livelihoods during adverse conditions.

x. Establishment of a Revolving Fund for Financial Resilience

A revolving fund**,** managed by the Tea Small Holdings Development Authority (TSHDA) or smallholder cooperatives, could serve as a financial safety net. Contributions from both smallholders and factories (e.g., LKR 0.10 per kg of green leaf) could accumulate into a fund for emergency relief or microcredit schemes, such as fertiliser procurement during crises like the 2022 fertiliser shortage. Transparent governance is essential; an independent monitoring committee could oversee fund management, ensure equitable distribution, and mandate regular audits to maintain accountability.

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2. Sri Lanka's Tea Sector

Dr M T Ziyad Mohamed

Abstract

Sri Lanka's tea industry remains a central pillar of the national economy and a globally recognized source of high-quality orthodox tea. Over the past several decades, smallholders have emerged as the dominant producers, contributing the majority of national output and playing a critical role in sustaining rural livelihoods. This paper reviews the historical evolution of tea cultivation in Sri Lanka and examines contemporary production trends across different agro-climatic regions. It also analyses the institutional framework supporting the sector, including research, extension services, and regulatory bodies. Key challenges affecting the industry—including declining productivity, rising production costs, labour constraints, and policy uncertainties—are discussed in detail. The paper provides a comprehensive overview of the sector's current structure and performance, laying the foundation for identifying strategic pathways to strengthen resilience, productivity, and global competitiveness.

Keywords: Sri Lanka tea industry, Tea smallholdings, Agricultural economy, Tea production trends, Export commodities, Plantation sector, Rural development

Overview of Sri Lanka's Tea Sector

Sri Lanka is one of the oldest tea-producing countries in the world, having commenced commercial-scale production in 1867. The tea produced in the country, popularly known as *Ceylon Tea*, is globally recognised for its superior quality. Over time, the term "Ceylon Tea" has become synonymous with premium-quality tea worldwide.

Extent of Tea Cultivation

Tea cultivation, initiated by the British in 1867, gradually expanded and continued as large plantations under private ownership until the early 1970s, when ownership was transferred to local entities and the state (Mendis, 1992). Under the Land Reforms Act No. 2 of August 1972 and its Amendment Act No. 39 of October 1975, the majority of tea estates were nationalised and placed under the management of two state corporations: the Janatha Estates Development Board (JEDB) and the Sri Lanka State Plantations Corporation (SLSPC). By 1975, the government decided to nationalise all plantations exceeding 50 acres in extent.

According to the Sri Lanka Tea Board (SLTB), the current area under tea cultivation in Sri Lanka is 267,186 hectares (Ministry of Plantation Industries, 2023). Before the privatisation of estate management in 1992, the large-estate sector, managed by the JEDB and SLSPC, accounted for approximately 120,841 hectares, representing 54.49% of the total estimated tea area of 221,836 hectares. The remaining area was under private holdings (17.84%) and smallholdings (27.07%) (Central Bank Report 1992).

A comprehensive survey in 1996 revealed a reduction in total tea extent to approximately 188,971 ha, primarily due to the abandonment of marginal mid-country tea lands with low productivity. Although production and productivity in the corporate sector declined, tea cultivation under smallholdings expanded steadily, with the smallholder extent increasing to 157,838 ha in 2016 and 158,221 ha in 2023 (Sri Lanka Tea Board, 2023).

Corporate Sector and Privatisation of Estate Management

By the early 1990s, state management of plantations under JEDB and SLSPC had become financially unsustainable. In response to persistent financial losses and operational inefficiencies, the government decided to privatise management in order to introduce private-sector efficiency and relieve the fiscal burden of estate administration (Manikkam, 1995). Consequently, 22 state-owned Regional Plantation Companies (RPCs) were established under the Plantations Restructuring Unit (PRU). Following competitive bidding, the management of these RPCs was transferred in June 1992 to successful private bidders, referred to as Managing Agents, for a period of five years.

These RPCs were handed over on a debt-free basis, with the Managing Agents obtaining working capital from commercial banks on behalf of each RPC. Certain unviable estates in the Matale and Kandy districts, previously managed by JEDB and SLSPC, were excluded from the privatisation process and retained under state management (Plantation Reform Project Evaluation Report, 1997).

Managing Agents were granted 51 % ownership of the “profit-making” RPCs at a par value of Rs 10 per share, amounting to a total purchase of Rs 102 million across all 22 RPCs. This purchase also conferred leasehold rights to the estates for a period of 53 years. The selection criterion was based solely on profitability, without regard to whether the profits were derived from input reductions, asset liquidation, or prevailing market conditions.

Until the mid-1950s, commercial tea cultivation in Sri Lanka relied primarily on low-yielding seedling tea. By the turn of the century, more than 120,000 ha had been replanted under the Tea Replanting Subsidy Scheme, with the national extent peaking at 238,770 ha. However, the Tea Lands Survey of 1994/1995 recorded a reduced extent of 187,971 ha, which subsequently increased to 210,621 ha by 2002, a 12% rise within eight years, driven by rising demand for low-grown teas (Anon., 2002).

According to the Tea Research Institute (TRI) survey of 2002, the corporate sector accounted for 81,591 ha, while smallholdings covered 132,329 ha, resulting in a total of 221,969 ha (Anon., 2003). Subsequent TRI field-based surveys conducted in 2002 and 2011 confirmed a further decline in the extent of the corporate sector to approximately 70,365 ha (Anon., 2003; Samansiri et al., 2011; Anon., 2005).

These surveys also revealed that nearly 50% of the corporate sector’s tea area remains under old, less-productive seedling tea (Samansiri et al., 2011). The persistently low replanting rate, less than 0.5% per annum compared to the 2% target recommended by TRI during the 1960s and 1970s, is mainly responsible for this condition. Following privatisation in 1992, the corporate sector significantly reduced replanting, citing high costs and long payback periods (Sidhakaran et al, 2022).

Smallholder Sector

Expansion of the Smallholder Sector

Some of the land acquired by the state in 1972 was redistributed among villagers under the Village Expansion Programme (Manikkam, 1995). Subsequently, the economic environment became highly favourable for the expansion of small-scale tea cultivation, particularly in the Low Country. This was primarily driven by attractive tea prices resulting from increased demand from the Russian Federation, the Commonwealth of Independent States (CIS), and Middle Eastern countries for Low Country teas (Anon., 2005). While both large and small estates were concentrated in the High and Mid-Country regions, smallholdings remained predominantly confined to the Low Country.

Over time, production and productivity within the corporate sector have steadily declined, whereas the extent of tea under smallholdings has continued to increase, rising from 157,838

ha in 2016 to 158,221 ha in 2023. Correspondingly, the number of smallholders increased to 418,938 in 2023 (Tea Small Holdings Development Authority [TSHDA], Annual Report, 2023).

Smallholders are often located in remote areas with limited access to basic infrastructure and transport facilities. Case studies indicate that many smallholders lack formal training in tea cultivation techniques, harvesting, and sustainable agricultural practices. This knowledge gap has resulted in low productivity, higher rates of leaf rejection, reduced profitability, occupational risks, and environmental degradation (Perera, 2014). Tea cultivation is highly labour-intensive, and the escalating cost of labour, coupled with labour shortages, presents significant challenges for smallholders. When hired labour is employed, cultivation costs become the highest among all production stages (Munasinghe, 2017).

The level of technical knowledge among smallholders remains low, and access to effective extension services is limited (Bandula & Sandika, 2017; Munasinghe & Wanigasundera, 2017). Their educational attainment also influences farmers' ability to seek and apply technical advice. Smallholders rely heavily on Tea Inspectors or Extension Officers of the TSHDA; however, each officer is typically responsible for 2,000–3,000 smallholders, significantly constraining outreach effectiveness.

To address this, a factory-level extension system was introduced, whereby each factory employs an Extension Officer to monitor and improve the quality of green-leaf intake. This initiative aims to enhance both input and output quality, and numerous success stories have been reported across the central tea-growing districts (Samanga & Sachithra, 2017).

Production Trends

The proliferation of smallholdings in the Low Country contributed significantly to the overall increase in national tea production. Output rose from approximately 220 million kilograms in the 1990s to over 300 million kilograms in the following decade, peaking at 341 million kilograms in 2013. This growth was primarily driven by the smallholder sector, which now accounts for nearly 75% of total national production. However, production has declined sharply over the past five years, mainly due to the economic crisis and the abrupt policy decision in 2021 to transition the entire agricultural sector to 100% organic cultivation.

Tea is cultivated at elevations ranging from sea level to nearly 2,000 m (6,500 ft) above mean sea level (amsl). Based on elevation, production is categorised as follows:

- **Low grown:** 0 – 600 m (0 – 2,000 ft amsl)
- **Mid grown:** 600 – 1,200 m (2,000 – 4,000 ft amsl)
- **High grown:** > 1,200 m (> 4,000 ft amsl)

Tea is produced across several districts, with the contribution from each region varying by elevation. Production from the Nuwara Eliya District is primarily derived from the corporate sector. In contrast, the increased output in the Low Country, particularly from Ratnapura, Galle, Matara, and Kalutara Districts, is mainly attributed to smallholder production. The overall production ratio by elevation is approximately **61: 16: 23** for Low, Mid, and High elevations, respectively (Source: SLTB Annual Report, 2023).

As a rain-fed crop, tea production is susceptible to climatic variability, and yield fluctuations are closely linked to rainfall distribution and temperature patterns prevailing in respective agro-ecological zones (Nijamdeen et al., 2017; Thennakoon & Edirisinghe, 2022).

	High	Medium	Low	Total
Badulla	14,315,083	10,723,264	-	25,038,346
Colombo	-	-	1,233,378	1,233,378
Galle	4,534	-	38,067,233	38,071,767
Hambantota	-	-	82,564	82,564
Kalutara	-	-	15,870,895	15,870,895
Kandy	564,607	17,181,391	9,446,287	27,192,284
Kegalle	-	245,643	7,960,580	8,206,223
Matale	-	1,502,990	364,724	1,867,714
Matara	-	61,170	29,323,341	29,384,511
Monaragala	-	155	-	155
Nuwara Eliya	43,755,636	10,896,549	793,643	55,445,828
Ratnapura	-	1,726,735	51,968,246	53,694,981
Total	**58,639,860**	**42,337,897**	**155,110,891**	**256,088,646**
Percentage	**22.90**	**16.53**	**60.57**	**100.00**

Table 11: Tea production (in kg made tea) in different districts (TSHDA Annual Report, 2023)

Production Forecasts and Trends

Government projections for national tea production up to 2020 estimated an output of approximately 325,000 metric tonnes per annum, constrained primarily by the limited availability of land for new planting. These projections were based on the expectation that declining yields from the corporate and state-managed estates would likely offset any marginal increase in production from the smallholder sector.
The government also expressed concern that expanding smallholder tea cultivation was leading to encroachment into protected areas**,** including the *Sinharaja Forest*. Consequently, stricter regulations were introduced to control new clearings and to formalise land ownership. A legal framework mandating the registration of all tea lands came into effect in 2016 (Sri Lanka Tea Board, Annual Report, 2016).

More recently, the government has set an ambitious target of 400,000 metric tonnes per annum by 2030. However, this appears optimistic given current production levels, declining productivity, and the ageing tea stock in smallholdings, which now account for nearly 75**%** of total production. The latest reported yield figures of approximately 1,205 kg ha^{-1} in smallholder holdings further underscores this challenge.

Multiple factors contribute to yield decline in smallholder systems, including poor management practices, suboptimal soil fertility, and the use of aged or unproductive tea bushes (Sidhakaran et al., 2022; Samaraweera & Samansiri, 2025; Mahindapala et al., 2020). Furthermore, a 21.7% reduction in the tea extent within the Regional Plantation Company (RPC) sector in the Low Country and persistently low replanting rates across most districts have also been identified as major contributors to reduced yields (Mahindapala et al., 2018).

Exports

Sri Lanka was the world's largest tea exporter until 2004, but now ranks fourth, following Kenya, China, and India, in terms of export volume. Approximately 90% of Sri Lanka's tea is still marketed through the long-established Colombo public auction system**,** which consistently

records the highest average auction prices globally, for instance, US$4.06 per kg in 2024 (Source: F & W Tea Review 2024). The strong performance of leafy-grade teas, primarily produced in the Low Country, has elevated the national average price and maintained Sri Lanka's position as a premium tea supplier. High auction prices, combined with a substantial degree of value addition, nearly 60 % of total exports, by local tea exporters, have resulted in record free-on-board (FOB) prices, reaching US$5.41 per kg in 2023 (Source: F & W Tea Review 2024).

Despite these price gains, export volumes have been declining. Sri Lanka consistently exported over 300 million kg annually until 2020; however, volumes fell to 242 million kg in 2024. Export earnings remain significant, contributing approximately 2% of national GDP and 12.8% of total export revenue, generating around US$1.3–1.4 billion in foreign exchange (Central Bank of Sri Lanka, 2022). The tea industry continues to play a vital socio-economic role, providing direct and indirect employment to nearly 2 million people, representing almost 10 % of the national population (Central Bank of Sri Lanka, 2022).

Year	RPC Factories	%	JEDB,SLSPC,TSF,TRI & (Kalubovitiyana factories)	%	Private Factories	%	National Production
2006	128.30	41.30	19.50	6.30	163.00	52.40	310.80
2007	126.30	41.50	20.50	6.70	157.90	51.80	304.60
2008	131.00	41.10	19.90	6.30	167.80	52.60	318.70
2009	115.40	39.60	11.30	3.90	164.40	56.50	291.10
2010	136.20	41.10	12.20	3.70	183.10	55.20	331.40
2011	134.10	40.90	7.60	2.30	185.80	56.70	327.50
2012	119.90	37.00	7.90	2.00	200.60	61.00	328.40
2013	125.30	37.00	7.40	2.00	207.30	61.00	340.00
2014	122.70	36.30	5.00	1.50	210.30	62.20	338.00
2015	11810	35.90	5.70	1.70	205.00	62.40	328.80
2016	99.30	33.90	3.60	1.20	189.70	64.80	292.60
2017	100.10	32.50	4.60	1.50	202.90	66.00	307.70
2018	98.84	32.52	5.77	1.90	199.33	65.58	303.94
2019	96.96	32.31	5.74	1.91	197.42	65.78	300.12
2020	94.86	34.02	6.13	2.20	177.85	63.78	278.85
2021	101.8	33.98	6.83	2.28	190.91	63.74	299.49
2022	82.1	32.61	6.02	2.39	163.69	65.00	251.84
2023	85.0	33.21	6.18	2.41	164.86	64.38	256.09
2024	84.9	32.33	1.77	0.68	176.00	67.00	262.69

Table 12: Tea production ('000 metric tons) by type of manufacturer

Source: Sri Lanka Tea Board

Sri Lanka's position in the Global marketplace

Global Tea Production and Market Trends

Global tea production increased in 2024, driven primarily by higher output in several major producing countries. Expansion in the production of green tea and other speciality teas offset the decline in black tea production, which was attributed mainly to a crop shortfall in Sri Lanka, the world's third-largest producer of black tea. Global tea consumption also rose by 4.0% in 2024 compared with 2023, supported by strong import demand (International Tea Committee, *Annual Bulletin of Statistics*, 2024). Over the past decade, global tea consumption has expanded at an average annual rate of 3.3%, reflecting robust growth in producing countries that has more than compensated for declining consumption in traditional importing markets. In 2024, tea exports from Kenya, China, and India recorded significant increases, while Sri Lanka, the second-largest exporter of black tea, saw shipments decline.

Following a sharp 14.5% increase in 2022, international tea prices declined by 9.2% in 2023, as global supply outpaced demand, exerting downward pressure on prices. In the medium term, the black tea market is expected to continue expanding, though at a slower rate than in the previous decade. In contrast, the green tea market is projected to grow more rapidly, driven by the continued expansion of China's domestic market. The diversification of products and value addition remain critical strategies for enhancing sector performance, particularly as global consumer preferences shift towards speciality teas and high-quality value-added products (FAO, Committee on Commodity Problems, Intergovernmental Group on Tea, 2024).

The tea sector continues to face external pressures stemming from the COVID-19 pandemic, geopolitical conflicts, global inflation, and adverse climatic events, all of which have disrupted agri-food systems. Nonetheless, the overall impact on the global tea industry has been moderate relative to other agricultural commodities. Globally, the total area under tea cultivation is approximately 5 million hectares, with China accounting for 66%, India for 13%, and both Sri Lanka and Kenya each representing about 5.5%. Collectively, these four countries account for nearly 90% of the world's tea-growing area (FAO, Committee on Commodity Problems, Intergovernmental Group on Tea, 2024).

Extent of tea (ha) in different countries						
Country	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
China	3,059,000	2,985,800	3,065,500	3,165,130	3,264,060	3,330,270
India	590,000	636,560	636,560	636,560	636,560	619,770
Sri Lanka	202,540	202,540	202,540	202,540	202,540	267,258
Kenya	232,742	234,300	269,430	269,430	269,430	276,258
Vietnam	134,000	130,000	130,000	130,000	130,000	128,000
Indonesia	116,500	115,300	114,300	113,500	113,400	111,900
Myanmar	80,000	81,000	81,400	81,400	81,600	82,000
Turkey	77,000	83,000	83,000	83,000	83,000	81,000
Bangladesh	59,000	59,300	61,000	65,429	65,972	66,000
Japan	42,400	41,600	40,600	39,100	38,000	37,000

Table 13: Extent of tea (in hectares) in major producing countries

(Source: Annual Statistics, International Tea Committee 2024)

Global tea production, including black, green, instant, and other tea types, increased at an average annual rate of 3.2% over the past decade, reaching 7.05 million tonnes in 2024 (Table 4). China continues to dominate global production, accounting for approximately 50% of total output, followed by India, which contributes around 20.5%. Tea production in India rose by 1.8% in 2022 to 1.37 million tonnes, up from 1.35 million tonnes in 2021. However, the Indian tea industry continues to face several challenges, including adverse climatic conditions and weakened demand both internationally and domestically.

In Sri Lanka, tea production declined by 15.6% compared with the pre-2020 period, marking the most significant crop shortfall since 1995. This downturn was primarily due to the 2021 fertiliser ban, which severely affected yields, compounded by the economic crisis that disrupted the broader agricultural sector. In addition, rising fuel prices and labour costs since 2022 have constrained logistics and factory operations, further impacting national production (FAO, *Committee on Commodity Problems, Intergovernmental Group on Tea*, 2024).

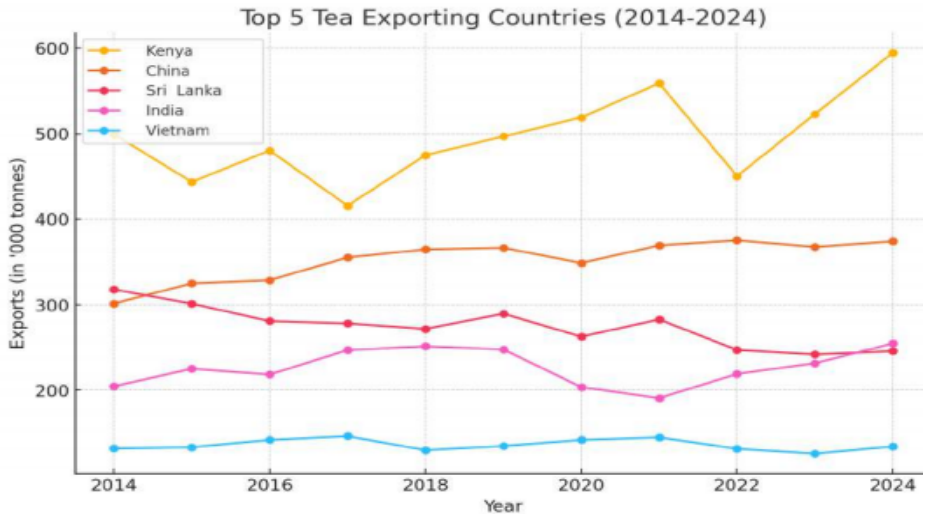


Figure 1: Trends in Tea Export of Major Exporting Countries from 2014 to 2024

Year	Production	Retentions (A)	Exports (B)	as a % of production	Global Consumption (C)
2015	5306	3508	1719	32	5047
2016	5595	3793	1729	31	5302
2017	5719	3918	1725	30	5493
2018	5967	4102	1741	29	5683
2019	6162	4255	1790	29	5895
2020	6287	4437	1759	28	5944
2021	6449	4531	1775	28	6173
2022	6477	4658	1763	27	6234
2023	6701	4860	1681	25	6351
2024	7053	5040	1748	25	6635

Table 14: Global production and export volumes ('000 metric tons)
(Source: Annual Bulletin of Statistics, International Tea Committee, 2024)

At the global level, black tea production increased annually by 2.1% and green tea by 4.9% over the last decade, driven by sustained high prices and the health benefits associated with tea. The present global tea production stands around 7,053,000 metric tons, with the bulk of the production coming from Asia, contributing nearly 5,903,000 metric tons, accounting for nearly 88% of the production and about 12% from Africa. China, India, Kenya, Turkey, Sri Lanka, and Vietnam are the leading producers, contributing approximately 53%, 18%, 9%, 4%, 4% and 3% respectively (Annual Bulletin of Statistics, International Tea Committee 2024).

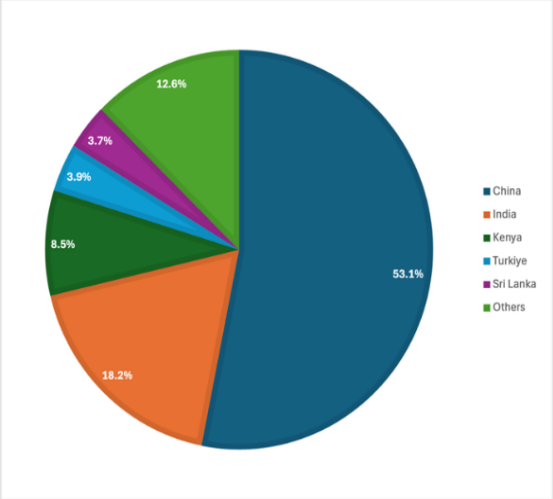


Figure 2: Production percentage by major tea producers

The amounts of black and green tea produced globally are approximately 68% and 32%, respectively. India, Kenya, Sri Lanka and Turkey are the major producers of black tea. China is the major producer of green tea, accounting for 60% of production, i.e., about 2,100,000 metric tons, followed by Vietnam with 180,000 metric tons and Indonesia with approximately 38,000 metric tons (Annual Bulletin of Statistics, International Tea Committee 2024).

Global Exports

Global tea exports expanded at an average annual rate of 0.5% over the past decade, reaching 1.84 million tonnes in 2022. This growth was primarily driven by a 2.0% annual increase in green tea exports, compared with a modest 0.2% annual growth in black tea exports. In 2022**,** black tea exports rose by 0.9%**,** mainly due to increased shipments from Kenya and India, the world's first- and third-largest exporters of black tea, respectively. In contrast, exports from Sri Lanka**,** the second-largest supplier of black tea to the international market, recorded a decline during the same period, dropping by 12.5 percent in 2022, the lowest level since 1996. This was primarily due to the sharp decline in tea production, coupled with the country's economic crisis. Global exports of green tea increased by 1.7 percent in 2022, driven by increased shipments from China, which accounts for over 75 percent of green tea exports (Source: Committee on Commodity Problems, Inter-Governmental Group on tea, FAO Report 2024 / Annual Bulletin of Statistics, International Tea Committee 2024)

Global tea exports reached about 1,944,063 metric tons, with the four major producers contributing to about 65% of that quantity. When one considers the Global outlook, the tea trade value chain indicates a drop, in percentage terms, of the production. Health awareness and steady growth in tea consumption in producing countries might have constrained export volumes globally.

Leading tea exporters in 2024 (metric tons)

Country	2024	%
Kenya	594,503	30.58
China	374,101	19.24
India	254,670	13.10
Sri Lanka	245,788	12.64
Vietnam	134,388	6.91

Country	2024	%
Indonesia	34,002	1.75
Turkey	5,302	0.27
Bangladesh	2,441	0.13
Others	298,868	15.37
Total	**1,944,063**	**100.00**

Table 15: Leading tea exporters in 2024 (metric tons)
(Source: Annual Bulletin of Statistics, International Tea Committee 2024)

Imports

As for global imports, Asia accounts for nearly 32% of total imports, followed by Europe and Africa (Table 6). Pakistan is the leading importer, accounting for nearly 222,000 metric tons (nearly 40%), followed by the USA and Russia (Table 7).

Country	Metric tons	%
Europe	473125	27.1
North America	139540	8.0
Latin America	27792	1.6
Asia	550059	31.5
Africa	386816	22.2
Others	168414	9.6
Total	**1745746**	**100.0**

Table 16: Imports into different continents in 2023
(Source: Annual Bulletin of Statistics, International Tea Committee 2024)

Country	Volume	Value	Price
	('000 metric tons)	(Million US $)	(US $ per kg)
Pakistan	222	634	2.86
USA	123	578	4.70
Russia	119	350	2.94
UK	99	377	3.81
Egypt	96	210	2.19

Table 17: Major importers of tea in the year 2023
(Source: Annual Statistics, International Tea Committee 2024)

Global Tea Exports

Global tea exports have expanded at an average annual rate of 0.5% over the past decade, reaching 1.84 million tonnes in 2022. This increase was primarily driven by a 2.0% annual growth in green tea exports, compared to a modest 0.2% annual growth in black tea exports. In 2022, black tea exports rose by 0.9%, supported by increased shipments from Kenya and India, the world's largest and third-largest exporters of black tea, respectively. In contrast, exports from Sri Lanka, the second-largest supplier of black tea to the international market, declined by 12.5%, the lowest level since 1996, due to a significant fall in national production

coupled with the ongoing economic crisis in the country (*Committee on Commodity Problems,* FAO *Intergovernmental Group on Tea*, 2024).

Global exports of green tea increased by 1.7% in 2022, driven mainly by higher shipments from China, which accounted for over 75% of global exports.

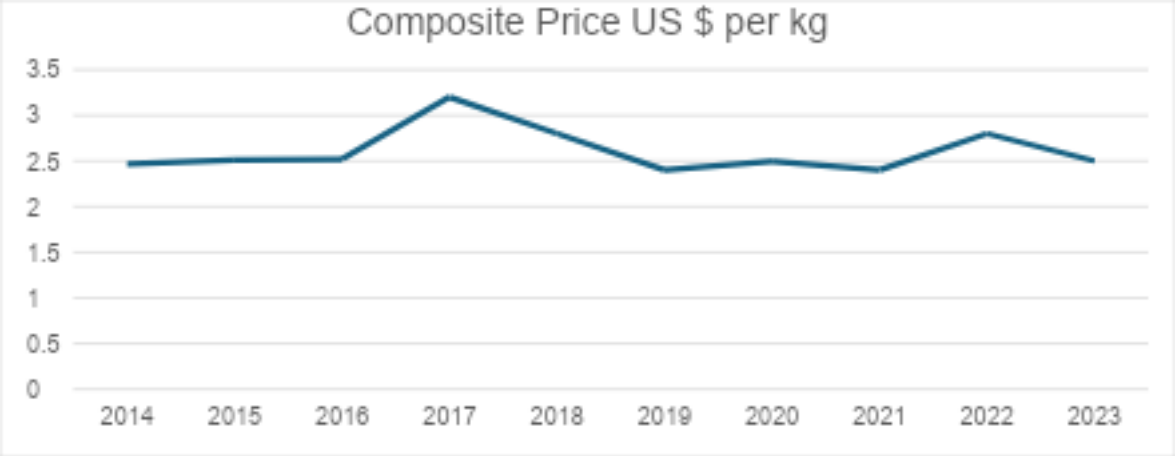
Tea consumption in traditional import regions, particularly Europe and North America, has declined due to increased competition from alternative beverages such as bottled water, carbonated drinks, and coffee. In addition, tea imports by the Russian Federation have been adversely affected by the war in Ukraine.

Although global tea production and consumption have each increased by approximately 100% over the past two decades, the volume of tea available for export has risen only marginally, by around 2%, from 1.43 million tonnes to 1.76 million tonnes. Over the past decade (2015–2024), global tea production and consumption have expanded by about 32% (FAO, *Committee on Commodity Problems, Intergovernmental Group on Tea*, 2024).

Global Tea Prices

The Tea Composite Price has remained relatively stable at around USD 2.50 per kilogram over the past decade, except for a notable surge in 2017. In 2022, the composite price increased by 14.5% to USD 2.80 per kilogram, driven by strong demand and reduced supply, particularly from Sri Lanka. However, in 2023, prices declined by 9% to USD 2.54 per kilogram, reflecting higher global availability, subdued demand, and a shortage of high-quality teas. The global economic slowdown further exerted downward pressure on both domestic and international demand, leading to an oversupply in the tea market (FAO, *Committee on Commodity Problems, Intergovernmental Group on Tea*, 2024).

Figure 3: FAO Tea Composite Price for the last 10 years



Value Addition in Sri Lankan Tea Exports

To promote value addition within Sri Lanka's tea industry, a lower export cess of Rs. 4 per kilogram is levied on value-added tea exports, compared with Rs. 10 per kilogram imposed on bulk tea exports (Source: Sri Lanka Tea Board). The cess, which generates approximately Rs. 1.6 billion annually constitutes a significant source of funding for industry development programs and is regarded as one of the key pillars supporting the sector's success.

Until 2010, tea export packs weighing no more than 3 kg were classified as value-added. However, the definition was revised to include packs weighing up to 10 kg, resulting in a

notable shift in the proportion of value-added exports from around 40% to nearly 60% within a single year.

Among Sri Lanka's tea export destinations, Iraq remained the largest importer, followed by Russia, the United Arab Emirates, Turkey, and China (Table 9).

Country	Quantity (metric tons)	Export earnings	FOB Price
		('000 US $)	(US $ per kg)
Sri Lanka	241,913	1,302,947	5.39
India	225,511	709,730	3.15
Kenya	522,915	1,288,501	2.46
Indonesia	35,971	68,869	1.91
Vietnam	125,990	211,000	1.67

Table 18: Quantities exported and average FOB prices recorded by major exporters – 2023 (Source: Annual Statistics, International Tea Committee 2024)

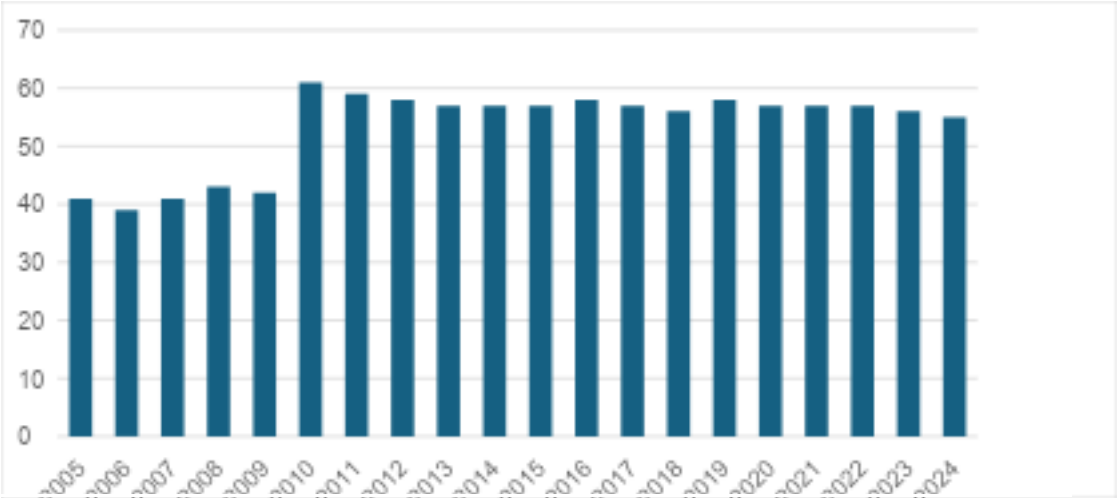
Country	Quantity ('000 metric tons)
Iraq	34.26
Russia	24.98
UAE	21.13
Turkey	17.30
China	11.56
Iran	10.43
Azerbaijan	10.43
Libya	10.29

Table 19: Leading importers of Ceylon tea, with quantities imported (International Tea Committee, 2024)

Export Prices

Sri Lanka records the highest FOB price per kg for tea exports, far higher than those of its competitors. Sri Lanka could achieve such high prices as a result of;

- highest auction averages, which are a reflection of the quality of tea on offer
- A very high percentage (nearly 60%) of its exports is in value-added form.



The average Free on Board (FOB) prices recorded by Sri Lanka over the past four years are presented in Table 10. A significant increase in FOB prices was observed in 2022, reaching approximately USD 5.39 per kilogram. This rise can be primarily attributed to the sharp decline in national tea production and the substantial depreciation of the Sri Lankan rupee against the US dollar, from LKR 185 in 2020 to nearly LKR 369 in 2022, before stabilising around LKR 301 in 2024.

	FOB Price	**Export earnings**		Conversion **rate**
	Rs /kg	**SL Rs billion**	**US $ billion**	**US$/SL Rs**
2021	615.44	263.3	1.30	203
2022	1234.24	411.1	1.11	369
2023	1171.29	428.3	1.31	328
2024	1255.17	433.5	1.44	301

Table 20: Annual Sale Averages and Tea Export Value (F & W Tea Review, 2024)

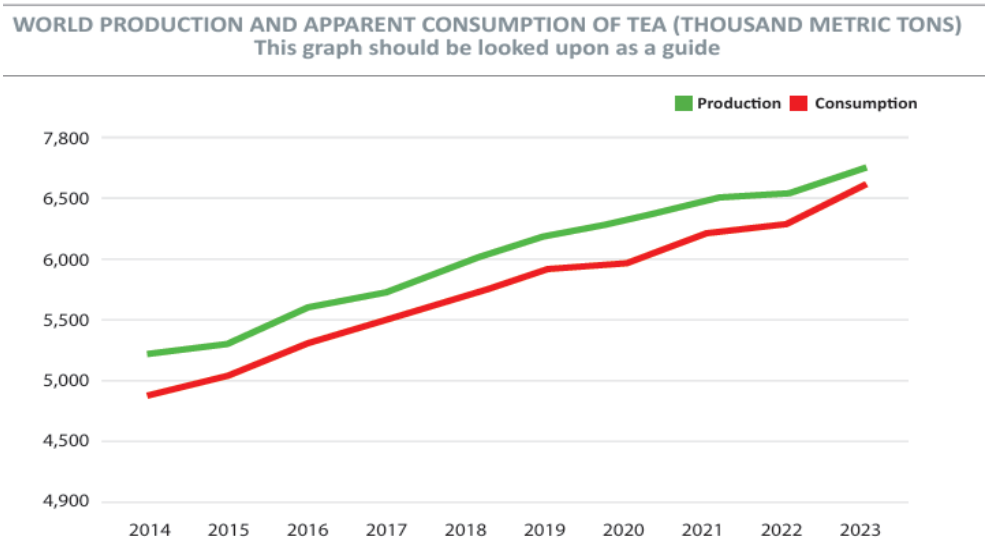


Figure 5: World production and apparent consumption of tea (in '000 metric tons)

Projections

World black tea production is expected to grow at a slightly lower rate compared to the previous decade. The projections indicate that black tea production will increase annually by 1.6% to reach 4.42 million tonnes in 2032, reflecting increases in the major tea-producing countries, including Sri Lanka, which is anticipated to recover from the recent crop shortfalls (Source: Committee on Commodity Problems, Inter-Governmental Group on tea, FAO Report 2024).

The Food & Agriculture Organisation (FAO) projects a 1.6% annual increase in black tea production globally by 2024, compared with 2014 figures, and a similar increase in consumption. Green tea production is projected to increase at about 6.3% and reach about 4,250,000 metric tons, almost a two-fold increase relative to present levels. Tea consumption in India is set to increase by about 3-4 % over the next 2 – 3 years and reach about 20% of the global total. (Source: Committee on Commodity Problems, Inter-Governmental Group on tea, FAO Report 2024).

Exports

Black tea exports

Black tea exports are projected to reach 1.81 million tonnes in 2032, reflecting a stronger medium-term annual growth rate of 1.2%, compared to the 0.2% annual growth rate of the previous decade. Increases are expected in all major exporting countries, with Kenya maintaining its leadership with an average annual growth rate of 1.4%, followed by India and Sri Lanka, with average annual growth rates of 1.1% and 0.7%, respectively. India has already become the second-largest exporter of black tea, surpassing Sri Lanka, where exports are anticipated to rebound from the current setbacks, but at a slower pace. (Source: Committee on Commodity Problems, Inter-Governmental Group on tea, FAO Report 2024).

Green tea exports

World green tea exports are projected to grow by 3.5% annually to reach 574,000 tonnes by 2032, mainly driven by increasing sales by China and Vietnam. China is expected to continue to dominate the export market, with an export volume of 429,919 tonnes, representing 75% of global green tea shipments, followed by Vietnam with 84,409 tonnes, Japan with 14,320 tonnes and Indonesia with 6,244 tonnes. All of the major green tea exporters are expected to register favourable growth rates over the medium term.

Tea is one of the most important cash crops in the world and contributes significantly to rural development, poverty reduction and food security, supporting the livelihoods of millions of smallholder farmers in many low-income countries. However, the tea industry faces several challenges that must be addressed to ensure its long-term sustainability. Issues to be addressed include climate change, price volatility, low productivity, increasing production costs and declining returns for farmers.

Tea exports are a vital source of foreign exchange for many low-income countries. For example, export revenues contribute significantly to financing the food import bills of Kenya and Sri Lanka, the largest exporters of black tea. Foreign exchange earnings from tea are relatively less for other producing countries, but they remain significant.

As consumer preferences shift, innovation and diversification into other market segments, such as organic, speciality, and premium teas, are key for market expansion, higher returns for tea producers and processors, and the long-term performance of the sector. New growth markets are also driving product innovation and diversification into new consumer segments.

Compliance with food safety and quality standards is fundamental to expanding the tea market. In a changing world, maximum residue levels (MRLs) of pesticides in tea are almost becoming a non–trade barrier. To overcome this, collaboration between producing and consuming nations is vital to harmonise market requirements (MRLs and quality parameters) and reduce compliance costs.

Further, to ensure the sustainability of this important sector, future strategies and appropriate enabling policies should be developed to sustain the development of the rapidly changing global tea economy and to mainstream climate change, standards, and sustainability into tea development strategies.

No	Country	Consumption
1	Turkey	3.10
2	Libya	2.35
3	Hong Kong	2.06
4	China	1.94
5	Morocco	1.87
6	Ireland	1.54
7	UK	1.36
8	Sri Lanka	1.25
9	Iraq	1.05
10	Poland	1.00

Table 21: Per capita consumption of tea (kg / person/ annum)
(Source: Annual Statistics, International Tea Committee 2024)

Per capita consumption

Black tea consumption is projected to grow at 1.8% annually to reach 4.06 million tonnes in 2032, reflecting growth in consumption in producing countries and a gradual recovery in traditional tea-importing countries. Over the next decade, strong growth is expected in all major producing countries in Asia and Africa, with growth rates ranging from 1.9% to 2.8% and from 1.6% to 3.4%, respectively. In the medium-term, India is anticipated to remain the largest black tea-consuming country, maintaining a market share of 32%, followed by China and Pakistan, accounting for a share of 14% and 7% respectively (Source: Annual Bulletin of Statistics, International Tea Committee, 2024)

Turkey leads per capita consumption at 3.10 kg per person, followed by Libya, Hong Kong, China, and Morocco. It is noteworthy that traditional tea-drinking countries, such as Ireland and the United Kingdom, have been pushed to sixth and seventh place in per capita consumption. This is mainly due to more consumption of CTC tea (mostly imported from African countries) in tea bags, where the “cuppage” is more, as the quantities imported into these destinations indicate. Also, it may be due to the new generation moving away from tea consumption and growing demand for herbal tea infusions in those countries, with perceived/claimed health benefits of the latter (Source: Annual Bulletin of Statistics, International Tea Committee 2024).

Historical Context of Ceylon Tea

The history of the Sri Lankan tea industry dates back to 1867, when James Taylor established the first commercial tea plantation at Loolecondera Estate in Kandy. From its beginnings in the Mid-Country, tea cultivation gradually expanded to the Up-Country and later to the Low-Country regions over the following decades. The tea produced in Sri Lanka, popularly known as "Ceylon Tea", is internationally recognised for its superior quality and distinctive regional characteristics. Unique agro-climatic conditions across tea-growing regions have given rise to a diverse range of teas. For example, Nuwara Eliya, Dimbula, Uva, and Uda Pussellawa are celebrated for their distinct flavours, while Kandy, Ruhuna, and Sabaragamuwa are noted for the appearance and colour of their liquor.

Since its introduction, the term "Ceylon Tea" has become synonymous with premium quality, establishing a strong reputation in global markets, particularly under British promotion. Historical records indicate that the first consignment of tea from Ceylon, weighing approximately 10 kilograms (23 pounds), was exported to London in 1873, marking the beginning of Sri Lanka's tea export trade.

Corporate Sector

Initially, tea plantations remained under private ownership until 1972, when the majority were nationalised under the Land Reforms Act No. 2 of 1972 and the Land Reforms (Amendment) Act No. 39 of 1975. Estates exceeding 50 acres were vested in the state and subsequently managed by two government corporations: the Janatha Estates Development Board (JEDB) and the Sri Lanka State Plantation Corporation (SLSPC). By the early 1990s, state-managed plantations were experiencing substantial financial losses. Consequently, in 1992, the government initiated a privatisation programme to introduce private-sector management practices and improve operational efficiency.

Following privatisation, the corporate sector initially recorded increased production between 1992 and 2012. However, during the subsequent decade, a steady decline in output was observed, warranting detailed investigation. Among the key factors identified, the lack of systematic replanting programmes has been cited as the most critical constraint. According to data from the Tea Research Institute (TRI), the annual replanting rate in the corporate sector had declined to 0.47%, far below the recommended 2% required to maintain productivity and sustainability (Sidhakaran et al, 2022; Samansiri et al., 2011; Jayakody, 1999).

Comprehensive surveys conducted by TRI in 2002 and 2008 revealed a reduction of 2,637 hectares under bearing tea, with no significant improvement in productivity, despite the removal of marginal lands (Anon., 2002; Anon., 2011). The current extent of bearing and yield levels in the corporate sector remains unsatisfactory, reflecting persistent challenges of inadequate replanting, ageing tea stock, and management inefficiencies.

	2002			2008		
	Extend	**%**	**Yield(kg/ha)**	**Extend**	**%**	**Yield(kg/ha)**
OST	41674	53	1050	38299	50.7	1089
VP	36514	47	1927	37242	49.3	1888
Total	78188		1459	75541		1483

Table 22: Changes in the extent and yield of RPC estates within 6 years

Small Holder Sector

While the corporate sector was struggling, the tea smallholdings grew gradually, as returns had been good, as reflected in the extent planted over time. The increase peaked at around 210 million kg in 2014.

Sri Lanka, predominantly a black tea producer, had been producing more than 300,000 metric tons per year since 1995 until 2021. In 2013, it recorded the highest ever crop of about 341,000 metric tons. However, production began declining rapidly after 2021, reaching only 261,000 metric tons in 2024 and contributing about 4% to global production. The policy decision to convert the entire tea production to organic virtually overnight, coupled with economic turmoil in 2021, led to a drastic drop in production. Total production over the last 10 years has declined (Table 16).

The expansion of small holdings over time is depicted in Table 13. The districts of Ratnapura, Galle, Matara, Kalutara, and Kegalle had recorded significant extents. Regrettably, none of those districts have recorded yields higher than 1205 kg/ha (Table 14), of late. It is alarming, as these are the districts which contributed to higher production in the past decade. This amply demonstrates the drop in overall productivity. The Nuwara Eliya, Kandy, and Matale districts are showing productivity above 2000 kg/ha. The Colombo district is ignored as the extent is too small.

	2005		2023	
District	**Number of Tea Small Holders***	**Hectares***	**Number of Tea Small Holders****	**Hectares****
Colombo	1,345	246	1,236	404
Gampaha	319	2	278	100
Kaluthara	48,752	7,823	43,984	17,092
Kandy	31,635	16,058	29,039	11,388
Matale	1,656	1,672	1,551	740
Nuwara Eliya	19,361	7,205	16,801	5,857
Galle	92,578	27,427	85,210	30,193
Matara	73,907	25,417	65,238	25,733
Hambanthota	2,833	546	2,542	1,004
Kurunegala	-	180	-	0
Badulla	33,093	9,020	30,151	9,449
Monaragala	600	199	572	293
Ratnapura	118,444	30,441	108,475	43,077
Kegalle	37,842	6,093	33,861	12,891
Total	**462,365**	**132,329**	**418,938**	**158,221**

Table 23: Distribution and extent cultivated by smallholders in different districts over a period (TSHDA Annual Report, 2023)

Administrative District	Extent of Tea (Ha)	Production Highlands	Production Midlands	Production Lowlands	Production Total	Productivity (kg/ha)
Badulla, Monaragala	9,743	4,460,043	6,077,358		10,537,401	1,082
Galle	30,193			37,710,347	37,710,347	1,249
Hambantota	1,004			82,564	82,564	82
Kalutara	17,091			15,597,053	15,597,053	913
Colombo	404			1,233,378	1,233,378	3,053
Kandy	11,388	54,673	14,175,126	9,446,287	23,676,086	2,079
Kegalle Gampaha	12,991		86,735	7,586,615	7,673,350	591
Matale	740		1,168,323	364,724	1,533,047	2,072
Matara	25,733		61,170	28,223,544	28,284,714	1,099
Nuwara Eliya	5,857	6,975,582	6,401,401	793,643	14,170,626	2,419
Rathnapura	43,077		576,354	49,587,227	50,163,581	1,165
Total	**158,221**	**11,490,298**	**28,546,467**	**150,625,382**	**190,662,147**	**1,205**

Table 24: Distribution of small holdings according to extent and productivity in 2023 (TSHDA Annual Report 2023)

Acres	Extent of Lands Acres	Percentage %	Number of Plots of Land	Percentage %
Less than 1	113,190	34.60%	297,342	74.90%
1 – Less than 2	85,517	26.20%	74,314	18.70%
2 – Less than 3	31,882	9.80%	15,101	3.80%
3 – Less than 5	18,413	5.60%	5,299	1.30%
5 – Less than 10	18,251	5.60%	2,936	0.70%
10 and more	59,731	18.30%	2,231	0.60%
Total	**326,984**		**397,223**	

Table 25: Overall distribution of small holdings in Sri Lanka according to size (TSHDA Annual Report, 2023)

Year	RPC Factories	%	JEDB,SLSPC,TSF,TRI & (Kalubovitiyana factories)	%	Private Factories	%	National Production
2006	128.30	41.30	19.50	6.30	163.00	52.40	310.80
2007	126.30	41.50	20.50	6.70	157.90	51.80	304.60
2008	131.00	41.10	19.90	6.30	167.80	52.60	318.70
2009	115.40	39.60	11.30	3.90	164.40	56.50	291.10
2010	136.20	41.10	12.20	3.70	183.10	55.20	331.40

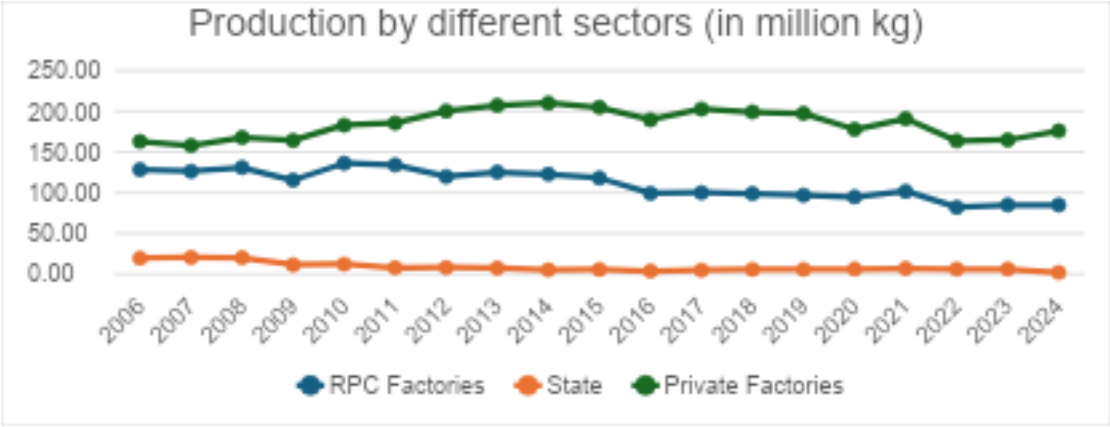
Year	RPC Factories	%	JEDB,SLSPC,TSF,TRI & (Kalubovitiyana factories)	%	Private Factories	%	National Production
2011	134.10	40.90	7.60	2.30	185.80	56.70	327.50
2012	119.90	37.00	7.90	2.00	200.60	61.00	328.40
2013	125.30	37.00	7.40	2.00	207.30	61.00	340.00
2014	122.70	36.30	5.00	1.50	210.30	62.20	338.00
2015	11810	35.90	5.70	1.70	205.00	62.40	328.80
2016	99.30	33.90	3.60	1.20	189.70	64.80	292.60
2017	100.10	32.50	4.60	1.50	202.90	66.00	307.70
2018	98.84	32.52	5.77	1.90	199.33	65.58	303.94
2019	96.96	32.31	5.74	1.91	197.42	65.78	300.12
2020	94.86	34.02	6.13	2.20	177.85	63.78	278.85
2021	101.8	33.98	6.83	2.28	190.91	63.74	299.49
2022	82.1	32.61	6.02	2.39	163.69	65.00	251.84
2023	85.0	33.21	6.18	2.41	164.86	64.38	256.09
2024	84.9	32.33	1.77	0.68	176.00	67.00	262.69

Table 26: Made tea production ('000 metric tons) by type of manufacturer (Source: Sri Lanka Tea Board)

**(Note: Production figures from RPC factories include small holder leaf as well)*

Sector	2016			2024		
	Extent (ha)	**Production %**	**Yield kg/ha**	**Extent (ha)**	**Production %**	**Yield kg/ha**
Small holders/Private Estates	132,329	73%	1,776	158,221	74.4	1205
Regional Plantation Companies	71,796	23%	1,239	70,365	24.6	1000*
Public (JEDB,SLSPC,TRI) Elkaduwa)	9,303	3%	516	8,204	1.00	570
Total	**213,428**	**100%**	**1,692**	**262,393**	**100**	

Table 27: Tea extents, production and yield - sector-wise (2016 vs 2024)
(Source: Sri Lanka Tea Board Annual Reports)
** - estimate*



	2016		2024	
Elevation	'000 metric tons	%	'000 metric tons	%
High	61.6	21.1.	55.7	21.2
Mid	45.0	15.4	47.4	18.0
Low	185.4	63.5	159.6	60.8
	292.0		**262.7**	

Table 28: Elevation-wise production in 2016 & 2024

Recent Trends in Production and Productivity

Over the past decade, production and productivity across all three elevation categories, low, mid, and high-grown tea, have declined significantly. The sharpest reductions began in 2021, following a government policy to convert the entire agricultural sector to organic cultivation overnight, compounded by a severe economic crisis that brought much of the country's activity to a near standstill.

Detailed analysis indicates that the low-grown sector was the most affected, primarily due to productivity constraints in smallholdings, as illustrated in Figure 6. The economic crisis of 2021 also severely limited fertiliser availability, which is estimated to have contributed substantially to the decline in tea yields across all sectors. Interestingly, the mid-grown and high-grown sectors have maintained relatively stable productivity levels following the crisis. Although the mid-grown sector contributed more to national production in 2024, the relative shares among the three elevation categories largely preserved historical patterns, similar to those observed in 2016.

A recent report by TRI (Sidhkaran et al., 2022) highlighted the reasons for the decline in productivity across the entire sector. It reports a replanting rate of only 0.62 % in the smallholder sector, during the period 2012 – 2018.

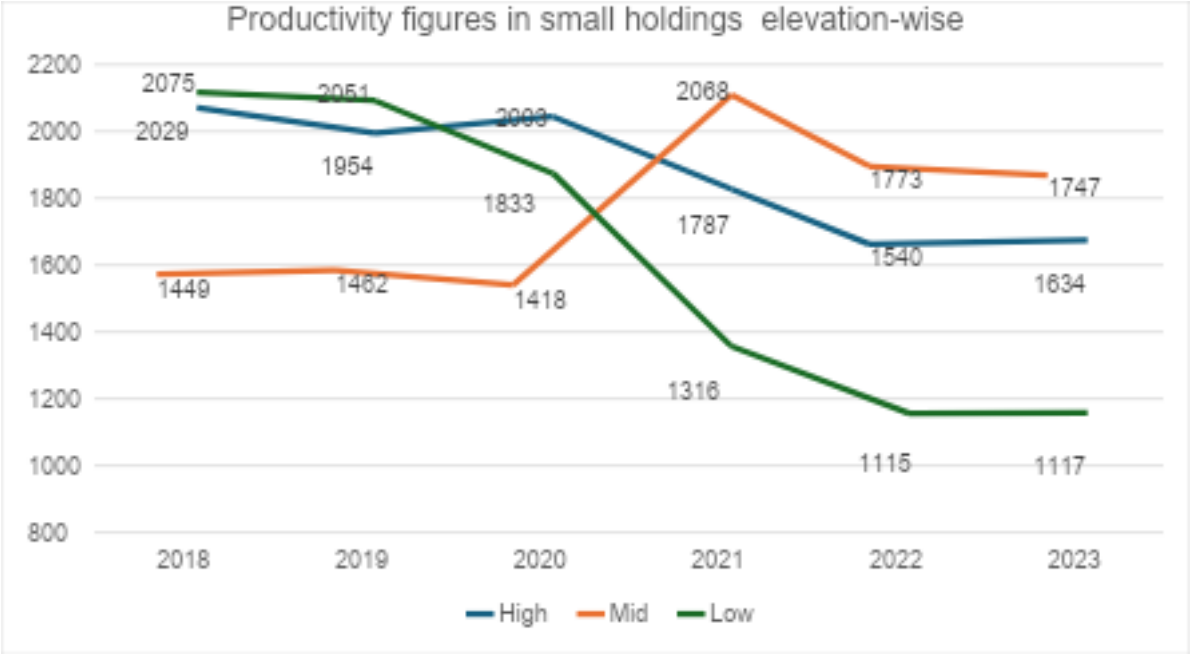


Figure 7: Productivity figures (kg made tea/ha) during the period 2018 – 2023

Economic Margins and Smallholder Viability

Over the years, the margins between green leaf prices and production costs have declined substantially. Although margins improved in 2022, the period coincided with severe economic turmoil in the country and a sharp increase in the cost of living**.** Overall, these conditions present a concerning economic situation for smallholders and are likely to contribute to the abandonment of tea lands in certain regions.

Year	Average GL Price (Rs/kg)	Average Production Cost (Rs/kg)
2006	29.18	21.87
2007	40.88	30.64
2008	45.45	36.24
2009	52.71	37.24
2010	54.11	38.56
2011	52.63	44.43
2012	57.27	49.50
2013	64.99	51.40
2014	67.54	54.54
2015	58.80	55.08
2016	68.53	64.52
2017	90.69	71.65
2018	85.48	71.86
2019	80.15	56.28
2020	92.55	59.94
2021	90.57	65.20
2022	182.07	136.33

Year	Average GL Price (Rs/kg)	Average Production Cost (Rs/kg)
2023	162.66	136.09

Table 29: Green Leaf price and cost of production over the years (TSHDA Annual Report, 2023)

Labour Availability and Mechanisation in Tea Production

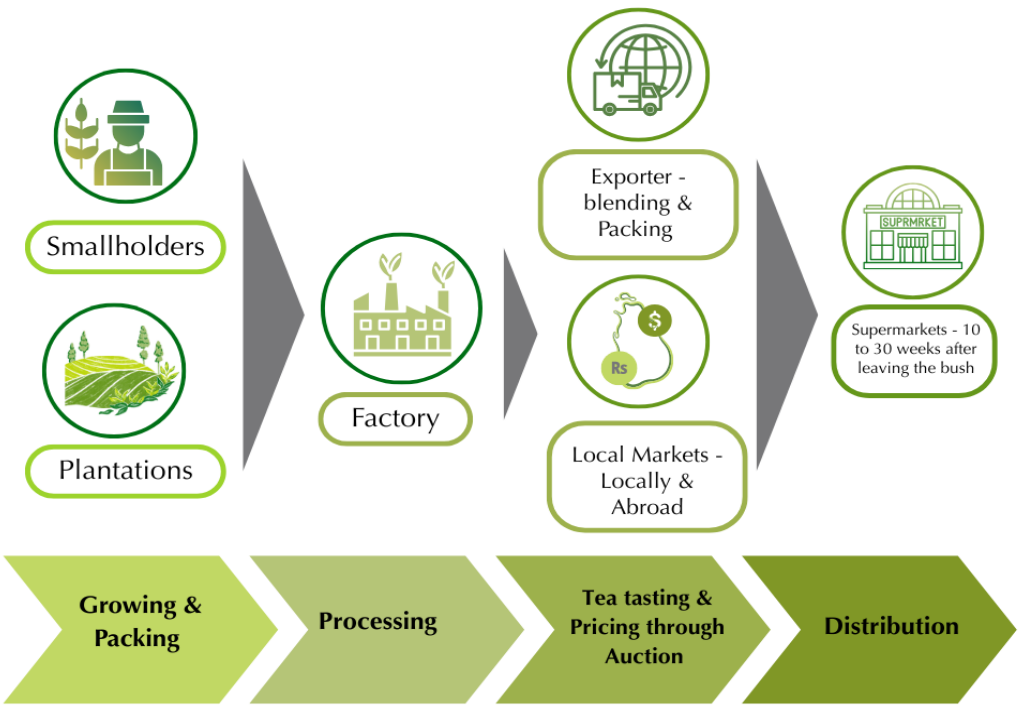
Beyond the challenges discussed previously, labour availability poses a significant threat to the sustainability of both the corporate and smallholder sectors. Plantation labourers typically enjoy better job security and higher earnings. In contrast, workers on smallholder plots often have greater autonomy and control over working conditions, though evidence on their overall welfare remains mixed.

Upgrading tea production systems can reduce the environmental footprint by minimising agrochemical use, improving energy efficiency, and reducing deforestation. Empowerment of women, particularly those engaged in plucking, is critical, as they are primarily responsible for activities that determine the quality and price of made tea (Mohan, 2017).

Reports indicate that the industry will likely need to adopt mechanisation of field practices and other labour-efficient techniques to maintain sustainability (Shyamalie et al., 2018). The compound annual decline in labour has been reported at 2.94% in Up-Country**,** 4.87% in Mid-Country**,** 4.22% in Uva**,** and 5.06% in Low-Country. Analyses further indicate that average productivity declines as labour scarcity increases, suggesting that the productivity gap widens with the severity of labour shortages.

However, mechanisation of plucking may also lead to yield reductions due to insufficient carbohydrate availability and impaired translocation capacity, resulting in lower shoot density and weight, higher dormancy, reduced root starch reserves, and overall reduced yield. To mitigate these effects, mechanised harvesting should be limited to cropping months, avoid excessive cutting of the plucking table, and be combined with sound agronomic practices that minimise environmental stress (Pathiranage et al., 2019).

Analysis of the tea value chain in Sri Lanka



Tea Marketing and Auction Procedures

Current Structure of Tea Production in Sri Lanka

Sri Lanka contributes approximately 7.3% of global tea production. National output remained relatively stable, ranging between 300,000 and 340,000 metric tonnes annually from 2010 to 2020**,** before experiencing a sharp decline thereafter. According to the latest data, smallholders account for nearly 75% of national production, with approximately 420,000 smallholders managing small plots, while the corporate and state sectors contribute the remaining 25% (TSHDA, 2023).

Green leaf harvested from tea fields is processed in either private factories or factories managed by Regional Plantation Companies (RPCs). The resulting tea is sold primarily through the weekly public auction in Colombo**.** Sri Lanka produces approximately 90% orthodox black tea**,** less than 10% CTC tea**,** and about 1% green tea**.**

Demand for CTC tea at the Colombo auction remains comparatively low (Table 20), which has constrained production despite factory capacity to produce up to 20% CTC tea**.** This capacity expansion was supported by an 85% government subsidy for the commissioning of CTC factories in the early 1990s.

YEAR	2022	2023	2024
ORTHODOX	227,117,701	230,143,431	236,216,949
CTC	22,571,797	22,587,136	23,680,883
Green Tea	1,809,969	2,283,508	2,261,443
	251,499,467	256,039,432	262,159,275

Table 30: Production by type (Orthodox, CTC and green tea)
(Source: F &W Tea Review 2024)

Colombo Tea Auction and Export Mechanism

Approximately 90% of Sri Lanka's tea production is sold through the Colombo Tea Auction**,** a transparent, competitive, open-bidding system, and is subsequently exported either in bulk or as value-added products by registered exporters. The auction process is well-regulated**,** governed by the By-Laws and Conditions for the Sale of Tea by Public Auction and Private Treaty of the Colombo Tea Traders' Association (Annexure I), and sales are conducted through eight registered brokers (Annexure II).

In 2024, out of a total production of 262,159 metric tonnes, approximately 241,000 metric tonnes were sold via the Colombo auction. The Sri Lanka Tea Board continues to promote new entrants into the export sector, with several new exporters registering each year (Source: F & W Tea Review 2024).

Quantities sold through the Colombo auction and the average prices realised by elevation over the last three years are summarised in Tables 16 and 17, respectively. Notably, production declined by approximately 13% over this period compared to previous years, while yields in smallholdings decreased by nearly 40%, indicating a significant reduction in productivity. Tea sales typically peak in the second quarter of the year, consistent with the cropping pattern. The green leaf price is determined monthly using the Reasonable Price Formula introduced by the Sri Lanka Tea Board, based on the average price realised by factories at the Colombo auction (Annexure III).

	2022	2023	2024
1st QTR	63,335,710	59,514,372	58,268,831
2nd QTR	69,966,064	75,151,372	69,330,424
3rd QTR	59,472,567	58,961,871	68,618,570
4th QTR	59,064,655	62,593,930	65,941,450
	251,838,996	256,221,545	262,159,275

Table 31: Tea production (in '000 metric tons) during the period 2022 – 2024
(Source: F &W Tea Review 2024)

Elevation-wise Tea Prices and Revenue Contribution

The average price for low-grown tea is generally higher than that for mid- and high-grown teas, which most of the time trade below the national average (Table 22). When production volumes are considered**,** low-grown tea contributes approximately 66% of total revenue from tea sales. Historically, before the mid-1990s, tea produced in high elevations, particularly orthodox rotorvane teas, commanded premium prices relative to mid- and low-grown teas, which were predominantly pure orthodox or leafy grade types. However, this pricing trend reversed after the early 1990s, with low-grown teas achieving comparatively higher market prices.

Category	2024 (SLR)	2024 (USD)	2023 (SLR)	2023 (USD)	VARIANCE (SLR)	VARIANCE (USD)
High Grown	1,141.63	3.80	1,072.48	3.28	69.15	0.52
Medium Grown	1,064.48	3.55	1,012.35	3.10	52.13	0.45
Low Grown	1,304.38	4.34	1,252.15	3.83	52.23	0.51
TOTAL	1,225.17	4.06	1,171.29	3.59	53.88	0.47

Table 32: The recent average auction prices recorded (2024 vs 2023)
(Source: F &W Tea Review 2024)
**(Note: USD to SL Rs conversion rate: 320.1 in 2024 and 326.6 in 2023)*

Month	High Growns		Medium Growns		Low Growns	
	Orthodox	CTC	Orthodox	CTC	Orthodox	CTC
Mar	~1,240-1,300	~1,100-1,200	~1,170-1,250	~1,020-1,100	~1,350-1,450	~1,020-1,100
Jun	~1,150-1,220	~1,050-1,130	~1,100-1,200	~980-1,070	~1,250-1,350	~1,000-1,120
Sep	~1,200-1,280	~1,080-1,150	~1,150-1,230	~1,000-1,080	~1,300-1,400	~1,010-1,140
Dec	~1,100-1,200	~1,050-1,150	~1,000-1,150	~950-1,100	~1,200-1,350	~1,000-1,150

Table 33: Auction averages (Rs/kg) by type - Orthodox Vs CTC
(Source: F &W Tea Review 2024)

Apart from the usual quantities sold through auction, a small percentage, about 3-4 % is sold through private sales and forward contracts, as detailed in Table 24, for the last two years.

Year	Private Sales (kg)	Forward Contracts (kg)	Total (kg)
2023	5,157,482	2,211,908	7,369,390
2024	6,685,057	2,693,516	9,378,573

Table 34: Quantities sold through private sales and forward contracts in the years 2023 & 2024 (Source: F &W Tea Review 2024)

Online Auction System

Sri Lanka first attempted an online tea auction in 2001 through Forbes & Walker Tea Brokers (Pvt) Ltd., but the initiative was largely unsuccessful. The primary reasons were limited internet access at factories and estates, and a lack of familiarity with information technology tools. However, the COVID-19 pandemic necessitated a shift to online auctions. Despite initial challenges, the industry has since successfully adopted this system, ensuring the continuous operation of the tea sector, making it one of the few industries in the country to function uninterrupted during the pandemic.

Salient Features of the Colombo Tea Auction

The Colombo Tea Auction is unique in the global commodity market in that it compels available demand to compete for the product, consistently delivering higher prices to producers over time. It hosts a deep pool of international buyers, brand owners, and intermediaries, comparable in significance for orthodox black tea to the New York Stock Exchange for equities. The auction system has facilitated the shortest tea-to-cash cycle among major tea-exporting countries.

Logistics at the Colombo auction are among the most advanced globally, supported by a transparent, competitive environment, a well-defined legal framework, and a bankable settlement mechanism. Governance is private-sector-driven, inclusive of all stakeholders, and reinforced by legal protections provided by the Sri Lanka Tea Board. The Colombo Tea Cluster, comprising the auction, port facilities, marketers, traders, brokers, and developed industrial capacity, provides Sri Lanka with a strong competitive advantage.

Historically, these operational efficiencies partly contributed to resistance to shifting toward online auctions, despite the auction handling 5,000–7,000 metric tonnes weekly. The pandemic, however, necessitated the shift, and online auctions have since operated smoothly, with only minor initial challenges.

Private sales, facilitated by brokers, were previously permitted but have recently been restricted at the request of some producers. Exporters may also import speciality teas within regulated limits to support value addition, under strict supervision by the Tea Board.

Sri Lanka continues to maintain the highest average auction prices globally (Table 25). The improvement in prices for leafy-grade teas, predominantly produced in the low-country sector, has significantly contributed to the national average tea price. This trend persists to the present.

Average auction price (in US $) in major auction centres										
Location	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Sri Lanka	**2.96**	**3.27**	**4.05**	**3.59**	**3.06**	**3.42**	**3.13**	**3.83**	**3.57**	**4.06**
Kolkata	2.47	2.42	2.46	2.45	2.43	2.92	2.85	2.97	2.52	2.97
Cochin	1.55	1.75	1.81	1.81	1.74	1.90	1.92	1.82	1.68	1.85
Guwahatti	2.16	2.05	2.16	2.13	2.09	2.70	2.49	2.43	2.28	2.70

Average auction price (in US $) in major auction centres										
Chittagong	2.45	2.60	2.48	3.14	2.34	2.09	2.36	2.13	1.73	1.64
Mombasa	2.73	2.29	2.81	2.43	2.04	1.93	1.97	2.33	2.07	2.07
Jakarta	1.56	1.38								
Limbe	1.56	1.55	1.83	1.84	1.45	1.44	1.37	1.41	1.30	1.23
Kenya	3.02	2.41	2.97	2.59	2.20	2.01	2.10	2.49	2.24	2.19

Table 35: Price of tea at major auction centres (2015 - 2024)
(Source: F &W Tea Review 2024)

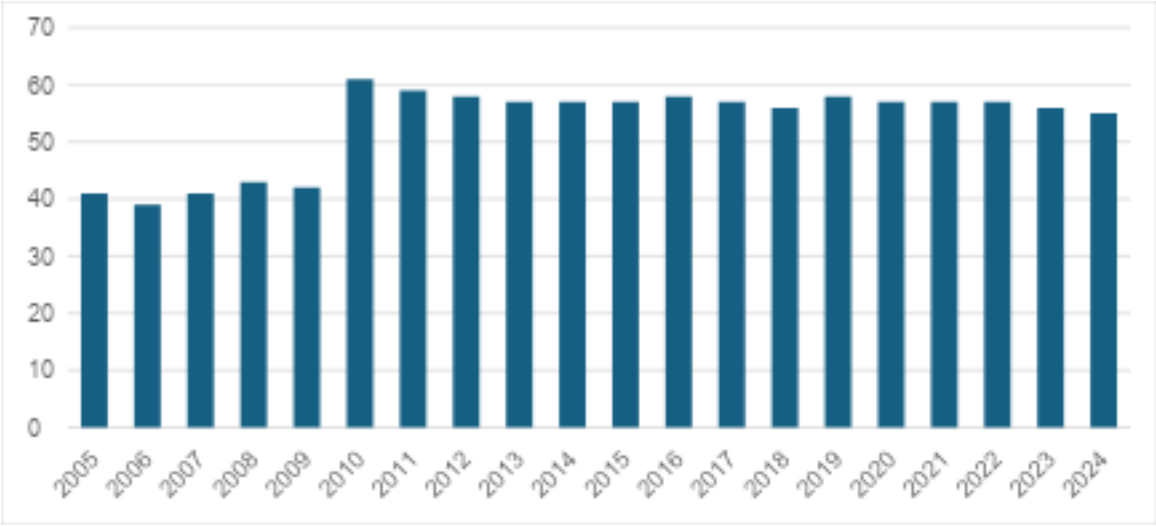


Figure 9: Value-added tea exports percentage from Sri Lanka

Attractive auction prices, coupled with a high level of value addition by tea exporters after purchasing teas at the auction, resulted in the highest export prices, with the FOB price reaching US$5.41 per kg in 2023, a performance that many competitors envy. Sri Lanka earned nearly US$1.43 billion in foreign exchange from tea exports in 2024.

Value Addition in Sri Lanka's Tea Industry

The percentage of value addition in Sri Lanka's tea industry is notably high, at approximately 60%**,** compared to minimal levels in competing countries. This achievement has been primarily supported by government subsidy schemes, which, in some instances, such as converting orthodox tea factories to CTC production or installing tea-bagging machinery**,** covered up to 85% of machinery and installation costs**.**

Despite significant investments by tea exporters in machinery for value addition and export-related operations, the benefits of higher export prices are not fully transmitted to producers. Global consumers pay prices more than 10 times higher than those received by Sri Lankan producers, indicating that a substantial proportion of the economic gains from value-added tea products accrue to consumers in consuming countries.

To enhance the long-term sustainability of the tea industry, it is essential to:

1. Develop and export more locally value-added tea products.
2. Create and promote Sri Lankan tea brands internationally, strengthening their global presence.

3. Utilise the promotional levy collected by the government to support these initiatives (Hilal et al., 2019).

Comparative performance in other competing countries is summarised as follows:

- **Kenya:** Total tea earnings amounted to Ksh 215.21 billion in 2024, of which Ksh 181.69 billion (US $1.39 million) was earned from exports, with an average price of US $2.34 per kg. Local sales contributed an additional Ksh 18.00 billion (US $141 million)**.** Value-added exports are estimated at 14% of total exports (Tea Board of Kenya, 2024).
- **India:** In 2023, India exported 231.69 million kg of tea, valued at INR 6,161 crore (US $715 million), corresponding to an average price of approximately US $3 per kg.

Comparative Value Addition and Impact on Employment

In Indonesia**,** only approximately 6% of export volumes consisted of value-added tea. In 2023, the country exported around 34 million kg, earning US $69 million, with an average export price of roughly US $2 per kg**.** Similarly, Vietnam exported 108,000 tonnes of tea, generating about US$189 million at an average price of US$1.75 per kg. In contrast, the export of higher volumes of value-added tea from Sri Lanka has encouraged new exporters to enter, generating employment opportunities in blending centres and warehouses in Colombo and its suburbs. According to the Central Bank of Sri Lanka (2022), more than 2.2 million people, or nearly 10% of the country's population, are engaged in the tea sector.

A comparative analysis of tea value chains in Sri Lanka, Kenya, and Nepal (Mohan, 2017) highlights how government policies, firm organisation, and standards adoption shape competitive niches and sustainability outcomes:

- **Kenya:** Policies focused on productivity and maintaining existing firm structures encouraged product upgrades, leading to a competitive profile in high-quality bulk exports**.** This approach provided employment and stimulated consumption and fiscal linkages, but it had limited integration with the broader economy and modest potential for broader economic development.
- **Sri Lanka**: Policies that incentivised functional upgrading promoted a competitive profile in value-added packaged products**,** creating forward linkages from the tea sector to the wider economy and supporting broader economic development. However, additional measures are required to ensure sustained social and environmental benefits.
- **Nepal:** Policies promoting product upgrading from bulk low-quality to speciality tea enabled export diversification and higher revenue per unit of output. Nevertheless, challenges remain in terms of infrastructure, quality control, and marketing

Despite these successes, challenges remain in Sri Lanka. Lack of product diversification**,** limited access to factors of production, stringent government regulations, and insufficient information-sharing networks negatively affect the sustainability of the value chain (Hettiachchige & Rathnayake, 2021).

Regrettably, the benefits of high-value addition in Sri Lanka have not adequately reached producers**,** particularly smallholders**,** who contribute substantially to production volumes. According to 2023 data, smallholders' share of income (Table 26), highlighting a significant gap between production contribution and income capture.

Year	Exported Qty (Mn kg)	Export Revenues (Million Rupees)	Small holder Contribution (%)
1995	240	24638	12.62
2000	288	53133	12.06
2005	309	81480	12.70

Year	Exported Qty (Mn kg)	Export Revenues (Million Rupees)	Small holder Contribution (%)
2010	315	155608	16.60
2015	307	182054	12.80
2020	266	230170	12.35
2021	286	263353	12.50
2022	250	411054	10.00
2023	242	428291	10.90

Table 36: Contribution of smallholders to export revenue from tea (TSHDA Annual Report, 2023)

Major Destinations and Trade Opportunities

In the past, Sri Lankan tea exports were significant to Middle Eastern and North African countries, as well as the Russian Federation and CIS countries. In recent years, however, exports to Russia and the CIS region have declined sharply, primarily due to the devaluation of the Russian Ruble and the ongoing crisis in Ukraine. Total tea imports in this region, which peaked at approximately 274,000 metric tons in 2011, have since declined to about 237,000 metric tons, reflecting a clear downturn (Source: Sri Lanka Tea Board, Tea Promotion Division)

Sri Lankan pure orthodox teas remain highly sought after in these markets, often fetching higher prices than those in other destinations. This preference emerged in the 1990s, coinciding with the rapid expansion of smallholdings in low- and mid-elevation areas, which eventually surpassed the corporate sector's share of production.

Tea was historically cultivated in Russia and other CIS countries, including Georgia, Azerbaijan, and Armenia, with domestic production partially meeting local demand. However, the Chernobyl nuclear disaster in 1986 severely affected tea cultivation in several of these regions (Source: Radiofree Europe, October 2019). Consequently, demand shifted to leafy low-grown teas from Sri Lanka from the early 1990s onwards, further driving prices upward.

Other major importers of Sri Lankan tea include Turkey, Germany, Japan, Chile, and China, with China absorbing a significant and increasing volume. Exports to Syria have declined due to political instability, but this reduction is partially offset by increased exports to neighbouring Turkey, which may serve as a conduit for Syria.

Although Sri Lanka has entered into free trade agreements (FTAs) with Pakistan and India, the volume of tea exported under these agreements remains negligible. Given that Pakistan is one of the largest tea importers globally, these agreements present an untapped opportunity. Lessons could be drawn from Kenya's use of the Common Market for Eastern and Southern Africa (COMESA) framework with Egypt to expand market access.

Historically, Sri Lanka was the world's largest tea exporter until 2004, when it exported approximately 295 million kilograms, before Kenya overtook it. Ceylon tea has maintained global recognition as a premium-quality tea. However, much of the tea produced in Sri Lanka is purchased at auction by multinational companies, which subsequently blend it with teas from other origins. The global tea market is dominated by these multinationals, which control most leading tea brands. Consequently, the distinct identity of Ceylon tea is preserved in only select market segments, despite its reputation as one of the finest teas worldwide.

Tea bags have become the dominant form of tea consumption globally, particularly in Europe and the United States, accounting for over 80% of total tea consumption. In contrast, high-quality teas are typically marketed as loose-leaf products in small packets, tins, or speciality containers, for example, premium brands such as Twinings.

		2016		2023		
	Country	Quantity (kg)	%	Quantity (kg)	%	Var %
1	Russia / CIS	53,662,549	18.58	41,954,000	17.34	(1.24)
2	Iraq	32,557,218	11.27	32,750,063	13.54	2.27
3	Turkey	27,068,973	9.37	30,412,898	12.57	3.20
4	U.A.E	18,411,409	6.38	18,460,692	7.63	1.25
5	China	7,603,870	2.63	12,320,616	5.09	2.46
6	Chile	6,671,542	2.31	7,887,329	3.26	0.95
7	Libya	12,645,055	4.38	7,405,941	3.06	(1.32)
8	USA	5,217,959	1.81	7,249,970	3.00	1.19
9	Syria	12,107,280	4.19	7,084,711	2.93	(1.26)
10	Saudi Arabia	4,513,578	1.56	7,013,986	2.90	1.34
11	Iran	33,928,611	11.75	6,502,076	2.69	(9.06)
12	Germany	6,854,336	2.37	6,148,368	2.54	0.17
13	Jordan	3,996,222	1.38	4,785,040	1.98	0.60
14	Japan	7,763,608	2.69	4,763,988	1.97	(0.72)
15	Taiwan	3,077,046	1.07	4,286,000	1.77	0.70
16	Hong Kong	4,620,052	1.6	3,809,573	1.57	(0.03)
17	Lebanon	3,467,815	1.2	2,544,000	1.05	(0.15)
18	Netherlands	3,043,879	1.05	1,623,000	0.67	(0.38)
19	Egypt	3,053,184	1.06	1,588,000	0.66	(0.40)
20	Others	34,979,839	12.11	31,532,960	13.03	0.92
	Total	**288,771,081**	**100**	**241,913,605**	**100**	

Table 37: Major Importers of Ceylon Tea in 2016 vs 2023 and quantity (Units: kg)
(Source: F &W Tea Review 2024)

Historically, Iran was the second-largest importer of Sri Lankan tea. However, the United States sanctions imposed on Iran after 2016 had a profound impact on Sri Lanka's tea exports, reducing exports from 33 million kilograms in 2016 to only 6.5 million kilograms in 2023. The continuation of even this limited trade has mainly been facilitated by a barter system known as the "oil-for-tea" arrangement, implemented in 2012 (Sri Lanka Tea Board, 2023).

In contrast, China has emerged as a growing market for Ceylon tea. Recent surveys indicate that China is increasingly shifting its consumption towards black tea, for which it relies on imports, despite producing a total tea volume comparable to that of Sri Lanka (Committee on Commodity Problems, FAO/IGG, 2024).

Tea Exports from Sri Lanka to the UK, Pakistan, and Egypt

The United Kingdom, Pakistan, and Egypt have historically been among the leading tea importers in Europe, Asia, and Africa, respectively. Currently, these three countries collectively import approximately 321 million kilograms of tea. Before the 1980s, they were major buyers of Ceylon tea. However, Sri Lanka gradually lost market share in these countries as consumer preferences shifted during the 1970s towards CTC teas from East Africa, primarily due to lower prices and limited value addition in Sri Lankan exports.

Consequently, a significant proportion of East African tea began to be auctioned in London. The subsequent establishment of independent auction centres in individual countries led to the closure of the London Tea Auction in 1998. Additionally, preferential treatment and duty concessions for East African imports under the COMESA agreement further reduced Sri Lanka's market share in Egypt, which increasingly sourced tea from Kenya.

Challenges Posed by Herbal Teas to the Promotion of Quality Teas

Herbal teas, including chamomile, rooibos, and similar beverages, have gained popularity globally due to their perceived health benefits. However, many of these products contain little or no actual tea from *Camellia sinensis*. Recognising this, the Subcommittee on Tea of the International Organisation for Standardisation (ISO/TC 34/SC 8) has highlighted the term "herbal tea" as a misnomer. It is developing methods to differentiate herbal infusions from authentic tea. Efforts include establishing chemical criteria to distinguish products derived from ***Camellia sinensis*** from those made with other herbs.

Marketing and Value Chain for Ceylon Tea

Sri Lankan black tea can be broadly classified into Orthodox and CTC (crush, tear, curl) types. Orthodox teas are further divided into leafy grades and broken grades. Traditionally, broken-grade teas from the Up-Country and Uva regions were highly valued for their distinctive flavour, commanding higher prices than leafy grades until the early to mid-1990s. However, from the 1990s onward, growing demand for leafy-grade teas from CIS countries drove their prices above those of broken grades.

This shift in market preference contributed to the rapid expansion of tea smallholdings, particularly in low-country areas, where production and prices soon exceeded those of Up-Country teas. It also prompted several RPC-managed factories in the Up Country and Uva regions to focus on pure orthodox manufacturing. Most RPC factories are located in the Up Country, producing rotorvane-type orthodox teas.

Globally, Sri Lankan teas consistently achieve the highest auction and FOB prices among major tea-producing countries, reflecting strong demand for orthodox teas, particularly from CIS, Middle Eastern, and North African markets. The Colombo Tea Auction, the country's sole auction centre, is the second-largest globally, handling 5,000–7,000 metric tons weekly, while Mombasa handles 10,000–12,000 metric tons. Auctions in Colombo are held twice a week (Tuesdays and Wednesdays) and attract over 300 active buyers. Eight licensed tea broking companies operate under the Colombo Tea Traders' Association (CTTA) by-laws, managing 10,000–12,000 lots weekly from more than 650 factories.

Despite the high weekly volumes, the large number of buyers keeps the market competitive and buoyant, while transparent regulations govern it. Payments to producers are typically settled within seven days of the sale. In addition to auction sales, a small proportion (approximately 3–4%) is sold through private sales and forward contracts, all of which are monitored by the Tea Tasting Division of the Sri Lanka Tea Board to safeguard the quality and reputation of Ceylon tea and ensure reasonable pricing.

Although the export sector remained relatively complacent until the production decline in 2021, a structured analysis of the strengths, weaknesses, opportunities, and threats (SWOT) is warranted to inform strategies for this critical industry.

SWOT Analysis of Ceylon Tea

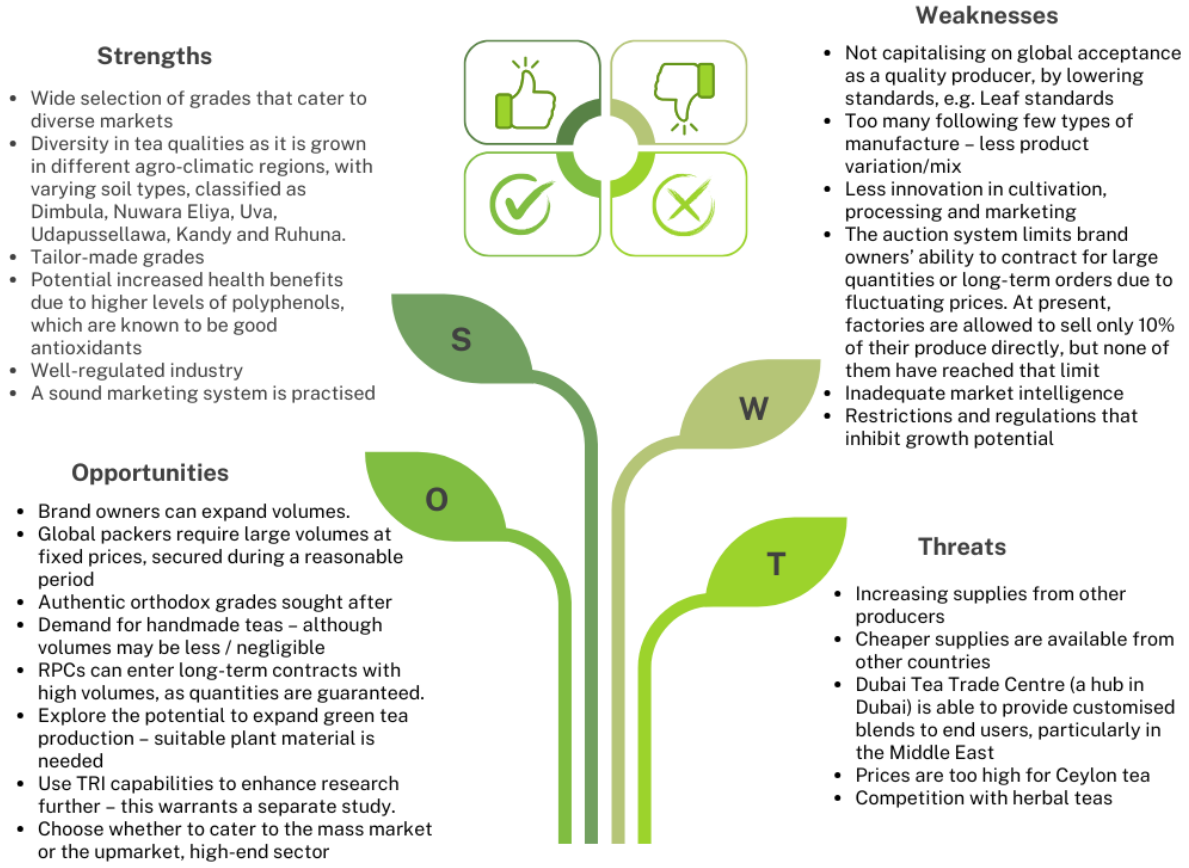


Figure 10: SWOT Analysis of Ceylon Tea

Demand for teas at Colombo Auction

There is generally strong demand for all types of tea offered at the Colombo Tea Auction, driven by the participation of over 300 active buyers each week. The demand for teas produced in the Up Country and Uva regions, mainly by RPC factories, largely depends on product quality and the quantities available at other major international auction centres, such as Mombasa. This is because, although teas from these higher elevations are produced using the orthodox-rotorvane method, such broken-grade teas are often compared with CTC teas produced predominantly in East African countries. Many industry experts believe that excessive leaf maceration in factories within these regions has diminished Sri Lanka's reputation as a producer of teas with distinctive flavours.

**The average prices realised at the Colombo Auction nearly doubled in 2022. In line with the basic principles of demand and supply, the sharp decline in production, coupled with the depreciation of the Sri Lankan Rupee, had a substantial impact on auction averages and FOB prices after 2021. However, the reduced crop volumes adversely affected overall export earnings (Table 28).*

Average FOB Price of tea exported (in SL Rs)	
2015	593.08
2016	639.88
2017	807.44
2018	820.75

Average FOB Price of tea exported (in SL Rs)	
2019	822.25
2020	866.70
2021	921.23
2022	1,643.09
2023	1,770.44
2024	1,774.00

Table 38:Trend in Average FOB Price of tea exported (in SL Rs)
(Source: F &W Tea Review 2024)

CTC Vs Orthodox teas at Colombo auctions

The average price of CTC (crush, tear & curl) teas is usually much less compared to orthodox teas, at the Colombo auction (Table 29). As such, there is less demand for CTC tea, accounting for about 7-10% of total production. However, factory capacity exists in Sri Lanka to produce 20% CTC tea.

Prices of orthodox Vs CTC teas (in SL Rs)						
Month	**High Grown Orthodox**	**High Grown CTC**	**Medium Grown Orthodox**	**Medium Grown CTC**	**Low Grown Orthodox**	**Low Grown CTC**
Mar	~1,240-1,300	~1,100-	~1,170-1,250	~1,020-1,100	~1,350-	~1,020-
Jun	~1,150-1,220	~1,050-	~1,100-1,200	~980-1,070	~1,250-	~1,000-
Sep	~1,200-1,280	~1,080-	~1,150-1,230	~1,000-1,080	~1,300-	~1,010-
Dec	~1,100-1,200	~1,050-	~1,000-1,150	~950-1,100	~1,200-	~1,000-

Table 29: Average auction price (in SL Rs) for orthodox and CTC teas in 2024
(Source: F &W Tea Review 2024)

Local exporters purchase their teas at the auction, blend, pack and export in bulk and value-added forms to various destinations. A list of major exporters is presented in Table 30, along with the quantities exported.

Rank	Exporter Name	Quantity (kg)	%
1	**Akbar Brothes (Pvt) Ltd.**	28,850,265	12.52
2	Uniworld Teas (Pvt) Ltd	11,753,520	5.10
3	Empire Teas (Pvt) Ltd	9,400,214	4.08
4	Anverally & Sons (Pvt) Ltd	9,175,735	3.98
5	Stassen Exports (Pvt)Ltd	8,249,147	3.58
6	Van Rees Ceylon Ltd	7,997,373	3.47
7	Vintage Teas Ceylon (Private)Ltd	7,768,349	3.37
8	Mabroc Teas (Pvt)Ltd	7,492,462	3.25
9	Inter Tea (Pvt)Ltd	7,361,544	3.19
10	Shan Teas (Pvt) Ltd	7,088,585	3.08
11	Heritage Teas Private Ltd	7,058,622	3.06
12	Jafferjee Brothers	6,549,094	2.84
13	George Stuart Teas (Pvt)Ltd	6,247,076	2.71
14	Finlays Colombo Limited	6,200,238	2.69
15	Ceylon Tea Marketing (Pvt)Ltd	4,683,228	2.03
16	Dilmah Ceylon Tea Company	4,416,269	1.92
17	A F Jones Exporters Ceylon (Pvt)Ltd	4,150,647	1.80
18	Quick Tea (Pvt)Ltd	3,984,711	1.73
19	Akbar Brothes Exports (Pvt)Ltd	3,492,845	1.52
20	Walters Bay Teas (Pvt)Ltd	3,015,134	1.31

Table 30: Major exporters from Sri Lanka and their ranking (2024)
(Source: Sri Lanka Tea Board Annual Report 2023)

**Note: Total quantity exported from Sri Lanka was approximately 241 mn kg*

Role of Brokers and their services

Muster Reports

Eight registered tea brokers are operating at the Colombo auction (Annexure II). Apart from acting as Brokers to sell the tea produced, brokers are expected to offer advisory services on ways and means to improve the quality of tea produced in a factory. However, the producers feel that these services are not offered by most of the brokers. “Muster reports” on samples sent by Brokers are mainly of the “post mortem” type and highlight only negative aspects of samples, without suggesting remedies.

Technical Advice

Brokers are also expected to visit factories regularly and advise on the manufacturing improvements implemented. However, in many cases, visits are mainly limited to courtesy calls to maintain a business relationship. The Brokering firms may not be able to provide sound advisory services on processing, possibly due to a lack of competency among their staff in tea processing.

In the past, the Tea Research Institute (TRI) provided advisory and extension services on tea processing and cultivation-related matters, entirely free of charge, as cess allocations supported its funding. At present, however, due to funding constraints, TRI requires estates and smallholders to provide transport for such services. This requirement not only escalates costs but also introduces logistical complications, thereby discouraging stakeholders from seeking assistance from the TRI. According to stakeholders, diminished confidence in the institution also discourages stakeholders from seeking assistance from TRI. Given this gap, it would be beneficial to establish comprehensive skill development and training programs on tea processing for staff attached to brokering companies as well.

Crop Advances and Loans

Brokers also organise loans and lend crop advances against the quantity catalogued for auction/sale. The norm is to lend about 80% of the value of the stocks /crops sent for auction. However, sometimes the Brokers advance more than this limit and also grant loans that are recovered at higher interest rates. The producers claim that the brokers are making more money by charging higher interest rates on such advances/loans, while they borrow funds at a lower rate from commercial banks.

Strengthening the auction system and support services

The backbone of this vibrant and effective auction system is the synergies derived from broker infrastructure supporting the Colombo tea auction. It naturally extends to the “total value” of Ceylon tea, which in turn enhances the value of the individual product and thereby the price realised. Therefore, by engineering value addition by the eight brokering firms, there could be disproportionate gains to the forward and backward linkages of the value chain. There are requests for funding to enhance their infrastructure.

Few brokering firms have invested heavily in their operations/logistics, especially in warehouse facilities, to add value to their services, including transactions, and to benefit producers. Since its inception, and even today, tea producers and marketers have received state assistance to develop their businesses. The brokers claim that they have been compelled to raise finance at high cost to enable the development made thus far. These investments have added value to Ceylon Tea and strengthened the cluster.

Earnings from tea exports and funding mechanisms for tea-related institutions

Tea export earnings account for about 2% of Sri Lanka's overall GDP and about 12.8% of total export earnings. The tea industry employs nearly two million people (Ref: Central Bank Report 2022). It is interesting to note that the industry has survived for a long time through its own funding, collected as cess, i.e. Rs 4/- per kg of tea exported. Subsequently, in 2010, the state imposed a promotional levy of Rs 3.50 per kg on tea exported and also increased the cess to Rs 10/- for bulk exports, while it remained at Rs 4/- per kg for value-added exports.

Annual cess collection amounted to about Rs 1.6 billion over the last 3 years, based on the quantity exported (Source: Sri Lanka Tea Board). Apart from bringing the much-needed foreign exchange to the country, the cess collected from tea exports was utilised for research, promotional, development and regulatory activities. Basically, the three organisations responsible for research (TRI), regulatory activities (SLTB) and small holdings (TSHDA) were funded by this cess collection. It is not an exaggeration to state that the subsidy offered for value addition by the Sri Lanka Tea Board helped improve the value-added percentage and export (FOB) prices, as evidenced by the amount of value added.

Until 2006, cess on tea exports collected by the customs was transferred directly to the Sri Lanka Tea Board, which divided and distributed the amount in a fixed ratio (e.g., 26:40:34) among the three state organisations, TRI, TSHDA, and SLTB. This ratio was changed from time to time by the Ministry of Plantation Industries, through consultations with respective

organisations. These funds were used for various purposes, as indicated against each institution, to sustain and maintain momentum in the industry. In other words, the contributions from these organisations right through should be commended.

- SLTB - Regulatory;
- TRI - Research & Extension;
- TSHDA - Extension and Development activities in small holdings.

Apart from cess funds, the Sri Lanka Tea Board introduced a promotional levy of Rs 3.50 per kg of tea exported to fund the Ceylon Tea promotional campaign from November 2010. Later, this levy was reduced to Rs 3/- per kg. An approximate calculation would run into billions, at the rate of 300 kg per year for almost 15 years. The collected levy is deposited with the Tea Board for allocation toward future projects. E.g., a percentage of this collection was used as a subsidy for fertiliser during the country's economic turmoil in 2022.

Year	Price Rs/kg	Export earnings (Rs bn)
2021	615.44	263.3
2022	1234.24	411.1
2023	1171.29	428.3
2024	1255.17	433.5
2025 (August)	1156.37	263.8

Table 31: Average auction price and total export earnings after value addition
(Source: F &W Tea Review 2024)

Export earnings showed a positive trend over the 10 years from 2014 to 2024, doubling primarily due to higher value addition and the depreciation of the rupee in 2022. It was also a landmark for export earnings to pass US$1.5 billion in 2014, but they have since come down slightly.

	TOTAL QTY (kg)	TOTAL VALUE (SL Rs)
IRAQ	34,260,353	45,668,250,707
RUSSIA	24,987,458	41,972,196,125
UAE	21,132,763	37,124,511,014
TURKEY	17,734,353	28,716,671,131
CHINA	11,564,609	16,702,758,005
AZERBAIJAN	10,435,696	18,254,161,193
IRAN	10,432,333	19,001,154,464

Table 32: Prime destinations for Ceylon tea in 2023
(Source: F &W Tea Review 2024)

It is worth noting that, in the past, a significant percentage of tea was exported to Middle Eastern/North African Countries, as well as to Russia and CIS countries (Sri Lanka Tea Board Annual Reports). Pure orthodox teas from Sri Lanka are mainly sought after by these two segments, which pay attractive prices compared to other types of teas, exported elsewhere. The preference for this shift occurred in the 1990s, resulting in the proliferation of small holdings in Low and Mid elevations, which subsequently accounted for a significantly larger share of production than the corporate sector. Other major importers are China, Turkey, Germany, Japan, and Chile.

Year	High	Medium	Low	Total
1994	66.30	57.93	67.38	65.12
1995	70.40	62.89	77.27	72.21
2000	128.46	119.08	144.79	135.53
2005	170.85	161.37	198.59	185.84
2010	337.82	330.88	393.40	370.61
2015	388.38	362.57	416.32	402.14
2020	580.90	553.94	666.32	628.21
2021	587.13	550.80	644.23	615.14
2022	1,093.10	1,030.82	1,339.86	1,234.24
2023	1,072.48	1,012.35	1,252.15	1,171.29
2024	1,141.63	1,064.48	1,304.38	1,225.17

Table 33: Average Colombo auction prices (Rs/kg)
(Source: F &W Tea Review 2024)

It is encouraging to note significant year-on-year price improvements over the last three decades (Table 33).

It is noteworthy that imports into Iraq, Libya, Turkey, and China are showing significant growth over the last 5 years. Iran used to be a leading buyer in terms of both quantity and price, especially of more flowery grades of tea from Mid and Low elevations. However, the sanctions imposed by the USA on Iran have impacted its economy, and as a result, its buying power has been curtailed. However, the Sri Lankan government was able to circumvent the situation to a great extent by a barter system known as “Tea for oil”, initially signed in 2012 and later renewed in 2021 (Sri Lanka Tea Board, Annual Report 2023)

Exporters have identified China as one of the most promising and growing markets for Ceylon tea and have strengthened promotional activities there. The Colombo Tea Traders Association has already taken many initiatives in this regard in China. This included trade exhibitions, competitions, charity auctions, and other events to popularise Ceylon tea.

What is encouraging is the presence of Ceylon tea in almost all the major consuming countries across the continents. This stands in sharp contrast to Sri Lanka’s main competitor in black tea, Kenya, whose market presence is concentrated in only a few countries, primarily the United Kingdom, Pakistan, and Egypt. Exports from East African countries, mainly CTC teas, are sold in bulk, with minimal value addition, at significantly lower prices than orthodox teas from Sri Lanka. Consequently, supported by their lower production costs, the profitability of these industries has been primarily confined to the estate and factory levels.

Processing and value addition

The types of tea produced in Sri Lanka can be categorised as Black tea, Green tea, Ready-to-Drink (RTD) tea, and instant tea – the production of the latter two is negligible compared to the total. Out of the total production, nearly 90% is of the orthodox type, which clearly demonstrates a higher demand for orthodox teas (Table 34). This is in spite of the efforts by the state to promote production of CTC tea in the early 1990s, by providing a subsidy of up to 85 % on machinery for conversion to CTC manufacture from Sri Lanka.

	2015				2024			
Description	(kg Mn)	%	Rs/kg	US $/kg	(kg Mn)	%	Rs/kg	US $/kg
Tea In Bulk	132.75	43.3	514	3.5	111.15	45.19	1,507.57	4.67
Tea In Packets	145.44	47.3	553	3.76	101.82	41.43	1,661.30	5.14
Tea In Bags	22.15	7.2	1125	7.65	25.58	10.41	2,751.84	8.52
Instant Tea	2.13	0.7	1023	6.96	2,.62	1.07	3,122.90	9.67
Green Tea	4.48	1.5	1361	9.26	4.69	1.91	3,898.64	12.07
Total	306.96	100	593	4.03	245.79	100	1763.61	5.46

Table 34: Value-added tea exports – 2015 vs 2024
(Source: F &W Tea Review 2024)

Among the value-added forms, green tea has the highest average price per kg (Table 34). At the moment, about 18 factories are producing a total of only about 4,500 metric tons of green tea. Only 2 or 3 factories produce green tea exclusively, whereas others produce both green and black tea. Sri Lanka is known to produce mediocre green tea, and the main reason cited for not producing the best-quality green tea is the raw material used, which is not suitable for green tea and is more suited to black tea. Thus, the volumes remain very low, and difficulties are encountered in expanding volumes (Table 34).

The need for external germplasm is generally felt to improve the plant breeding program, especially for the production of green tea. For producing the best green tea, the smaller China jat leaf is preferred, but most gardens use the wider Assam jat leaf, which gives a * be from a single parent source (ASM 4/10). This leaves hardly any room for exploitation in developing new cultivars, while making the entire industry vulnerable in the event of a pest or disease outbreak.

During a presentation by Sri Lanka, a proposal was made to exchange germplasm between tea-producing countries at the first-ever Association of Tea Producing Countries meeting held in Colombo in 1995 (Gunawardene et al., 1995). However, the proposal did not generate much enthusiasm among other producers.

There were offers of germplasm from Japan to promote green tea production during the latter part of the 1990s. However, TRI rejected such offers, citing the danger/risk of local tea gardens being infected with some unknown pests or diseases. However, of late, some material has been brought in from Korea and Taiwan for experimental purposes and is tested at TRI (Source: Tea Research Institute of Sri Lanka).

Other forms of value addition

Apart from the above forms, tea is also exported as gift items, such as in porcelain ware, for which Sri Lanka is famous. Through this approach, not only tea but also porcelain is marketed at premium prices. Similar marketing is carried out in tea outlets, established in major cities, patronised by tourists.

Tea packed in gift cartons and small sachets

Some exporters have invested significant funds in presenting tea in gift cartons at tea castles and tea lounges established across the island, which has paid rich dividends. This is again to capitalise on the large number of tourists visiting Sri Lanka every year. Beyond the dividends earned, these outlets provide a unique opportunity to benchmark and showcase Ceylon tea, in its pure form, as one of the finest teas in the world. If not for such exposure, many tourists visiting Sri Lanka might not have access to high-quality Ceylon tea. This is

because they depend too much on tea bags of somewhat inferior quality in their respective countries or in the hotels where they stay, even in Sri Lanka.

Tea as an ingredient in cosmetics, toothpaste, and pharmaceuticals

Given the incredible health benefits of tea, it could be marketed as an ingredient in cosmetics, toothpaste, pharmaceuticals, etc. However, the volume of tea that could be traded in this form is negligible, but it could be pursued without much investment.

Artisanal teas

Artisanal teas, either black tea or green tea, could be produced in small volumes and marketed through social media, without worrying about a massive budget for marketing. This could be done on a small scale and may be a possible option for smallholders to increase their income. The Tea Research Institute (TRI) has been promoting this concept all over tea-growing areas. However, the volumes that could be marketed will be negligible compared to Sri Lanka's overall tea production and exports.

Year	Private Sales (kg)	Forward Contracts (kg)	Total (kg)	Total exports	%
2023	5,157,482	2,211,908	7,369,390	241912704	3.05
2024	6,685,057	2,693,516	9,378,573	245987876	3.81

Table 35: Quantities sold through private sales and forward contracts 2023 vs 2024 (Source: Sri Lanka Tea Board Annual Report 2023 & 2024)

Challenges faced in marketing

To sustain the industry and ensure the quality of exports, the Sri Lanka Tea Board has put in place stringent mechanisms. A Tea Tasting Panel (comprising senior tea tasters and scientific staff) appointed for this purpose checks hundreds of samples every week to approve/reject/withdraw, mainly to safeguard the image of Ceylon tea as a supplier of quality tea.

While encouraging factories to achieve different types of certifications to meet the global demand, the panel tests samples for various parameters. These include testing random samples catalogued at the auction and pre-shipment testing, through visual observations and chemical analysis of the same samples. A considerable amount of funds has been utilised in establishing analytical laboratories and the procurement of costly laboratory equipment (analytical) to meet these requirements, and this investment should be appreciated. They could be briefly summarised as follows:

- All parameters related to Food Safety Management Systems ISO 22000: 2018, viz
- Quality parameters as per the minimum standard ISO 3720:2011, Definition and basic requirements for tea
- Chemical parameters
- Microbial counts
- Pesticide residues in tea
- Moisture content in tea
- Glucose, fructose and sucrose content in tea

Details of the number of samples subjected to such testing by the Sri Lanka Tea Board under each category, in the year 2023, are given in Annexure IV.

Smallholder Contribution and Profile

Role and share of smallholder farmers in the tea economy

As highlighted earlier, the smallholders do make a significant contribution towards National production. Their contribution was very prominent since the early 1990s. However, after 2020, the yield or productivity of smallholdings has dropped sharply. While they lose income from lower production, this has also pushed up production costs, making them vulnerable and threatening the economic viability of those small holdings. A drop of nearly 730 kg/ha in this sector is alarming.

Performance of the small holding sector over the last 5 years is summarised in Table 36

No.	Description	2019	2020	2021	2022	2023
1	Extent of Tea Small Holdings (ha)	122,900	123,324	*157,907	*158,060	*158,221
2	Number of Tea Small Holders	400,987	404,291	*418,328	*418,531	*418,938
3	Made Tea production of the Tea Small Holding sector (Million kg)	225.728	205.666	223.197	189.734	190.662
4	Percentage of Contribution of the Tea Small Holding sector to the National production (%)	75.2	73.8	74.56	75.44	74.46
5	Average Productivity (Made Tea/ Kilograms per Hectare)	1,938	1,766	*1,414	*1,200	*1,205
6	Extent of lands of Tea Replanting – with STaRR project under incentives (Ha)	787	946	1,466	1,596	1,076
7	Extent of lands of New Tea planting Hectares (Under incentives)	296	424	678	408	43.61
8	Percentage of Tea replanting (%) (With STaRR project) (%)	0.79	0.95	1.47	1.6	0.6
9	Crop Rehabilitation – Number of plants (Millions)	1.921	2.137	3.324	2.431	0.2

Table 36: Performance of the small holding sector over the last 5 years (TSHDA Annual Report, 2023)
**As per the land registration of the Sri Lanka Tea Board in 2016*

The extent of land used for new planting is negligible. The extent of replanting is also low, and such low percentages do not contribute significantly to the overall productivity.

Production by small holders

Demand for low-grown leafy grade teas and proliferation of small holdings:

Sri Lanka was producing about 220 million kg of tea up to about 1990, with smallholders accounting for 33% of the total at that time. At present, it stands at around 75% of the production, according to data maintained by the Sri Lanka Tea Board.

Year	National production (mn kg)	Production by small holders (mn kg)	% of Total
1980	191.3	—	
1981	210.1	—	
1982	188.6	35.5	18.82
1983	179.9	38.7	21.51
1984	209.2	48.4	23.14
1985	215.3	54.8	25.45
1986	212.7	57.6	27.08
1987	214.6	66.3	30.89
1988	228.1	73.9	32.40
1989	207.9	68.9	33.14

Table 37: Contribution of small holders towards National Production up to the year 1990 (Source: Plantation Sector Statistical Pocket Book 1990)

Initially, tea was grown in the Soviet Union and in some CIS countries, such as Ukraine, Georgia, and Azerbaijan. From this production, a certain percentage of demand in Russia and the individual (CIS) countries was met. However, with the nuclear disaster in Chernobyl in 1986, some of those teas got wiped out due to contamination with radioactive substances. While looking for a replacement to fill the supply shortfall, the tea produced at low elevations (leafy type) was preferred. This created additional demand for such teas, leading to a price increase from the early 1990s onward. Since then, the prices of tea produced in low country have shown a steady upward movement, overtaking the average prices for high-grown and mid-grown teas. This resulted in the proliferation of smallholders, mainly in the low country and to a lesser extent in the mid country.

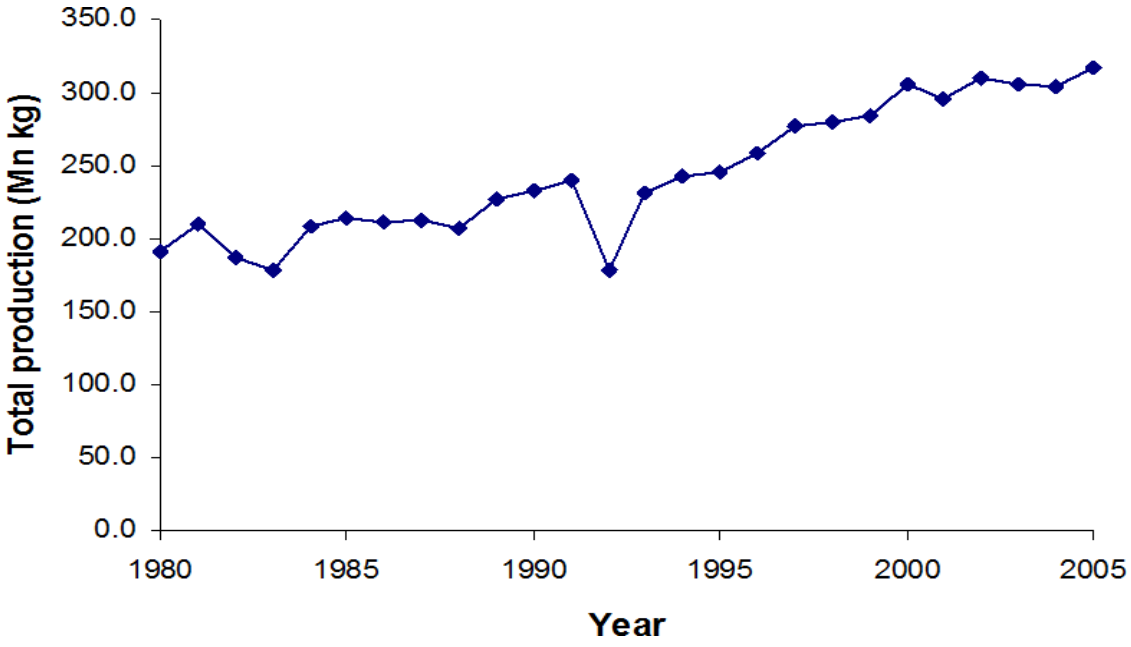


Figure 11: Growth in production due to contributions from the holder sector.

This resulted in the proliferation of small holdings in the low country and, in turn, in the evolution of a "tea economy" in the low country and also some parts of the Country (including parts of Uva Province) from the mid-1990s. Smallholders began planting tea on virgin land (utilising every available inch) and sometimes uprooting other plantations, such as rubber. Additionally, national production peaked in 2005, surpassing 300 million kg. New tea smallholdings were established in many districts, including Matara, Galle, Ratnapura, Deniyaya, Kegalle, Badulla, and Kalutara.

District	Smallholding Sector		Estate Sector		Total	
	No. of Holdings	Extent (ha)	No. of Holdings	Extent (ha)	No. of Holdings	Extent (ha)
Colombo	366	93	7	60	373	153
Gampaha	38	12	-	-	38	12
Kalutara	22,967	6,117	78	1,054	23,045	7,171
Kandy	18,432	7,609	235	14,990	18,667	22,599
Matale	747	356	87	4,774	834	5,130
Nuwara Eliya	11,936	4,045	195	46,222	12,131	50,266
Galle	58,314	22,062	235	3,568	58,549	25,629
Matara	45,863	17,326	289	6,378	46,152	23,704
Hambantota	1,619	440	-	-	1,619	440
Kurunegala	95	31	1	10	96	41
Badulla	17,553	5,616	161	25,024	17,714	30,639
Monaragala	247	70	7	852	254	922
Ratnapura	70,752	25,433	331	12,918	71,083	38,352
Kegalle	14,089	4,551	114	3,107	14,203	7,658
Total	263,018	93,760	1,740	118,956	264,758	212,716

Table 38: The extent held by different sectors in tea-growing districts

This has also resulted in smallholder production far exceeding that of the corporate sector. About 85% of the small holdings, out of a total of 418,938, are in the low country, covering 74% of the total of 158,221 hectares under small holdings. The extents under small holdings saw a significant increase, i.e., almost 70%, from about 80,000 ha in 1994 to 132,000 ha within a decade (by year 2005), called the "boom period". The extent of tea small holdings reached 158,000 ha in the year 2014 and remained almost static thereafter (Source: Tea Small Holdings Development Authority, Annual Report 2023).

MADE TEA PRODUCTION BY TYPE OF MANUFACTURER								
Year	RPC Factories	%	JEDB, SLSPC, TSF, & TRI (Kalubovitiyana factories)		%	Private Factories	%	National Production
2006	128.30	41.30		19.50	6.30	163.00	52.40	310.80
2007	126.30	41.50		20.50	6.70	157.90	51.80	304.60
2008	131.00	41.10		19.90	6.30	167.80	52.60	318.70
2009	115.40	39.60		11.30	3.90	164.40	56.50	291.10

MADE TEA PRODUCTION BY TYPE OF MANUFACTURER							
Year	RPC Factories	%	JEDB, SLSPC, TSF, & TRI (Kalubovitiyana factories)	%	Private Factories	%	National Production
2010	136.20	41.10	12.20	3.70	183.10	55.20	331.40
2011	134.10	40.90	7.60	2.30	185.80	56.70	327.50
2012	119.90	37.00	7.90	2.00	200.60	61.00	328.40
2013	125.30	37.00	7.40	2.00	207.30	61.00	340.00
2014	122.70	36.30	5.00	1.50	210.30	62.20	338.00
2015	11810	35.90	5.70	1.70	205.00	62.40	328.80
2016	99.30	33.90	3.60	1.20	189.70	64.80	292.60
2017	100.10	32.50	4.60	1.50	202.90	66.00	307.70
2018	98.84	32.52	5.77	1.90	199.33	65.58	303.94
2019	96.96	32.31	5.74	1.91	197.42	65.78	300.12
2020	94.86	34.02	6.13	2.20	177.85	63.78	278.85
2021	101.8	33.98	6.83	2.28	190.91	63.74	299.49
2022	82.1	32.61	6.02	2.39	163.69	65.00	251.84
2023	85.0	33.21	6.18	2.41	164.86	64.38	256.09
2024	84.9	32.33	1.77	0.68	176.00	67.00	262.69

Table 39: Production ('000 metric tons) by different sectors (Source: Sri Lanka Tea Board)

Area	2021			2022			2023		
	Target (kg/ha)	Achievement (kg/ha)	%	Target (kg/ha)	Achievement (kg/ha)	%	Target (kg/ha)	Achievement (kg/ha)	%
Lowland	2,500	1,316	53%	2,500	1,115	45%	2,500	1,117	45%
Midland	1,700	2,068	121%	1,700	1,773	104%	1,700	1,747	103 %
Uva	1,600	1,787	111%	1,600	1,540	96%	1,600	1,634	102 %
Average	2,307	1,414	61%	2,307	1,200	52%	2,307	1,205	52%

Table 40: Elevation-wise productivity in small holdings (Source: TSHDA Annual Report, 2023)

The percentage production from small holdings improved significantly over the years to nearly 75% in year 2020. However, from that time onwards the productivity seems to take a downward trend (Figure 11), culminating in both the small holder as well as corporate sector, plummeting to 1205 kg/ha and about 1000 kg/ha respectively in year 2023. Recent progress made against the target set is summarised in Table 40 (Source: TSHDA Annual Report, 2023). Although in Uva and Midland the targets were achieved, the achievement in low land is only 45% of the set target.

Description	2020	2021	2022	2023	2024
National Production (Million Kilograms) Target	278	310	325	335	340
Production of Tea Small Holdings sector (Million Kilograms) Target	205	230	237	245	255
National Production (Million Kilograms) Progress	278	299.34	251	256	261
Production of Tea Small Holdings Sector (Million Kilograms) Progress	205	223.2	189	190	194
Percentage of progress	100%	97%	80%	78%	77%

Table 41: Progress made against the target set for production by small holders over the years

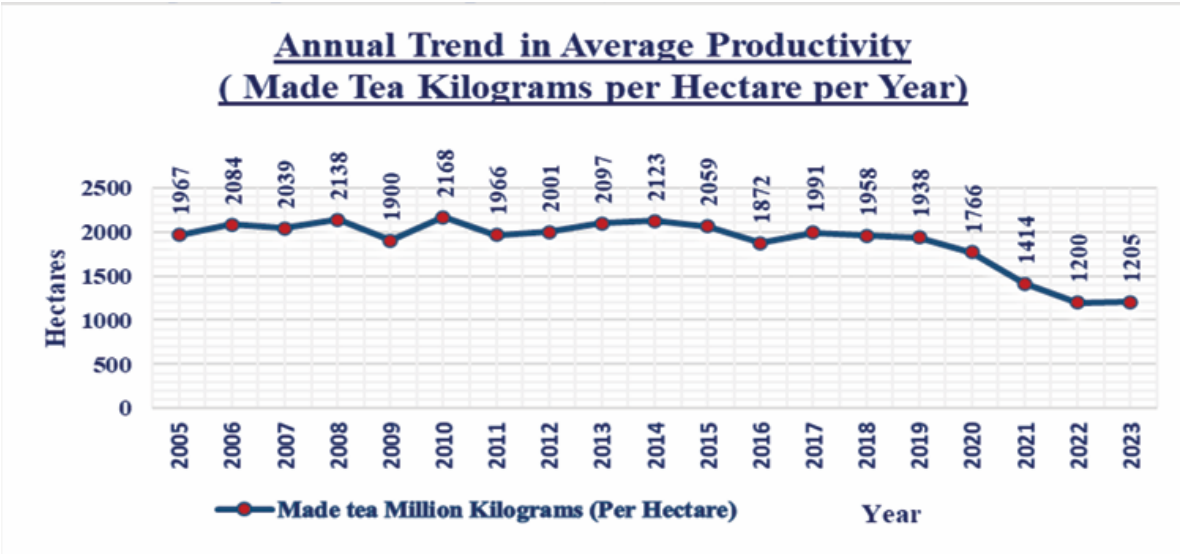


Figure 12: Annual trend in average productivity in small holdings (TSHDA Annual Report, 2023)

Administrative District	Extend of Tea (Ha)	Production Highlands	Production Midlands	Production Lowlands	Production Total	Productivity (kg/ha)
Badulla, Monaragala	9,743	4,460,043	6,077,358		10,537,401	1,082
Galle	30,193			37,710,347	37,710,347	1,249
Hambantota	1,004			82,564	82,564	82
Kalutara	17,091			15,597,053	15,597,053	913
Colombo	404			1,233,378	1,233,378	3,053

Administrative District	Extend of Tea (Ha)	Production Highlands	Production Midlands	Production Lowlands	Production Total	Productivity (kg/ha)
Kandy	11,388	54,673	14,175,126	9,446,287	23,676,086	2,079
Kegalle Gampaha	12,991		86,735	7,586,615	7,673,350	591
Matale	740		1,168,323	364,724	1,533,047	2,072
Matara	25,733		61,170	28,223,544	28,284,714	1,099
Nuwara Eliya	5,857	6,975,582	6,401,401	793,643	14,170,626	2,419
Rathnapura	43,077		576,354	49,587,227	50,163,581	1,165
Total	**158,221**	**11,490,298**	**28,546,467**	**150,625,382**	**190,662,147**	**1,205**

Table 42: Productivity figures in small holdings in different districts by the year 2023
(Source: TSHDA Annual Report, 2023)

Year	Number of Permits Issued	Extent of Lands Covered by Permits (Ha)	Extent of Uprooted Lands (Hectares)	Extent of Cultivated Lands (Hectares)	Annual Expenditure (Million Rupees)	Annual Provisions (Million Rupees)
2018	3,899	681	443	435	12.168	117
2019	2,887	567	29	295	91.69	92
2020	3,304	661	422	424	123.4	117
2021	4,968	1,076	681	678	238.56	237.3
2022	3,212	694	414	408	*169.53	168.89
2023	181	36	44	47	*82.02	23.38

Table 43: Small holdings qualifying for subsidy payments for uprooting and replanting
(Source: TSHDA Annual Report, 2023)

Smallholders contribute approximately 75% of Sri Lanka's total tea production. In sharp contrast, in India, about 52% of the total production, nearly 1,300 million kilograms, comes from smallholdings, with the remainder produced by the corporate sector. In Kenya, smallholders account for about 47% of the total 598 million kilograms produced, or about 285 million kilograms. In Indonesia, smallholders account for nearly 45% of the total production of 120 million kilograms, while in Vietnam, smallholders account for about 80% of the total production of 170 million kilograms. A detailed comparison of productivity in the Small Holder sector in Sri Lanka with that of other tea-producing countries (China, India, Vietnam, Indonesia, Kenya) can be found in Chapter 2 of this White Paper. To improve productivity in small holdings, the state has introduced many subsidy schemes, viz., for fertiliser, nurseries, replanting, infilling, etc.

Establishment of societies

The Tea Small Holdings Development Authority (TSHDA) has made significant efforts to establish smallholder societies to provide better services and strengthen smallholders' organisational capacity. Forming such societies also enables more effective resource management and overall operational efficiency. A few well-organised societies in the Deniyaya area have demonstrated sustained success, functioning smoothly without significant issues.

Smallholders are encouraged to form societies rather than operate individually, as collective action offers numerous benefits through economies of scale. Details of the number of societies and their membership are presented in Table 44. A similar and highly successful model has been implemented by the Kenyan Tea Development Agency (KTDA). Through collective decision-making, societies can more effectively manage the sale and transport of green leaf, fertiliser procurement, and other operational matters. To promote this approach, and with funding support from donor agencies such as IFAD, the TSHDA facilitated financial assistance to societies for purchasing lorries and other essential resources. However, due to administrative and logistical challenges, smallholders were unable to realise the anticipated benefits of this support fully.

Unfortunately, in the Sri Lankan context, Tea Sector Farmer Organisations, Tea Smallholding Development Societies (TSDS), have not achieved their intended objectives (Mahindapala, 2020). Strategic approaches adopted by Indian Farmer-Producer Companies, Japanese Agricultural Cooperatives, and the Kenyan Tea Development Agency, such as shifting toward market orientation, enhancing value addition, diversifying products, integrating services, fostering collective approaches, and strengthening management structures, should be considered in the future development of Tea Smallholder Development Societies.

IFAD / Donor Projects such as Smallholder Tea and Rubber Revitalisation Project (STaRR):

This project was supported by the International Fund for Agricultural Development (IFAD) and the Government of Sri Lanka to assist smallholder farmers in the tea and rubber sectors, with particular focus on poorer rural households and women-headed households. The overall development objective of the project was to make smallholder tea and rubber production **more productive, profitable, and resilient**. The project had provisions (funding) for matching grants, resilience funds, and component financing aimed at value-chain investments (transport could be eligible under producer group strengthening or value chain grants) in small holdings in the tea and rubber sector. These funds are sometimes channelled through societies or district project offices.

Regional Office	No. of Societies		No. of Members	
	2022	2023	2022	2023
Galle	217	219	49,230	43,714
Matara and Hambanthota	192	192	53,978	54,263
Kaluthara	116	119	23,217	23,464
Kegalle	148	150	28,903	29,589
Kandy and Matale	227	227	22,231	22,306
Nuwara Eliya	127	127	14,837	14,137
Rathnapura	291	291	88,893	88,893
Badulla and Monaragala	166	167	24,447	24,340
Total	1,484	1,492	305,736	300,706

Table 44: Number of societies established in each district and their membership (Source: TSHDA Annual Report, 2023)

Further, TSHDA promoted replanting (or rather direct planting by incorporating compost into the planting hole) through partial funding. Due to pressure from stakeholders to minimise replanting costs, TRI issued guidelines on direct planting with compost in the planting holes.

Details of funds distributed in the year 2023 on this activity are summarised below. However, experts warn that such planting will affect the long-term productivity /sustainability of the industry.

Activity	Total cost of the project (Rs Mn)
i. Land preparation (Digging pits)	187.5
ii. Applying compost (1 kilogram per pit)	187.5
iii. For tea plants	375.0
Total	750.0

Table 45: Subsidy offered for direct planting by incorporating compost (Source: TSHDA Annual Report, 2023)

Economic and social impact due to small holdings

Tea production is one of the primary sources of foreign exchange for Sri Lanka, and accounts for 2% of GDP contributing over US$1.3 billion in foreign exchange earnings to the economy of Sri Lanka.

The tea industry earns over USD 1.2–1.5 billion in foreign exchange annually. Since smallholders produce nearly three-fourths of the total volume, their indirect contribution to export earnings is roughly USD 900–1,000 million per year. Their production sustains thousands of small- and medium-scale tea factories that rely primarily on smallholder leaf supply, thus stimulating rural industrial linkages. Smallholder tea has driven economic dynamism in rural districts**,** especially in the Southern, Sabragamuwa, and Central Provinces, creating downstream employment in transport, tea collection, input supply, and processing.

The small holders can be proud of infusing new hope into this important industry. Their roles should be appreciated and acknowledged in several fora. Further, given the number of smallholders involved in tea cultivation, the sector attracted the attention of politicians and policymakers. Income from tea cultivation brought significant changes to the economic situation of smallholders over the last 3 decades.

Improvements in household incomes on smallholdings have led to better livelihoods, which have definitely contributed to the social life of every family involved in tea cultivation and processing. This relates to education, food security, women's empowerment, and poverty reduction, while keeping the youth away from other vices. Increased tea production in each district where tea is produced also created jobs/businesses for others, such as green leaf dealers, transporters, and associated services. Further, increased quantities exported created more job opportunities (at different levels) in warehouses and blending centres in Colombo.

With the proliferation of small holdings and the resulting increase in production, many private buyers bought leaf-processing factories to process the green leaf produced by tea smallholders. This also created more jobs and increased income for the local population. Further, this necessitated the collection and transport of such leaves to processing factories, thereby creating demand for more leaf collectors to enter the sector. The Tea Board intervened and regularised such leaf collection by registering and issuing a license to them, safeguarding smallholders. It is interesting to note that many of those collectors later established their own bought leaf processing factories, especially in the low country. However, despite all the efforts by the Tea Board and TSHDA, an amount exceeding Rupees One billion is still outstanding (Source: Sri Lanka Tea Board, Annual Report, 2023)

To regulate their role, with special emphasis on safeguarding the interests of smallholders, leaf transport was allowed only with the Tea Board's approval, i.e., through registered leaf collectors. The amount due to the smallholder is paid by the factories that process their leaf

through the collectors. Although the system seems to be working satisfactorily in the majority of cases, there have been serious issues of non-payment for green leaf suppliers (smallholders). According to data monitored and maintained by the Tea Board, an amount exceeding Rupees one billion has accumulated by the end of 2023 due to non-payment for green leaf over a period of time (Source: Annual Report SLTB, 2023).

Impact on the environment

Tea plantations are carbon-negative or climate-positive. There is potential to collect and market information on the carbon sequestration potential and a carbon budget for tea plantations to ensure the industry's sustainability. Proper establishment and management of both high- and medium-shade trees in plantations will not only enhance the physiology of tea plants, resulting in higher yields, but also contribute significantly to maintaining a negative carbon balance, thereby promoting environmental sustainability (Wijeratne, 2018).

The ecosystem has improved, with plots of tea fields being established in every village. However, many of these smallholders lacked knowledge of proper tea cultivation, despite having participated in training programs on Good Agricultural Practices (GAPs). Although smallholders have enjoyed the benefits of tea planting over the last 3 decades, it may be said that smallholdings are facing a major crisis at the moment. The situation is mainly driven by a significant drop in production/productivity on small holdings, especially in the low-grown sector. A detailed summary of the factors contributing to such a decline is included in Chapter 2 of this report. A common notion is that the tea bushes had passed their productive life span of 30 years (especially the VP tea), as claimed by the TRI.

From cess funds collected, the Tea Small Holdings Development Authority provided subsidies for new planting, replanting, infilling, and other activities. In contrast, the Sri Lanka Tea Board provided funds for new machinery and the establishment of new bought leaf processing factories. It is worth noting that all these were achieved, mainly using the cess funds collected from tea exports, without any burden on the treasury / consolidated fund.

In addition to this funding, there was donor funding by the Asian Development Bank (ADB) twice, under the project titled “Tea Small Holder Development Project”, during the period 1998 – 2008. The project included a component, viz., Value Chain Development for the Tea Sector, which provided a grant to smallholders to improve access to financing for replanting and new planting.

This funding accelerated replanting and new planting programs in small holdings and may have contributed to their excellent performance until 2020, i.e., their sustainability. Extents under tea increased significantly in Ratnapura, Kalutara and Galle Districts during this period (Table 46).

Extents under tea in Ratnapura, Kalutara and Galle Districts	**2005**		**2023**		
	Extents (ha)	**%**	**Extents (ha)**	**%**	**Increase**
Galle	27427	20.73	30193	19.08	2766.00
Kalutara	7823	5.91	17092	10.80	9269.00
Matara	25417	19.21	25733	16.26	316.00
Ratnapura	30441	23.00	43077	27.23	12636.00
Sub Total	91108	68.85	116095	73.38	
Grand Total	**132329**		**158221**		**25892**

Table 46: Tea Small Holder Development Project Funding

The project was implemented in two phases: the first from 1998 to 2004 and the second from 2004 to 2008. (Ref: Sri Lanka: Tea Development Project; ADB Validation Report). This project had the following objectives/outputs:

- Institutional reform and strengthening component, intended to improve cess fund access and availability for field development and to increase the efficiency of tea-related institutions namely (a) TSHDA, (b) the Sri Lanka Tea Board, (c) the Tea Research Institute (TRI), and (d) the National Institute of Plantation Management (NIPM), in service delivery.
- cess reallocation for the Project; amendments to existing or new enabling legislation to promote the independence of tea-related institutions from the Government;
- conversion of NIPM into an independent, self-financed training organisation.

However, under the same project, TRI was entrusted with the following tasks to improve the productivity in the small holder sector;

- Establishment of mother bush areas (94 ha) in tea growing areas with the latest TRI 3000 & 4000 series cultivars, to provide quality planting material for the establishment of good plants/nurseries
- Certifying commercial nurseries
- Infrastructure development at TRI Low Country Station, Ratnapura, with a view to improving the advisory and extension services to the small holdings in the Low Country area, especially in Ratnapura district, which has a very high percentage of small holdings.

TRI achieved over 90% success in meeting those objectives during the project period (Source: TRI Annual Reports, 2005 and 2006

ADB, through its studies, identified challenges for the long-term sustainability of the tea industry and quantified the financial gap in the tea sector. It also noted that, aside from labour shortages in the sector, the lack of investment in replanting has led to declining yields due to ageing tea bushes.

Subsidy schemes implemented

In order to ensure the sustainability of the tea sector, the Tea Board, along with TSHDA, had implemented a subsidy scheme for the following:

For cultivation:

- new planting
- replanting
- replanting with mechanised harvesting
- establishment of a model tea garden
- sprinkler irrigation systems
- application of organic fertiliser
- establishment and management of nurseries
- establishment of high and medium shade

For the factories involved in processing,

- Establishment of Good Manufacturing Practices (GMPs)
- HACCP and ISO 22000 standards in tea
- Factory modernisation
- Installation of solar power on factory rooftops
- Purchase of moisture meters

Contribution from smallholders to national production improved from 33% in 1990 to 70% in 2011 and 75% in 2017, and has since remained around that level. As a result, income generated helped boost National Foreign Exchange earnings while shaping the livelihoods of

many families living in those districts. Further, it also created employment opportunities for many youths (Central Bank Report 2022). Many smallholders used family labour to minimise costs and maximise income/profit. The number of small holders also increased to about 422,000.

However, regrettably, the yield (or productivity) has declined, especially in small holdings to an alarming level of 1205 kg/ha in the small holdings (Figure 12). This is after recording the highest yield of 2168 kg/ha in the year 2010. What is more alarming is that the yield decline has been more pronounced over a short span of 6 years since 2018 (Figure 12). A yield drop of nearly 750 kg/ha over 5 years requires serious scrutiny and remedial action. There are many reports highlighting the probable reasons and conclude that it is a result of a combination of factors.

Drop in production district-wise (in the low country) is depicted in Figure 12.

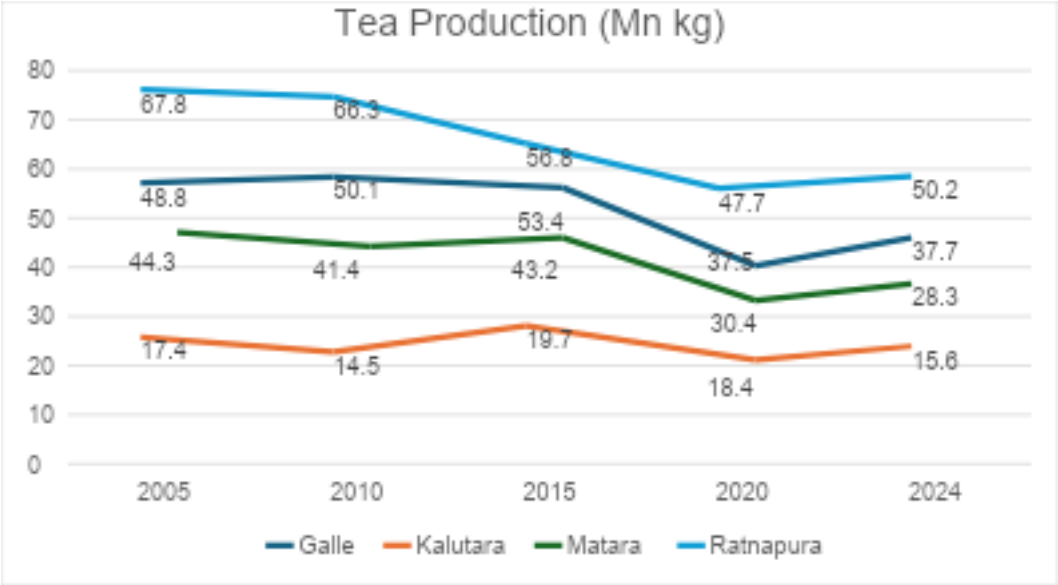


Figure 13: Drop in production district-wise (in the low country)

	District	Number of Factories
1	Badulla	62
2	Colombo	2
3	Galle	116
4	Hambantota	1
5	Kalutara	34
6	Kandy	88
7	Kegalle	24
8	Matale	6
9	Matara	96
10	Nuwara Eliya	129
11	Ratnapura	104
	Total	**662**

Table 47: Registered operational tea factories in different districts
(Source: Sri Lanka Tea Board, Annual Report 2023)

In the Low Country, the increase in production from smallholdings has led to the establishment of many new factories, often within the same district. This expansion has resulted in labour shortages in certain areas. To overcome this challenge, factories have increasingly relied on hired workers from other districts, including distant locations such as Embilipitiya and Hambantota. To accommodate these workers, many factories in the Low Country have built hostels and other facilities nearby, similar to arrangements common in garment factories. In Mid Country, too, almost all factories have shifted their processing focus from orthodox broken grades to leafy grade teas to capitalise on the growing demand for the latter.

Year	RPC Factories	%	JEDB,SLSPC,TSF,TRI &(Kalubovitiyana factories)	%	Private Factories	%	National Production
2006	128.30	41.30	19.50	6.30	163.00	52.40	310.80
2007	126.30	41.50	20.50	6.70	157.90	51.80	304.60
2008	131.00	41.10	19.90	6.30	167.80	52.60	318.70
2009	115.40	39.60	11.30	3.90	164.40	56.50	291.10
2010	136.20	41.10	12.20	3.70	183.10	55.20	331.40
2011	134.10	40.90	7.60	2.30	185.80	56.70	327.50
2012	119.90	37.00	7.90	2.00	200.60	61.00	328.40
2013	125.30	37.00	7.40	2.00	207.30	61.00	340.00
2014	122.70	36.30	5.00	1.50	210.30	62.20	338.00
2015	11810	35.90	5.70	1.70	205.00	62.40	328.80
2016	99.30	33.90	3.60	1.20	189.70	64.80	292.60
2017	100.10	32.50	4.60	1.50	202.90	66.00	307.70
2018	98.84	32.52	5.77	1.90	199.33	65.58	303.94
2019	96.96	32.31	5.74	1.91	197.42	65.78	300.12
2020	94.86	34.02	6.13	2.20	177.85	63.78	278.85
2021	101.8	33.98	6.83	2.28	190.91	63.74	299.49
2022	82.1	32.61	6.02	2.39	163.69	65.00	251.84
2023	85.0	33.21	6.18	2.41	164.86	64.38	256.09
2024	84.9	32.33	1.77	0.68	176.00	67.00	262.69

Table 48: Made tea production by type of manufacturer (Source: Sri Lanka Tea Board)

Issues faced by the tea industry

Some of the issues faced by the Sri Lankan Tea Industry could be summarised as follows:

Overall, tea production in Sri Lanka has been declining since 2013. The country recorded its highest-ever production of 340 million kilograms in 2013, which dropped to about 251 million kilograms in 2022, before slightly recovering to 262 million kilograms in 2024. In a broader sense, the issues facing the industry could be summarised under the following categories:

- Low field/factory/worker productivity

- Highest cost of production
- Poor/eroded soils, Declining quality of tea - green leaf standards
- Lack of qualified staff (Managerial, Field, Factory and Office staff)
- Worker shortage, including skilled workers

Low field productivity – compared to our competitors

Reasons for low productivity**:**

The contributing factors to low productivity in the tea sector are thoroughly documented (Sidhkaran et al., 2022) and are summarised below.

i. Low carbon content: Low carbon levels of about 1.5% - 2.0% in Low & Mid Country and about 3% in Up country – levels are much lower compared to carbon levels in competing countries

ii. Other contributory factors in the corporate sector:

a) High percentage of old seedling tea– nearly 50% due to low levels of replanting, 0.42% against the anticipated 2% per annum, after 1992, i.e., privatisation of estate management, considering high capital cost and longer payback periods on replanting (TRI of Sri Lanka). This has led to a very high percentage of less productive seedling tea in the corporate sector. Further, even the VP tea in the corporate sector was planted more than 30 years ago, which is its productive lifespan, according to TRI. All these factors have contributed to inferior yields in the corporate sector, i.e. less than 1000 kg/ha.
b) Neglect of Good Agricultural Practices, due to cost constraints (Eg, plucking, weeding, fertilising)
c) Curtailing inputs: Essential inputs have been curtailed due to increased cost of inputs such as fertiliser, agrochemicals, etc., by a few folds, as a result of economic turmoil and currency depreciation.
d) Poor leaf standards: Average leaf standards in the industry are about 40 - 50% in general, compared to about 85% prior to privatisation in 1992. Low field productivity (low yields) was identified as the main reason for low intake by pluckers, with worker shortages also contributing.
e) Poor knowledge among Management staff, field staff, factory staff and Office staff. The industry is facing a massive crisis in recruiting and maintaining high-calibre staff at all levels. Changes in the country's education system are identified as the major contributor. Additionally, “brain drain” caused by limited opportunities has affected staff retention. This has led to younger, less experienced individuals being promoted to managerial positions. Further, staff is not exposed to training programs, which may be due to not realising the importance of training and also may be due to a lack of confidence in training programs offered by relevant institutions.
f) Extension services from TRI are not sought, probably due to lack of confidence and also TRI insists on stakeholder meeting part of the cost (e.g., transport) incurred on such visits. In sharp contrast, TRI previously provided advisory and extension services to the estate/smallholder, absolutely free of charge. This was a result of limited fund allocation /restriction for TRI by the Treasury. Prior to 2005, nearly 25–30% of the cess collected by customs on tea exports was channelled directly to TRI (through the Tea Board). After the year 2005, the cess fund was diverted to the Treasury, and the latter decided on the amount to be allocated to each organisation, i.e., Sri Lanka Tea Board, TRI, and TSHDA, for research as well as development programs.

iii. Other contributory factors in the small holder sector:

a) Non–implementation of GAPs due to:

b) lack of knowledge /understanding about the basics of GAPs. The delivery method needs to be re-examined to improve its effectiveness. E.g.: Use of software through social media; Using Demonstration blocks, “Crop Clinics”, etc., could be explored.
c) due to cost constraints. E.g., Plucking – although some smallholders may be aware of the benefits of plucking good leaves, they face logistical issues, as they might have to depend on hired labour – the scale of the operation can make things worse.
d) Severe weeds, pest and disease problems (Eg, Low Country Live-wood termite)
e) Increasing cost of inputs such as fertiliser, agrochemicals, etc. With fertiliser costs rising, the tea sector was struggling to fertilise.
f) Senility - age of tea, passing the productive lifespan of 30 years for VP tea in the Low Country, as claimed by TRI
g) Adverse/negative impact on economic viability, mainly due to inherent issues in processing/factory operations leading to low NSA, which leads to diminishing share of small holders.
h) Unhealthy competition for green leaf leading to green leaf transport lorries crossing districts – leading to more damage to the leaf and also increased cost of transport.
i) Malpractices by middleman – addition of water resulting in undue deductions and negative impact on the quality of tea produced (NSA price)
j) Lack of crop insurance systems. Over-dependence on tea income, i.e., lack of alternate income sources, makes it difficult to implement certain practices (e. g., timely pruning

Recommendations:

i. Ban the transportation of leaf from one district to another and implement strict punishment for violators.
ii. Propose establishing a funding scheme with collection from smallholders as well as factory owners, to contribute 10 cents per kg of green leaf supplied to each factory and the factory in turn to contribute 10 cents, amount collected to be invested in an insurance scheme or used as a revolving/consolidated fund.

Other issues facing the industry

- Low factory productivity, compared to our competitors. SL has too many factories with lower production capacities (eg, in SL, the average factory capacity is about 400,000 kg tea made/annum, compared to 2- 3 million kg per annum in Africa and India)
- Many factories are operating “under capacity”, resulting in increased cost of production, making them financially non-viable. This had also led to unhealthy competition for green leaf, which in turn had led smallholders to prioritise volume, due to a serious mismatch between factory capacity and leaf availability.
- Declining quality of tea - Drop in quality of green leaf – leading to loss of income to both the factory as well as SHs – the middleman will improve his profits through volumes.
- Increased cost of processing affects the margins for factory owners, thus resorting to cost-cutting at the expense of the quality of tea produced. Lower crop (capacity) led to increased cost of production, due to high General charges (fixed charges) per kg
- Increased cost of inputs (e.g., firewood, electricity, packing material, labour, etc.). The industry is facing a significant shortage of firewood.

Recommendation: A planned reforestation program should be implemented as practised in Africa and India, to ensure a continuous supply of firewood.

- Lowest worker productivity, compared to our competitors: But the worker productivity depends on field and factory productivity. Increased wages, coupled with low worker productivity, have raised the COP, and as a result, Sri Lanka is probably experiencing the highest cost of production.

- Higher labour wages not being tied to productivity is a sensitive issue.
- Poor/eroded soil management practices – according to data, 300 mm of topsoil is lost in Mid Country (where planting of tea commenced with more seedling tea) over the last 158 years of planting tea.
- Lack of qualified staff across various categories, including managers, field staff, office staff, and factory personnel, has become a significant concern. The migration of skilled professionals, driven by the brain drain following the 1983 communal riots, three decades of civil conflict, and, more recently, the economic crisis, has severely affected the sector. Additionally, shortcomings in the education system may have contributed to a decline in personnel's knowledge and practical skills. This represents a stark contrast to the past, when Sri Lanka was recognised for having some of the best-trained plantation professionals, including managers, field officers, factory officers, and chief clerks.

Recommendation: The effectiveness of skill development and training programs conducted by relevant organisations should be systematically evaluated. Emphasis should be placed on assessing actual outcomes and impact, rather than merely counting the number of programs conducted, and appropriate corrective measures should be introduced accordingly.

- Worker Shortage**:** The shortage of workers poses a serious threat to the survival of the tea industry. While mechanisation and automation can provide some relief, their application remains limited, particularly given Sri Lanka's firm reliance on orthodox tea manufacture.
- Lack of Skilled Workers**:** The country faces a shortage of skilled labour across many sectors, including tea cultivation and processing. Training programs for workers in these areas are insufficient, resulting in skill gaps that affect productivity and quality.
- Outmigration**:** A growing number of youths from estate communities are choosing not to register for plantation work, mainly due to social stigma. Many prefer employment in urban areas, such as supermarkets in Colombo, even for lower wages. Poor living conditions, including inadequate water and sanitation facilities in line rooms, have further contributed to this trend. Addressing issues of worker motivation and creating clear career advancement opportunities could significantly reduce outmigration and help retain a stable workforce.

Broader Recommendations

Improve productivity: As smallholders occupy nearly 2/3 of the area under tea and contribute nearly 75% of the production, the industry's sustainability largely depends on smallholder productivity. There are umpteen publications discussing the reasons for productivity decline in small holdings (Samaraweera & Samansiri, 2025). Such reasons should be carefully analysed, prioritised, and remedial actions implemented to ensure the industry's successful journey so far continues.

Tea is a perennial crop, and no shortcuts must be taken, especially at the time of establishment (starting with sound planting material, nursery practices, planting, bringing into bearing, and following up with Good Agricultural Practices). In this regard, an accelerated, effective program of skill development among smallholders is crucial.

Should the economic viability of smallholdings be strengthened? It depends not only on field productivity but also on the price paid for green leaf by bought-leaf processing factories. Therefore, enhancing both field and factory productivity is essential, and any meaningful intervention should give this aspect due prominence.

The establishment of the Tea Shakthi Fund, along with its own factories, was a sound initiative aimed at preventing exploitation by private factory owners. Kenya's Tea Development Agency

(KTDA) provides many success stories demonstrating the effectiveness of such an arrangement. Unfortunately, in Sri Lanka, the Tea Shakthi Fund was eventually dissolved due to management malpractices. This situation warrants a thorough review and the implementation of appropriate corrective measures.

Smallholders rely on the support of all plantation-related organisations, such as TSHDA, TRI, the Tea Board, and NIPM, for their survival. Unfortunately, the roles and responsibilities of these organisations are often underappreciated, with criticisms citing inefficiency and insufficient funding to fulfil their mandates. It is therefore essential that these organisations receive adequate funding and guidance to deliver on stakeholder expectations, including those of the corporate sector. Notably, TSHDA's funding was reduced by 60% in 2022 compared to 2021, even as operational costs had risen sharply. Funding allocations should be sufficient to support both routine operations and developmental initiatives.

Major Issues Faced in Black Tea Processing

Green Leaf standard

Quality raw materials are essential for producing high-quality tea. Tender green leaf is preferred as raw material for black tea processing. Further, the standard of raw material has been declining over the years. This is mainly due to a lack of knowledge of Good Agricultural Practices, low land productivity, attempts to reduce costs by harvesting more, worker shortages,etc.

According to data maintained by the TRI and the Tea Commissioner's Division, the standard has dropped to about 40–50% (good leaf) in both sectors, from 75–85% maintained in the early 1980s. In this regard, the "B 60" program (requiring a minimum of 60% good leaf) implemented by the Tea Commissioner's Division should be commended and aggressively promoted. Further, the awareness program "*Dallakin Wenasak*" (change through one leaf), implemented by TSHDA in collaboration with CIC Agribusinesses, should be commended, as this program could change the destiny of smallholders.

The tea industry, which was initially established with old seedling tea (OST), characterised by inherently low yields, gradually transitioned to high-yielding vegetatively propagated (VP) cultivars introduced during the 1960s. Subsequently, a wide range of VP cultivars with enhanced yield potential and other desirable traits was developed. The productivity of VP tea is several times higher than that of old seedling tea (OST).

During the 1960s and 1970s, a policy directive was implemented to replant 2% of the OST extent annually, aiming to achieve complete replacement by 2010 and thereby resolve issues related to low productivity. Unfortunately, the corporate sector has neglected replanting, and the current ratio of seedlings to VP tea remains around 50:50. It is noteworthy that, prior to 1992, i.e., before the privatisation of estate management, the replanting rate was generally sustained at approximately 2% across most estates.

In sharp contrast, with the expansion of the smallholder sector, nearly all smallholdings established after the 1980s and 1990s were planted with 100% VP (vegetatively propagated) cultivars, resulting in significantly higher productivity. Combined with cultivation in the low-country regions, where growing conditions are favourable, these smallholdings historically recorded average yields exceeding 2,000 kg/ha. However, it is disappointing to note that average yields in smallholdings have now declined to approximately 1,205 kg/ha. The reasons for this decline are discussed elsewhere in this report.

Plucking / Harvesting

Plucking costs are the highest component of production costs. In general, as field productivity is low in the corporate sector, management compels workers to pluck a certain percentage of substandard leaves to increase intake and thereby reduce production costs (COP). According to data collected, plucking costs are the most significant component of tea production costs (Wijeratne, 2003).

Manual harvesting is preferred because selectivity is always better than mechanical harvesting. However, to improve plucker intake, plucking shears are widely used in many producing countries, which inevitably results in damage to the harvested leaves. However, the TRI developed a tea plucking shear (TSHS - TRI Selective Tea Harvester), which won a Gold Medal at the International Inventors Forum in Geneva in 2000 for its selectivity and output (Wijeratne, 2003). However, adoption of this shear in the tea sector is somewhat limited due to a lack of training, i.e., limited promotion highlighting its benefits.

Plucking machines

To reduce plucking costs, various types of plucking machines are used on a limited scale. Research findings indicate that the use of such machines consistently results in inferior-quality harvests and reduced yields over the long term, unless the bushes are planted and trained to suit the machine's design (e.g., in tea gardens in Japan).

Leaf transport

Proper handling of the harvest, including transport to the factory, directly impacts the final quality of the tea produced. Studies reveal significant damage to the harvested leaf during plucking, due to poor plucking baskets, poor packing materials, and poor transport methods. As soon as the leaf is damaged, fermentation begins. If the fermentation commences before withering, it is termed “premature fermentation”. The tea made from such leaves will be of poor quality.

However, based on ergonomic studies, many lightweight plucking baskets have been introduced recently to reduce damage to harvested leaves and stress on pluckers. Coir bags were considered cheap and ideal, but were discontinued due to cost considerations. To reduce damage during transportation, plastic baskets/crates are introduced in place of nylon or coir bags previously used. Some other RPCs discontinued using plastic crates because the quality improvement was not significant, and the volume transported per trip dropped, creating other issues.

Technological Standards/machinery

TRI of Sri Lanka has been at the forefront of research since its inception in 1925, in both cultivation and processing. Regarding tea processing, the establishment of two commercial-scale factories for research purposes has yielded extraordinary research output since the 1930s. While the research findings have been proven through commercial-scale implementation, the industry has shown no reservations about adopting them. This is in sharp contrast to the research focus in some competing countries, where most research is conducted using miniature machinery.

The establishment of such commercial-scale factories at the Tea Research Institute should be commended and reflects the research thrust on the importance of research for the sustainability of the industry. Findings from such research culminated in the publication, Monograph on Tea Manufacture (No 4), by Mr E L Keegel (a former Technologist at TRI) in the 1950s, which is still known as “the Bible of tea manufacture”.

The Tea Research Institute (TRI) has historically provided substantial research and extension services on tea processing, which is reflected in the higher auction and FOB prices of Sri Lankan teas compared to competitors. However, many staff involved in processing currently

lack the necessary skills and knowledge. Enhancing their expertise should therefore be a priority. Without improvements in this area, even the best field cultivation practices may not yield the desired results.

Product certification

The tea industry, particularly during processing, is subject to various certifications to ensure that products are safe for consumption and produced under ethical conditions. Obtaining phytosanitary certifications, such as HACCP and ISO 22000, requires a significant financial investment, and support should be considered. Most factories have already secured these certifications to remain competitive in the market. The relevant certifications are summarised as follows:

Minimum Quality Standard (ISO 3720) for marketing tea

ISO (International Organisation for Standardisation) has set a minimum standard to confirm the quality of tea, which, in short, is termed as “Minimum ISO 3720 standard” (Annexure III). While it establishes minimum levels of soluble solids and the alkalinity of the acid-insoluble ash, etc., one of the crucial parameters in this standard is the crude fibre (a measure of cellulose and lignin) content, which should be less than 16.5%.

Food Safety Management Systems

With growing health concerns, consumers expect the food they consume to be free of physical, chemical and biological impurities. Towards this, consumers demand the implementation of Food Safety Management Systems not only in estates/factories but also in warehouses and bulking centres, primarily through GAP (Good Agricultural Practices) and GMP (Good Manufacturing Practices). Some of the standard Food Safety Management System certifications applicable are;

ISO 22000:2018 Food Safety Management Systems based on HACCP (Hazard Analysis and Critical Control Points) principles. HACCP is a set of principles designed to ensure that the risks of physical, chemical and biological contamination are avoided or minimised at all stages of harvesting and processing. To achieve the above certification, it should be demonstrated that all the above principles are adhered to through documentation and practice. This certification will also address:

- Standards for Heavy Metals in made tea
- Standards for Microbiological Parameters in made tea
- Standards for Pesticide Residue in Made Tea

While the above standards address the quality and safety of food products, other standards address worker welfare. They are;

Corporate Social Responsibility (CSR) Standards:

OHSAS 18001: 2007 (Occupational Health and Safety Management Standards)

There are a few more standards that address environmentally responsible, sustainable production, such as Ethical Tea Partnership, Rainforest Alliance, Fair Trade labelling, UTZ, Regenagri, etc. These certifications include safeguarding fauna, flora, and wildlife on the estates.

Corporate Social Responsibility (CSR) Standards

There are several standards (listed below) that buyers demand to ensure that, in addition to adopting GAPs (Good Agricultural Practices) and GMPs (Good Manufacturing Practices), the teas are ethically produced, i.e., that the producers address corporate responsibility concerns.

FLO - Fair Trade Labelling Organisation certification

ETP - Ethical Tea Partnership certification
RA - Rainforest Alliance certification
UTZ - UTZ (good inside) certification
Regenagri certification

Payments for bought leaf

Green leaf produced on smallholdings is either processed in privately owned leaf factories or in factories managed by Regional Plantation Companies. Processed tea is then sold through the Colombo auction. The Sri Lanka Tea Board had introduced a "Reasonable green leaf price formula" to determine the price of bought leaf (Annexure III). This formula is subject to amendments from time to time, taking costs into account on both sides. The last revision of this formula was implemented in 2021.

However, the smallholders (or suppliers) will not be complacent; they will only be paid for the leaf they bought. Apart from payment for bought leaf, they do expect better / additional services from the factories. The incentives and services offered by the Private tea factory owners could be summarised as follows;

- Out-of-pocket payment (over and above the price for green leaf as per the formula)
- Regular advances
- Short-term and long-term loans
- Annual incentives
- Donations advance for social functions, viz., weddings, funerals and other social engagements

Many factories manipulate the grade mix of tea, sending it to auction to achieve a higher price. In other words, they do not send an adequate quantity of secondary and off-grade grades produced, which they sell privately to outside parties involved in reprocessing such teas. By doing this, the factory owners end up paying a higher rate for bought leaf, but a reduction in COP compensates them, as it helps them attract a larger quantity.

Profitability analysis

Economic viability is key to the sustainability of tea plantations, in general and for smallholders in particular. Profitability in small holdings will depend on the cost of production (COP) of green leaf and the green leaf price. The COP of green leaf will depend heavily on the productivity of the smallholding, which, in turn, is determined by bush health and by all other cultural practices implemented / not.

The cost of green leaf production will depend on field productivity and worker productivity. The green leaf price will be decided by the Reasonable Price Formula (Annexure III) approved by the Tea Commissioner's Division, based on the quality of tea produced, i.e., the net sale average price the factory records for a particular month. Apart from the green leaf standard, the net sale average price will depend on all unit operations in tea processing, and there is much to be addressed, again due to a lack of qualified staff. Further, some malpractices by leaf collectors (e.g., adding water to the leaves to increase weight) will result in poor-quality tea and increase processing costs.

The cost of production of tea (including cultivation and processing) in Sri Lanka is the highest in the world. Rising input costs, declining productivity, an uneconomic age profile of tea bushes and high social costs have led to declining profits. Perhaps higher productivity and cost reduction will have to be achieved to enhance the sustainability, or rather competitiveness, of 'Ceylon Teas' in the world market in the long term.

Economic Benefits

Establishment of Thea Shakthi Fund

Prior to the year 2000, the green leaf produced by smallholders was mainly processed in privately owned leaf factories, which made huge profits as tea prices boomed. At that stage, to benefit from the buoyant market conditions, the state decided to establish the Thea Shakthi Fund, following the successful model set by the Kenyan Tea Development Authority (KTDA).

Thus, the Tea Shakthi Fund was established under the Tea Shakthi Fund Act No. 47 of 2000, with the following objectives:

- Inculcating the savings habit in tea smallholders and uplifting their economic and social status - Promoting necessary investments related to the tea industry.
- Acquiring and developing tea factories and providing other required facilities to tea smallholders for the manufacturing of their products.
- Improving and developing the marketing of the tea produced from such tea factories.
- Taking such steps as may be necessary for the improvement of the well-being of those who are engaged in the production of tea as smallholders.
- Importing, manufacturing and selling of fertiliser required for the plantation industry, with a view to maintaining it as a strong self-financing organisation.
- Converting into a viable and profitable entity and maintaining a net profit margin of 10%.
- Achieving a sustainable growth of 25%.
- Risk identification and proper management

The Thea Shakthi Fund was a timely and meaningful initiative aimed at organising tea smallholders, who had rapidly established their presence in the tea industry beyond the formal estate sector, by recognising their significant contribution to the national economy and, in particular, to the country's poverty alleviation efforts.

The following projects were implemented under the Thea Shakthi Fund:

1. Factory Project - Twelve (12) factories were established

2. Fertiliser Project - Procurement and distribution of fertiliser to small holders

3. Local Tea Sales Project - Sale of tea produced in Thea Shakthi Factories

However, it was later observed that the expected objectives were not achieved due to deficiencies in its management. As such, it was decided to dissolve the Board of Directors of the Tea Shakthi Fund in the year 2016. Although it made significant profits around 2012, it incurred huge losses (Rs 59 million and Rs 128 million) in the subsequent years. As such, after restructuring, the lease rentals and management fees from the factories are received by the Tea Shakti Fund, and approval of the Cabinet of Ministers has been granted to credit the remaining sum of money to the Consolidated Fund after settlement of the short-term liabilities and the formation of the Welfare Insurance Fund of Rs.135 million (Annual Report 2014 Tea Shakthi Fund)

Annexes

Annexure I: Auction procedures at Colombo tea auction

The Colombo Tea Auction, managed by the Colombo Tea Traders' Association (CTTA), transitioned from a traditional "outcry" auction to a digital e-auction in 2020 due to the COVID-19 pandemic.

This process involves several key steps, from the initial tea harvesting to the final sale and settlement.

1. Pre-auction preparations

Tea tasting and valuation: Before the auction, tea brokers, who are representatives of the sellers, receive tea samples from the factories. Buyers also send representatives to taste, grade, and value the thousands of teas lots available each week.

Quality testing: The Sri Lanka Tea Board's Tea Tasting Division assesses samples according to the international standard ISO 3720. Any tea suspected of not meeting the standard is withdrawn from the auction and re-evaluated by an expert panel.

Catalogue creation: The brokers catalogue the teas electronically, detailing the estate, tea grade, and quantity.

Settlement and finance: The Colombo Tea Traders' Association (CTTA), in collaboration with financial institutions, provides a robust settlement mechanism that ensures payment to sellers. This helps to maintain constant cash flow for producers.

2. The e-auction

Regular schedule: Auctions are held weekly, typically on Tuesdays and Wednesdays, with a break for the New Year and Christmas.

Online bidding: The e-auction platform allows registered buyers to bid online, providing a transparent and efficient market where prices are determined openly.

Broad participation: Hundreds of buyers, including both local and international traders, participate in the electronic bidding process.

Large volume: The auction handles a massive volume of tea, with around 6-6.5 million kilograms sold weekly.

3. Post-auction

Delivery and shipment: After the auction, buyers purchase the tea and arrange shipment. The process is designed to be highly standardised and efficient to meet the needs of the global market.

Market information: The auction serves as a valuable market barometer, providing reliable tea price data for Colombo and insights into the broader global tea market.

Regulatory framework

The auction operates under the oversight of the CTTA, which sets and updates the rules and regulations for the sale of tea. The Sri Lanka Tea Board provides additional regulatory guidance and ensures quality standards are met throughout the process.

ANNEXURE II: Tea Brokers operating in Sri Lanka:

Ceylon Tea Brokers PLC**:**

Forbes & Walker Tea Brokers **(Pvt) Ltd:**

John Keells PLC**:**

Asia Siyaka Commodities PLC**:**

Eastern Brokers Limited**:**

Mercantile Produce Brokers**:**

Lanka Commodities Brokers Ltd..

Bartleet Produce Marketing (Pvt) Ltd

Annexure III: Reasonable price formula for bought leaf operations

Smallholder leaf is processed mainly (over 90%) in privately owned leaf factories. The Tea Control Act stipulates the payment of a reasonable price for green leaf supplied by the smallholder (directly or through a leaf dealer) as well as for the cost of manufacturing the same. There have been several schemes for payment (or apportionment) of the net sale average (NSA) price of green leaf tea, and the current one is called the New Reasonable Price Formula.

According to the New Reasonable Price Formula (NRPF),

When the factory's monthly NSA is equal to or less than the monthly elevational average price of tea (E.Av), then proceeds shall be shared in the proportion of 32% to the manufacturer and 68% to the leaf supplier.

When the factory monthly NSA (or GSA) is greater than E.Av, proceeds shall be shared in the proportion of 32% to the manufacturer and 68% to the leaf supplier up to the elevational average, plus 50% of the premium to each of them. Elevational average is the average auction price of teas from all the factories in that elevation, computed by the Brokers, every month.

NSA / GSA Price (Rs/kg)	Small holder share (68%) Rs/kg	Factory owners share (32%) Rs/kg	Price of Green leaf (Rs/kg)
1000	680	320	68.82
1100	748	352	75.70
1200	816	384	82.58

Table 49: History of changes in net outturn (made tea to green leaf) percentages to work out green leaf price

Year	Small holder share	Factory share	Net outturn MT/GL %
1968	75	25	22.22
1978	70	30	22.22
1988	68	32	22.22
1998	68	32	21.50
2021	68	32	21.50 & 21.00*

Table 50: Historical Distribution of Tea Production Between Smallholders and Factories with Net Outturn (1968–2021)

During dry months (Jan, Feb, March, July & Aug) - 21.50% During wet months - 21.00%;

The net outturn percentage was adjusted from 22.22% to 21.50% in the Low country in the late 1990s (Ziyad Mohamed et al., 1998). However, since then, there have been many changes to net outturn, and the last change was made in 2021.

Annexure IV: Chemical Requirement for Black Tea - ISO 3720:2011

Characteristic	Requirement	Reference method of test
Water extract,%(m/m) Minimum	32	ISO 9768
Total ash,%(m/m) -		
Maximum	8	
Minimum	4	ISO 1575
Water-soluble ash, as % of total ash,		
Minimum	45	ISO 1576
Alkalinity of water-soluble ash (as KOH),		
Maximum % (m/m)	3.0	
Minimum % (m/m)	1.0	ISO 1578
Acid-insoluble ash, % (m/m)		
Maximum	1.0	ISO 1577
Crude fibre % (m/m)		
Maximum	16.5	ISO 5498
Total polyphenols,% mass fraction		
Minimum	9.0*	ISO 14502 -1
Total catechins %	-**	ISO 14502 -2
Ratio of TC/TP	-***	

Table 51: Chemical Requirement for Black Tea - ISO 3720:2011

Annexure V: Number of samples analysed by Sri Lanka Tea Board in the year 2023

Description	No of Samples Tested	No of Samples Suspected
Visual Examinations	236,822	
Pre-Auction samples		
Random Basis (BSL) Evaluation	3,783	392
Panel rejections for suspected liquor contamination		223
Siliceous matter		828
Crude fibre		1,391

Table 52: Summary of Samples Tested and Suspected Samples Reported in 2023

Type of microbiology tests	Below the minimum quality Standard / Guideline
Total Plate Count	191
Yeast and Mould count	266
Coliform	191
E coli	2

Table 53: Microbiological Test Results Below the Minimum Quality Standard / Guideline

Analysis Unit	No. of tests below the minimum quality standard
Microbiology	650
Chemical	390
Pesticide residues	38

Table 54: Number of Tests Below the Minimum Quality Standard by Analysis Unit

Type of chemical tests	Number of samples below The minimum quality Standard (ISO 3720)
Crude Fibre content	72
Alkalinity content	13
Moisture content	297
Acid-insoluble Ash content	1
Total Ash content	4
Water Soluble Ash content	3

Table 55: Chemical Test Results Below the Minimum Quality Standard (ISO 3720)

In addition to the above, 38 samples were found to be below the acceptable levels tested for Glucose (7), Fructose(3) and Sucrose (28) (Source: Annual Report Sri Lanka Tea Board, 2023)

No. of Societies	1,475	1,483	1,484	1,484	1,492
No. of Members	329,963	309,710	279,594	305,736	300,706
Extension and Advisory Services					
No. of Individual Extension Services	12,955	14,439	15,866	19,565	20,678
No. of Group Programs	4,575	1,956	2,530	3,179	3,185
No. of Farmers Participated	119,265	53,068	43,138	90,451	72,445

Table 56: Details of Extension programs carried out by the staff of TSHDA

Region	HACCP	ISO 22000	Other Certifications **
Bandarawela	61	61	21
Gampola	4	5	-
Ratnapura	44	46	10
Matara	26	49	18
Galle	50	4	12
Kalutara	7	24	8
Nuwara-Eliya	2	91	16
Total	194	280	85

Table 57: Number of factories certified under various certification programs, in different districts:

Registrations	As of 01.01.2023	New Registrations	Total No. as at 31.12.2023
Exporters	401	58	421
Packers	703	157	670
Warehouse	283	28	292
Importers	103	3	111
Produce Brokers	8	-	8

Table 58: New registrations of exporters, packers, warehouses and importers in 2023

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3. Problem Diagnostics of Sri Lanka's Tea Smallholdings

By Prof. S. P. Premaratne

Abstract

Tea smallholdings form the backbone of Sri Lanka's tea industry but face multiple interconnected challenges that constrain productivity and sustainability. This paper presents a diagnostic assessment of the economic, agronomic, environmental, and institutional barriers affecting smallholder tea cultivation. Key constraints include declining soil fertility, limited adoption of improved agronomic practices, rising input costs, labour shortages, and weak market bargaining power. Climate variability and land degradation further exacerbate production risks and income instability among smallholders. Drawing on stakeholder consultations, research evidence, and sector data, the paper identifies the underlying causes of declining yields and profitability. The diagnostic framework provides an evidence-based foundation for designing targeted interventions aimed at revitalizing smallholder production systems and improving long-term sustainability.

Keywords: Tea smallholder challenges, Agricultural productivity constraints, Soil degradation, Climate vulnerability, Smallholder livelihoods, Tea sector sustainability

Situational Assessment – Consolidated Stakeholder Rankings

Stakeholder consultations with smallholder farmers, regional plantation companies, officials from the Tea Small Holdings Development Authority (TSHDA) and the Tea Research Institute (TRI), private-sector actors, exporters, and community-based organisations identified a consistent set of challenges shaping the resilience and sustainability of Sri Lanka's smallholder tea sector. The consultations, complemented by recent empirical data and policy reviews, identified five key priority areas ranked according to stakeholder consensus: (1) declining productivity and profitability, (2) soil degradation and unsustainable farming practices, (3) labour shortages and youth outmigration, (4) weak institutional and market linkages, and (5) policy and regulatory challenges. Climate variability was identified as a cross-cutting factor exacerbating all these vulnerabilities.

Rank	Priority Area	Key Issues Identified	Representative Evidence	Stakeholders Concerned
1	Declining productivity & profitability	Low yields, ageing bushes, high-cost inputs	Low yields (1,200 kg/ha vs 2,200 globally)	Smallholders, TSHDA, exporters
2	Soil degradation & unsustainable farming	Soil erosion, fertility decline, and low plant density.	Case study in Central Highlands: yield 1,000 kg/ha vs potential 2,400 kg/ha	TRI, agronomists, farmers
3	Labour shortages & youth out-migration	Ageing workforce, youth leaving, labour cost and availability issues	Reports of >50% workforce decline in estates, young disinterest	Farmer groups, Ministry of Labour

Rank	Priority Area	Key Issues Identified	Representative Evidence	Stakeholders Concerned
4	Weak institutional & market linkages	Limited extension, weak farmer-orgs, poor bargaining power	Only 25% of TSDS organisations provide full services	TSHDA, cooperatives
5	Policy & regulatory challenges	High VAT, tax burden, unclear subsidies, unstable policies	Abolition of SVAT, introduction of VAT adversely highlighted	Policymakers, exporters, smallholders

Table 1: Synthesised Stakeholder Ranking

Declining Productivity and Profitability

Across all tea-growing regions, stakeholders emphasised declining yields and shrinking profit margins as the most urgent challenge facing smallholders. The national average yield for tea currently stands at around 1,200 kg of made tea per hectare per year, significantly lower than the global average of 2,200 kg (SLTB Annual Report, 2024). While tea production in other major producing countries continues to rise, Sri Lanka's output has been steadily declining - from **328,964 metric tons in 2015** to **262,159 metric tons in 2024** (Annual Bulletin of Statistics, 2024). The smallholder sector, which contributes approximately 75% of Sri Lanka's total tea output, is particularly affected by ageing tea bushes, inadequate replanting rates (estimated at less than 1% annually, compared to the recommended 2%), and escalating input costs for fertiliser, fuel, and labour (Daily News, 2021). Technical efficiency levels are also low, averaging 68.8%, suggesting that output could increase by nearly one-third without additional inputs if good agricultural practices were adopted (Shyamalie et al., 2022).

Stakeholders also noted that unpredictable rainfall patterns and prolonged dry spells have further reduced yields, thereby limiting their reinvestment capacity. Declining profitability, combined with fluctuating market prices, has made many smallholders increasingly vulnerable to financial stress, undermining both livelihood resilience and sector sustainability.

Soil Degradation and Unsustainable Farming Practices

The second-ranked concern was soil degradation, identified as a direct threat to both productivity and long-term ecological sustainability. Empirical studies in the Central Highlands show that degraded tea lands produce as little as 1,000 kg/ha of green leaf compared to a potential 2,400 kg/ha, primarily due to erosion, nutrient depletion, and reduced organic matter (University of Peradeniya, 2023). In districts such as Ratnapura and Kegalle, continuous cultivation on steep slopes without adequate soil conservation measures has led to severe erosion and acidification (IPS, 2017). Stakeholders noted that heavy reliance on chemical fertilisers, limited use of organic compost, and inadequate shade management have further deteriorated soil health.



Figure 1: Soil Degradation

Agronomists from the TRI highlighted that land degradation has reduced the soil's water retention capacity, amplifying the adverse effects of erratic rainfall and drought. Sustainable land management and replanting programs, therefore, emerged as essential components of future climate-resilience strategies.

Labour Shortages and Youth Outmigration

Labour shortages were consistently cited as a pressing structural challenge across all regions. The workforce in tea production, especially in the plucking segment, is ageing rapidly, with younger generations showing little interest in continuing the occupation due to poor wages and limited career prospects. Literature indicates that many youths from estate and smallholder families are migrating to urban centres or overseas in search of higher-paying employment (Ceylon Today, 2025). The lack of mechanisation in hilly terrain further compounds the issue, as labour-intensive plucking remains essential to maintain quality.

Smallholders in low-country regions, particularly in Galle, Matara, and Ratnapura, reported difficulty hiring seasonal workers during peak periods, which directly affects leaf standard and harvest cycles. The International Labour Organisation (ILO, 2024) warns that the sector's future competitiveness will depend on improving working conditions and incentivising youth participation through training, modernisation, and decent employment initiatives.

Weak Institutional and Market Linkages

Stakeholders emphasised the limited institutional and market linkages available to smallholders. While the Tea Smallholdings Development Authority and farmer cooperatives (Small Tea Grower Societies – STGS) provide some extension services, their coverage and capacity remain inadequate. Studies reveal that only about **25%** of these organisations offer comprehensive support services, including market facilitation, credit access, and collective bargaining (Tea Research Institute, 2023). Many smallholders still depend on private brokers and green-leaf collectors, who often determine prices without transparent mechanisms.

This weak institutional connectivity has constrained technology adoption, financial inclusion, and sustainable land management practices (University of Peradeniya, 2023). Stakeholders highlighted the need to strengthen smallholder cooperatives, introduce digital platforms for market transactions, and improve coordination between government institutions, exporters, and farmer organisations.

Policy and Regulatory Challenges

The policy and regulatory environment were identified as the fifth central area of concern. Recent tax and fiscal policy changes - particularly the introduction of 18% VAT on tea-related transactions (January 2024) and the planned abolition of the Suspended VAT (SVAT) scheme (effective October 2025) - have increased financial burdens on both producers and exporters (Colombo Gazette, 2025). Inconsistent policy decisions, such as the 2021 chemical fertiliser ban, were also cited as having long-term negative impacts on productivity, soil health, and export competitiveness.

Exporters and smallholders alike expressed uncertainty about government subsidy mechanisms and credit access through state banks. Such unpredictability discourages reinvestment and replanting and undermines smallholders' capacity to adopt climate-smart agricultural practices.

Cross-Cutting Factor: Climate Variability

All stakeholder groups unanimously agreed that climate variability is a critical cross-cutting issue that intensifies the impacts of every other challenge identified. Observed trends in tea-growing districts include rising average temperatures, erratic rainfall patterns, and increased frequency of drought events (Journal of Agricultural and Environmental Economics, 2024). In Ratnapura and Badulla, for example, rainfall variability has shortened harvesting cycles and reduced leaf quality, leading to lower incomes and unstable livelihoods. Shade management,

soil conservation, and water-harvesting techniques have been recognised as critical adaptation measures; however, their adoption among smallholders remains limited due to knowledge gaps and resource constraints (Daily News, 2023). Waste management also presents a significant challenge - only about 15.3% of smallholders (A Survey, October 2025) currently utilise tea pruning waste for compost production.



Figure 2: Smallholders affected by Drought

In summary, the consolidated stakeholder ranking clearly demonstrates that the Sri Lankan smallholder tea sector faces a complex interplay of economic, environmental, and institutional challenges. Declining productivity, soil degradation, and labour shortages are immediate operational threats, while weak institutional coordination and policy uncertainty create systemic barriers to sustainable growth. Climate variability functions as a stress multiplier, exacerbating both economic and environmental vulnerabilities. Addressing these issues will require a coordinated multi-stakeholder approach that combines climate-smart agriculture, institutional strengthening, policy coherence, and youth-inclusive livelihood strategies to ensure the long-term resilience and sustainability of the smallholder tea sector.

Economic Viability, Low Productivity, High Costs, and Green Leaf Standard

The economic viability of Sri Lanka's smallholder tea sector is increasingly strained by declining productivity, rising input costs, and deteriorating green leaf quality. These issues collectively weaken the industry's competitiveness and threaten the long-term sustainability of livelihoods reliant on tea cultivation.

Problems

Stakeholders identified the following main problems related to the economic viability of the smallholder tea sector in Sri Lanka: (i) declining yields and poor green leaf quality, (ii) rising input and transport costs, and (iii) reduced profit margins and income instability.

Declining Yields and Poor Green Leaf Standard

Productivity levels among smallholder tea farms have shown a persistent downward trend over the past decade. According to the Food and Agriculture Organization (FAO, 2023) and the Tea Research Institute of Sri Lanka (TRI, 2022), many smallholdings report yields (green leaf) as low as 350–400 kg per acre per month (approximately 850–1,000 kg/ha/month), far below the potential yield of 2,000–2,400 kg/ha achievable under optimal management conditions. This productivity gap reflects a combination of biophysical and management factors, including poor soil fertility, ageing tea bushes, and limited replanting.

Furthermore, the green leaf standard, a key determinant of auction prices and export competitiveness, has declined in many regions due to irregular plucking intervals, labour shortages, and inconsistent fertiliser use. The Ethical Tea Partnership (ETP, 2024) reports that smallholders supplying to bought-leaf factories in low-country areas often produce lower-quality leaf, reducing the price premium available for higher-grade teas.

Rising Input and Transport Costs

The recent economic crisis in Sri Lanka (2021–2024) has severely disrupted input markets. Fertiliser prices tripled following the temporary fertiliser import ban in 2021 and subsequent foreign exchange shortages (World Tea News, 2023). Energy and fuel costs also rose sharply, driving up the cost of both field operations and transport of green leaf to collection centres. Many smallholders, unable to afford adequate fertiliser or weedicides, have reduced input use, further depressing yields.

Data from the Department of Agriculture (2024) show that fertiliser costs increased by over 200% between 2020 and 2023, while transport costs rose by more than 150%, significantly eroding profit margins.

SRI LANKA TEA BOARD
Tea Commissioner's Division
No 574, Galle Road, Colombo 03

23rd January 2025

Ref: TB/TC/DP/2025

Chief Executive Officers of
Regional Plantation Companies,
Chairman of JEDB, SLSPC, TRI
Owners of tea estates more than 10 Acres

Sirs,

FINANCIAL ASSISTANCE FOR DIRECT PLANTING AND INFILLING SCHEME FOR THE CORPORATE SECTOR & PRIVATE SECTOR ESTATES OF MORE THAN 10 ACRES - 2025

Introduction :

A budgetary provision out of the Sri Lanka Tea Board funds for the year 2025 is being made available to be utilized as financial assistance for direct planting and Infilling for the corporate sector and the tea estates having more than 10 acres of tea. Please note that all private & corporate estates should be registered under Tea Land Registration of the section No.02 of Tea Control Act No 51 of 1957, prior to apply for this subsidy.

1.0 Method of application :

(i) Regional Plantation Companies and the owners of the estates who have more than 10 acres of tea,that are in valid legal possession of the estates are eligible to apply for subsidy assistance using the application in annexure I.(Form No. TB/TC/DP/2025). It is compulsory to provide all the information as required by the application form. Failure to furnish the required information will lead to rejection of the application. Duly completed applications should be submitted to the relevant Assistant Tea Commissioner of the area where the estates are located on or before 15th February 2025. As the funds are limited, the applications will be entertained on a "First Come-First Serve"

Figure 3: Sri Lanka Tea Board

Reduced Profit Margins and Income Instability:

The combination of low productivity and high input costs has led to severe margin compression across the smallholder segment. Even as global tea prices exhibit volatility, local cost structures, especially labour and transport costs, have risen faster than producer prices. The FAO (2023) and Sri Lanka Tea Board (2024) estimate that production costs for smallholders now exceed LKR 700 per kg in some districts, while auction prices fluctuate between LKR 850–950 per kg, leaving minimal surplus after factoring in transport and processing deductions.

As a result, many smallholders find it increasingly difficult to break even, leading to underinvestment in replanting and maintenance and, in some cases, to the gradual abandonment of tea cultivation in marginal areas, according to many stakeholders.

Root Causes

The following root causes were identified via several consultation meetings: (i) ageing tea bushes, (ii) dependence on imported fertilisers and agrochemicals, (iii) limited uptake of climate-smart agronomy and mechanisation, (iv) limited access to affordable financing, and (v) global price volatility and market risk.

Ageing Tea Bushes

A primary structural issue is the ageing of tea bushes, many of which exceed their optimal productive lifespan of 20–25 years. According to the Smallholder Tea and Rubber Revitalisation (STARR) Project implemented by the International Fund for Agricultural Development (IFAD, 2023), nearly 50% of Sri Lanka's smallholder tea lands are over 20 years old, resulting in declining yields and susceptibility to pests and diseases. A 2025 survey found that 63.3% of plants are over 20 years old. A recent study of a sample of 157 smallholders conducted by Nucleus Foundation (Nucleus Foundation, 2025) found that the average age of tea bushes is about 16 years, and only 25% of smallholder farmers have bushes that are less than 10 years old. According to a study conducted by the Colombo Tea Traders Association, in 2025, 24% of plants were less than 10 years old. Replanting rates remain far below the recommended 2% per year, constrained by high upfront costs and long gestation periods before new plants become productive. For example, according to the recent study (October 2025), only 37.6% of tea smallholders have undertaken to fill in the last 10 years. Infilling is the most urgent matter to improve productivity. The majority of smallholders gave multiple reasons for not planting in the last 10 years. Among them, key reasons include: (i) high cost

(35.7%), (ii) lack of finance 35%), (iii) lack of labour (22.9%), and (iv) lack of knowledge (11.5%) (The survey, October 2025). In the same survey, 45.9% of smallholders reported rarely or never receiving extension or advisory services. However, in the same survey, 31.8% of smallholders reported having access to affordable credit facilities for replanting or inputs.

Dependence on Imported Fertilisers and Agrochemicals

Sri Lanka remains heavily dependent on imported fertilisers and agrochemicals for tea cultivation. Import restrictions, foreign exchange shortages, and logistical bottlenecks have made these inputs both scarce and increasingly expensive. During the 2021–2022 fertiliser ban, national tea yields reportedly declined by 20–30% (FAO, 2022). The continued volatility in input availability has discouraged regular fertiliser application, resulting in uneven nutrient management that adversely affects both productivity and leaf quality.

Results of a recent survey (TRI, 2025) revealed weak adoption of soil improvement practices among smallholders. Only 46% of smallholders reported using soil-improving inputs. Furthermore, only 11.2% applied micronutrients, and 26.8% conducted soil pH testing. In contrast, 57.9% relied primarily on organic fertilisers. These figures indicate significant gaps in the adoption of balanced nutrient management practices, highlighting the need for improved access to affordable inputs and extension support.

Limited Uptake of Climate-Smart Agronomy and Mechanisation

Although the TRI and the Ministry of Agriculture promote climate-smart agronomic practices, such as soil conservation, organic mulching, and drought-tolerant cultivars, their adoption among smallholders remains limited. For example, on average, only 44.7% of respondents employ soil conservation practices, according to a recent TRI survey (2025). A study published in the *Sri Lanka Journal of Tea Science* (2022) found that over 50% of surveyed smallholders perceived mechanisation as unsuitable for their small, sloped plots, citing topographical constraints, high initial costs, and lack of technical know-how. This perception has limited innovation uptake, leaving the sector reliant on traditional and labour-intensive methods that are increasingly uneconomic.

Limited Access to Affordable and Sustainable Financing

Replanting, rehabilitation, and mechanisation in the tea sector require substantial upfront capital investment. However, limited access to affordable, sustainable financing remains one of the most persistent challenges for smallholders. According to the IFAD STARR Project (2023), most government subsidy schemes operate on a reimbursement basis, requiring farmers to bear the initial costs before receiving financial support, an impractical model for liquidity-constrained households. Formal financial institutions, meanwhile, often demand collateral and verifiable income documentation, which many smallholders are unable to provide. Consequently, farmers tend to rely on informal lenders or postpone essential investments, resulting in chronic underinvestment across the tea value chain. This financial exclusion perpetuates low productivity, ageing tea bushes, and declining quality (Tea Science International, 2023).

To address these challenges, smallholders require innovative, inclusive, and sustainable financing models, such as revolving funds, blended finance schemes, 4P-based or cooperative-based credit systems, that can ease liquidity constraints and support long-term investment in productivity enhancement and climate resilience.

Global Price Volatility and Market Risk

Sri Lanka's tea sector remains highly exposed to global market fluctuations. The Colombo Tea Auction, while offering transparency, links domestic producer prices directly to volatile international demand and currency movements. In 2023, global tea prices declined by nearly 12% year-on-year (FAO Tea Market Review, 2024), impacting smallholder incomes more severely than estate producers, who have greater price-hedging capacity. The lack of

diversified marketing channels or value addition (e.g., direct exports, speciality teas) further increases vulnerability to market risk. The smallholders usually sell their green leaves to leaf factories (65.6%), agent collectors (28%) or cooperative societies (6.4%). In such a case, all smallholders agreed they have no bargaining power in price negotiations. However, only 64.9% of farmers (14.6% very satisfied and 50.3% somewhat satisfied) were satisfied with the price they received (Nucleus Foundation, 2025).

To sum up, a combination of structural inefficiencies and external shocks undermines the economic viability of Sri Lanka's smallholder tea sector. Low productivity, escalating costs, and poor-quality leaf production have significantly reduced profitability. These problems are rooted in ageing plantations, dependence on costly imported inputs, weak financial mechanisms, and limited technology adoption. The overall picture is one of declining economic resilience, where even minor fluctuations in input prices or global markets can push smallholders into financial distress. Enhancing productivity and profitability will therefore require a multi-pronged strategy—combining replanting support, financial inclusion, input market stabilisation, and promotion of climate-smart, quality-oriented agronomy.

Human Capital Constraints: Labour Shortages, Youth Outmigration & Skills Gaps

Main Problems

Stakeholder consultations and national data consistently identify labour shortages as one of the most critical constraints facing the tea smallholder sector in Sri Lanka. These shortages are particularly severe during key agricultural operations such as plucking and pruning, directly reducing yield potential and compromising green leaf quality. Furthermore, an ageing farming population and the limited participation of youth have raised serious concerns regarding the long-term sustainability of the sector.

According to the Tea Small Holdings Development Authority (TSHDA, 2023) and a recent study by TRI (2025), the average age of smallholder tea farmers now exceeds 55 years, with nearly 50% aged 56 or older. Results of another study (October 2025) indicate that the average age of smallholder farmers in the tea sector is 56 years, and 75% of the farmers are older than 49 years.

Educational attainment among smallholders is also low; only 1.9% possess qualifications above the Advanced Level. This demographic imbalance, combined with the continued migration of rural youth to urban centres and overseas labour markets, has further depleted the sector's available workforce. As a result, tea smallholding communities face mounting



Figure 4: Aging Workforce

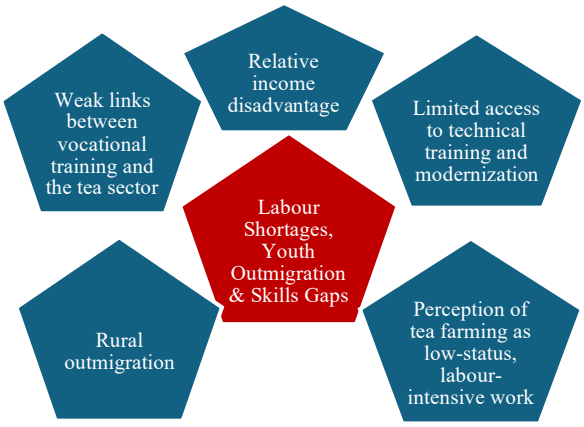


Figure 5: Human capital constraints

challenges in sustaining productivity, adopting modern cultivation practices, and ensuring intergenerational continuity in the industry.

Root Causes

Relative Income Disadvantage

Rural youth increasingly prefer off-farm employment due to higher and more stable incomes in urban or overseas markets. In 2023, the average monthly income for plantation workers was approximately LKR 35,000 - 40,000, compared to LKR 60,000 - 80,000 in urban manufacturing or service jobs (Department of Census and Statistics, 2023). The International Labour Organisation (ILO, 2022) noted that Sri Lankan youth are three times more likely to be unemployed than adults, reflecting a mismatch between aspirations and available rural work.

Limited Access to Technical Training and Modernisation

Tea farming in Sri Lanka is widely perceived as a traditional and low-technology enterprise, offering limited opportunities for innovation, modernisation, or entrepreneurship. According to the IFAD Country Diagnostic (2022), only 15–20% of young farmers in rural areas have participated in formal agricultural training programs. Mechanisation and the adoption of digital agriculture tools remain minimal, primarily due to inadequate extension services, limited collaboration between the tea sector and technical or vocational education institutions, and the absence of structured capacity-building programs.

Furthermore, low levels of digital literacy among smallholders and the high cost of internet data in Sri Lanka have further constrained the integration of modern technologies into tea cultivation. For example, only about 20.4% of smallholders use mobile phone apps for farming and market price updates, even though 60.5% have smartphones (A Survey, October 2025). These limitations collectively hinder productivity growth, knowledge transfer, and the sector's ability to attract younger generations into tea farming.

Perception of Tea Farming as Low-status, Labour-intensive Work

Cultural factors also play a significant role. Young people view estate and smallholder tea work as physically demanding, low-prestige, and offering little upward mobility. Studies by the World Bank (2021) and Oxfam (2022) suggest that gender norms and social perceptions further discourage educated youth, especially young women, from engaging in any agricultural labour.

Rural Outmigration

Labour migration, both internal and international, has steadily increased. The Central Bank of Sri Lanka (CBSL, 2023) reported a 20% increase in overseas labour deployment from pre-crisis levels, particularly among youth aged 20 - 35. Many rural youth from tea-growing regions, such as Ratnapura, Kandy, and Badulla, migrate to Colombo or Gulf countries in search of stable employment, leading to seasonal labour shortages during critical agricultural periods.

Weak Links Between Vocational Training and the Tea Sector

Despite the existence of more than 500 vocational training centres across Sri Lanka, the alignment between technical and vocational education and training (TVET) curricula and the needs of the tea sector remains extremely limited. According to the Ministry of Skills Development (2023), fewer than 10% of TVET programs include modules in agribusiness, plantation management, or sustainable agriculture. Notably, none of these programs specifically target estate or tea smallholder workers, leaving a significant segment of the rural labour force without access to relevant skills development opportunities.

This lack of integration has resulted in a pronounced skills mismatch between youth entering the workforce and the technical, managerial, and entrepreneurial competencies required for

modernised and climate-resilient tea production. Strengthening institutional linkages between the tea industry, the Tertiary and Vocational Education Commission (TVEC), and the TRI is therefore critical to bridging this gap and fostering a skilled, future-ready workforce.

In summary, labour scarcity in the tea smallholder sector is a structural issue linked to demographic ageing, low youth engagement, inadequate training linkages, and the poor image of agricultural work. Without targeted interventions, such as introducing modern, technology-driven farming practices, improving wages and working conditions, and aligning TVET programs with plantation sector needs, the sector's human capital base will continue to erode, undermining both productivity and resilience.

Policy & Governance Constraints: VAT Burdens, Regulatory Gaps & Institutional Challenges

Main Problems

Stakeholder consultations reveal that policy uncertainty, taxation burdens, and weak institutional coordination continue to constrain the tea smallholder sector's efficiency and competitiveness. The recent Value Added Tax (VAT) policy changes, combined with inconsistent governance structures across government agencies, have created significant uncertainty for both smallholders and exporters.

Moreover, fragmented policy implementation, especially in land use, environmental management, and subsidy administration, undermines long-term sustainability goals. Smallholders, in particular, lack representation in decision-making processes, making it challenging to align national policy frameworks with grassroots realities.

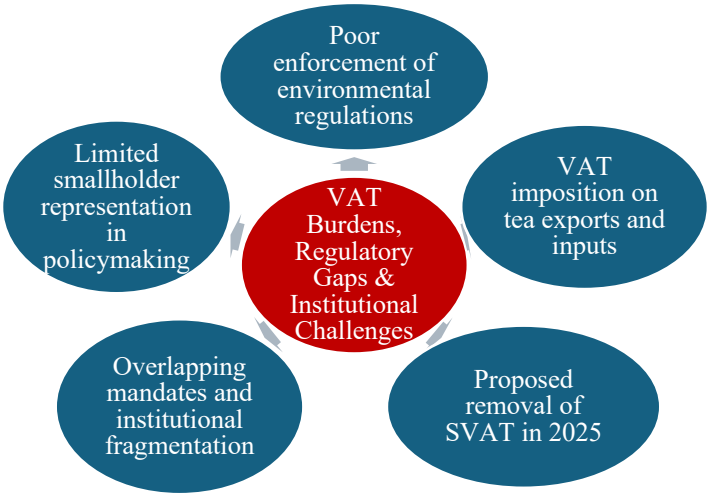


Figure 6: Policy & Governance Constraints

Root Causes

VAT Imposition on Tea Exports and Inputs

In January 2024, Sri Lanka introduced an 18% VAT on both tea exports and local production inputs, replacing the previous zero-rated structure (World Tea News, 2024). Although exporters are technically eligible for refunds under the Simplified Value Added Tax (SVAT) system, the process is slow and administratively complex, leading to cash flow problems and liquidity constraints, especially among small and medium exporters who lack working capital buffers.

According to the Colombo Tea Traders' Association (CTTA, 2024), refund delays often last 4-6 months, significantly disrupting operations and discouraging new entrants into export markets.

Proposed Removal of SVAT in 2025

The government's announced plan to abolish the SVAT scheme in October 2025 has triggered further uncertainty in the tea sector (Lanka Talks, 2024). The SVAT was initially introduced to simplify VAT refunds for exporters and prevent working capital shortages. Its removal is expected to increase transaction costs, reduce liquidity, and undermine export competitiveness, a serious concern given that over 70% of Sri Lankan tea is exported (CBSL, 2023).

Overlapping Mandates and Institutional Fragmentation

Policy coordination challenges are compounded by overlapping responsibilities among multiple institutions, including the TSHDA, TRI, the Ministry of Agriculture (MoA), the Ministry of Plantation Industries (MPI), and the Sri Lanka Export Development Board (EDB).

A governance assessment by Wijeratne et al. (2022) found that fragmented mandates often lead to program duplication, delays in decision-making, and ineffective policy delivery. For instance, both TSHDA and TRI engage in smallholder training and extension, yet lack a unified monitoring framework to measure outcomes or avoid overlap.

Poor Enforcement of Environmental Regulations

Despite a strong policy framework, such as the National Environmental Act (amended 2021) and the Soil Conservation (Amendment) Act of 2020, implementation remains weak, especially in smallholder zones. Reports from FAO (2023) and the ADB (2022) highlight limited field-level monitoring of land-use restrictions, agrochemical control, and buffer zone protection. This has led to unregulated cultivation on steep slopes, increased soil erosion, and reduced water quality in tea-growing regions like Ratnapura and Kandy.

Limited Smallholder Representation in Policymaking

Although smallholders produce over 70% of Sri Lanka's total tea output, they remain underrepresented in key policy forums such as the Sri Lanka Tea Board (SLTB) and Plantation Human Development Trust (PHDT).

According to TSHDA (2023), local cooperative societies and farmer associations rarely participate in higher-level decision-making processes, limiting the feedback loop between policy design and on-ground realities. This top-down policy approach has contributed to poorly targeted subsidies, misaligned quality standards, and limited policy responsiveness to smallholder needs.

In summary, policy and governance constraints in the tea sector reflect a combination of regulatory uncertainty, taxation burdens, and institutional fragmentation. The 2024 VAT policy and pending SVAT reforms have worsened liquidity and market competitiveness, while overlapping institutional mandates continue to dilute accountability. Strengthening inter-agency coordination, improving fiscal predictability, and enhancing smallholder representation in sectoral governance are essential steps to ensure equitable and sustainable growth.

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4. Proposed Solution Portfolio and Implementation Pathways for Smallholders

By Prof. S. P. Premaratne

Abstract

Transforming Sri Lanka's tea smallholding sector requires an integrated set of solutions that address both technical and institutional constraints. This paper presents a portfolio of interventions designed to enhance productivity, strengthen resilience, and improve smallholder incomes. The proposed solutions include improved soil management practices, replanting and rehabilitation initiatives, adoption of regenerative and climate-smart agricultural techniques, and strengthened extension services. The paper also highlights opportunities for strengthening farmer organizations, improving market access, and integrating digital tools into agricultural advisory systems. Implementation pathways are discussed with emphasis on collaboration among government agencies, research institutions, private sector actors, and development partners. By aligning technical innovation with institutional reform, the paper outlines practical strategies for achieving sustainable transformation within the tea smallholding sector.

Keywords: Smallholder development, Sustainable tea production, Agronomic innovation, Replanting programs, Climate-smart agriculture, Agricultural extension

Micro-Entrepreneurship and Local Input Production

Context and Problem Overview

High input costs and heavy reliance on imported agrochemicals increasingly constrain the profitability and long-term sustainability of Sri Lanka's smallholder tea sector. These factors erode farmer income, reduce reinvestment capacity, and weaken environmental resilience. The lack of local production systems for organic and bio-based inputs has made smallholders vulnerable to global price fluctuations and supply chain disruptions.

The smallholder tea sector in Sri Lanka faces a persistent challenge of high input costs and heavy dependency on imported agrochemicals, which have significantly reduced farm profitability and overall resilience. At the root of this issue lies limited local capacity to produce organic fertilisers, compost, and bio-inputs, forcing smallholders to rely on costly, often unstable import markets. This dependency is further exacerbated by weak entrepreneurship and inadequate technical know-how among rural producers, which hinders innovation and localised input production. Additionally, restricted access to finance and markets prevents farmers and small-scale enterprises from investing in sustainable production systems or expanding their operations.

As a result, productivity levels and farm incomes have continued to decline, limiting smallholders' ability to reinvest in their farms and adapt to changing market or climatic conditions. The excessive use of chemical inputs has also contributed to severe environmental degradation, including soil fertility loss and biodiversity decline. Collectively, these dynamics have increased the economic and climatic vulnerability of rural tea-growing communities, undermining both their livelihoods and the long-term sustainability of Sri Lanka's smallholder tea industry.

Strategic Solution Portfolio

Promoting Micro-Entrepreneurship in Input Production

a. Establish **village-level micro-enterprises** to produce compost, bio-fertilisers, and organic pesticides using locally available materials such as tea waste, livestock manure, and green biomass.
b. Introduce **green business incubation programs** that encourage youth and women to engage in bio-input enterprises, promoting inclusive rural growth.
c. Encourage **public–private-people partnerships (PPPPs)** and linkages with plantation companies to enhance product quality, marketing, and certification.

Building Local Resource and Input Networks

a. Develop **community-based cooperatives or clusters** that integrate producers, suppliers, and service providers to ensure input availability, affordability, and quality assurance. A recent survey (October 2025) found that the smallholders (93.7%) are willing to work with such local cooperatives or hubs.
b. Facilitate access to **small-scale equipment** (e.g., shredders, composters, solar dryers) through shared ownership or revolving fund models through PPPPs.
c. Introduce **digital platforms** and mobile applications to connect producer groups, markets, and technical advisors.

Strengthening Capacity and Institutional Support

a. Deliver **entrepreneurship, business management, and financial literacy training** through TSHDA, vocational training centres, and universities.
b. Integrate **climate-smart production modules** into extension programs to encourage organic, low-carbon farming practices.
c. Promote **research–industry partnerships** among the Tea Research Institute (TRI), universities, and local entrepreneurs for product testing, standardisation, and innovation.

Implementation Pathways

Step	Action	Lead / Partners	Timeframe	Expected Outcomes
1	Establish pilot **micro-enterprise hubs** in key tea districts (Kandy, Galle, Badulla)	TSHDA, Divisional Secretariats	Year 1–2	Local bio-input units established; reduced dependency on imports
2	Provide **seed grants, concessional credit, and mentorship** to youth- and women-led start-ups.	IFAD, SAPP, Regional Development Banks	Year 1–3	Sustainable, youth-led green businesses are operational
3	Strengthen **linkages with research and innovation institutes** to validate products and improve quality.	TRI, University of Colombo, NIFS	Continuous	Enhanced quality assurance and product diversification
4	Establish a **policy coordination platform** to facilitate sustainable input production and market access.	Ministry of Agriculture, TSHDA, Provincial Councils	Year 2–4	Institutional framework for scaling micro-enterprises and policy integration

Table 1: Implementation Pathways

Expected Impacts and Policy Implications

Impact Domain	Key Results
Economic	20–30% reduction in input costs; higher profit margins and reinvestment capacity among smallholders.
Social	Creation of new employment opportunities, especially for youth and women in green value chains.
Environmental	Reduced chemical dependency, improved soil fertility, and adoption of circular bio-economy practices.
Institutional	Strengthened collaboration among government agencies, research institutions, and community enterprises.

Table 2: Policy Implications

Policy Recommendations

- Recognise **village-level bio-input micro-enterprises** as a strategic component of the national tea value chain.
- Introduce **incentive schemes** (e.g., tax relief, concessional loans, or matching grants) for certified local input producers.
- Develop a **standardised certification system** for organic and bio-inputs in collaboration with TRI and the Sri Lanka Standards Institute (SLSI).
- Integrate **entrepreneurship modules** and bio-input technologies into national agricultural and TVET curricula to sustain skills pipelines.

Alignment with National Priorities

This initiative aligns with the National Agricultural Policy (2021), Green Growth Strategy (2023–2030), and National Adaptation Plan for Climate Change Impacts (NAP, 2016–2025). It directly supports Sri Lanka's commitments to the Sustainable Development Goals (SDGs), particularly SDG 2: Zero Hunger (through improved productivity and sustainability) and SDG 8: Decent Work and Economic Growth (via local entrepreneurship).; SDG 12: Responsible Consumption and Production (through circular bioeconomy); and SDG 13: Climate Action.

Smallholder-Focused Carbon Finance Models
Context and Problem Overview

Although smallholder tea farmers in Sri Lanka increasingly adopt sustainable land management, reforestation, and soil carbon practices, they remain excluded from climate finance and carbon market opportunities. The current institutional and technical framework does not enable farmers to quantify or monetise their carbon sequestration potential. As a result, climate-smart practices remain underfunded, and the sector loses access to emerging green finance opportunities that could reward sustainability efforts.

Smallholder tea farmers in Sri Lanka face a significant constraint in accessing climate finance and participating in carbon market mechanisms, even when they adopt sustainable or climate-smart practices. This challenge stems primarily from the absence of standardised methodologies to quantify and certify carbon sequestration within tea-growing landscapes. The highly fragmented nature of smallholder landholdings, combined with weak collective verification systems, further complicates efforts to measure, aggregate, and validate carbon credits at scale. Moreover, the limited technical and institutional capacity for carbon

accounting, monitoring, and reporting restricts both awareness and participation in emerging carbon market opportunities.

Compounding these barriers is the inadequate availability of green finance and credit instruments that integrate climate performance indicators or reward low-carbon agricultural practices. Consequently, smallholders miss out on potential income streams and incentive mechanisms tied to carbon trading and climate finance. This gap discourages investment in reforestation, agroforestry, renewable energy, and other regenerative land management approaches that could enhance both productivity and environmental resilience. Ultimately, the lack of integration between national climate commitments, such as Sri Lanka's Nationally Determined Contributions (NDCs), and the on-the-ground realities of smallholder farmers results in a weak alignment between policy ambitions and practical implementation, undermining the inclusive transition toward a low-carbon, climate-resilient tea sector.

Strategic Solution Portfolio

Design Smallholder Carbon Finance Mechanisms

a. Develop **aggregated carbon credit models** that organise smallholders through cooperatives, producer associations, or district-level clusters to achieve economies of scale for carbon accounting and verification.
b. Pilot a **"Carbon-Positive Tea Certification"** system that integrates carbon performance with existing **organic, fair-trade, or ethical tea standards**, allowing exporters to attract premium markets.
c. Encourage **blended finance instruments** combining concessional loans, grants, and carbon credit revenues to fund replanting, soil improvement, and tree integration in tea landscapes.
d. Facilitate **access to carbon pre-financing** through partnerships with green investors, commercial banks, and microfinance institutions.
e. Strengthening Digital Monitoring, Reporting, and Verification (D-MRV)
f. Deploy **mobile GIS and remote sensing tools** to track changes in tree cover, soil carbon, and agroforestry adoption at farm and cluster levels.
g. Introduce **simplified digital MRV systems** tailored to smallholder capacities, low-cost, mobile-friendly, and compatible with government data systems.
h. Link data platforms to the **national carbon registry** under the Climate Change Secretariat, ensuring transparency and recognition of farmer contributions.
i. Engage local youth as **"Carbon Data Stewards"**, trained in field monitoring and digital data collection.
j. Financial Inclusion through Climate Credits and Green Finance
k. Establish **Village Climate Funds (VCFs)** to channel carbon revenues and reinvest them in infilling, replanting, soil conservation, renewable energy, and organic input production.
l. Promote **green credit lines** and **carbon-linked microloans** through rural banks and cooperatives, where climate-smart practices reduce interest rates or improve credit eligibility.
m. Integrate carbon finance models with **existing programs such as SAPP, IFAD projects, and rural development schemes**, leveraging institutional networks and financial instruments.
n. Encourage **insurance-linked carbon finance**, where verified emission reductions contribute to lower climate risk premiums.

Implementation Pathways

Step	Action	Lead / Partners	Timeframe	Expected Outcome
1	Develop a **pilot smallholder carbon registry** in major tea-growing regions	TSHDA, Climate Change Secretariat, Provincial Councils	Year 1	Operational framework for smallholder carbon accounting
2	Partner with **global carbon standards and platforms** (Gold Standard, Verra, Plan Vivo) for validation and certification	Exporters, MoE, Private Sector	Year 1–2	Verified access to voluntary carbon markets
3	Establish **community-level carbon funds** and reinvest revenues into climate-smart activities.	Cooperative Societies, Rural Banks	Year 2–4	Income diversification and enhanced ecosystem restoration
4	Introduce **green financing products** integrating carbon performance indicators.	CBSL, DFCC, Regional Development Banks	Year 2–4	Wider access to affordable credit for sustainable farming
5	Build a **national knowledge-sharing and policy-coordination platform linking carbon finance to** smallholder livelihoods.	MoA, MoE, TSHDA, TRI, Universities	Continuous	Institutional alignment and upscaling of climate-smart tea models

Table 3: Smallholder Carbon Financing Implementation Pathways

Expected Impacts and Policy Implications

Impact Domain	Key Results
Economic	Additional revenue streams for smallholders through verified carbon credits; improved access to concessional green finance.
Social	Strengthened community institutions and new youth employment opportunities in carbon data management and monitoring.
Environmental	Increased reforestation, improved soil carbon retention, and reduced greenhouse gas emissions from tea landscapes.
Institutional	Enhanced coordination among TSHDA, the Climate Change Secretariat, financial institutions, and research bodies.

Table 4: Smallholder Carbon Financing Policy Implications

Policy Recommendations

- **Integrate carbon finance mechanisms** into the national tea development strategy and recognise smallholder participation under Sri Lanka's **Nationally Determined Contributions (NDCs)**.
- Establish a **"Smallholder Carbon Facility"** under the Ministry of Environment or the Ministry of Agriculture to coordinate certification, capacity building, and market linkages.

- Introduce **regulatory incentives** for financial institutions (e.g., green credit quotas, tax relief) to support climate-smart and carbon-linked lending.
- Ensure **gender and youth inclusion** in all climate finance mechanisms, with targeted training and equity in benefit-sharing frameworks.
- Develop **carbon literacy and extension modules** for TSHDA officers and rural training centres to mainstream knowledge on carbon markets and D-MRV systems.

Alignment with National and Global Priorities

This initiative directly contributes to Sri Lanka's commitments under the Paris Agreement and the National Climate Change Policy (2023). It also aligns with national strategies for green growth, rural transformation, and financial inclusion, while advancing multiple Sustainable Development Goals (SDGs): SDG 8: Decent Work and Economic Growth; SDG 12: Responsible Consumption and Production; SDG 13: Climate Action; and SDG 15: Life on Land

5. Proposed Strategic Recommendations to Improve Tea Smallholdings

By Prof. S. P. Premaratne

Abstract

Strengthening Sri Lanka's tea smallholding sector requires coordinated policy, institutional, and technical interventions. This paper outlines strategic recommendations aimed at improving productivity, profitability, and long-term sustainability. Key recommendations include strengthening extension services, expanding access to improved planting material, promoting good agricultural practices, and supporting soil rehabilitation programs. The paper also emphasises the importance of strengthening farmer organizations, improving access to finance and inputs, and encouraging value addition within the tea value chain. Market-oriented strategies such as quality enhancement, certification, and branding are explored as pathways to increase smallholder income. Collectively, these recommendations provide a strategic roadmap for revitalizing the tea smallholding sector while ensuring environmental sustainability and economic resilience.

Keywords: Tea sector policy, Smallholder strategies, Agricultural extension systems, Value chain development, Sustainable livelihoods, Tea productivity improvement

Strategic Objectives and Targets (Inputs, Outputs, Outcomes, Impact)

Objectives and expected outcome: to develop a **sustainable and climate-resilient smallholder tea sector** that is productive, market-oriented, environmentally sustainable and socially inclusive, contributing to national economic growth and rural transformation.

Tea Smallholder Development Objective

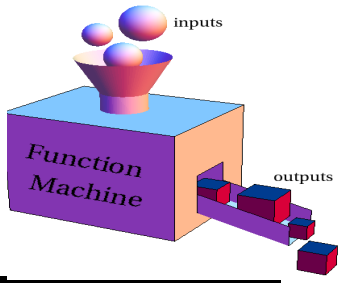
By 2030, the tea industry, driven by Sri Lanka's smallholder tea sector, will achieve **enhanced productivity, income diversification, and climate resilience** through the adoption of sustainable agronomic practices, strengthened institutional and market linkages, inclusive entrepreneurship, and access to green and carbon finance, leading to improved livelihoods and ecosystem integrity in tea-growing regions.

Specific Objectives:

1. **To secure economic viability and enhance productivity** by improving farm management efficiency, optimising resource use, and upgrading green-leaf standards to strengthen competitiveness and farmer profitability in line with Good Agricultural Practices (GAP), with due attention on block infilling for field consolidation, proper harvesting and replanting of tea.
2. **To reverse declining soil health and promote sustainable farming practices** through soil conservation, organic matter restoration, and integrated nutrient management to ensure long-term ecological sustainability.
3. **To develop human capital and address labour shortages** by upgrading skills, improving working conditions, and creating attractive pathways for youth participation and gender-inclusive employment in the tea value chain.

4. **To strengthen extension services and empower smallholders** through institutional linkages, digital advisory systems, and cooperative mechanisms that improve bargaining power, access to finance, and market participation.
5. **To address policy and governance gaps** by recommending reforms that improve fiscal predictability (e.g., VAT and SVAT), enhance coordination among key agencies, and ensure effective, accountable sectoral governance.
6. **To promote transformation toward climate resilience and social sustainability** by embedding regenerative and climate-smart agricultural practices and fostering positive socio-cultural norms supportive of collective action and equitable participation.
7. **To minimise post-harvest losses and improve value retention** through better logistics, storage, and quality assurance systems, ensuring that productivity gains translate into real income growth for smallholders.

Strategic Objectives and expected outcome (Inputs, Outputs, Outcomes, Impact)



The National Action Plan (NAP) for the revitalisation of Sri Lanka's smallholder tea sector is structured around four interlinked strategic objectives derived from the situational analysis and stakeholder consultations:

Strategic Objective	Inputs	Outputs	Outcomes	Impact
1. Enhance productivity, quality, and climate resilience	Block Infilling with Jumbo plants and replanting funds, fertiliser subsidies, training modules, mechanisation pilots, digital tools, and PPP partnerships	Adoption of Good Agricultural Practices (GAP), Regenerative Agricultural Practices (RAP)	20% yield increase/yr and 70% green leaf standards by 2030;	Competitive, climate-resilient production base
2. Strengthen local entrepreneurship and input self-sufficiency	Seed grants, revolving funds, training for youth/women, PPP partnerships	300+ micro-enterprise hubs in organic/bio-inputs; local compost and fertiliser supply networks	20–30% reduction in input costs; rural employment growth	Sustainable, inclusive rural bio-economy
3. Diversify income and green finance access	Institutional partnerships, carbon verification tools, and climate funds	Operational smallholder carbon registry; verified carbon credits and climate-linked microloans	Additional revenue from carbon and green credit schemes	Low-carbon, climate-smart tea landscapes
4. Increase market integration and value addition	Branding fund, certification support, traceability tech, SME finance	"GAP and RAP Certified Tea" label; 25+ local branding and value-added units	15–25% rise in farm-gate prices; improved bargaining power	Globally recognised, sustainable Ceylon Tea brand

Table 1: The National Action Plan (NAP)

Collectively, these targets aim to improve productivity, profitability, and environmental sustainability while ensuring equitable participation of women, youth, and vulnerable smallholders.

Priority Interventions and Phased Implementation

Implementation Approach

The implementation of the National Action Plan will adopt a phased, participatory, and evidence-based approach, ensuring that interventions are both context-specific and scalable across all tea-growing regions. The process will begin with pilot initiatives in selected districts to validate innovative solutions, such as micro-enterprise development for bio-input production, climate-smart replanting, selective mechanisation, and GAP and RAP certification, before expanding to national coverage. Institutional coordination will be led by the TSHDA and the Ministry of Plantation and Community Infrastructure (MPCI), in partnership with the Tea Research Institute (TRI), Sri Lanka Tea Board (SLTB), Export Development Board (EDB), and Provincial Councils, ensuring strong linkages between research, policy, and field implementation. A separate implementation unit will be established in the Ministry of Plantation and Community Infrastructure.

Implementation will integrate public–private–people partnerships (PPPPs), leveraging the comparative strengths of government agencies, private exporters, cooperatives, and community organisations. Financing will blend public funding, donor support, and private-sector co-investment, while capacity development and knowledge-sharing will be mainstreamed through extension systems, vocational training centres, and digital platforms. Monitoring and Evaluation (M&E) will operate as a continuous learning mechanism, using clear indicators, community feedback, and adaptive management to guide decision-making, enhance transparency, and scale up successful models.

This integrated approach ensures that strategic objectives translate into tangible improvements in productivity, profitability, and resilience, while embedding inclusivity, innovation, and environmental sustainability at every level of the smallholder tea value chain.

Implementation plan and actions

Thematic Area 01: Micro-Entrepreneurship and Local Input Production
Thematic Area 02: Smallholder-Focused Carbon Finance Models

Phase	Key Actions	Lead / Partners	Timeframe
Phase I – Foundation (Years 1–2)	• Establish pilot hubs for compost/bio-input micro-enterprises in Ratnapura, Kandy, Galle, Matara, and Badulla. • Introduce modular plucking training programs and quality-based incentives. • Initiate carbon accounting pilot registry. • Launch GAP and RAP Tea certification (i.e., SLSI GAP for Tea and Regenagri CoC) pilots.	TSHDA, SLTB, TRI, MPCI, SLSI IFAD/SAPP, Exporters	Short term
Phase II – Expansion (Years 2–4)	• Scale up micro-enterprises and input clusters across districts. • Develop digital traceability and trade platforms for smallholders. • Establish community carbon funds and green microfinance channels. • Operationalise mini-processing and branding units.	TSHDA, SLTB, TRI, EDB, DFCC, Cooperative Societies, Provincial Councils	Medium term

Phase	Key Actions	Lead / Partners	Timeframe
Phase III – Institutionalisation (Years 4–6)	• Integrate carbon finance and branding within national policy frameworks. • Institutionalise training through TVET and universities. • Establish National GAP and RAP Tea Platform for coordination. • Continuous Monitoring, Evaluation and Learning (MEL) feedback for adaptive policy refinement.	MPCI, TRI, SLTB, Universities, Donor partners	Long term

Table 2: Implementation Plan and Action

Thematic Area 03: Tailor-made harvesting programmes (under farmer school and use of trained Pivithuru cluster leader para extension group) to enhance productivity and green leaf standards

Phase	Key Actions	Lead / Partners	Timeframe
Phase I – Foundation (Years 1–2)	• Conduct a baseline survey to identify the knowledge and the adoption of proper harvesting, reasons for the gap in adoption, and other demographic details across the Smallholder tea growing regions. • Develop suitable programmes accordingly with execution modules • Distribution of plucking baskets for pluckers, green leaf collecting bags for keeping and transporting green leaf to minimise post-harvesting damage •Introduce synchronised collection schedules and factory feedback mechanisms •Test selective motorised harvesters under controlled TRI supervision	TSHDA, TRI, SLTB, Tea Smallholder Development Societies Federations (TSHDSF), Sri Lanka Tea Factory Owners' Association (SLTFOA), Tea processing Factories	Short term
Phase II – Pilot and Scale-up (Years 2–4)	• Expand modular training and certification to all tea-growing regions. • Establish cooperative plucking pools and community labour-sharing models. • Introduce digital tools (leaf-quality alerts, plucking calendar reminders, factory SMS feedback). • Create pilot premium payment systems for quality-based buying by factories. • Support access to green credit/subsidies for harvesting tools and baskets.	TRI, TSHDA, SLSI, SLTB, NIPM Cooperative Societies, Donor Partners (IFAD/SAPP)	Medium term
Phase III – Institutionalisation (Years 4–6)	• Integrate plucking standards, GAP, and RAP into national extension and TVET curricula. • Establish a GAP and RAP Tea Quality Certification Platform linked to GI (Ceylon Tea) branding. • Implement rental/contract models for mechanisation through farmer organisations. • Institutionalise factory feedback and M&E systems using mobile platforms.	MPCI, TRI, SLTB, SLSI, Universities, Exporters, Provincial Councils	

Phase	Key Actions	Lead / Partners	Timeframe
	• Policy alignment on premium pricing and quality-based buying rules through SLTB and MPCI.		

Table 3: Tailor-made harvesting programmes

Thematic Area 04: Block infilling with Jumbo plants and Replanting tea after soil rehabilitation – Implementation Plan and Actions

Phase	Key Actions	Lead / Partners	Timeframe
Phase I – Foundation (Years 1–2)	• conduct a baseline survey on Smallholder land profile to identify the current productivity and the gap between the potential & the existing • Draw a strategic plan to improve productivity in line with identified contributory factors in connection with the low productivity in the short, mid and long run • Establish standard tea plant nurseries with recommended cultivars under the Seed Act • Soil Quality Index (SQI)-based field assessment to guide rehabilitation vs. replanting decisions. • Strengthen coordination between TRI, SLTB, and TSHDA for nursery certification and quality assurance.	MPCI, TSHDA, TRI, SLTB, TSHDSF, Department of Census & Statistics, IFAD/SAPP	Short term
Phase II – Expansion (Years 2–4)	• Scale-up infilling and field rehabilitation in priority districts using SQI-based decision support. • Promote integrated soil/water management, contouring, mulching, soil amendments improving physical and chemical properties, erosion control, and shade tree /agroforestry models. • Establish low-interest credit lines and upgraded replanting subsidy schemes with flexible instalments. • Expand community nurseries and promote PPP micropropagation centres in all major tea-growing zones. • Launch Farmer Field Schools (FFS) and demonstration plots for rehabilitation, clone selection, soil quality enhancements, and planting layout.	TSHDA, TRI, SLTB, Cooperative Societies, TSHDSF, Provincial Councils, Donor Partners (IFAD, ADB)	Medium term
Phase III – Institutionalisation (Years 4–6)	• Integrate replanting, infilling, and field rehabilitation standards into national policy and extension curricula. • Operationalise a national Tea Replanting and Soil Health Database at SLTB for monitoring and planning. • Institutionalise SQI testing services and certification of nurseries and rehabilitation sites. • Implement climate-smart crop insurance and blended financing mechanisms for smallholders. • Introduce continuous M&E with mobile data	MPCI, TRI, SLTB, TSHDA, SLSI, Universities, Financial Institutions, Exporters	

Phase	Key Actions	Lead / Partners	Timeframe
	systems for tracking survival rates, SQI improvement, and income changes. • Policy reviews and scaling of group/cooperative replanting and mechanisation-friendly planting systems.		

Table 4: Block infilling with Jumbo plants and Replanting tea after soil rehabilitation

Thematic Area 05: New Models for Training, Demonstration, and Peer Learning for the Tea Smallholders in Sri Lanka

Phase	Key Actions	Lead / Partners	Timeframe
Phase I – Foundation (Years 1–2)	• Establish pilot Clustered Farmer Field Schools (FFS+) with demonstration hubs in key tea-growing districts. • Identify and train "Lead Farmers" or Community Tea Advisors within Tea Smallholding Development Societies (TSHDS). • Develop standardised training materials and audiovisual content with TRI and NIPM. • Initiate pilot Public–Private-People Partnership (PPPP) extension models linking TRI/TSHDA with private factories, exporters, TSHDSF and cooperatives. • Begin collaboration with Dialog "Govi Mithuru" and other mobile platforms for digital advisory pilot rollouts. • Strengthening social media platforms	TSHDA, TRI, NIPM, MPCI, TSHDSF, Private Factories, Cooperative Societies, Dialog Axiata	Short term
Phase II – Expansion (Years 2–4)	• Scale up the Lead Farmer Network to cover all 1,492 active Tea Smallholding Development Societies. • Develop market-linked demonstration plots aligned with buyer quality and certification standards. • Expand PPP extension platforms and mobile extension units (PPPP framework) for remote clusters. • Roll out blended digital learning systems — SMS, voice, and short-form video demos — through Govi Mithuru and TRI channels. • Establish reciprocal exchange visits and peer learning tours between clusters to enhance adoption and leadership.	TSHDA, TRI, SLTB, NIPM, TSHDSF, IFAD, Private Sector (Exporters, Buyers, Processors), Cooperative Federations	Medium term
Phase III – Institutionalisation (Years 4–6)	• Integrate FFS+, PPP extension, and digital training models into the national Tea Sector Extension Framework. • Institutionalise training-of-trainers (ToT) programs through NIPM and universities for sustainable capacity building. • Develop national certification for "Accredited Lead Farmers" and digital learning platforms. • Strengthen linkages between demonstration programs and market-based certification or micro-verification schemes.	MPCI, TRI, SLTB, NIPM, MoA, Universities, Donor Partners (IFAD, ADB), Exporters	

Phase	Key Actions	Lead / Partners	Timeframe
	• Establish Tea Sector Learning and Innovation Network to coordinate extension, digital content, and market partners. • Continuous M&E and adaptive policy support for scaling innovation diffusion.		

Table 5: New Models for Training, Demonstration, and Peer Learning

Thematic Area 06: Market Linkages, Value Addition, and Branding for Smallholders – Implementation Plan and Actions

Phase	Key Actions	Lead / Partners	Timeframe
Phase I – Foundation (Years 1–2)	• Introduce GAP and RAP Code of Conduct (CoC) for smallholder tea growers and establish pilot regenerative tea clusters in Ratnapura, Kandy, Galle, Matara and Badulla. • Develop national GAP & RAP Tea Certification and Branding Framework in partnership with SLSI, TRI, EDB, and local/international certification bodies. • Build a national registry and traceability system to track certified smallholders and link them to buyers. • Conduct stakeholder consultations and awareness programs on sustainable branding and export readiness. • Formulate policy and legal groundwork for recognising regenerative certification under the national export policy.	TRI, EDB, SLTB, Regenagri Network, Exporters, MPCI	Short term
Phase II – Expansion (Years 2–4)	• Establish and strengthen Smallholder Marketing Collectives (SMCs) for aggregation, quality control, and price negotiation. • Develop digital trade and traceability platforms integrating QR or blockchain-based systems for buyer linkages. • Facilitate contract farming and long-term supply agreements between SMCs and ethical exporters. • Support local value addition and branding initiatives, including mini-processing, packaging, and product diversification. • Promote youth-led entrepreneurship in tea-based products and tea tourism through concessional loans and technical support.	TSHDA, TSHDSF, Ceylon Tea Traders' Association (CTTA), EDB, DFCC, NEDA, SAPP, Cooperative Societies, Private Tech Firms	Medium term
Phase III – Institutionalisation (Years 4–6)	• Launch the National Regenerative Tea Platform for policy coordination, knowledge exchange, and brand governance. • Integrate GAP / RAP certification and branding into SLTB quality assurance systems. • Establish Smallholder Tea Marketing and Branding Fund for promotion, packaging, and participation in trade fairs.	MPCI, SLTB, TRI, EDB, CTTA, Tea Exporters' Association (TEA), Cooperative Federations	

Phase	Key Actions	Lead / Partners	Timeframe
	• Implement fiscal incentives (tax credits, reduced export levies) for certified exporters and cooperatives. • Scale-up digital traceability infrastructure across all smallholder supply chains and link with international buyers. • Institutionalise periodic market intelligence and buyer engagement forums under MPCI, SLTB and EDB.		

Table 6: Market Linkages, Value Addition, and Branding for Smallholders

Thematic area 07: Village-Level Enterprise Hub with PPPP model

Conceptual Harmony

The village-level enterprise hub model (as outlined in Chapter 6.4 – *Micro-Entrepreneurship and Local Input Production*) already emphasises: (i) Localised production of compost, bio-fertilisers, and organic pesticides; (ii) Youth and women entrepreneurship; (iii) Cooperative-based micro-enterprises; and (iv) Integration with provincial and national support systems.

The PPPP model acts as the institutional and financial delivery mechanism to make those hubs work sustainably. *The "Village Enterprise Hub" is the operational unit. The PPPP framework is the governance and financing engine behind it.*

Functional Integration of micro-enterprise village hub

Element	Village Hub Model Role	PPPP Mechanism Added Value
People (Community)	Operate the micro-enterprises (bio-inputs, plucking service units, or mini-processing)	Ensures ownership, reinvestment via revolving funds, and social accountability
Public (Government/TSHDA/TRI)	Provide seed grants, technical training, and certification support	Formalises hubs as part of national programs and provides policy/institutional backing
Private Sector (Exporters/Factories/Investors/Input suppliers)	Offer market access and co-financing for product development, packaging, and branding	Links hubs to value chains and introduces sustainable market demand
Finance Integration	Cooperatives manage small revolving funds.	PPPP structure blends public grants, private equity, and community capital into a sustainable financing loop

Table 7: Functional Integration of micro-enterprise village hub

Implementation Flow of Village Enterprise Hubs (Step-by-Step)

Step 1: Formation Phase

- Select strong Tea Smallholding Development Societies or Tea Farmer Cooperatives as *village hubs* (each covering 200–300 smallholders).
- Formalise them under the PPPP framework through a Memorandum of Collaboration (MoC) between TSHDA, the cooperative, and a private partner (e.g., factory or exporter).

Step 2: Investment Phase
- Public contribution: seed capital, training, equipment subsidies.
- Private contribution: co-financing, branding, and purchase agreements.
- People's contribution: labour, local resources, share contribution, and management through cooperative structures.

Step 3: Operational Phase
- Hubs manage local enterprises (bio-inputs, harvesting services, micro-processing, or value addition).
- Earnings feed into a Community Revolving Fund, creating internal capital for smallholder loans.

Step 4: Market & Scale-Up Phase
- Private partners integrate the hubs into national or export supply chains.
- Performance-based incentives (carbon credits, leaf quality premiums) strengthen long-term sustainability.

Example of an Integrated PPPP–Hub Business Model

District: Badulla
Enterprise Hub: "*Uva Green Smallholder Growers Cooperative*"

Partner	Role	Investment / Contribution
People **– 200 smallholders, 50 youth, 50 women**	Operate compost production, green leaf collection, and training	Labour, land, share contribution, cooperative governance
Public **– TSHDA, TRI, MPCI**	Provide LKR 3 million seed grant, training, GAP / RAP certification	Extension & policy support
Private **– Local exporter/tea factory**	Co-invest LKR 2 million; guarantee purchase at a premium rate	Co-financing, quality assurance, and the export market
Finance **– Regional bank**	Revolving fund (LKR 5 million) with partial interest subsidy	Loan for expansion and working capital
Outcome	25% reduction in input costs, 20% increase in leaf quality, 50 new local jobs, and participation in carbon credit pilot	Sustainable village enterprise model

Table 8: Integrated PPPP–Hub Business Model

Policy Implications

- Recognise Village Enterprise Hubs as PPPP implementation units under the Ministry of Plantation and Community Infrastructure.
- Integrate PPPP-hub approach into TSHDA's district development plans.
- Provide fiscal incentives for private partners who co-invest in community-based enterprises.
- Establish "National Smallholder Enterprise Network (NSEN)" for policy coordination, training, and performance tracking.

Structure and Institutional Responsibilities

Level	Institution/Actors	Roles and Responsibilities
Community / Enterprise Hub Level	TSHDSF, Tea Smallholder cooperatives, village enterprise hubs, factory partners	Collect field-level data (leaf quality, input costs, income, participation). Conduct community scorecards and social audits.
District Level	TSHDA District Offices, Divisional Secretariats, TRI field stations	Compile and verify data, conduct quarterly reviews, and provide feedback to cooperatives and hubs. Coordinate local learning sessions.
National Level	TSHDA, TRI, MPCI, SLTB, EDB, Ministry of Environment	Consolidate district data, analyse performance trends, and publish annual sector reports. Coordinate cross-institutional learning and policy adjustments.
External Partners	Donors (IFAD, ADB, FAO, UNDP), Universities, Research Institutes	Provide technical backstopping, independent evaluations, and knowledge-sharing platforms.

Table 9: Institutional Responsibilities

Policy and SDG Alignment

The objectives of this National Action Plan are consistent with the National Policy on Plantation Sector in Sri Lanka (2024), Sri Lanka's National Agricultural Policy (2021), the Green Growth Strategy (2023–2030), and the National Climate Change Policy (2023), all of which emphasise sustainable resource management, inclusive growth, and resilience building.

They further contribute to Sri Lanka's Nationally Determined Contributions (NDCs) under the Paris Agreement by integrating climate-smart agriculture, carbon finance, and sustainable land management across the smallholder tea sector.

Globally, these strategic objectives advance multiple Sustainable Development Goals (SDGs):

- **SDG 1 – No Poverty**: Enhanced smallholder income and livelihood resilience.
- **SDG 2 – Zero Hunger**: Improved productivity and food security.
- **SDG 5 – Gender Equality**: Increased participation of women in entrepreneurship and leadership.
- **SDG 8 – Decent Work and Economic Growth**: Expansion of green employment and inclusive rural entrepreneurship.
- **SDG 12 – Responsible Consumption and Production**: Adoption of regenerative and circular production systems.
- **SDG 13 – Climate Action**: Mainstreaming carbon finance, soil conservation, and adaptive practices.



Together, these objectives and strategies reinforce the national commitment to a sustainable, equitable, and climate-resilient tea economy that benefits both people and the environment.

Financing Strategy (Public, Private, Donor, Factory-Based Models)

The financing framework combines blended financing, public–private partnerships, and performance-based incentives:

1. **Public Financing:** Budget allocations through the Ministry of Plantation and Community Infrastructure, and Climate Change Secretariat for replanting, extension, and soil conservation. Subsidised loans and matching grants for youth and women entrepreneurs under SAPP, STARR, and IFAD-supported initiatives.
2. **Private Sector Contributions:** Exporters and tea factories to co-finance certification, training, and quality premium schemes through Corporate Social Responsibility (CSR) funds or out-grower models. Financial institutions (DFCC, CBC, CDB) to offer concessional green loans linked to carbon or regenerative standards.
3. **Donor and Development Partner Support:** IFAD, FAO, ADB, and UNDP to provide technical assistance, initial catalytic capital, and monitoring expertise. Climate finance facilities (Green Climate Fund, Gold Standard, Plan Vivo) to back carbon verification and offset schemes.
4. **Factory-Based and Cooperative Models:** Factory-led revolving funds for shared mechanisation, improved plucking tools, and collection logistics. Cooperative-owned micro-enterprises reinvest profits into local value chains and soil rehabilitation.

This multi-tiered approach ensures financial sustainability and minimises dependence on a single funding stream**.**

Achieving the objectives of the NAP requires a diversified, blended financing framework that mobilises public, private, community, and international resources in a coordinated manner. The following financial models are proposed to ensure both fiscal sustainability and inclusive access to investment capital across the smallholder tea value chain.

Blended Finance Model

A blended finance approach will strategically combine public grants, concessional credit, and private investment to de-risk and crowd in capital for smallholder-focused interventions in the tea sector. The model's structure will use catalytic grants from sources such as the Government of Sri Lanka (GoSL), IFAD, or the Green Climate Fund (GCF) to leverage co-investment from tea factories, exporters, and local banks. This blended capital will be applied to activities such as replanting, climate-smart infrastructure development (including rainwater harvesting and solar dryers), and micro-enterprise incubation. The approach is expected to lower the overall cost of capital, mobilise private sector engagement, and accelerate the flow of sustainability-linked investments at scale.

Factory-Based Revolving Fund Scheme

The factory-based revolving fund scheme will be established through tea factories and cooperative societies at the district level, drawing financing from profit-sharing mechanisms or corporate social responsibility (CSR) allocations. The primary purpose of these funds is to provide low-interest working capital for inputs, mechanisation tools, and green-leaf collection equipment, thereby easing liquidity constraints faced by smallholders. Under this mechanism, smallholders will repay loans through leaf deliveries, ensuring a continuous recycling of funds within the community. This model enhances immediate access to finance at the local level

while fostering stronger vertical integration between producers and processors, creating a mutually beneficial ecosystem across the tea value chain.

Cooperative Microfinance and Cluster Credit Model

The cooperative microfinance and cluster credit model promotes the formation of Smallholder Financial Cooperatives or credit clusters that enable pooled savings and collective lending among members. Financing for these cooperatives will combine public seed capital, channelled through institutions such as TSHDA or Provincial Councils, with donor contributions. The model features joint liability arrangements to reduce credit risk and offers interest rebates to farmers who adhere to Good Agricultural Practices (GAP) and Regenerative Agricultural Practices (RAP) standards. By encouraging responsible farming and shared financial management, this mechanism aims to expand credit access for smallholders who often lack conventional collateral, strengthening local financial autonomy and resilience.

Green and Carbon Finance Mechanisms

To integrate environmental sustainability with financial innovation, the NAP proposes the creation of green and carbon finance mechanisms within the tea sector. A dedicated Smallholder Carbon Facility will aggregate carbon credits generated from replanting, agroforestry, and soil carbon sequestration, and partner with international standards such as the Gold Standard, Verra, and Plan Vivo for verification. Revenues from these credits will be channelled into Village Climate Funds (VCFs) managed by cooperatives to reinvest in community-level sustainability projects. In parallel, local financial institutions - including DFCC, NDB, and regional banks - will design green credit products that offer reduced interest rates linked to verified emission reductions or adoption of soil conservation practices. This mechanism directly incentivises low-carbon agriculture while unlocking new revenue streams for smallholders.

Public–Private–People Partnership (PPPP) Financing

The Public–Private–People Partnership (PPPP) financing model emphasises shared ownership, accountability, and sustainability across stakeholders. The public sector will provide policy incentives, subsidies, and extension services; the private sector will contribute market linkages, value addition, and co-financing for certification or branding; and communities will engage through labour, local resource contributions, and cooperative governance. A practical example of this approach is the development of micro-enterprise hubs for compost production, bio-fertiliser manufacturing, or boutique tea packaging, jointly funded by donors, factories, and farmer organisations. This inclusive framework encourages collective investment and innovation while reinforcing local economic empowerment.

Youth and Women Entrepreneurship Fund

A dedicated Tea Entrepreneurship and Innovation Fund will be established under the TSHDA or the Ministry of Plantation and Community Infrastructure to support youth and women entrepreneurs in the tea value chain. The fund will provide matching grants covering 50-70% of start-up costs, along with technical mentorship, training, and facilitated access to domestic and export markets. Priority sectors include bio-inputs, agri-tourism, and local tea branding and packaging enterprises. By targeting women and youth, this initiative will foster gender-balanced economic participation, stimulate local employment generation, and inject new entrepreneurial dynamism into rural tea communities.

Performance-Based Incentive Mechanisms

The performance-based incentive model links financial rewards directly to measurable improvements in sustainability and productivity. Under this system, farmers will receive bonuses, premiums, or credit score upgrades for verified achievements, such as improved green-leaf quality, adoption of soil conservation measures, successful replanting, or measurable carbon sequestration, through the Digital Monitoring, Reporting, and Verification (D-MRV) platform. This payment-for-performance approach motivates behavioural change, ensures accountability, and channels finance toward outcomes that align with both environmental and economic sustainability objectives.

Smallholder Tea Social Protection Fund

A Smallholder Tea Social Protection Fund (ST-SPF) will be established as a dedicated national mechanism to enhance the resilience and well-being of tea smallholders across Sri Lanka. The Fund will combine public resources, private sector contributions, and donor support to provide targeted income protection, contributory micro-pensions, insurance subsidies, and emergency relief to vulnerable smallholder households affected by market volatility, climate shocks, and production losses. By linking social protection with productivity enhancement, such as climate-smart investments, financial literacy, and access to insurance, the ST-SPF will help stabilise livelihoods, reduce poverty, and promote inclusive growth within the tea sector. The Fund will operate under a multi-stakeholder governance framework, ensuring transparency, accountability, and sustainability in its implementation, and will serve as a model for sector-based social protection in Sri Lanka. Designed as a multi-purpose, evolving mechanism, the ST-SPF will gradually transition into a self-contributory, financially sustainable fund, enabling smallholders to build long-term security and resilience through shared responsibility and ownership.

Donor and Development Partner Engagement
Multilateral and bilateral development partners - including IFAD, ADB, FAO, UNDP, GIZ, and JICA - will continue to play a catalytic role in financing and technical assistance for the tea smallholder sector. Their contributions will include grant co-financing for pilot interventions, capacity building for farmer organisations, and technical support for monitoring, evaluation, and learning (MEL) systems. In addition, these partners will help establish trust funds and blended financing instruments aligned with Sri Lanka's Green Growth Strategy and Nationally Determined Contributions (NDCs). By anchoring donor support to scalable, results-based models, this framework ensures continuity, accountability, and long-term sustainability of sectoral reforms.

Expected Results of the Financial Strategy

- 30–40 % increase in credit access among smallholders within five years.
- 25 % reduction in input cost through local micro-enterprise networks.
- At least LKR 10 billion in new public–private investment mobilised for replanting and climate-smart infrastructure.
- Inclusion of over 10,000 smallholders in verified carbon or green finance programs by 2030.

Key Performance Indicators (KPIs)

MEL will focus on a concise set of **quantifiable indicators** aligned with the strategic objectives and SDG targets. These will be tracked annually and reported semi-annually.

Strategic Objective Area	Core Indicators	Data Source / Frequency
Productivity & Quality	• % yield increase (Made tea/kg/ha/yr) • % green leaf standards (best, below best & poor) • % reduction of post-harvesting losses • % of Green Leaf increased per acre (GL/kg/Ac/yr)	Factory intake records, TSHDA / SLTB reports (quarterly)
Economic Viability	• Input cost reduction (%) • Smallholder profit margin (%) • Number of micro-enterprises established	Cooperative records, hub accounts (semi-annual)
Soil & Environmental Health	• Change in Soil organic carbon content (%) • Extent (ha) under application of preliminary GAP / RAP guidelines (readiness / preparatory phase) •Extent (ha) under GAP / RAP Certifications (Implementation phase) • Reduction in chemical fertiliser use (%)	TRI field assessments, D-MRV platform (annual)
Human Capital & Inclusion	• Youth/women participation rate (%) • Number of trained workers/operators • Labour retention rate (%)	TSHDA HR and training data (annual)
Market & Value Addition	• Number of certified GAP / RAP tea producers • Average farm-gate price increase (%) • Volume of value-added or branded tea exports	SLTB/EDB records (annual)
Policy & Institutional Coordination	• Number of joint programs implemented • Time taken for policy responses • Stakeholder satisfaction rate (%)	Annual performance reviews, policy tracking
Climate Finance Integration	• Volume of carbon credits verified • Value of green finance accessed (LKR) • # of farmers with carbon-linked loans	D-MRV system, financial reports (annual)

Table 10: KPIs of SDG Targets

Mapping and Stakeholder Implementation Structure of the NAP

The practical implementation of the NAP for the smallholder tea sector requires the active participation and coordination of multiple stakeholders, including government agencies and research institutions, private sector actors, civil society organisations, and smallholder communities. Stakeholder mapping enables the identification of each actor's role, level of influence, and specific interests, ensuring that interventions are participatory, coherent, and aligned with the NAP's overall development objectives.

Stakeholder	Description	Interest	Influence
Smallholder Tea Farmers	Produce tea on small landholdings across diverse agro-ecological zones; form the backbone of national production (contributing nearly 75%).	Improve livelihoods, stabilise income, access to finance and sustainable practices.	High
Tea Small Holdings Development Authority (TSHDA)	Statutory body supporting and regulating smallholder tea farmers through extension, input facilitation, and policy coordination.	Enhance smallholder productivity, promote sustainable production systems.	High
Sri Lanka Tea Board (SLTB)	National regulatory and promotional body for the tea industry, overseeing governance, export promotion, and quality assurance.	Improve export competitiveness, quality standards, and branding.	High
Ministry of Plantation and Community Infrastructure (MPCI)	Provides policy oversight and strategic direction to the plantation sector, including coordination of the NAP.	Develop a resilient and inclusive plantation sector; improve livelihoods and governance.	High
Tea Factories and Processors	Responsible for green leaf procurement, processing, and manufacturing of final tea products.	Ensure a consistent supply of high-quality leaf; improve production efficiency and quality control.	Medium
Exporters and Traders	Export and market Sri Lankan tea globally through branding, packaging, and certification.	Expand market access, strengthen traceability, and secure premium prices.	High
Civil Society Organisations (NGOs, CBOs, Smallholder Federations)	Support sustainable development, social welfare, and environmental initiatives in tea-growing areas.	Promote social equity, gender inclusion, and environmental sustainability.	Medium
Research and Academic Institutions (TRI, NIPM, Universities)	Conduct applied research, training, and innovation in agronomy, processing, and extension methodologies.	Strengthen R&D, training, and knowledge dissemination.	High
Financial Institutions and Donor Agencies (IFAD, ADB, FAO, UNDP)	Provide concessional finance, technical assistance, and programmatic support.	Promote financial inclusion, climate resilience, and green investment.	High

Table 11: Stakeholder Matrix- Mapping Structure of the NAP

This mapping confirms that the NAP's success relies heavily on strong multi-stakeholder collaboration, where coordination among public, private, and community actors ensures synergy and scalability across interventions.

Implementation Structure

The NAP proposes a multi-tiered institutional and governance framework to operationalise its strategic objectives. This framework ensures participatory decision-making, accountability, and integration of field-level realities into national policy processes.

A. National Steering Committee (NSC)

Chair: Secretary, Ministry of Plantation and Community Infrastructure (MPCI)
Members: Senior representatives of TSHDA, SLTB, TRI, EDB, Ministry of Environment, Department of Agriculture, Ministry of Finance, and private sector/exporter associations, and Representatives of Village Enterprise Hubs.
Role:

1. Provide strategic oversight and policy direction for NAP implementation.
2. Approve annual work plans and budgets.
3. Ensure inter-agency coordination and alignment with national policies and SDGs.
4. Review performance reports and make adaptive policy decisions.

However, if the proposed national stakeholder committee to drive implementation of the Tea Industry National Strategic Plan is established and functional, the NAP's role can be integrated into this committee, eliminating the need for a separate NAP committee.

B. Technical Working Groups (TWGs)

Specialised TWGs will function under the guidance of the NSC, bringing together technical experts from research institutions, universities, and stakeholder organisations. Each TWG will focus on a thematic area aligned with the NAP's pillars:

1. Sustainable Tea Production and Soil Health
2. Market Access, Value Addition, and Branding
3. Climate Change Adaptation and Carbon Finance
4. Capacity Building, Digital Extension, and Youth Engagement
5. Micro-Entrepreneurship, Enterprise Hub and PPPPs

Each TWG will develop technical guidelines, support field pilots, and synthesise lessons for scale-up and policy refinement.

C. Secretariat

A dedicated NAP Secretariat will be established within the MPCI (Policy and Development Division) to coordinate day-to-day operations.
Responsibilities include:

1. Overall coordination of activities across implementing partners.
2. Administrative and financial management of NAP projects.
3. Monitoring and Evaluation (M&E) coordination and reporting.
4. Communication and stakeholder engagement, including annual reviews and dissemination of progress reports.

The Secretariat will be headed by an Additional Secretary (Policy and Development) and supported by a technical coordination team seconded from TSHDA and SLTB.

Nevertheless, if the proposed unit responsible for providing secretarial and coordination support to the National Committee of Stakeholders under the Five-Year Strategic Plan for the tea industry is established and functioning, the role of the NAP Secretariat can be integrated into this unit, removing the need for a separate NAP Secretariat.

Key Interventions and Coordination Streams

Focus Area	Lead Institutions	Key Functions / Coordination Streams
Sustainable Tea Production Practices	TSHDA, TRI, Provincial Councils	promote GAP, RAP and GMPs, through continuous training, extension programs and field visits
Market Access and Trade Facilitation	SLTB, EDB, Exporters' Associations	Enhance buyer linkages, improve quality certification systems, and promote traceability and branding for smallholder tea.
Climate Change Adaptation and Resilience	Ministry of Environment, TRI, MPCI	Implement climate-smart agriculture, promote resilient tea varieties, and support agroforestry and adaptation planning.
Capacity Building and Training	NIPM, TSHDA, TRI, NIPM, Universities	Conduct structured training, develop digital learning platforms, and strengthen the National Institute of Plantation Management as a key training institution.
Micro-Entrepreneurship, Enterprise Hub and PPPPs	SLTB, EDB, TSHDA, TRI, NIPM, Universities	Establish Village-level Enterprise Hubs and form PPPPs.

Table 12: Key Interventions and Coordination Streams

Implementation Timeline

Timeframe	Key Milestones
Short-term (0–12 months)	Establish the NSC, TWGs, and NAP Secretariat; conduct baseline studies and needs assessments; prepare detailed annual implementation and financing plans.
Medium-term (1–2 years)	Launch and scale up key interventions (training programs, pilot demonstration sites, certification programs, market partnerships, and adaptation initiatives).
Long-term (2–5 years)	Institutionalise successful interventions and mainstream NAP approaches into national policy frameworks, conduct impact evaluations, and update the NAP for the next phase.

Table 13: Implementation Timeline

Integration with Monitoring, Evaluation, and Learning (MEL) Framework

The implementation structure will be fully integrated with the NAP's **MEL system** described in above.

- District and provincial level coordination units will submit quarterly progress reports to the Secretariat.
- The Secretariat will consolidate data and present biannual performance reviews to the National Steering Committee.
- Annual stakeholder forums will provide a platform for participatory review, knowledge sharing, and adaptive management.

Expected Institutional Outcomes

- Strengthened coordination between national and district-level agencies.
- Enhanced accountability and participatory governance within the tea sector.
- Improved flow of information, technical expertise, and financial resources to smallholders.

- Accelerated adoption of sustainable and climate-smart tea production systems.
- Greater synergy between policy, research, and practice in implementing the NAP.

The proposed implementation structure provides the institutional backbone for the successful execution of the National Action Plan. The framework ensures that all relevant actors, from national policymakers to grassroots farmer cooperatives, work in coordination under a transparent, inclusive, and adaptive governance system that will drive the transformation of Sri Lanka's smallholder tea sector toward sustainability and resilience by 2030.

Prof. S. P. Premaratne



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6. Problem Tree Analysis of Tea Smallholding in Sri Lanka

By Priya Gunewardene

Abstract

Understanding the structural challenges facing Sri Lanka's tea smallholders requires a systematic analysis of cause-and-effect relationships within the sector. This paper presents a problem tree analysis that maps the root causes, core problems, and resulting impacts affecting smallholder productivity and livelihoods. Key underlying causes include declining soil health, limited access to technical knowledge, inadequate institutional coordination, and weak market linkages. These factors collectively contribute to reduced yields, declining farm incomes, and increased vulnerability to climate and market shocks. The paper also highlights the broader implications for rural employment, export earnings, and national economic stability. By visually illustrating these interconnected issues, the problem tree framework provides a clear foundation for designing targeted interventions that address both immediate constraints and long-term systemic challenges.

Keywords: Problem tree analysis, Tea smallholder constraints, Agricultural systems analysis, Rural livelihoods, Tea productivity decline, Sector diagnostics

Problem Diagnostics: Constraints and Root Causes

The Impact of Climate Change on Sri Lanka's Tea Industry

Climate change poses substantial challenges to Sri Lanka's tea industry, with its effects primarily driven by three interrelated factors: rising atmospheric CO_2 concentrations, rising ambient temperatures, and fluctuations in rainfall patterns (TRI, 2019). These environmental changes have direct and indirect implications for tea cultivation, productivity, and the livelihoods of those dependent on the sector.

Changes in Atmospheric Co_2 Levels

Projections suggest that atmospheric CO_2 concentrations could reach approximately 600–700 ppm by 2100 (Wijeratne et al., 2007). Elevated CO_2 levels influence photosynthesis, plant physiology, and broader ecosystem functions, thereby affecting tea growth and productivity. While short-term increases in CO_2 may stimulate plant growth, the long-term effects interact with other climatic variables, often exacerbating stresses such as heat and water scarcity.

Changes in Ambient Temperature

Temperature increases in Sri Lanka are projected to range from 0.4 °C to 3.0 °C by 2070. Historical data show a steady rise in mean annual air temperature of approximately 0.016°C per year between 1961 and 1990. Notably, major tea-growing regions such as Ratnapura, Badulla, and Nuwara Eliya exhibit significant linear warming trends in decadal mean temperatures. In most of these areas, the warming rate has exceeded the global average of 0.074°C per decade (Mohotti & Mohotti, 2020).

Variability in Rainfall Patterns

Rainfall forecasts for the Wet Zone indicate an annual increase of around 10% during both dry and wet seasons. However, long-term records show a decline of 144 mm (7%) in mean annual precipitation during 1961–1990 compared with 1931–1960. This variability, combined with

prolonged droughts, heavy rainfall events, flash floods, and landslides, poses severe risks to tea production and rural livelihoods (Mohotti & Mohotti, 2020).

Sri Lanka's Vulnerability to Climate Change

According to the Global Climate Risk Index, Sri Lanka ranks among the ten countries most affected by climate change, placing second in 2017 and sixth in 2018 (Eckstein et al., 2018; Eckstein et al., 2019). The nation's high exposure to extreme weather events, rising sea levels, and precipitation irregularities directly threatens key economic sectors, particularly tea cultivation, which sustains millions of livelihoods (Mohotti & Mohotti, 2020).

Projected Impacts on Tea Yields Across Elevations

Climate change impacts on tea yield vary according to elevation. Projections for 2050 indicate potential yield reductions in the up-country intermediate (IU), mid-country wet (WM), and low-country wet (WL) zones. In contrast, yields in the up-country wet (WU) zone may increase (Wijeratne et al., 2007). Consequently, production is expected to rise at higher elevations but decline in low-elevation areas where vulnerability to heat and drought stress is greater (Mohotti & Mohotti, 2020).

Given this divergence, growers in low- and mid-elevation regions where smallholders dominate must adopt targeted adaptation measures to mitigate productivity losses associated with climatic variability.

Effects on Tea Yield Components and Land Suitability

Tea yield depends primarily on shoot density and mean shoot weight, both of which are sensitive to climatic variations (Mohotti & Mohotti, 2020; Watson, 2008). The optimal temperature for tea growth and shoot regeneration is approximately 22°C. Growth declines when temperatures fall outside the 18–25°C range, and shoot numbers decrease significantly at temperatures above 27–29°C (Wijeratne, 2001; Wijeratne et al., 2007). Studies estimate that a 1°C rise in mean temperature can reduce tea yields by 4.6% (Wijeratne et al., 2007; Mohotti & Mohotti, 2020).

A national land suitability assessment classifies 42.1% (27,581 km²) of Sri Lanka's land as low suitability for tea, while 28.5% (18,695 km²) is unsuitable. Moderately suitable land accounts for 8,137 km², and 9,498 km² is highly suitable, with only 1,627 km² deemed very highly suitable. Nuwara Eliya District possesses the highest share (25%) of very highly suitable land, followed by Kandy, Matara, Galle, Kegalle, and Ratnapura districts (Jayasinghe et al., 2019, p. 20). Suitability assessments are based on climatic factors (rainfall, temperature, elevation) and edaphic characteristics (soil type, pH, drainage,

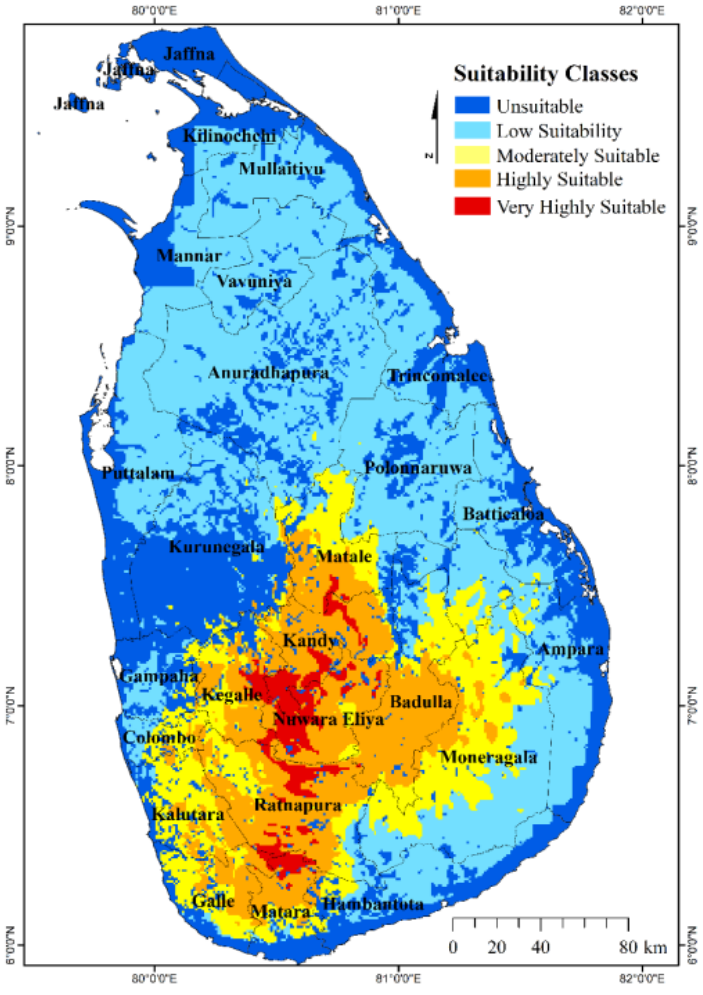


Figure 1: Sri Lanka's Temperature by Elevation

depth, and texture). Thus, shifts in rainfall and temperature are expected to reduce land suitability for tea cultivation further.

Vulnerability of Tea-Growing Regions and Smallholder Implications

According to FAO (2016) and Wijeratne & Chandrapala (2013), several agro-ecological zones, including WL1a, WL1b, WL2a (Wet Zone Low Country), WM2a, WM2b, WM3a (Wet Zone Mid Country), and IM3c (Intermediate Zone Mid Country), are categorised as highly vulnerable to climate change. Notably, the Wet Zone Low and Mid Country regions are dominated by tea smallholders.

Districts such as Ratnapura, Galle, Matara, Kalutara, Kegalle, and Colombo account for approximately 81% of national tea smallholdings, representing around 319,000 ha of tea smallholder-cultivated area. Among these, 77% of smallholdings and 49% of their land area are less than 1 acre. This distribution indicates that a large proportion of smallholders are economically dependent on tea, making them highly susceptible to climatic shocks that can exacerbate poverty and socio-economic instability.

Recent data also reveal a post-2013 decline in tea production across all sectors, with smallholders experiencing sharper declines than the estate sector. Given that smallholders contribute roughly 75% of national output, their performance critically determines national production trends (Sidhakaran et al., 2021). Erratic weather patterns, including prolonged dry spells, are a major driver of this decline.

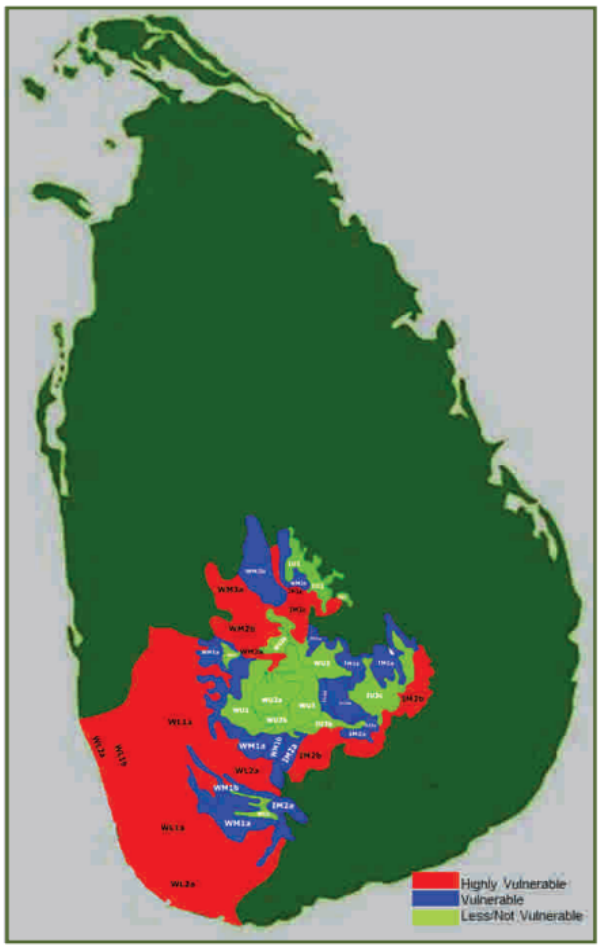


Figure 2: Tea Smallholder Cultivation Distribution

Adaptation and "No-Regret" Strategies

To strengthen climate resilience, the FAO (2016) and Mohotti & Mohotti (2020) prescribe several "no-regret" and high-priority strategies for the tea sector:

- Selecting suitable agro-ecological zones and soils for replanting and expansion.
- Promoting crop diversification and the use of drought-, pest-, and disease-tolerant cultivars.
- Implementing soil and moisture conservation practices.
- Managing shade trees effectively.
- Investing in rainwater harvesting and irrigation infrastructure.
- Applying fertilisers judiciously and promoting afforestation.
- Enhancing research and development through policy support.
- Conducting further impact assessments and developing region-specific technologies.
- Providing training, financial support, and awareness programs on climate adaptation.
- Encouraging eco-tourism, conservation initiatives, and knowledge-sharing networks.

The Tea Research Institute's (TRI) *Guidelines on Adaptation Strategies to Minimise Climate Change Impacts on Tea Production* (TRI Guideline No. 01/2019) further emphasise:

- Cultivation of resilient tea varieties (e.g., improved seedlings and grafted plants).
- Establishment of shade trees and shelterbelts to regulate microclimate.
- Adoption of rainwater harvesting and soil conservation techniques (e.g., contour drains, terraces, mulching).
- Enhancement of soil organic matter via composting, biochar, and cover crops.
- Implementation of integrated pest and disease management.
- Improved soil aeration, drainage, and irrigation systems.
- Strategic fertiliser use, including slow-release formulations.
- Diversification of crops and income sources (e.g., livestock, beekeeping, eco-tourism).
- Promotion of afforestation, watershed management, and sustainable land use.

Current Practices and Key Constraints Among Tea Smallholders

Despite the availability of recommended adaptation measures, evidence shows limited adoption among tea smallholders, driven by a combination of economic, technical, and institutional constraints (Samaraweera & Samansiri, 2025).

Ageing Tea Cultivations and Low Replanting Rates

Productivity in tea smallholdings has declined since 2013, primarily due to ageing plantations and limited replanting. According to the 2005 census, approximately 70% (81,500 ha) of tea smallholdings were between 10–25 years old, implying that by 2023 these fields will have reached 30–45 years old (Sidhakaran et al., 2021). With an average annual replanting rate of only 0.6%, around 40% of tea fields are currently beyond their productive lifespan, particularly in the low country.

Financial barriers remain the primary obstacle: (1) high capital investment requirements for replanting, and (2) income loss during the three-year gestation period.

According to TRI, in Low Grown regions, the capital cost of tea replanting at the end of the sixth year (including soil rehabilitation and up to third-year upkeep) is approximately LKR 2.93 million per acre. The extended soil rehabilitation period often leads to a reduction in household income, prompting many tea smallholders to be reluctant to replant ageing plantations. Nevertheless, actual cash outflows may be lower if family labour is utilised during the replanting process.

Vacant Patches and Lack of Infilling or Crop Diversification

Surveys in Ratnapura district indicate that nearly 43% of smallholders report 10–30% vacancy in tea fields (Samaraweera & Samansiri, 2025, p. 63). Similar findings from Badulla and Matara districts indicate that up to 30% of the land remains uncultivated, leading to erosion and increased landslide risk (Palihakkara et al., 2015). Causes include rocky terrain, shallow soils, and drought-induced mortality.

Vacancies reduce plant density and, in turn, yield potential. Infillings often fail due to poor-quality seedlings, limited availability of recommended “Jumbo Bag” plants, and lack of awareness regarding productivity losses (MPCI, 2025). Unused patches also accelerate soil degradation, erosion, and weed growth. These areas could be rehabilitated through replanting, intercropping with biomass crops (e.g., *Gliricidia*), or establishing cover crops for mulching.

Limited Access to Quality Planting Material

Most smallholders source seedlings from unregulated nurseries that lack quality-control mechanisms. Financial constraints lead many to purchase low-cost “battery plants” rather than TRI-recommended “Jumbo Bag” plants, which offer higher survival and faster establishment (Samaraweera & Samansiri, 2025).

The dominant cultivars in the low-grown sector, TRI 2026 and TRI 2023, were released in the 1950s–60s and are highly susceptible to *Macrophoma theicola* (stem and branch canker).

Despite TRI's removal of TRI 2023 from its recommended list, its use persists due to the unavailability of newer varieties (Samaraweera & Samansiri, 2025). This reliance on outdated disease-prone cultivars continues to depress yields and resilience.

Lack of Soil Testing Facilities and Inappropriate Fertiliser Use

Inadequate access to soil testing leads smallholders to rely on guesswork when applying fertiliser and dolomite (Samaraweera & Samansiri, 2025). Outdated mixtures such as U709 and T750 remain common despite TRI's recommendations (SP10, 2016) for region-specific fertilizers (U834, UT752, VP/LC880, VP/LC1075). Weak extension services further constrain the dissemination of updated fertiliser practices (Samaraweera & Samansiri, 2025, pp. 38, 88).

Improper fertiliser use not only wastes resources but also reduces nutrient-use efficiency, particularly under high-temperature conditions, worsening both productivity and environmental outcomes.

Low Adoption of Good Agricultural Practices (GAP)

Research reveals persistently low adoption of core Good Agricultural Practices among smallholders (Samaraweera & Samansiri, 2025). While some basic practices, such as correct fertiliser use, show moderate uptake, soil rehabilitation, deep forking, and proper pruning, as well as more advanced procedures like proper resting periods before pruning, burial pruning, and wound dressing after pruning, all recommended for the post-pruning phase, are rarely implemented (Mahindapal et al., 2019).

Knowledge gaps regarding pruning objectives and techniques have contributed to reduced bush health and lower yields. Labour shortages and extended plucking intervals (often 8–10 days instead of 5) further compromise leaf quality and overall output (Samaraweera & Samansiri, 2025).

Dependence on Non-Professional Sources of Technical Information

Smallholders frequently rely on factory staff, fertiliser company representatives, and peers for technical guidance rather than on trained extension officers (Samaraweera & Samansiri, 2025; Samaraweera et al., 2013).

Samaraweera et al. (2013) reported that a study conducted in the Matara district found that tea smallholders in the sample primarily relied on tea processing factories for technical knowledge dissemination, rather than alternative sources.

This dependence often results in inconsistent or inaccurate advice, delaying adoption of appropriate climate adaptation measures.

Effective climate resilience requires informed decision-making supported by credible technical guidance. Strengthening extension services and improving access to reliable information are therefore essential to enable tea smallholders to adapt successfully to evolving climatic conditions.

In Summary

The challenges confronting Sri Lanka's tea industry under a changing climate stem from a complex interplay of **environmental, economic, and social factors**.

Environmentally, rising temperatures, erratic rainfall, and increasing CO_2 levels have altered the agroecological balance, threatening both yield potential and land suitability.

Economically, low replanting rates, high production costs, inadequate access to high-quality planting materials, and inefficient use of inputs have reduced the sector's competitiveness.

Socially, the heavy dependence of smallholders on tea for income, limited institutional support, and reliance on non-professional information sources have constrained adaptive capacity.

Together, these issues reinforce a cycle of declining productivity, vulnerability, and poverty. Strengthening research-extension linkages, enhancing financial and technical support for smallholders, and promoting climate-smart agricultural practices are therefore critical to building a resilient, sustainable, and inclusive tea sector in Sri Lanka.

Declining Soil Health due to Unsustainable Practices in Tea Smallholdings in Sri Lanka

Tea is not only a crop in Sri Lanka; it is a landscape-shaping livelihood. Smallholder tea plots, often family-run holdings that supply a large share of the country's tea, are concentrated in steep hill country where soils are naturally shallow and vulnerable. Over decades, a combination of socio-economic pressures and management choices has put persistent stress on these soils. The result is a downward spiral of declining organic matter, nutrient imbalance, erosion, compaction and loss of productivity, symptoms that together define "poor soil health." Understanding the drivers in smallholdings is essential: these farms are economically fragile, ecologically important and socially central to the tea sector.

On many smallholdings, topsoil depth has been reduced, and subsoil exposure increases after heavy rainfall events, resulting in an immediate loss of the most biologically active horizon. Empirical studies in Sri Lanka have shown substantial yield losses linked directly to soil erosion on smallholder tea plots; the long-term economic cost of soil loss for small estates is significant and measurable. Repeated removal of nutrient-rich topsoil reduces crop resilience and forces reliance on external inputs to maintain yields. (Ananda, 1997)

Soil organic carbon, a key indicator of soil health, is frequently low in intensively managed plots. Low organic matter diminishes the soil's water-holding capacity, aggregate stability, and the activity of beneficial soil organisms. These changes increase runoff and make soil more prone to erosion, especially on the steep slopes common to many tea smallholdings.

Unsustainable Practices Affecting Soil Health

Several standard practices on smallholdings accelerate soil degradation:

Poor Erosion Control on Steep Slopes

Many small plots lack permanent contour barriers, edgerows, terracing or other physical conservation measures. Where natural forest cover has been removed for tea, soil becomes exposed to high-intensity rains, leading to gullying and loss of topsoil. Field-based analyses and economic assessments of erosion damage in Sri Lankan smallholdings document this as a key driver of both yield decline and land degradation. (Rathnayake et al, 2021)

The loss of soil nutrients is a significant problem in mountainous plantations, primarily due to erosion-related soil degradation. In tea plantations, nutrient depletion poses challenges for efficient resource use and optimal production. Soil and nutrient runoff from plantation areas not only diminishes land productivity but also contributes to surface water pollution and creates less favourable ecosystems.

In Sri Lanka's Uva region, annual soil loss due to runoff in old seedling tea fields was measured at 25.52 tons per hectare per year. In comparison, VP (vegetatively propagated) tea fields experienced a much lower rate at 3.41 tons per hectare per year. Nitrogen losses were recorded as 29.34 kg/ha/yr for seedling fields compared to 4.80 kg/ha/yr for VP fields. Phosphorus depletion amounted to 2.10 kg/ha/yr in seedling tea fields and 0.92 kg/ha/yr in VP tea fields. Potassium losses reached 182.4 kg/ha/yr in seedling fields, whereas VP fields lost 13.6 kg/ha/yr. Overall, organic matter loss was 319.01 kg/ha/yr in seedling tea fields and 60.03 kg/ha/yr in VP tea fields. (Dharmasena and Bhat, 2011)

Excessive or Imbalanced Agrochemical Use

Prolonged reliance on inorganic fertilisers and herbicides without matching soil-building practices can create nutrient imbalances, reduce microbial diversity, and change soil pH. Overapplication, often practised by chasing short-term yield gains, can degrade soil structure and contaminate water bodies, further undermining landscape health. The broader literature on agrochemical impacts in Sri Lanka links these practices to reduced soil quality on smallholder farms.

The sustainability of tea cultivation depends significantly on the implementation of effective agricultural practices. Suboptimal management can adversely affect growing conditions and reduce crop yields. Non-adherence to recommended field protocols, such as improper use of fertilisers and agrochemicals, is commonly observed among tea smallholders, especially those not participating in certification programs. Fertiliser subsidies have contributed to over-application, leading to environmental issues such as soil and water pollution and threats to local biodiversity. Additionally, excessive use of agrochemicals can detrimentally affect tea plant health, the surrounding ecosystem, and regional biodiversity. (Rathnayake et al. 2021)

The extensive use of nitrogen fertilisers in tea plantations has led to significant reductions in soil pH, with older tea gardens exhibiting more acidic conditions than younger ones. This ongoing fertiliser application over the life of a tea farm is seen as the leading cause. As soil becomes more acidic, manganese accumulates in tea leaves, potentially becoming harmful at high levels. Acidification also disrupts the soil's microbial community, affecting essential ecosystem functions. Over time, continued nitrogen fertiliser input lowers microbial biomass, suppresses respiration, and decreases microbial diversity. While many soil microbes are adapted to break down rigid organic material to release nitrogen, excessive nitrogen or high substrate nitrogen levels can actually inhibit their enzyme production. This results in reduced carbon availability, further diminishing both microbial biomass and activity. (Rebello et al, 2022)

According to Samaraweera and Samansiri (2025), most tea smallholders in the Ratnapura District use recommended herbicide brands, primarily Glyphosate, while some continue to rely on older brands that are no longer officially approved but were commonly used in the past. Additionally, about 5% reported using brands that were either unknown or never authorised. Typically, growers buy herbicides from local agricultural shops that supply a wide range of chemicals for various crops, industries, and home gardens. These vendors generally do not provide advice regarding which products are suitable for tea cultivation. Despite strict regulations by the Registrar of Pesticides (ROP), smuggled herbicides are still reportedly available in several areas.

Abrupt Policy Shifts and Input Insecurity

The 2021 national ban on chemical fertilisers (and related abrupt changes in access to agrochemicals) had complex, regionally variable effects on smallholders. While reducing chemical dependence may have long-term benefits, the sudden transition has created short-term nutrient deficits on many small farms. It intensified pressures on remaining resources, sometimes leading to fallowing or other coping responses that disturb soil cover and the continuity of organic matter inputs. Post-policy analyses highlight how abrupt input shocks can exacerbate soil health problems unless accompanied by strong technical support and accessible organic nutrient sources. (Kumari and Malkanthi, 2024)

Monoculture and Lack of Crop Diversification

Continuous tea monoculture without intercrops, shade trees, or agroforestry reduces biodiversity both above- and belowground. That simplification lowers nutrient cycling efficiency and resilience to pests, diseases and climate variability.

Inadequate Organic Matter Return

On many smallholdings, harvested biomass and removed weeds are not consistently returned to the soil as compost or mulch; this loss of organic input starves soil biology and accelerates structural decline.

According to Dandeniya et al. (2022), land productivity is strongly correlated with Soil Organic Carbon (SOC) levels. SOC has been identified as a key factor influencing the productivity of tea smallholdings in their study area of the Mid Country Wet Zone (MCWZ) and the Low Country Wet Zone (LCWZ) of the Kegalle and Kandy administrative districts. It has been reported that approximately 45% of the tea smallholdings of the study area possess SOC levels below 1%, with a maximum recorded value of 2.97%. It is predicted that increasing SOC content by 1% in these regions could increase tea green-leaf yield by 4,851 kg/ha/year in MCWZ and 9,973 kg/ha/year in LCWZ. Consequently, adopting best agricultural practices to elevate SOC levels is essential for improving land productivity in the tea smallholdings.

Consequences for Livelihoods and Ecology

Declining soil health reduces yields and increases production costs as growers apply more inputs to compensate. For smallholders who often operate on tight margins, this can push fragile farms into long-term decline or abandonment. Environmentally, degraded soil increases downstream sedimentation in rivers and reservoirs, worsens water quality, and reduces the landscape's capacity to buffer extreme weather events, which are important considerations in Sri Lanka's increasingly variable climate. (FAO, 2016)

Pathways to Recovery: Sustainable Practices That Work for Smallholders

Restoring soil health is feasible, but it requires context-sensitive, low-cost measures that smallholders can adopt and sustain. The literature and field projects in Sri Lanka point to several pragmatic interventions:

Sustainable Land Management (SLM) techniques

Training and extension on contour planting, ridges, gully repair, and permanent vegetative barriers reduce erosion and stabilise topsoil. FAO-supported programs working with smallholders have shown measurable improvements when SLM practices are adopted alongside capacity building. (FAO,2021)

Agroforestry and Intercropping

Integrating trees or shade species into tea holdings improves litter return, increases rooting diversity (reducing erosion), and builds soil organic matter over time. Recent agroforestry guidance for Sri Lanka highlights practical models suitable for tea smallholdings, tailored to local slope conditions. (Anon, 2025)

Organic Amendments and Composting:

Promoting locally produced compost, green manures and mulches can restore organic carbon and biological activity. Transition strategies that blend judicious fertiliser use with organic inputs reduce yield shocks and build long-term fertility.

Tailored, Phased Policy Approaches:

Abrupt nationwide input bans or shifts can destabilise smallholder systems. Policy measures that combine phased transitions, targeted support, access to compost feedstocks or organic inputs, and training reduce unintended damage to soil health and livelihoods. Analyses of recent policy experiments underscore the importance of gradual, supported change (Kumari and Malkanthi, 2024).

In Summary

Declining soil health on Sri Lankan tea smallholdings is a multifaceted problem: steep slopes, historical forest clearance, erosion, reliance on external inputs, and sometimes abrupt policy shocks interact to reduce organic matter, nutrient balance and the living community of the soil. The good news is that many effective, affordable remedies exist: contour measures, agroforestry, composting, and farmer training, all of which both restore soil health and strengthen smallholder resilience. For sustainable tea production and the well-being of rural communities, restoring soil is not optional; it is an investment in the land's productive future.

Gaps in Extension Services and Weak Tea Smallholder Bargaining Power in Sri Lanka

Sri Lanka's tea sector remains a cornerstone of the national economy and rural livelihoods, with smallholders supplying a substantial share of green leaf to Bought Leaf Factories (BLFs). Despite their importance, tea smallholders frequently face constrained productivity, uneven access to technical support, and limited market power, problems that are mutually reinforcing and that undermine both household welfare and sectoral competitiveness. This note synthesises published evidence on (1) structural and operational gaps in extension services available to tea smallholders, and (2) the mechanisms by which smallholders' bargaining power is weakened. It concludes with concise policy- and practice-oriented recommendations. (Wijayasiri et al., 2018)

Gaps in Extension Services

Fragmentation of Service Delivery and Institutional Capacity Shortfalls

Extension provision for tea smallholders in Sri Lanka involves a complex network of actors, including the Tea Research Institute (TRI), the Tea Small Holdings Development Authority (TSHDA), plantation companies (in mixed or adjacent estates), private agro-input suppliers, and various farmer-based organisations. While this multi-actor system, in principle, offers opportunities for diverse expertise and outreach, in practice, it has led to overlapping mandates, uneven resource allocation, and fragmented service delivery. Institutional coordination among research institutions, extension agencies, and farmer organisations remains weak, leading to communication gaps and duplication of efforts.

The TRI, which serves as the main research body responsible for developing new cultivars, pest management techniques, and soil fertility recommendations, often struggles to disseminate its findings effectively to field-level extension staff and smallholders. Similarly, the TSHDA tasked with delivering extension and development programmes to smallholders faces constraints in staff capacity, budget allocations, and logistical reach, particularly in geographically dispersed smallholder areas across hilly terrain. Limited transport facilities, inadequate field allowances, and a shortage of trained extension officers reduce the frequency and quality of on-site advisory support.

Private agro-input dealers (i.e. fertiliser companies) and private tea factories and plantation companies occasionally fill some of these gaps. However, their interventions are typically commercially driven, focusing on product promotion rather than integrated technical guidance. Consequently, smallholders receive fragmented and sometimes inconsistent messages about recommended practices, leading to confusion and partial adoption of innovations. The absence of a coordinated, well-resourced institutional framework has thus hindered the effective transmission of research outputs, such as improved tea cultivars, integrated pest management (IPM) systems, and site-specific soil fertility management, from laboratory and trial stages into routine smallholder practice. This institutional disconnect between research generation, extension dissemination, and farmer application remains a significant barrier to

productivity enhancement and sustainability in Sri Lanka's smallholder tea sector (Wijayasiri et al., 2018; ILO, 2018).

Limited Reach and Frequency of Advisory Support

Empirical studies show that many smallholders receive extension contacts too infrequently to achieve sustained improvements in agronomic practices. In most tea-growing regions of Sri Lanka, extension visits are irregular and often limited to short-term project cycles rather than continuous, follow-up-based advisory relationships. The Tea Small Holdings Development Authority (TSHDA) and Tea Research Institute (TRI) provide technical guidance through field officers; however, the ratio of extension personnel to smallholders remains disproportionately low. As a result, a single officer is often responsible for hundreds of small plots scattered across hilly, remote terrain, making regular engagement logistically challenging and financially burdensome.

At present, the extension services required by tea smallholders are primarily delivered by TSHDA. However, with only 120 tea inspectors/extension officers nationwide, each officer is responsible for approximately 2,909 farmers , an unrealistic ratio for effective service delivery. This service gap is reflected in poor adherence to best practices, including fertiliser use, pre- and post-pruning care, and management of the harvesting cycle, ultimately leading to reduced yields and a long-term decline in productivity. (TSHDA, 2023)

Where extension occurs, it tends to emphasise broad or standardised recommendations, such as fertiliser schedules or pest control protocols, without adequate adaptation to local field conditions. Consequently, advice frequently fails to account for variations in slope gradient, microclimate, soil fertility, or intercropping potential, all of which influence the effectiveness of recommended practices. For instance, soil-erosion control measures or shade-tree management strategies suitable for mid-country plantations may be less appropriate for high-elevation or low-country tea zones. The absence of site-specific, adaptive guidance limits both the relevance and the uptake of extension messages among smallholders.

Systemic resource constraints further compound these weaknesses. Budget limitations restrict field mobility and reduce opportunities for demonstration plots, farmer field schools, or participatory training methods that could reinforce learning through practice. Similarly, inadequate in-service training and limited performance incentives for extension officers have led to a reliance on conventional, top-down communication methods rather than participatory or problem-solving approaches. The combined effect is an extension system that, while formally present, struggles to maintain the frequency, quality, and contextual sensitivity necessary to support meaningful behavioural change and sustained productivity improvement among tea smallholders (Munasinghe et al., 2020; Wijayasiri, 2018).

Inadequate Emphasis on Market- and Post-harvest Quality Skills

Historically, the extension services available to tea smallholders in Sri Lanka have focused primarily on increasing field-level productivity and managing pest and disease risks. While these areas are crucial, they have often overshadowed another equally important dimension of competitiveness: maintaining green leaf quality and post-harvest handling standards, which directly influence market returns. Extension curricula and field demonstrations typically prioritise agronomic recommendations such as fertiliser application, pruning cycles, and soil conservation, while providing minimal technical guidance on harvesting intervals, leaf-plucking standards, or the logistics of transporting green leaf to factories under optimal conditions.

This imbalance has significant economic consequences. Poor leaf-handling practices, such as over-plucking, delayed transportation, or contamination during collection, can reduce the freshness and chemical composition of the leaves, leading to a deterioration in cup quality and a corresponding downgrade in price at the factory gate. Studies have shown that even when yields increase through improved agronomic practices, the absence of consistent quality management along the post-harvest chain prevents smallholders from realising higher income

levels (Ariyaratne, 2024). Moreover, since green leaf quality is a decisive factor in the valuation process used by Bought Leaf Factories (BLFs), farmers who lack training in quality control are disadvantaged in price negotiations and more vulnerable to arbitrary downgrading.

Another contributing factor is the limited integration between extension and market-oriented training programmes. Few initiatives systematically link smallholders to value-chain development, branding, or certification schemes that reward quality and sustainable production. Consequently, extension fails to bridge the gap between field-level production and market demand, leaving smallholders locked into a volume-oriented model with limited incentives to improve quality. Addressing this deficiency requires reorienting extension systems toward holistic, market-responsive approaches that combine agronomy with post-harvest quality management, certification awareness, and value-addition skills. Only by strengthening smallholders' capacity to meet factory and export quality standards can Sri Lanka's tea extension system enhance both productivity and profitability in the smallholder subsector (Ariyaratne, 2024; Wijayasiri, 2018)

Financial and Incentive Barriers to Farmer Uptake

Fee-based extension or private advisory services face limited willingness to pay among smallholders, especially where short-term cash constraints and risk aversion prevail. Although many tea smallholders recognise the potential long-term benefits of professional advisory support, such as improved yield, enhanced quality, and reduced input waste, their immediate financial realities constrain demand. Smallholder tea cultivation in Sri Lanka is characterised by small, often fragmented landholdings, typically less than one hectare, that generate modest, irregular cash flows insufficient to cover the costs of private advisory or consultancy services. Seasonal income volatility, particularly during low-yield or price-depressed periods, further discourages investment in external expertise.

Empirical research has shown that smallholders' limited access to affordable credit compounds this problem: even when farmers are aware of improved cultivation or soil management techniques, they often lack the liquidity to purchase necessary inputs such as fertiliser, planting material, or irrigation equipment (Yapa & Ariyawardana, 2010). Moreover, risk aversion among smallholders, shaped by their dependence on tea as a primary livelihood and the absence of formal safety nets, creates reluctance to experiment with unfamiliar practices that could disrupt short-term income. Consequently, advisory innovations that require upfront financial outlays or additional labour are less likely to be adopted or sustained.

In many regions, extension programmes that attempt to recover costs through service fees or input-linked commissions therefore experience low participation rates, particularly among poorer households. Without complementary mechanisms such as microcredit, group-based financing, or targeted subsidies, fee-based extension models risk excluding the most vulnerable producers. The result is a persistent divide between awareness of improved practices and their actual implementation, which ultimately limits productivity growth and quality enhancement in the smallholder tea sector (Yapa & Ariyawardana, 2010; Munasinghe, 2020)

Mechanisms of Weak Bargaining Power Among Tea Smallholders

Market Structure and Buyer Concentration

Smallholder tea producers in Sri Lanka operate within a highly asymmetric market structure, where a limited number of regional Bought Leaf Factories (BLFs) and brokers act as the principal buyers of green leaf. The majority of smallholders do not possess their own processing facilities and therefore depend almost entirely on these factories for the sale of their produce. In many tea-growing districts, the number of operational BLFs is small relative to the number of supplying smallholders, resulting in a concentrated buyer network that exhibits strong monopsonistic tendencies. Under such conditions, a handful of factories or

intermediaries effectively determine the purchase price, leaf acceptance criteria, and payment schedules, leaving producers with limited scope for negotiation (Ariyaratne, 2024).

Logistical and infrastructural constraints further reinforce this imbalance. The perishability of green leaf requires processing within a few hours of harvest to preserve quality, compelling smallholders to sell to the nearest BLF. Limited access to transport facilities and the absence of alternative market channels restrict farmers' ability to seek better prices elsewhere. Consequently, factories and brokers not only dictate prices but also establish quality standards and rejection thresholds that smallholders must comply with, often without transparency or independent grading mechanisms. In some instances, delayed payments and arbitrary quality downgrades further erode producers' confidence and financial stability.

The concentration of buyer-side power diminishes the share of final value retained by smallholders, who are primarily restricted to the initial tier of the value chain. Although global tea markets place a premium on attributes such as quality certification, traceability, and sustainability, these advantages seldom extend to smallholders, as they are often limited to leaf production. In the absence of collective bargaining mechanisms or regulatory frameworks to ensure equitable price transmission, smallholders remain structurally disadvantaged, resulting in persistently low returns and discouraging investment in quality enhancement or replanting. Consequently, the structure of Sri Lanka's tea sector, characterised by a few dominant BLFs and numerous fragmented suppliers, remains a primary factor underlying the weak bargaining position and ongoing rural vulnerability of smallholder tea producers (Ariyaratne, 2024; Wijayasiri, 2018).

Weak Collective Organisation and Limited Producer-led Marketing

Although tea societies and smallholder organisations are widespread in Sri Lanka, their functional effectiveness in improving members' economic outcomes remains constrained. Most tea societies primarily operate as administrative units for leaf collection and input distribution rather than as strong cooperatives capable of negotiating markets or managing enterprises.

Their limited capacity to negotiate for higher green leaf prices or better contract terms with Bought Leaf Factories (BLFs) stems from weak institutional governance structures, inadequate financial capital, and low levels of managerial and entrepreneurial skills among leadership committees. Many societies also suffer from low member participation, irregular meetings, and poor accountability mechanisms, which reduce trust and collective cohesion. Furthermore, organisational resource constraints hinder investment in shared infrastructure, such as mini-processing units, transport facilities, or storage systems, that could enable them to aggregate and market leaf collectively. As a result, the vast majority of smallholders are compelled to sell individually to local factories or intermediaries, typically under disadvantageous terms determined by the buyer. This fragmented marketing approach reduces their bargaining leverage, limits their ability to benefit from economies of scale, and reinforces a dependency on factory networks for price determination and input access.

Consequently, while tea societies exist nominally across most smallholder areas, their limited organisational maturity and resource base have prevented them from functioning as effective vehicles for collective marketing or value addition in the tea sector (Yapa & Ariyawardana, 2010; Mahindapala, 2020).

Information Asymmetries and Price Transmission Failures

Smallholders frequently lack timely and reliable market intelligence regarding prevailing factory prices, quality-based premiums, and broader trends in export-market demand. The dissemination of market information within Sri Lanka's tea value chain is uneven, with intermediaries, brokers, and factory owners holding privileged access to pricing data and market forecasts. Most smallholders depend on informal communication channels such as word-of-mouth updates from collectors or neighbouring farmers to estimate daily or weekly

green-leaf prices. As a result, they often make production and marketing decisions based on incomplete or outdated information (Wijayasiri et al., 2018).

This informational opacity allows buyer-side actors to capture informational rents, particularly in localities where a small number of factories control both collection and payment systems. Factories are typically informed about export-market prices through the Colombo Tea Auction and international brokerage networks. However, there are few institutional mechanisms to ensure that these market signals are transmitted transparently to small-scale producers. Consequently, increases in international or auction-level prices seldom translate into corresponding improvements in farm-gate prices. The benefits of price spikes or quality premiums are often absorbed at intermediary stages of the supply chain, leaving smallholders with stagnant or marginally adjusted payments.

The absence of transparent price reporting systems and the limited access of smallholders to digital communication tools exacerbate this asymmetry. While large estates and corporate producers can access market data through online bulletins, auction reports, and industry associations, smallholders in rural and hilly regions remain excluded from such information flows. This disconnect discourages investment in quality improvement and productivity-enhancing practices because producers are unable to predict whether higher quality or greater production volumes will be financially rewarded. The resulting inefficiency in price transmission thus not only perpetuates low-income levels but also undermines incentives for technological adoption and sectoral competitiveness (Wijayasiri et al., 2018).

External Shocks and Rising Costs That Compress Margins

Macroeconomic shocks (e.g., the country's recent financial difficulties), input-price inflation, and policy-driven cost increases (notably labour-cost adjustments) have compressed producer margins. When costs rise sharply, BLFs and planters may exert pressure on smallholders through lower purchase prices or stricter quality rejections, further eroding smallholder bargaining power and resilience. Contemporary reporting and sector analyses highlight how labour- and input-cost shocks intensify existing vulnerabilities. (Reuters, 2022)

Key Implications and Concise Recommendations

Strengthen Coordinated Extension Architecture

Establish clear institutional roles and joint programming among TRI, TSHDA, and farmer organisations; increase field extension staffing and provide targeted training for extension officers in agronomy and quality-focused advisory services. (Wijayasiri et al., 2018)

Promote Demand-driven, Bundled Advisory Services

Designing low-cost, locally tailored packages that combine agronomic advice with post-harvest quality training, input bundling, and links to microcredit, improving uptake and economic viability. Pilot fee-for-service models with targeted subsidies for the poorest smallholders. (Yapa & Ariyawardana, 2010)

Support Capacity-building for Producer Organisations

Invest in strengthening governance, developing business skills, and building market connections for tea smallholder development societies. This enables them to combine their supply, engage in collective bargaining, and gain added value through services such as direct sales or quality-based premium pricing. (Mahindapala, 2020)

Improve Market Transparency and Price Information Systems

Deploy mobile-based market information and quality-grading feedback loops so smallholders receive timely data and can make informed selling decisions (Wijayasiri et al., 2018).

Mitigate Shock Exposure Through Safety Nets and Targeted Subsidies

When macroeconomic shocks result in increased production costs, such as those for labour and fertiliser, timely and well-designed interventions can help prevent value-chain disruptions that threaten the viability of smallholder operations (Reuters, 2022).

In Summary

Addressing gaps in extension services and the weak bargaining power of tea smallholders in Sri Lanka requires interventions that are both technical (improving advisory reach and content) and institutional (strengthening organisations, market access and information). Because extension deficiencies and market-power imbalances interact, integrated programmes combining quality-focused extension with collective marketing and information transparency are likely to produce the most durable gains in smallholder welfare and sectoral competitiveness (Wijayasiri et al., 2018).

Traditional Practices and Socio-cultural Norms Constraining Sectoral Transformation in Tea Smallholders in Sri Lanka — Problems and Root Causes

Sri Lanka's tea smallholder subsector, which supplies the majority of the country's green leaf and plays an outsized role in rural livelihoods, is shaped by long-standing farming routines, gendered roles, land and labour traditions, and local social institutions. These socio-cultural practices provide stability and identity for communities, but also create friction with modernisation and sectoral transformation (productivity upgrades, diversification, contract farming, mechanisation, market integration).

Tea Smallholders and Why Socio-Cultural Norms Matter

Sri Lanka's tea industry is composed of two main sectors: the plantation sector (large estates managed by corporate entities) and the smallholder sector, which now produces more than 70% of the country's green leaf and contributes significantly to both rural livelihoods and national export earnings (MPI 2021; ILO, 2018). The smallholder subsector is therefore the economic backbone of rural tea regions, particularly in districts such as Galle, Matara, Ratnapura, and Kandy, where tea cultivation provides income and employment for hundreds of thousands of families.

Smallholders are typically family-based farming units that cultivate small plots averaging 0.5 to 10 acres, often intercropping other perennial or food crops for household use. Unlike corporate estates, these households rely heavily on family labour, including spouses and children, with only occasional hired labour during peak plucking or pruning periods. This reliance on family labour makes tea cultivation not merely an economic activity but a way of life shaped by long-standing traditions, kinship structures, and community relationships (ILO, 2018; Wijayasiri et al, 2018).

Within this setting, socio-cultural norms play a decisive role in determining how work, knowledge, and decision-making are distributed. Household roles are highly gendered; men are typically viewed as the formal "owners" or "decision-makers," while women perform most of the operational labour, such as plucking, weeding, nursery management, and fertiliser application (UN, 2021). However, women's contributions often remain undervalued in formal records, and they may have limited access to training, financial services, and extension programs. Such gender dynamics affect how effectively households can adopt improved technologies or respond to market incentives. When extension programs target "farm owners," they often reach men, even when women carry the technical knowledge of cultivation practices.

Moreover, tea smallholders are deeply embedded in village social networks and informal institutions that govern cooperation, labour exchange, and reputation. Farming practices are often transmitted intergenerationally, with younger farmers inheriting not only land but also traditional knowledge systems and cultivation norms from parents or elders. These inherited methods may persist even when new agronomic research suggests more efficient approaches. Social cohesion and respect for elders mean that deviation from traditional ways can be viewed as disrespectful or risky, limiting experimentation and innovation (Munasinghe & Wanigasundara, 2019).

Land tenure systems further reinforce these norms. Smallholdings are typically privately owned family lands, often subdivided through customary inheritance among siblings, resulting in fragmented, uneconomic plot sizes (Wijayasiri et al., 2018). This fragmentation affects the potential for mechanisation, collective action, and investment planning. Since land is a key symbol of social status and family continuity, decisions about its use are rarely made purely on economic grounds. Thus, even when market conditions encourage diversification or consolidation, cultural expectations about land stewardship and inheritance obligations constrain structural change.

Socio-cultural factors also shape how knowledge and innovation diffuse through communities. Farmers tend to rely on peer learning, advice from neighbours, or guidance from local "model farmers" rather than on formal extension services. While such community learning networks strengthen trust and local adaptation, they can also slow the diffusion of new technologies or scientific practices, especially when innovations challenge established norms (ILO, 2018). Consequently, the sector's transformation depends not only on technical interventions but also on understanding and engaging with these social systems of trust and authority.

In summary, tea smallholders in Sri Lanka are not simply small-scale producers; they are socially embedded economic actors whose decisions are influenced by gender relations, kinship structures, land inheritance systems, and collective norms. These social factors, while stabilising rural livelihoods, also mediate and sometimes constrain participation in modern, competitive tea value chains and adoption of transformative technologies. Recognising these dynamics is therefore essential for designing policies and programs that align modernisation with the social realities of rural tea communities.

Gendered Division of Labour and Constrained Female Agency

Gender relations are a defining feature of Sri Lanka's tea smallholder sector, shaping who does the physical work, who controls income, and who makes key farm management decisions. While women constitute the majority of the active labour force in tea cultivation, especially at the smallholder level, they often have limited control over productive resources and decision-making processes (UN, 2021; ILO, 2018). This asymmetry between women's contribution and their authority has become one of the most significant socio-cultural constraints to sectoral transformation.

Women's Predominance in Field Labour

In most smallholder households, women undertake the core day-to-day cultivation tasks, including tea plucking, nursery maintenance, weeding, fertiliser application, pruning, and harvesting. Studies by the International Labour Organisation (2018) and the UN (2021) indicate that women account for over 60% of field labour hours in smallholder tea production. These activities are labour-intensive, time-bound, and physically demanding. Despite this, women's work is often regarded as an extension of domestic responsibilities rather than as professional or skilled agricultural labour. As a result, their economic contributions are undervalued and rarely reflected in farm management decisions (UN, 2021).

Gendered Control Over Assets and Decision-making

Decision-making power, particularly regarding land use, investment, and financial management, tends to rest with men, who are culturally perceived as "heads of household"

and “farm owners.” Even when land titles are registered jointly or in women’s names, social norms often restrict their effective control. Women typically have little say in decisions about adopting new tea clones, purchasing fertilisers, or joining cooperative societies (FAO, 2018). This limited agency constrains the household’s ability to innovate, as many of these decisions require financial negotiation and risk-taking areas where women’s voices are muted.

Training schedules are often set during hours when women are occupied with domestic responsibilities, and logistical barriers such as childcare, travel costs, and cultural expectations further reduce their participation. Consequently, women who are responsible for the daily management of the tea crop often lack access to the technical knowledge and resources needed to improve productivity or adopt sustainable practices (Munasinghe & Wanigasundara, 2019).

Cultural and Social Roots of Constrained Female Agency

The roots of this gender imbalance lie in deeply ingrained patriarchal norms that define women’s primary identity as caregivers and men as providers. Moreover, in some estate-adjacent communities, the legacy of colonial labour hierarchies, where women were primarily assigned manual plucking tasks under male supervision, has persisted in shaping gendered expectations (ILO, 2018). These norms influence not only family behaviour but also institutional design: male bias in training, credit access, and leadership within farmer organisations.

Consequences for Innovation and Transformation

Excluding women from decision-making and training reduces a household’s capacity to invest in innovation. For instance, adoption of sustainable land management (SLM), organic cultivation, or mechanised tools requires reallocation of labour and capital, decisions typically made by men who may be less engaged in day-to-day agronomy. Without women’s inclusion, such interventions risk low uptake or poor implementation (UN, 2021). Gendered inequalities also limit access to microcredit or cooperative membership, since collateral or membership rights often depend on land ownership documents held by men.

Furthermore, socio-cultural barriers constrain women’s entrepreneurial potential. Studies in Matara and Ratnapura districts show that women smallholders who participate in cooperative or marketing groups demonstrate higher productivity and better income management. However, these examples remain exceptions due to persistent gendered barriers to leadership and information (ILO, 2018).

Policy Implications

Addressing this imbalance requires not only technical training but also transformative gender-responsive approaches, for instance:

- Scheduling extension programs at times suitable for women and ensuring female extension officers’ presence.
- Introducing microfinance schemes without collateral requirements, specifically targeting women smallholders.
- Encouraging joint land titling and recognition of women as registered tea smallholders.

Such interventions are vital not only for gender equity but also for enhancing the productivity and resilience of the entire tea smallholder sector.

Farmer Conservatism, Local Knowledge Norms and Slow Adoption of Recommended Practices

A persistent challenge in transforming Sri Lanka's tea smallholder sector lies in farmers' conservative orientation and the entrenchment of local knowledge systems that shape agricultural decision-making. While these local systems embody generations of practical experience and ecological adaptation, they also tend to resist formal innovations promoted through state or institutional extension services. This tension between traditional practice and scientific modernisation has slowed the diffusion of improved technologies, agronomic methods, and resource management practices across the smallholder landscape (Munasinghe & Wanigasundara, 2019; ILO, 2018).

Dependence on Traditional and Experiential Knowledge

Smallholders typically rely on experience-based, inherited knowledge rather than formal agronomic guidance. Cultivation decisions, such as pruning intervals, fertiliser application rates, pest control timing, and shade management, are often governed by customary seasonal rhythms and the advice of older farmers within the community. Munasinghe and Wanigasundara (2019), in their evaluation of smallholders' knowledge and attitudes, found that a majority of respondents followed fertiliser schedules and dosages based on "what their fathers used to do," rather than soil tests or recommendations from the Tea Research Institute (TRI). Although this experiential knowledge helps maintain soil fertility under traditional conditions, it often leads to overuse or misuse of chemical inputs, inefficient resource use, and long-term soil degradation.

Furthermore, smallholders display varietal conservatism, a reluctance to replace old tea bushes or adopt new high-yielding or drought-resistant clones. This conservatism is partly rooted in economic risk aversion: replanting tea requires a 3–5-year waiting period before bushes become productive, a delay many smallholders cannot afford. However, it is also cultural, reflecting a belief that local tea varieties are "tried and tested" and best suited to local soils and microclimates (Wijayasiri et al, 2018). Consequently, national replanting and rehabilitation rates remain below optimal levels, limiting productivity growth and resilience to climate variability.

Social Learning, Trust, and Diffusion of Innovation

Another factor shaping conservatism is the social structure of knowledge transmission. In rural tea communities, trust tends to reside within peer and kin networks rather than with external extension officers. Farmers often rely on neighbours' experiences to validate new technologies, a process known as "horizontal diffusion." While this peer-based learning fosters social cohesion and adaptation, it also delays the uptake of innovations until "trusted" community members have successfully tested them (Rathnayake et al., 2017). Consequently, even beneficial innovations such as integrated pest management (IPM) or soil testing, spread slowly, particularly where demonstration effects are weak or inconsistent.

Moreover, extension services remain limited and unevenly accessible. The Tea Smallholders Development Authority (TSHDA) and the Tea Research Institute (TRI) conduct periodic training and field demonstrations, but resource constraints and logistical challenges restrict their coverage. Many smallholders report that they have never received formal training or technical advice (Munasinghe & Wanigasundara, 2019). Where extension programs exist, communication barriers, such as the use of technical jargon, the lack of translation into local dialects, and top-down delivery, undermine their effectiveness. As a result, smallholders continue to depend on informal local experts, village leaders, or fertiliser company representatives for agronomic information, which often reinforces rather than challenges traditional norms.

Risk Aversion and Economic Insecurity

Economic insecurity reinforces conservatism. Tea smallholders operate under volatile market conditions, with fluctuating green-leaf prices and limited access to affordable credit. These uncertainties make farmers risk-averse toward untested technologies or practices that might jeopardise short-term income (ILO, 2018). For instance, integrated pest management or organic cultivation requires an initial investment in training, composting, and biological inputs, with uncertain payoffs. Without safety nets or credit support, smallholders prefer "safe," familiar practices, even if they are less efficient or sustainable. This economic rationality, combined with social conservatism, creates a reinforcing cycle of technological adoption stagnation.

Consequences for Productivity and Sustainability

The combination of knowledge conservatism, limited extension outreach, and risk aversion has direct consequences for productivity and environmental sustainability. Over-reliance on chemical fertilisers without proper soil testing has contributed to soil acidification, nutrient imbalances, and declining yields in many mid-country tea areas (Liyanage et al., 2014). Similarly, poor pest management practices lead to higher input costs and environmental degradation. The slow uptake of water-efficient irrigation systems and sustainable land management (SLM) practices also exacerbates vulnerability to drought and climate stress (UN, 2021).

From a transformation perspective, this indicates that technological diffusion cannot rely solely on information transfer; it must engage with the social logic of trust, risk, and local identity that underpins farmer behaviour. Community-based demonstration plots, farmer field schools, and peer-led innovation platforms have shown promise in gradually shifting norms toward more adaptive practices (FAO, 2017).

Land Fragmentation, Inheritance Norms and Insecure Investment Horizon

Land ownership patterns and inheritance practices play a critical structural role in shaping the behaviour, productivity, and long-term decision-making of Sri Lanka's tea smallholders. While land is the primary productive asset for these farmers, its fragmentation through customary inheritance and family divisions has created a landscape of small, scattered plots that are uneconomic to mechanise, difficult to manage collectively, and resistant to structural transformation. These constraints are not merely technical or economic but are deeply rooted in social norms about family, kinship, and land inheritance that govern rural life (Wijayasiri et al., 2018; Wickramaarachchi & Weerahewa, 2016).

Fragmented Landholdings and Their Economic Limitations

Most tea smallholders in Sri Lanka cultivate plots ranging between 0.25 and 2 hectares, often dispersed across multiple locations rather than in a single contiguous block. This fragmentation results from intergenerational land division, where parents subdivide holdings among children to maintain fairness and social harmony within families. Although this practice is culturally valued as a means of ensuring family equity, it leads to the progressive miniaturisation of holdings over generations.

Fragmented plots increase transaction costs; labour mobility, transport, and input application, and reduce economies of scale. For example, mechanised tea plucking or contour terracing requires contiguous, uniform terrain, which is rarely possible in fragmented holdings. As Wijayasiri et al. (2018) note, the average smallholder lacks both the land size and the capital base to justify investment in mechanisation or irrigation infrastructure, perpetuating a cycle of low productivity and labour-intensive production systems.

Inheritance Norms and the Erosion of Long-term Investment Incentives

Customary inheritance systems in Sri Lanka, such as *paraveni* (ancestral property) traditions, encourage land transfer among heirs, typically sons or, in some regions, all children equally.

However, this process creates uncertainty about future ownership and the continuity of tenure. When smallholders expect that their land will be divided or transferred in the near future, they are less inclined to make long-term investments, such as replanting, soil fertility improvement, irrigation, or terracing, which yield benefits only after several years (Bandara & Wijeratne, 2019).

This short planning horizon undermines the adoption of sustainable land management (SLM) and modern agronomic practices. For instance, Sidhakaran et al. (2021) observed that yield decline in VP tea commences around 20 years or earlier in the low country, 30 years in the up country, and around 40 years in the mid country and Uva. However, tea smallholders tend to postpone replanting cycles, due to long soil rehabilitation and gestation period as well as loss of income (Wijeratne and Samaraweera, 2021). Similarly, irrigation systems and soil conservation structures (such as bunds or contour drains) require collective investment and maintenance that fragmented ownership patterns make difficult.

Cultural and Social Meanings of Land Ownership

Land in rural Sri Lanka holds deep social and symbolic value beyond its economic worth. It represents lineage, identity, and social status within the village. Consequently, selling or consolidating plots is culturally discouraged, even when economically rational. Families prefer to retain fragmented parcels rather than risk losing ancestral connections. This cultural attachment to land continuity, rooted in agrarian traditions of stewardship, reinforces the tendency toward subdivision rather than consolidation, perpetuating inefficiencies in land use.

Moreover, land disputes among heirs can delay or prevent replanting and maintenance decisions. Without clear, registered ownership, smallholders are often ineligible for institutional credit, which in turn limits their ability to finance improvements. The Tea Smallholders Development Authority (TSHDA) has reported that there are around 113,190 acres in 297,342 plots under one acre, evidencing fragmented tenure that can cause informal ownership patterns, thus creating difficulties for smallholders to utilise available subsidies and technical assistance schemes (TSHDA, 2023)

Implications For Mechanisation and Collective Enterprise

Fragmentation also inhibits collective enterprise models such as shared mechanisation, cooperative processing, or standard irrigation systems. Since neighbouring plots often belong to different families or extended kin networks, coordination becomes socially and administratively complex. Social norms emphasising household autonomy and privacy further discourage joint land management. As a result, productivity-enhancing innovations that depend on collective action, such as cooperative replanting programs or shared machinery pools, struggle to gain traction in smallholder communities (ILO, 2018).

Consequences for Sectoral Transformation

The combined effects of small, fragmented holdings, insecure tenure, and cultural resistance to consolidation have far-reaching implications for sectoral transformation. It limits:

- **Investment in capital-intensive improvements**, such as irrigation, mechanisation, or replanting;
- **Adoption of modern enterprise models**, including contract farming or cluster-based production; and
- **Access to finance**, since land documents are often fragmented or not formally registered.

Therefore, land fragmentation operates as both a material constraint and a social institution, locking smallholders into low-investment, low-productivity systems. Addressing this issue requires policy measures that balance respect for family inheritance traditions with incentives for land consolidation, tenure security, and cooperative management, while ensuring that reforms remain socially acceptable to rural communities.

Social Expectations About Risk, Reputation and Quality vs. Quantity Trade-offs

In Sri Lanka's tea smallholder sector, transformation toward higher productivity or diversification is not solely constrained by economic and technical limitations; it is also shaped by social expectations and community norms surrounding risk, quality, and reputation. These socio-cultural dynamics foster continuity over experimentation, emphasising stability, social respectability, and established production identities. As a result, many smallholders exhibit a cautious, risk-averse attitude toward new technologies, production systems, or marketing arrangements that could disrupt traditional practices or community perceptions of quality (Wijayasiri et al., 2018; ILO, 2018).

Cultural Valuation of Continuity and Reputation

Tea smallholding communities in Sri Lanka are often deeply rooted in traditions that emphasise social continuity and intergenerational stewardship. Farming practices, including tea cultivation methods, are seen as both economic activities and cultural legacies inherited from ancestors. Many smallholders express pride in maintaining the distinctive flavour and aroma profiles of teas from their particular regions, whether in the low-country (Galle and Matara) or mid-country (Kandy and Badulla), which are regarded as symbols of local identity and community prestige (Wijayasiri et al., 2018).

In such contexts, reputation operates as a form of social capital. Farmers who maintain consistent leaf quality and reliable supply relationships with local green-leaf collectors or factories earn community respect and economic stability. Conversely, experimentation with unfamiliar clones or production methods—such as organic cultivation or mechanised plucking—is often perceived as risky, potentially jeopardising established buyer relationships or community standing. Therefore, the social reward system within smallholder communities inherently favours reliability and conformity over innovation.

Risk Aversion Reinforced by Limited Safety Nets

Economic and institutional factors amplify this social conservatism. Smallholders operate in a highly uncertain market environment, with fluctuating green-leaf prices, unpredictable weather patterns, and rising input costs. According to the International Labour Organisation (2018), the absence of formal insurance mechanisms or income stabilisation programs leaves smallholders vulnerable to losses if new ventures fail. As a result, they naturally prefer "safe" and familiar production practices, even when such methods are less profitable or sustainable in the long term.

Tea smallholders typically exhibit greater risk aversion and may reduce their relative production in response to increased tea price volatility. In contrast, large farms are often better positioned to manage price fluctuations due to their access to bank overdraft facilities and financial reserves. Smallholders, on the other hand, may mitigate risk by reducing planted area, potentially shifting to less risky crops, or by allocating more time to off-farm employment. (Hertah and Weersink, 2007)

Credit constraints and the prevalence of informal financial systems further exacerbate risk aversion. The absence of formal collateral, often due to fragmented or unregistered landholdings, can discourage many smallholders from seeking loans for technological investments or replanting initiatives. Unsuccessful ventures may result in indebtedness or loss of land, consequences that carry considerable social stigma within closely connected rural communities. As a result, decision-making tends to focus on minimising risk and ensuring household subsistence rather than pursuing innovation or long-term structural change.

Quality vs. Quantity: The Cultural Economics of Tea

Sri Lanka's tea culture has historically emphasised quality and craftsmanship rather than volume. The global reputation of "Ceylon Tea" as a premium product reinforces a social and

moral obligation among growers to uphold quality standards. For smallholders, producing a leaf of recognised quality brings not only economic reward but also symbolic prestige (Wijayasiri et al., 2018). However, this emphasis on traditional quality parameters such as leaf tenderness and flavour balance can inadvertently discourage experimentation with alternative clones, organic systems, or diversified products like green tea or herbal blends, which require different agronomic or processing approaches.

The structure of the tea value chain further perpetuates this quality-oriented conservatism. Many smallholders sell green leaves to local collection centres or buy-leaf factories, which demand uniformity to maintain factory-grade consistency. These market actors often penalise deviation from traditional standards (for example, leaves with different physical characteristics from new clones). Thus, even if new cultivars or methods offer higher yields, farmers may fear market rejection or price reductions, discouraging adoption.

Social Sanctions and Community Expectations

Rural tea communities often function as tightly interdependent social networks, where deviations from accepted norms can attract criticism or ostracism. Farmers who adopt "unproven" technologies or sign individual contracts with private processors may be viewed as self-interested or disloyal to community norms of cooperation (Munasinghe & Wanigasundara, 2019). This social pressure reinforces collective conservatism, ensuring conformity with established production routines.

Moreover, younger farmers, though sometimes more open to innovation, must navigate respect-based hierarchies where elders' opinions carry significant weight. Introducing new technologies or diverging from established practices without elder approval may be perceived as disrespectful. Hence, innovation becomes not only an economic but also a cultural negotiation within family and community structures.

Implications for Sectoral Transformation

These interlinked social, cultural, and economic dynamics create a highly path-dependent production system. Even well-designed modernisation initiatives, such as the Tea Smallholder Development Programme or climate-smart agriculture projects, struggle to gain traction unless they explicitly engage with farmers' perceptions of social risk and identity (ILO, 2018; UN Sri Lanka, 2021).

Overcoming this challenge requires socially attuned policy interventions that build trust and reduce perceived risks. Examples include:

- Community-based demonstration plots showcasing peer success stories;
- Insurance or price-stabilisation schemes that cushion initial risks;
- Inclusive marketing arrangements that reward innovation while respecting local quality reputations; and
- Extension programs that engage community leaders and elders as innovation champions.

In short, the transformation of Sri Lanka's tea smallholder sector is not simply a technical task but a cultural process, one that must reconcile innovation with the deeply held social values of continuity, quality, and reputation.

Labour Norms and Seasonal Rhythms that Resist Mechanisation or Schedule Change

Labour practices in Sri Lanka's tea smallholder sector are governed not only by economic necessity but also by deeply embedded social norms, gender roles, and seasonal rhythms that define when, how, and by whom work is performed. These cultural patterns have evolved over generations through community-based labour-sharing and family farming, ensuring social cohesion but often creating resistance to technological and organisational change. Attempts to introduce mechanised systems or altered work schedules frequently encounter

friction because they disrupt established expectations about labour division, gendered identity, and collective social obligations (Dishanka & Ikemoto, 2014; ILO, 2018).

Traditional Labour Organisation and Social Embeddedness

Local traditions and social ties shape labour organisation among Sri Lankan tea smallholders. Most tasks rely on household members, with additional help from informal reciprocal labour exchanges between neighbouring families or relatives, particularly during busy seasons such as plucking, pruning, or applying fertiliser. These exchanges, known locally as *attam* or *shramadana*, are long-standing cultural practices that foster community solidarity and mutual support, dating back to ancient times in rural communities.

The timing of these labour exchanges is synchronised with seasonal and cultural calendars that align agricultural work with religious observances (e.g., Poya days) and community events. For example, plucking schedules often adjust to avoid full-moon days or local festivals, even if this slightly reduces yield. Mechanisation, which requires consistent daily or weekly cycles to operate efficiently, can conflict with these flexible, socially responsive rhythms.

Gendered Division of Labour and Task Identity

Labour norms are also strongly gendered. Women traditionally dominate plucking, weeding, and nursery management, while men handle tasks such as pruning, land preparation, and agrochemical application (UN, 2021). These gendered identities are not merely practical distinctions; they carry cultural meanings of skill, respectability, and femininity/masculinity. For instance, hand-plucking is regarded as a skilled and respectable form of women's work, associated with patience and delicacy, qualities celebrated in both plantation and smallholder contexts.

Introducing mechanised plucking disrupts this identity, as mechanical harvesters are typically operated by men and produce coarser leaves that some buyers perceive as lower quality. Thus, beyond technical issues, mechanisation may be resisted because it challenges women's central role and social recognition within the household and community economy (Dishanka & Ikemoto, 2014). Women may perceive mechanisation as threatening both their livelihood and their social standing, while men may view it as undermining traditional gender boundaries.

Social Obligations and Flexibility of Work Rhythms

Smallholder tea cultivation coexists with a range of social and religious obligations, funerals, temple activities, community meetings, and kinship events that require flexible labour schedules. In many rural communities, attending to these obligations is not optional but socially mandatory. Mechanised systems, however, demand continuous, time-bound operations, especially during harvest seasons when machine scheduling cannot easily accommodate interruptions.

Dishanka and Ikemoto (2014) note that smallholders in the mid-country region resisted mechanised tea shears partly because mechanical plucking requires labour to be available at precise intervals (every 7–10 days), disrupting the community's preferred plucking rhythm of every 10–14 days, which allows families to balance farm work with social duties. Consequently, the "efficiency logic" of mechanisation clashes with the moral economy of social responsibility and communal flexibility.

Economic Rationality vs. Social Rationality

From a purely economic perspective, mechanisation can reduce labour costs and address chronic labour shortages. However, from a social rational perspective, the transformation of labour systems is judged not by efficiency but by compatibility with community values and lifestyles. Tea smallholders, especially older generations, often regard mechanisation as "dehumanising" or contrary to the dignity of agricultural work (Munasinghe & Wanigasundara, 2019).

Moreover, family-based labour offers non-monetary benefits, such as trust, kinship cohesion, and intergenerational teaching that machines cannot replace. As a result, resistance to mechanisation is not simply “backwardness” but a rational defence of social relations that sustain the household economy.

Institutional and Practical Constraints

Even where smallholders are willing to experiment with mechanisation, practical and institutional constraints reinforce traditional patterns. Many holdings are too small, steep, or irregularly shaped to accommodate machines, and equipment sharing across households is complicated by social hierarchies and trust issues. Furthermore, the available mechanised equipment often does not align with the physical or cultural needs of smallholders, as machines are designed for large estates rather than family-run farms with gender-diverse labour teams.

Thus, technical adaptation without social adaptation, such as redesigning machines to be lighter, gender-inclusive, and socially acceptable, has limited success.

Implications for Transformation

Labour norms and seasonal rhythms are thus not merely “soft” cultural barriers but structural features of Sri Lanka’s smallholder tea economy. They determine:

- The timing and flexibility of agricultural operations.
- The gender structure of work and income.
- The acceptability of mechanisation and technological change; and
- The capacity for collective organisation across households.

Successful transformation initiatives must therefore engage with these cultural dimensions. Policies promoting mechanisation or altered schedules should be accompanied by community consultation, gender-sensitive design, and adaptive extension approaches that align innovations with social rhythms rather than imposing rigid production timetables.

Weak Collective Organisation Shaped by Local Social Structures

In 2023, 1,492 Tea Small Holdings Development Societies were registered, with 300,706 members (TSHDA, 2023). While Sri Lanka has established a robust network of Tea Smallholding Development Societies (TSDS) under the Tea Smallholders Development Authority (TSHDA), the actual effectiveness of these grassroots institutions in driving transformation remains uneven.

In theory, such organisations are meant to aggregate smallholders, strengthen their bargaining power, coordinate input supply and extension, and facilitate collective access to markets and credit. However, institutional inertia, patronage politics, and localised social hierarchies have constrained their transformative potential. These dynamics not only weaken collective action but also erode trust, which is an essential ingredient for cooperative enterprise and long-term modernisation (Mahindapala, 2020; ILO, 2018).

The promise of Collective Institutions

Tea Smallholding Development Societies were initially conceived as participatory farmer organisations intended to link smallholders with state support structures, private factories, and technical advisory services (TSHDA, 2023). At their best, these societies can pool resources to procure bulk fertiliser, coordinate replanting programs, manage extension services, and negotiate better prices for green leaf. The aggregation model also offers pathways for smallholders to engage in contract farming, shared services, or collective certification (e.g.,

Regenerative Agriculture, Fairtrade or Rainforest Alliance), which can open access to premium export markets (Wijayasiri et al., 2018).

However, the ideal of participatory governance is often compromised by entrenched local power dynamics that shape leadership selection, decision-making, and access to benefits. Instead of functioning as democratic cooperatives, some societies operate as clientelist networks, reinforcing social inequality rather than challenging it (Mahindapala, 2020).

Local Power Relations and Elite Capture

In many rural tea-growing communities, leadership positions within Tea Smallholding Development Societies are dominated by local elites, wealthier smallholders, factory agents, or politically connected individuals, who command influence over access to inputs, information, and state resources. This phenomenon of elite capture results in disproportionate benefit distribution and limited voice for ordinary or marginalised members, especially women and youth (UN, 2021).

Mahindapala (2020) observes that this power imbalance often leads to symbolic participation, where decisions are formally collective but substantively directed by a few individuals. As a result, societies may prioritise short-term interests such as input subsidies or political patronage over strategic investments in modernisation or sustainability. The resulting institutional inertia reinforces dependence on government handouts and external directives, rather than fostering bottom-up innovation and entrepreneurship among members.

Patronage Networks and Politicisation

The integration of rural organisations into party-political patronage systems has further weakened their autonomy. Leadership contests within Tea Smallholding Development Societies often mirror national political divisions, and membership benefits, such as fertiliser allocations or training opportunities, can be distributed based on political loyalty rather than need or merit (Rathnayake, 2017). This politicisation undermines trust and discourages genuine cooperation among members of different factions.

Additionally, the organisational alignment of the TSDS system within the TSHDA has established a hierarchical framework that restricts local innovation. Although the TSHDA offers technical and financial assistance, its top-down governance limits the flexibility of societies to address local needs or implement alternative business models, such as cooperative processing or climate-smart practices.

Social Hierarchies and Trust Deficits

Beyond formal politics, social hierarchies based on caste, gender, and kinship influence participation within smallholder organisations. In many areas, leadership is concentrated among dominant caste or class groups, while poorer farmers or women are relegated to peripheral roles. These divisions erode the social trust and solidarity necessary for effective collective action.

Trust deficits also emerge from past experiences of failed cooperatives or unfulfilled promises from government programs. Many smallholders associate collective enterprises with mismanagement or corruption, fostering general scepticism toward group-based initiatives. Consequently, even when donor or state programs promote aggregation models, such as shared service centres or contract farming clusters, participation often remains superficial unless accompanied by deliberate trust-building and transparency mechanisms (ILO, 2018; Munasinghe & Wanigasundara, 2019).

Institutional Capacity and Focus

Another key constraint is the limited institutional capacity of many local societies. While they are effective in administrative tasks such as fertiliser distribution or subsidy documentation, they often lack the technical expertise, managerial skills, and strategic vision needed to drive structural transformation. Mahindapala (2020) highlights that most societies are “operationally

functional but strategically passive," performing basic coordination but not engaging in forward-looking initiatives such as joint marketing, cooperative processing, or investment planning.

Moreover, where Tea Smallholding Development Societies shift their focus away from sectoral issues, toward social welfare, politics, or routine administration, they lose their ability to mobilise members around transformative goals. Without dedicated leadership and professional management, these organisations struggle to facilitate the diffusion of innovation, technology adoption, or value-chain upgrading.

Implications for Sectoral Transformation

The limited transformative capacity of smallholder institutions has several implications:

- **Weak collective bargaining power**, leaving smallholders dependent on middlemen or factory agents for pricing and marketing.
- **Reduced ability to mobilise joint investments** in shared services such as mechanisation, transport, or irrigation infrastructure.
- **Fragmented engagement with policy processes**, as societies lack representation or strategic coordination at the regional and national levels.
- **Low trust and participation**, especially among marginalised groups, undermine inclusive transformation.

For true sectoral transformation, policy interventions must therefore address both institutional reform and social trust. Strengthening smallholder organisations requires:

1. **Democratizing leadership** through transparent elections and inclusive representation.
2. **Building managerial and financial literacy** among members.
3. **Fostering inter-society collaboration** through federations or cluster networks; and
4. **Creating accountability mechanisms** that minimise elite capture and depoliticise resource distribution.

Tea Smallholding Development Societies are most effective in facilitating collective transformation when they operate as trust-based, knowledge-driven organisations rather than merely serving as administrative intermediaries.

Root Causes (Social, Institutional and Historical)

Historical Plantation Legacy and Institutional Inertia

Sri Lanka's tea sector developed under colonial plantation structures that embedded particular labour and social norms (task segmentation, paternalistic labour relations, and centralised processing). The inheritance of these structures into present smallholder systems creates institutional inertia that favours continuity over entrepreneurial change. (Wijayasiri et al, 2018)

Weak, Uneven Extension and Knowledge Systems

Extension services and the diffusion of research recommendations (from Tea Research Institute, government agencies, NGOs) have limited reach and are unevenly resourced; where they do operate, they sometimes do not adapt recommendations to local socio-cultural realities (e.g., gender-sensitive training). This weakens knowledge flows that could overcome conservative local norms. (Munasinghe & Wanigasundara, 2019)

Land Tenure and Inheritance Patterns that Discourage Long-term Investment

Customary inheritance and land subdivision reduce the perceived and actual benefits of long-term investments, as owners expect the land to be fragmented or transferred. This

disincentivises investments that require several seasons to pay off (soil improvements, irrigation, terracing). (Wijayasiri et al, 2018)

Socio-economic Risk and Limited Access to Finance

Smallholders face price volatility and limited safety nets; they are therefore risk-averse. Credit products are often unsuited to seasonal agricultural cycles or to female borrowers without formal collateral, reinforcing dependence on familiar practices. (ILO,2018)

Gender Norms Embedded in Household Decision-making

Patriarchal norms around asset ownership, mobility, and participation in meetings/training reduce women's effective access to extension, credit and market linkages, despite their central role in production. This "labour without control" dynamic blunts the potential for household-level change. (UN, 2021)

Fragmented Collective Action and Local Power Structures

Local elites or informal hierarchies may capture leadership of farmer organisations, and social fragmentation can limit trust in cooperatives or shared investments. Where farmer organisations are weak or inward-looking, they cannot aggregate supply or negotiate contracts that would alter smallholders' incentives (Mahindapala, 2020).

In Summary

Traditional practices and socio-cultural norms serve as foundational elements within tea smallholder communities. Overlooking these factors during transformation initiatives may lead to unsuccessful outcomes or social disruption. Research suggests that effective change is facilitated when technical interventions are collaboratively developed with community members, women's agencies are enhanced, and institutions, such as farmer organisations, extension services, and financing mechanisms, are adapted to align with local norms. Approaches that integrate gender-sensitive training, collective action, tenure security measures, and accessible financing represent the most effective pathway toward sustainable transformation within the sector.

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7. Enhancing Tea Productivity and Capacity Building for Smallholders

By Priya Gunewardene

Abstract

Improving productivity in Sri Lanka's tea smallholding sector requires strengthening farmer knowledge, skills, and access to improved agricultural technologies. This paper explores strategies for enhancing productivity through targeted capacity-building initiatives and improved farm management practices. Emphasis is placed on farmer training in areas such as nutrient management, pruning cycles, soil conservation, pest control, and efficient harvesting techniques. The paper also highlights the importance of strengthening extension services and promoting participatory learning approaches such as farmer field schools and demonstration plots. By improving technical knowledge and management capacity among smallholders, these initiatives can bridge productivity gaps and support sustainable agricultural development.

Keywords: Tea productivity, Farmer training, Agricultural extension, Capacity building, Good agricultural practices, Smallholder empowerment

Plucking Practices to Improve Green Leaf Quality

Green-leaf quality is the single most crucial on-farm determinant of the final made-tea quality and price. Smallholders face specific constraints: limited labour, variable knowledge of plucking standards, broken supply/transport links, and capital limits for equipment or baskets, which reduce adherence to ideal plucking standards (two leaves and a bud, correct intervals, gentle handling).

A practical solution portfolio mixes low-cost behavioural fixes (training, incentives, better baskets), appropriate technology (selective motorised harvesters where suitable), and systems changes (cooperative collection, extension services, monitoring) implemented via stepwise pilots and scaled through farmers' organisations and public-private partnerships. (SLTB, draft 'Ceylon tea' Geographical Indication Product Specifications).

Problem Statement — Why Plucking Practice Matters for Smallholders

- **Leaf standard and plucking interval:** For example, B+2 or B+3: two leaves and a bud, or three leaves and a bud, along with the frequency of rounds, play a significant role in determining the physical quality of green leaf delivered to factories. These factors impact leaf chemistry, the grade of made tea, and its market value. Smallholders frequently adjust intervals (ranging from 4 to 10 days) and standards based on elevation and available labour, leading to variability in leaf standards. (Wijeratne, 2003)
- **Labour shortages and mechanisation pressure**: Using mechanical harvesters helps reduce the need for manual labour, but these machines may also remove maintenance

foliage and arimbu shoots, which could lower overall yields and affect leaf quality if not used carefully or with selective technology. Well-designed selective harvesters can benefit certain blocks, but their effects should be assessed at the smallholder level (Pathiranage et al, 2019).

Solutions Portfolio — What Interventions Improve Green-Leaf Quality

A. Improving Knowledge & Skills

Modular harvester training program for smallholders and hired harvesters
Modular training plays an essential role in enhancing the knowledge and skills necessary for improved plucking practices, which are critical for maintaining green leaf quality. Research by Wijeratne (2003) highlights that plucking standards, specifically the proportion of acceptable shoots, are significant determinants of made-tea quality and manufacturing costs. Adherence to plucking standards below approximately 75% acceptable shoots is associated with lower quality and higher production costs (Wijeratne, 2023).

Proper interval and frequency of plucking are crucial; delays result in over-mature shoots, reduced leaf quality, slower shoot regeneration, and adversely affect bush health, particularly in relation to source-sink dynamics (Wijeratne, 2023).

Appropriate handling and contamination prevention help preserve leaf freshness, reduce heating and wilting, and maintain optimal leaf chemistry for orthodox manufacturing or high-grade Ceylon tea.

Gentle plucking techniques protect bush structure, prevent removal of maintenance foliage or immature shoots, thus sustaining future flushes, and support both yield and quality (Wijeratne, 2003).

Smallholder systems frequently experience inconsistent plucking standards due to labour shortages or variability, limited training, and reliance on mixed or hired harvesters. Therefore, focused training interventions can deliver substantial benefits, primarily through behavioural changes rather than significant investments.

Modular training programs may be structured to teach recognition of B+2/B+3 (Bud and two leaves / Bud and three leaves) plucking standards, timing by elevation, avoidance of contamination, and gentle plucking methods to minimise breakage. Instructional materials, such as pictorial guides and concise field demonstrations, can effectively illustrate the strong links among plucking standards, frequency, and tea quality (Wijeratne, 2003).

B. Tools, baskets and handling

Improved plucking baskets and hygienic handling: baskets that reduce contamination (lined or cleaned regularly) and encourage rapid transfer to collection points minimise leaf heating/wilting. Good Agricultural Practices (GAP) recommend hygienic harvesting and the avoidance of contamination during harvesting and transport. (SLSI, 2015)

Scheduling and micro-logistics: synchronised pick-up windows and smallholder collection points reduce time between plucking and factory delivery, preserving green-leaf freshness.

C. Labour models and incentives

Flexible labour cooperatives and community plucking pools to cover labour shortages and maintain standards; provide short training encompassed with small productivity bonuses for broomstick/harvester performance (quality measured at factory intake).

Payment for quality: factories or intermediaries pay premiums for leaf that meets defined standards (documented in purchase terms, such as those in Sri Lanka Tea Board specifications), creating direct farmer incentives. (SLTB,2025)

D. Appropriate mechanisation (selective & piloted)

Selective motorised harvesters should be used only in suitable contexts (larger smallholdings, flatter terrain, where trials show intact bud/leaf retention). TRI has trialled motorised selective harvesters, shown benefits if used correctly, but mechanical harvesting also has documented yield/quality trade-offs if applied indiscriminately. Any mechanisation rollout must be selective and accompanied by monitoring. (TRI, 2025 & TRI, 2025a)

E. Extension, certification & policy supports

Integrate SLSI-GAP standards / Tea Board requirements into extension messaging and buyer contracts to align incentives and ensure traceability. (SLSI,2025)

Provide access to low-interest credit/subsidies for improved harvesting baskets, harvesting tools, and collective transport assets.

F. Digital & diagnostic support

Introduce simple mobile decision aids for plucking rounds (reminder calendar by elevation, visual leaf-standard atlas) and quality feedback from factories, such as daily SMS on acceptance rates.

Implement periodic foliar sampling and nutrient guidance in accordance with TRI guidance on foliar sampling to ensure plucking standards do not unintentionally exacerbate nutrient stress. (TRI, 2009)

Implementation Pathways - Stepwise, Evidence-Based Roll-Out

Step 01: Baseline & stakeholder alignment

- Map smallholder clusters by elevation, farm size, and proximity to the factory. Collect baseline data: current plucking standard adherence, plucking interval, basket types, time to factory, factory rejection rates. The TRI checklists and Tea Board specification can be used as reference standards. (SLTB, 2025)
- Engage factories, brokers and extension agents to agree on quality metrics and premiums.

Step 02: Pilot interventions

- Run several pilots across representative strata (lowland, mid-elevation, highland). Each pilot tests a package (training + improved baskets + scheduled pickup; or training + selective mechanical harvester trial + monitoring). Monitor: leaf standard (% of B+2 or B+3), time-to-factory, factory intake quality metrics, and smallholder income. Use TRI methodology to assess impacts. (TRI, 2025)

- Include control plots enabling measuring yield vs quality trade-offs (important where mechanical harvesting is tried). TRI studies show that mechanical harvesting can reduce yields if arimbu or maintenance foliage are removed; quantify the trade-offs. Pathiranage et al., 2019 & TRI, 2025)

Step 03: Scale-up & institutionalisation

- Expand elements that deliver obvious benefits, such as training, baskets, and collection windows, by working through farmer organisations, cooperatives, and extension agencies. Factory premiums and Sri Lanka Tea Board/GI (Ceylon Tea) labels should be used as incentives for compliance. (SLTB, 2022)

- For mechanisation, it is recommended to implement a rental or contract model in which tools/machinery are jointly owned by Tea Smallholder Development Societies, tea factories, or service providers, rather than acquired individually by each farm. Additionally, comprehensive operator training and coordinated harvest scheduling should be provided to minimise the risk of over-harvesting.

Step 04: Continuous improvement

- Establish factory feedback mechanisms, such as daily or weekly leaf quality reports provided to harvester groups, alongside periodic refresher training sessions and annual foliar nutrient assessments. Document key insights and revise the operational manual for smallholder plucking practices, ensuring inclusion of local language and pictorial guides. (TRI, 2009)

Monitoring & Evaluation (M&E) Simple Metrics That Matter

Pick a small set of indicators for repeated measurement:
- % of harvested good leaf that meets B+2/B+3 or B 60 standard at factory intake (primary quality metric). (Wijeratne, 2003)
- Time (hours) from plucking to factory intake.
- Factory acceptance/rejection rate and premium captured per kg. (SLTB, 2025)
- Yield per hectare and made-tea grade, especially to check mechanisation trade-offs, when applied. (Pathiranage et al, 2019)

It is advantageous to collect M&E data monthly during the pilot phase and quarterly after scale-up, preferably using simple mobile forms or paper registers.

Risks, Trade-Offs and Mitigation

- **Mechanisation impacting the yield or quality risk** — mitigate by piloting and only scaling selective harvesters where trials show minimal negative impacts; use rental/shared models to lower adoption risk. (Pathiranage et al., 2019 & TRI, 2025)
- **Weak market incentives risk** — align factories/buyers to provide premiums and preferential buying for certified/standard-compliant smallholders (potentially use Tea Board or GI specifications on a contract basis). (SLTB, 2025)
- **Labour displacement risk** — Introduce mechanisation gradually and pair it with alternative or higher-value roles, such as retraining tea harvesters as machine operators. Limiting mechanisation to suitable areas helps minimise job loss.

Potential Policy & Partner Actions

- **Smallholders & Tea Smallholding Development Societies**: adopt training, improved baskets, and scheduling of harvesting; pool resources for shared services such as tools and machinery.
- **Factories/brokers**: provide clear intake quality criteria, on-farm feedback, and payment incentives. (SLTB, 2022)
- **TRI & TSHDA extension services**: deliver training modules, run mechanisation trials, and provide foliar sampling protocols. (TRI, 2021)
- **Government/Tea Board**: integrate GAP/SLSI guidance & Regenerative Agricultural Practices (RAP) into smallholder programmes, support pilot financing and quality-based buying rules. (SLSI,2025)

Infilling, Replanting, And Field Rehabilitation

Solutions Portfolio & Implementation Pathways for Infilling, Replanting and Field Rehabilitation in Tea Smallholdings — Sri Lanka

Sri Lanka's tea smallholdings account for the majority of national tea production; however, many of these areas are ageing and exhibit issues such as senile plant blocks, soil erosion, low plant density, and inadequate nutrition. Current rates of replanting and infilling remain insufficient to restore optimal productivity.

A comprehensive strategy is recommended, comprising.
(A) short-term infilling and canopy/soil rehabilitation,
(B) medium-term replanting at the block level where required, and
(C) cross-cutting enabling measures, including finance, nursery development, extension services/FFS, monitoring, and policy incentives.

This integrated approach has the potential to enhance yields, improve incomes, and increase resilience.

This section details actionable technical solutions and a phased implementation pathway, with a focus on farmer organisation, access to low-risk financing, on-farm soil restoration, selection of suitable clones, improvement of nursery and transplant quality, and results-oriented extension services guided by national standards and proven project models. (IFAD, 2023)

Constraints

Key constraints in the tea smallholder sector:

- A significant proportion of tea smallholdings are over 20 years old, resulting in decreased yield per bush and increased susceptibility to disease. Additionally, replanting rates among tea smallholders remain substantially below recommended annual targets (Sidhakaran et al., 2021).
- Replanting tea smallholdings, particularly those under one acre in size, often leads to substantial household income losses because there is no crop produced during the soil rehabilitation and gestation period.
- Elevated replanting costs have deterred low-income smallholders from investing in tea replanting initiatives, while comparatively limited subsidy levels have provided insufficient support to vulnerable tea smallholders.

- Degraded soils, erosion and low organic matter reduce response to inputs; many smallholders lack access to quality planting material, affordable credit, and reliable extension (Dayarathne et al., 2018).

These facts create a strong case for three linked interventions: infilling (low-cost, targeted replacement of missing/poor bushes), field rehabilitation (soil, erosion, and shade management, and nutrients), and block replanting (when blocks are uneconomic).

Solutions Portfolio

A. PROPER ASSESSMENT AND DATABASE ABOUT THE AGE PROFILE, PRODUCTIVITY, ETC.

The only comprehensive census of tea smallholdings was carried out by the Department of Census and Statistics in 2005. Since then, estimates have been produced by updating the 2005 census data annually using information from the Sri Lanka Tea Board and the Tea Smallholding Development Authority. However, the accuracy and reliability of these subsequent estimates are questionable, as not all tea smallholders may be registered with these organisations. For instance, figures for yearly replanted and newly planted areas heavily depend on those cultivated under government subsidy programs, meaning that planting without subsidies might not be fully recorded. In addition, some original tea smallholding areas may have been abandoned or converted to other crops, and such changes may also be missing from current estimates.

A significant discrepancy exists between estimated and actual assessed (census) areas; for example, TSH areas increased sharply from 91,668 ha in 2004 to 116,492 ha in 2005.

Over the past twenty years, a substantial share of changes in tea smallholding extents may not have been captured in the estimates. Without a thorough assessment since 2005, the current age profile of tea smallholdings is based solely on estimates, making this data unreliable for decision-making, especially when planning replanting efforts or allocating financial support at the national level.

As a result, there is an urgent need for a new census of the tea smallholding sector to enable effective policy and development decisions and meet national targets related to the industry. Recognising the seriousness of this issue, the Ministry of Plantations and Community Infrastructure's National Strategic Plan for 2025-2029 (currently being developed) has designated the creation of an accurate tea plantation sector database as a key short-term strategic priority and proposed establishing a comprehensive database management system at the SLTB. (MPCI, 2025)

Recommendations:

- A PPP project could be developed with support from donors or funding agencies to carry out a comprehensive assessment of the tea smallholding sector.
- Since a nationwide assessment would require significant financial resources, collaboration with international development, donor, or monetary agencies is essential.
- Depending on available funding, it may be necessary to choose between conducting a rapid national assessment or phasing the assessment over several years by prioritising certain regions.
- The assessment could be incorporated into a new registration process for tea smallholdings, which may become a regulatory requirement for accessing future government services such as subsidies and extension programs. By promoting this widely, the registration can be conducted at the *Grama Niladhari Division* level within a defined timeframe and deadlines.

- All relevant data needed for the assessment can be collected through the registration application. After the registration is complete, the gathered information can be entered into a database.

B. INFILLING

Objective: quickly restore plant density and a productive canopy with minimal disruption to income.

Key practices:
- **Gap mapping & targeted infilling**: Identification and planning of infilling at the national level is vital to ensure appropriate resource allocation. Hence, it is important to identify vacant spots and weak stools by walking through surveys. The Tea Sector Strategic Plan has identified this as a priority. It has included activities to prepare replanting / new planting and infilling plans based on the tea database developed, and to implement these plans. (MPCI,2025)
- Use double-row or hedgerow spacing where mechanisation or future replanting is foreseen. (TRI, 2019)
- **Quality nursery stock**: It is recommended to use TRI-recommended clones for the altitude/region; ensure disease-free planting material and hardened seedlings. Centralised or community nurseries reduce costs and raise quality. (TRI, 2002)

Raising tea plants in jumbo bags at nurseries results in larger, more vigorous plants that are better suited for successful field establishment for the infilling of tea plants. In contrast, conventional grow bags or "battery plants" grown in tiny containers often struggle to compete with mature tea bushes for resources and are prone to damage from tea harvesters or trampling. Jumbo bag plants are more resilient in these conditions and, because of their advanced growth at planting, can shorten the field gestation period, enabling earlier income generation.

Based on current replanting rates of 0.6% of the total cultivated area, annual demand is about 17 million plants. If this rate increases to 1%, the requirement rises to 28.5 million plants. Achieving the recommended 2% replanting rate would push the annual demand to approximately 57 million plants, which is three times the current level.

Given this rising demand, adopting efficient, scalable technologies to produce high-quality planting materials is essential. In vitro micropropagation (tissue culture) is a highly viable solution.

In 2012, Ranaweera et al. demonstrated a significant advancement by using sago as a low-cost gelling agent, combined with *ex vitro rooting of in vitro-generated microshoots*. This approach reduced the cost of producing micropropagated plants by 75% compared to conventional micropropagation methods. Remarkably, the cost per plant was even lower than that of plants raised through traditional nursery propagation (Ranaweera et al., 2012).

Therefore, today, high-quality *in vitro* propagation technologies are available at relatively affordable prices. However, commercial adoption remains limited. This slow uptake is primarily due to a lack of technical knowledge and awareness among registered commercial tea nurseries, as well as the continued preference for traditional propagation methods.

According to Ranaweera, approximately 25–30% of vegetatively propagated (VP) tea fields and 40–50% of seedling tea fields require infilling. As such, several million nursery plants are needed annually for infilling and replanting (Ranaweera, 2024)

Recommendations for Advancing Micropropagation in the Tea Sector:

- **Standardisation: The Tea Research Institute (TRI) should complete and disseminate standardised** protocols as well as optimal micropropagation technologies.
- **Infrastructure Development:** Government investment is recommended to establish infrastructure, procure equipment, and supply necessary materials for micropropagation facilities in key tea-growing regions.
- **Public-Private Partnerships (PPPs):** These facilities are best managed through PPP models, wherein private operators run the sites at an agreed-upon cost per plant while utilising government-funded infrastructure. TRI would be responsible for ensuring quality assurance and compliance with technical standards.
- **Integrated Production Process:** All stages, including micropropagation, rooting, and acclimatisation, should occur within these centres. Once acclimatised, plants can be transferred to regional TSH nurseries or certified private nurseries at accessible pricing.
- **Support for Nursery Infrastructure:** Provision of one-time subsidies should be considered for nurseries to facilitate the establishment of irrigation systems and core infrastructure.
- **Final Hardening and Distribution:** Plants can undergo additional nurturing in stand-out beds, either conventional or with jumbo grow bags. Once sufficient hardening has occurred, the plants will be distributed to growers. The government could also evaluate the implementation of a maximum retail price to ensure affordability.

Adoption of these measures will support scalable and cost-efficient production of superior planting materials, thereby promote sustainable tea cultivation and enhancing overall sector productivity.

It is important to prioritise infilling over replanting, since infilling restores yield quickly at a lower cost than full replanting and buys time to plan more complex rehabilitation if needed.

C. FIELD REHABILITATION

Field rehabilitation is needed to restore soil functionality and reduce erosion, so plants respond to inputs and survive replanting.

- **Soil assessment & SQI-based decision-making**: use the Tea Research Institute's Soil Quality Index (SQI) approach to determine where only remediation (lime, organic matter, targeted nutrients) is required versus where full replanting is needed. (TRI, 2018)
- **Erosion control & land shaping**: contour terracing/benching on steep slopes, infiltration furrows, vegetative barriers (vetiver hedgerows), and rock check-walls where applicable. Stabilise drains and gully heads. (Dayarathne et al., 2018)
- **Organic matter & integrated nutrient management (INM)**: combine well-composted organic manures, green manures/cover crops, and balanced mineral fertilisers in a planned regime guided by soil tests. Avoid blanket cuts to fertiliser during transitions; follow TRI guidance for strategic nutrient management. (TRI, 2021)
- **Shade and agroforestry**: integrate appropriate shade trees where erosion and microclimate problems exist; manage shade density to keep yield and quality objectives. Agroforestry species can supply mulch, fuelwood, small livestock fodder or N-fixation benefits (site-specific). (Samaraweera & Samansiri, 2025; Wijerathna & Samaraweera, 2021)

D. REPLANTING

Where fields are senile or uneconomic to rehabilitate, replant using modern clones and optimised layouts.

Key steps:

- **Site selection using SQI and economics**: The Tea Research Institute (TRI) introduced the Soil Quality Index (SQI) methodology (TRI Guideline No. 01/2018) to support informed decision-making on whether soil rehabilitation is required before replanting. Despite its potential benefits, awareness and adoption of this method among tea smallholders remain limited. (TRI, 2018)

  The SQI assessment focuses on critical soil parameters, including bulk density, available water content, organic carbon levels, and microbial biomass, in the top 0–30 cm of soil. Additionally, the land must be free of parasitic nematodes, root diseases, and up-country live-wood termites.

  Suppose the soil meets or exceeds the region-specific SQI thresholds. In that case, replanting may proceed immediately, eliminating the standard 18-month fallow period typically used for growing Guatemala or Mana grass to rehabilitate the soil. Promoting the use of SQI assessments, especially among vulnerable smallholders, can significantly reduce unproductive periods by identifying land suitable for immediate replanting, ultimately improving productivity and income stability. However, SQI soil-testing facilities must be expanded and made easily accessible to tea smallholders to accommodate the high volume of samples that need to be analysed.

- **Staggered or phased out replanting model for tea smallholdings:** A primary reason for reluctance to undertake replanting is the potential loss of income during the initial soil rehabilitation phase and the subsequent gestation period. Many tea smallholders rely predominantly on income generated from their tea lands and lack alternative sources of revenue during this critical period (Wijerathna & Samaraweera, 2021). To mitigate total income loss, it is recommended to consider staggered or sectional replanting, allowing smallholdings to maintain some level of harvest annually.

  The extended soil rehabilitation period is a significant factor contributing to the low replanting rate. Accordingly, research should be conducted to identify appropriate rehabilitation crops and innovative models that can provide farmers with some economic returns during this phase.

  It is advantageous to implement targeted research to develop soil-rehabilitation crops and replanting models suited explicitly to smallholders. Existing replanting guidelines predominantly address large estates, where only sections of land are replanted at any given time. These approaches are often less feasible for smallholders, who may not have the capacity to suspend production across their entire holdings. Therefore, there is a need for new phased replanting strategies, such as sub-block or row-wise methods, to ensure continued partial income throughout the transition period.

  Furthermore, establishing mechanisms that enable vulnerable smallholders to participate in cooperative or group replanting strategies and incorporating revenue-sharing arrangements may also prove beneficial.

- **Adopt recommended planting systems:** Traditional tea planting layouts used by smallholders, often single-line or irregular systems, limit light interception, hinder mechanisation, and lead to uneven bush growth and poor soil conservation. Over time,

plant densities have declined due to vacant bushes and wide spacing, leading to yield losses.

Modern planting models developed by the Tea Research Institute (TRI) address these constraints through optimised spacing, planting geometry, and clone selection, thereby enhancing yield potential, ease of management, and long-term field sustainability.

Recommended spacing and Mechanisation-friendly layouts

Optimised spacing and geometry contribute to improved canopy closure, streamlined maintenance, and enhanced soil conservation. Traditional single-row planting systems, with a standard spacing of 0.6 m x 1.2 m (2 feet x 4 feet), can restrict both the application and effectiveness of mechanisation.

In contrast, the double-hedge-row planting system, widely adopted in tea-producing countries such as Japan and China, enables the mechanisation of many labour-intensive field operations. Accordingly, the double-hedge-row system, utilising a spacing of 0.6 m x 0.6 m x 1.5 m (2 feet x 2 feet x 5 feet), is well-suited to facilitate post-planting mechanisation in Sri Lanka's tea fields.

This approach also offers a higher theoretical planting density of 15,370 plants per hectare, representing an approximate 14% increase over the conventional system's density of 13,450 plants per hectare. As a result, it enhances overall yield potential and promotes early canopy closure. (TRI, 2019)

Advantages of adopting recommended planting systems

Benefit	Description
Higher yield potential	Closer spacing and a uniform canopy maximise light interception.
Improved tea quality	Clone selection ensures consistent flavour and leaf size suited to market demand.
Reduced soil erosion	Contour-aligned hedgerows combined with conservation structures stabilise slopes.
Ease of management	Machine-compatible layouts enable future mechanisation (pruning, plucking).
Long-term sustainability	Healthy, uniform stands with improved soil management reduce input waste and extend field life.

Table 1: Adopting the Planting System

- **Clone selection: matching genotypes to site and market**

Modern planting emphasises clone-based selection instead of seedling material. Using TRI-recommended clones ensures uniform growth, predictable yield, and resistance to local stresses. The following points should be considered when selecting site-specific clones.

- Altitude-specific clone selection
  As per the recommendations of TRI Advisory Circular No. PN 01 Serial No. 6/02, issued in December 2002
- Market-driven clone choice
  Orthodox (quality-focused) systems prefer clones with superior leaf quality and aroma.
  CTC or commodity markets can adopt high-yielding clones with robust leaf structure.
- Pest and disease resistance
  Clones are screened for resistance to major pests (e.g., shot-hole borer and mites) and diseases (e.g., blister blight and root rot). Blended planting (mixing 2–3 clones per field) is now recommended to improve field resilience and reduce uniform susceptibility.

TRI also advises avoiding monoclonal blocks, especially in disease-prone or variable environments.

- **Post-planting support**: guaranteed access to inputs (starter fertiliser, mulch), wage/food support or bridging finance during the first 2–3 years, and intensive extension visits.

Enabling Measures: Finance, Inputs, Extension, Monitoring

Subsidy for replanting:

One significant drawback of infilling and replanting is the capital cost. The cost of replanting per ha, as per TRI and TSHDA, is as follows.

Cost of replanting as per TRI (per ha)	Low country	UP country	Mid country	Uva
TRI - Total replanting cost (LKR Mn)	7.23	8.01	7.53	7.48

Table 2: Capital Cost of Replanting Source: Agricultural Economics Division, Tea Research Institute of Sri Lanka
*Note: The above TRI estimates include both RPCs and TSHs.

Cost of replanting as per TSHDA (per ha)	Low country	UP country	Mid country
TSHDA - Total replanting cost (LKR Mn)	5.27	5.47	5.47

Table 3: Cost of replanting as per TSHDA
Source: TSHDA Internal Operational Instructions Rev. 1 - 2025/1 - 2025.03.04
*Note: The above TSHDA estimates are for Tea Smallholdings only

As per the existing subsidy scheme, growers receive subsidy payments in instalments as they complete different tasks, including uprooting existing plants, soil rehabilitation, and planting tea, over the initial 03 years.

Instalment of tea replanting subsidy - per ha (LKR) *TSHDA Internal Operational Instructions Rev. 1 - 2025/1 - 2025.03.04*	
Uprooting the old tea plants	230,000.00
Soil rehabilitation -instalment 1	200,000.00
Tea Replanting	200,000.00
Total	**630,000.00**

Table 4: Instalment of tea replanting subsidy
Source: TSHDA Internal Operational Instructions Rev. 1 - 2025/1 - 2025.03.04

However, analysis of subsidy payments and the cost of planting for the respective period reveals that, based on TRI estimates, the subsidy is sufficient to compensate only 8.7% in the Low country, 8.4% in the Mid country and Uva planting regions, and 7.9% in the up-country region.

Cost of replanting as per TRI (per ha)	Low country	UP country	Mid country	Uva
TRI - Total replanting cost (LKR Mn)	7.23	8.01	7.53	7.48
Total subsidy entitlement (LKR Mn)	0.63	0.63	0.63	0.63
Subsidy as a % of total replanting cost	8.7%	7.9%	8.4%	8.4%

Table 5: Cost of replanting per TRI

In contrast, based on TSHDA replanting cost estimates for Tea Smallholdings, the subsidy covers 12% of replanting costs in the low country and 11.5% in the up- and mid-country planting regions.

Cost of replanting as per TSHDA	Low country	UP country	Mid country
TSHDA - Total replanting cost (LKR Mn)	5.27	5.47	5.47
Total subsidy entitlement (LKR Mn)	0.63	0.63	0.63
Subsidy as a % of total replanting cost	12.0%	11.5%	11.5%

Table 6: Cost of Replanting per TSHDA

According to a case study conducted in Matara District (Bandula et al., 2017), the majority of the Tea Small Holders (TSHs) in the sample are aware of the subsidy scheme and its procedures. A significant number of tea smallholders are also aware of the economic lifespan of a tea bush and the need for replanting after 20 years.

Despite this, most of the TSHs' plantations are over 20 years old, and the majority of them are unwilling to replant due to the lengthy rehabilitation period. Additionally, over 50% of the tea smallholders who participated in the study believe the subsidy amount is insufficient.

However, a small portion of TSHs have replanted a part of their land using their own funds, as they are reluctant to leave the land idle during the rehabilitation phase. The vast majority of the TSHs who attended the study expressed a preference for alternative economic crops to use during the soil rehabilitation period.

A significant number of participants in the study proposed increasing the subsidy and introducing an attractive loan scheme to develop their tea lands (Bandula et al., 2017).

Another case study by Wijerathna and Samaraweera in 2021 reveal that in the Galle District, the primary reasons for farmers' low interest in replanting were identified as the lack of alternative income sources during the replanting period, the long waiting period before new harvesting can begin, high labour costs and labour shortages, challenges related to the subsidy process and difficulties in accessing subsidies, and problems in obtaining quality planting materials (Wijerathna & Samaraweera, 2021).

In the Ratnapura District, financial constraints are delaying replanting, suggesting that without adequate financial support, growers are unlikely to undertake the necessary soil rehabilitation efforts. Substantial financial assistance is crucial for smallholders to undertake replanting, which represents the most significant investment in securing the sector's long-term sustainability. If these financial challenges are not addressed, a continued decline in production is likely (Samaraweera & Samansiri, 2025).

Recommendations

- **Revise The Replanting Subsidy Scheme:**

Reassess and increase the tea replanting subsidy to reflect current needs. Particular attention should be given to the most vulnerable tea smallholders (TSHs), especially those with less than one acre of land, whose household income depends entirely on tea farming. As nearly 49% of TSHs fall into this category and are reluctant to uproot existing crops, an attractive, targeted subsidy program is essential to encourage replanting.

- **Introducing Low-Interest Financing:**
  Establish low-interest loan schemes through the banking sector to support replanting. This would incentivise both smallholders with relatively larger plots and the medium- to large-scale tea estate sector to replant.
- **Implement a Crop Insurance Scheme:**
  Develop insurance coverage for both replanted and existing tea areas to protect growers' investments from unpredictable weather (abiotic stress) and pest and disease outbreaks (biotic stress), which are beyond farmers' control.

- **Inputs & nurseries**

To maintain high standards in planting materials, community or cluster nurseries operated by farmer groups, tea smallholding development societies, cooperatives, or private contractors should be responsible for supplying quality planting materials. TRI or relevant extension services should conduct certification and quality control.

The Ministry of Plantations and Community Infrastructure also consider the registration of plant nurseries with the assistance of the Department of Agriculture, to produce certified planting materials, including shade plants (MPCI,2025).

- **Extension & capacity building**

Farmer Field Schools (FFS), demonstration plots and PPP extension models (factory/leaf-buyer based field teams) for hands-on training in infilling, rehabilitation, nursery management and post-planting care. Public–private extension partnerships have proven effective in Sri Lankan smallholdings.

- **Data, monitoring and research feedback**

To enable adaptive management, a robust monitoring and evaluation (M&E) framework is necessary to track survival rates, SQI improvements, yield per hectare, and income changes at the village or cluster level.

User-friendly mobile applications and software currently being developed under the ADB grant, implemented by MPCI and SLTB, can be leveraged for mobile data collection related to M&E activities and for providing quick feedback to extension teams and donors (MPCI, 2025).

In Summary

A practical, step-by-step approach that combines infilling, field rehabilitation based on SQI guidance, and gradual replanting, with help from community nurseries, blended financing, and strong extension partnerships, can restore productivity to Sri Lankan smallholdings without putting smallholder incomes at undue risk. Existing national and donor initiatives, such as STaRR, RDALP, TRI recommendations, and Tea Board subsidies, provide reliable platforms for scaling up these efforts efficiently when paired with farmer involvement and thorough monitoring.

New Models for Training, Demonstration, and Peer Learning for the Tea Smallholders in Sri Lanka

Tea smallholders produce a significant amount of Sri Lanka's tea and are central to rural livelihoods and foreign exchange earnings. However, in the process, smallholders face several challenges: uneven access to up-to-date technical advice, fragmented advisory services, limited economies of scale for learning and demonstration, and growing climate and market pressures. For smallholders to remain competitive and resilient, training and demonstration systems must shift from top-down, one-off outreach towards continuous, participatory, hybrid and market-linked learning models that scale through farmer networks, private sector partnerships and digital tools.

Traditional extension (single lectures, occasional demonstrations) has its limits when addressing complex, context-dependent problems like soil health, integrated pest management, climate adaptation and quality improvement. Evidence from Sri Lanka and comparable settings shows that participatory, experiential approaches (notably Farmer Field Schools) increase knowledge, change practices, and can improve incomes, but they require good facilitation and local institutional support to scale. The Tea Research Institute and other agencies already provide important demonstration and training functions, but their reach remains uneven across the smallholder landscape (Amarathunge et al, 2023).

Below are practical, complementary models (many combinable) for training, demonstration and peer learning among Sri Lankan tea smallholders:

1. Clustered Farmer Field Schools (Ffs+) With Demonstration Hubs
Build on the FFS participatory, season-long learning model, but organise FFS around geographic or Tea Smallholding Development Societies clusters that share a demonstration hub (a "cluster demo plot") maintained by a lead smallholder or a cooperative. Hub plots host replicated trials (pruning regimes, intercropping, soil amendments, shade management, climate-smart practices) and short rotating modules so multiple FFS groups can learn from the same demonstrations. Centralising demonstration input reduces costs and creates a local research-to-practice pipeline. Evidence from Sri Lanka indicates that FFS improves knowledge and adoption when well-facilitated. (Amarathunga et al, 2023)

2. Public–Private Partnership (Ppp) Extension Platforms
Formalise PPPs in which TRI/TSHDA provide technical content, private factories/estates provide demonstration sites and supply chains (e.g., inputs, collection, quality grading), and NGOs/cooperatives manage farmer mobilisation and facilitation. PPP extension models tested in Sri Lanka show promise in combining institutional knowledge with private sector scale and farmer incentives. PPPs can support seasonal "intensive training sprints" before key operations (pruning, fertiliser application, pest windows) and ensure demonstrations link to market quality requirements. (Amarathunga, 2019)

3. Lead-Farmer Networks and Reciprocal Exchange Visits
Train and accredit "lead farmers" in each cluster for facilitation, record-keeping and on-farm trial management. Use short reciprocal exchange visits (peer-to-peer learning tours) between clusters to spread innovations and build farmer leadership. Peer credibility accelerates adoption more than top-down messaging. Integrating micro-incentives (small demonstration grants or market access agreements) helps sustain lead farmer activity. (Mahindapala, 2020) The Five-Year Strategic Plan for the tea sector (2026-2030) identified the lead farmer framework as an important element and planned Training programs of ToT and formation ToT pool for the selected 500 TSH villages (MPCI,2025).

1,492 active Tea Smallholding Development Societies with over 300,000 members represent nearly 72% of the total tea smallholder base. Hence, there is a strong opportunity to decentralise and scale up extension services by mobilising accredited “lead farmers” in these societies (TSHDA, 2023).

It is recommended to identify one or two suitable members from each TSHDS and equip them to serve as the focal points for knowledge dissemination within their community. These individuals would manage a local information centre for their respective society, initially supported with:

- A resource package containing selected literature, guidelines, and audio-visual materials.
- A structured series of short training courses developed with support from the National Institute of Plantation Management (NIPM) and the Tea Research Institute (TRI)
- Direct linkage to technical officers from TSHDA and TRI for ongoing advice and support

After training, these individuals can be officially designated as “Lead farmers of Government-Approved Community Tea Advisors”, providing them with both recognition and credibility within their communities. While their roles could be voluntary, an appropriate system of incentives and rewards should be established to encourage sustained engagement and commitment.

This community-based extension model would substantially enhance the existing extension capacity, generating approximately 10 to 20 times more contact points than are presently available through TSHDA officers alone. Additionally, it would enhance localised support and ensure timely access to critical agronomic information. Furthermore, this model will help prevent tea smallholders from relying on inaccurate or inappropriate technical information, which could adversely affect many field operations.

Implementation can begin with pilot projects in selected regions to test and refine the model. Based on the outcomes and insights gained, the initiative can then be gradually expanded to other areas, ensuring a scalable and sustainable approach to strengthening extension services in the tea smallholding sector.

4. Blended Digital Advisory (Voice, Sms & Smartphone Apps) with Multimedia Demos

Utilise low-bandwidth technologies to provide timely, seasonally relevant guidance, including voice-based advisories for farmers with limited literacy, SMS alerts for critical agricultural operations, and concise video demonstrations (such as planting and pruning techniques or soil and water conservation) for those with access to smartphones. This initiative can be integrated with an interactive hotline, directing technical inquiries to TRI/extension specialists, trained lead farmers, or even AI-driven advisory platforms. Digital advisory systems are intended to complement, rather than replace, hands-on demonstrations and peer-to-peer learning.

The collaboration between the Tea Research Institute and Dialog Axiata PLC in disseminating tea-related information via the “Govi Mithuru” app can be further developed to deliver enhanced services. This partnership is designed to offer essential advisory support to tea farmers through the *Govi Mithuru* platform, establishing it as an important resource for tea crop cultivation. Additionally, *Govi Mithuru*, in coordination with TRI, continues to implement comprehensive awareness programmes aimed at promoting best practices in tea cultivation (Dialog, 2023).

5. Market-Linked Demonstration and Certification Learning

When demonstration plots and training are explicitly designed to meet buyer/auction quality standards (e.g., leaf quality, harvest timing, traceability, organic or speciality production protocols), farmers receive *direct* and *timely* price signals for adopting better practices. This

makes behavioural change more likely and the training more sustainable, because farmers can expect a greater financial return (higher price or access to buyers) rather than only a technical benefit. IFAD's STaRR project and other Sri Lanka programmes explicitly include "market-driven production support" as a component for this reason (IFAD, 2015).

Such initiatives can be implemented through two linked interventions: (A) Market-compliant demonstration plots and (B) Micro-certification/verification:

A. Market-compliant demonstration plots

I. **Define buyer quality requirements first**
II. Obtain the written quality specifications from relevant buyers/processors/auctioneers (e.g., acceptable leaf grades, plucking standard, withering/handling requirements, traceability or organic inputs). These documents become the demonstration checklist. Projects such as STaRR and ADB value-chain interventions built market requirements into their production support planning. (IFAD, 2020)
III. **Select demonstration sites strategically**
IV. Use representative smallholder plots (different altitudes/soil types) or a cluster hub that can demonstrate practices across several micro-zones. Rotate demonstrations seasonally so more farmers can observe the effects across key calendar operations (pruning, fertiliser timing, pest windows).
V. **Implement treatment packages as per buyers' requirements**
VI. Each demo plot shows an explicit package tied to a market outcome (e.g., "package A = specified plucking rounds + Good Leaf % + improved handling, etc."). Document input, timing, labour and expected quality outcomes.
VII. **Collect simple on-plot metrics that buyers care about**
VIII. Examples: Good leaf %, post-harvest handling losses, traceability records, etc., as required by the buyer. These metrics feed into buyer discussions and price negotiations to obtain premiums for products that meet the package standards. Practical M&E is central in the IFAD supervision reports for linking production to marketing. (IFAD,2023)
IX. **Use demonstrations as buyer-farmer forums**
X. Invite buyers, factory managers or auction representatives to scheduled demo days with quality assessments so farmers get immediate feedback and see price implications of different practices.

B. Micro-certification & buyer verification (practical model)

Micro-certification refers to an efficient and streamlined process for verifying the adoption of locally set best practices with minimal documentation. This approach enables buyers to award premiums or grant preferred access, based on their own specifications or standards, without incurring the cost and time associated with comprehensive third-party certification.

I. **Define a short, auditable checklist**
   a. The buyer may introduce standards for documented plucking, records of approved inputs (or organic input logs), on-farm traceability tag/plot ID, basic IPM scouting records, and minimum post-harvest handling steps, etc., to meet their requirements. The list should be short (i.e. 6–10 items) to ensure that verification is cost-effective.

II. Assign verifiers (two options)

   a. **Buyer/Factory verifier,**
      a trained quality officer who visits demonstrations and selected member farms quarterly.

b. **Trusted third party / lead-farmer verifier:** trained lead farmers or cooperative officers who perform peer verification using standardised forms and photos; buyer spot-checks a sample to reduce risk. IFAD projects have used cooperative-level strengthening and local facilitators to perform routine verification and link to markets. (IFAD,2023)

III. **Verification process (fast cycle)**
Upon each visit, the verifier ticks the checklist and takes date-stamped photos of key items (plucking, drying area, records). The verifier issues a micro-certificate (digital or printed) valid for a short period (e.g., one season). Buyers use this certificate to offer a price premium or priority collection. Keep verification costs low (small fee or paid by buyer/ project initially).

IV. **Link the certificate to a simple payment/incentive**
The incentive for the grower would be a premium rate per kg for higher-grade lots, or preferential collection by a factory. The premium method should be transparent and conditional on documented verification so farmers can see the direct payoff.

V. **Audit & fraud control**
Buyers or third parties may implement randomised spot checks (covering 5–10% of certificates), which require fundamental traceability measures such as plot identification numbers and harvest records to mitigate malpractice. Over time, effective micro-certification schemes can develop into recognised standards or facilitate group certification, particularly if farmers or buyers seek to obtain export or organic premiums.

6. Mobile Extension Units

Mobile extension units equipped with demonstration kits, audiovisual materials, and presentations can be arranged to serve remote clusters regularly. Historically, both TRI and TSHDA extension services have effectively utilised mobile outreach programs and printed resources. Nonetheless, extending TRI/TSHDA mobile extension services faces significant constraints related to funding shortages and limited personnel.

As an alternative to government-funded mobile extension units, there is greater potential for advancing Private, Public, and People Participatory (PPPP) initiatives to enhance existing models. For instance, regional mobile extension units could be established through collaboration among Private Tea Factories or fertiliser companies, the Tea Smallholder Development Authority, and Tea Smallholdings Development Societies, utilising the PPPP framework.

Modern engagement strategies may incorporate tablets, projectors, and comprehensive training toolkits to deliver efficient and cost-effective education and support to smallholders in remote locations.

7. Smallholder Learning Cooperatives & Blended Financing for Pilots or Demonstrations

Member-based cooperatives, such as Tea Smallholdings Development Societies, play a crucial role in supporting smallholder tea farmers. These cooperatives can be mobilised to jointly manage groups of tea plots as larger, integrated demonstration plots. By working together in this way, members can collectively purchase agricultural inputs in bulk, which helps reduce costs and ensure consistent access to necessary materials.

Additionally, demonstration responsibilities can be rotated among cooperative members, enabling broader participation and shared learning opportunities. This collaborative approach strengthens the dissemination of best practices and fosters a sense of shared ownership over the demonstration plots.

To further encourage adoption of recommended practices, cooperatives can leverage small demonstration grants or revolving funds. These financial resources, which may be facilitated through leaf-collecting factories, allow farmers to finance short-term investments required for piloting new techniques. By providing accessible funding options, cooperatives help ensure that farmers have the means to experiment with and implement improvements, thus advancing the overall productivity and sustainability of smallholder tea cultivation.

Sri Lanka's Five-Year Strategic Plan (2026-2030) for the tea sector aims to set up 500 model TSH villages to boost bush and land productivity. The project will assist Tea Smallholdings Development Societies in collectively managing selected farmer groups as larger, integrated demonstration plots based on the model prescribed above.

In Summary

Sri Lankan tea smallholders need access to learning systems that are participatory, clustered, market-linked and digitally complemented. Farmer Field School principals, scaled through cluster hubs, lead-farmer networks and PPPs, and reinforced with affordable digital advisory services, provide a practical pathway toward resilient, high-quality smallholder tea production. With careful piloting, monitoring and alignment to value chains, these new models can raise adoption, improve quality and strengthen smallholder livelihoods.

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8. Stakeholder Contributions and Partnerships in the Tea Smallholder Sector

By Priya Gunewardene

Abstract

Sri Lanka's tea smallholder sector plays a crucial role in national tea production, rural employment, and foreign exchange earnings. Despite their significant contribution to green leaf supply, many smallholders face persistent challenges including low productivity, ageing tea bushes, limited access to finance, weak farmer organisations, and inadequate extension services. This paper examines the contributions of development partners, government agencies, and private-sector actors in strengthening coordination, financing, and service delivery within the tea smallholder sector. Drawing on project experiences and policy frameworks, the study highlights the roles of institutions such as the Tea Small Holdings Development Authority and the Sri Lanka Tea Board, alongside international development partners and private companies engaged in aggregation, processing, marketing, and financing activities. The analysis identifies key financing needs including seasonal working capital, medium-term rehabilitation finance for replanting, and investment in aggregation and value addition. It further evaluates public–private partnership models for extension and inclusive finance, including factory-based, input-supplier-based, and development-agency-based approaches. While initiatives such as donor-funded revitalisation projects and private-sector branding efforts have improved productivity, institutional knowledge, and market positioning, gaps remain in sustained financing, coordination, and smallholder representation in value-chain decision-making. The paper proposes practical policy and institutional reforms, including scaling blended finance mechanisms, strengthening farmer organisations and federations, formalising multi-stakeholder coordination platforms, and promoting value-chain finance linked to quality premiums and traceability systems. By integrating technical support, inclusive finance, and market incentives, Sri Lanka can transform its smallholder tea sector into a more productive, resilient, and value-adding component of the national tea economy.

Keywords

Tea smallholders, Sri Lanka tea industry, stakeholder partnerships, public–private partnerships (PPP), blended finance, value chain development, extension services, smallholder organisations, tea sector governance, rural livelihoods

Development Partners & Private-Sector Contributions for Coordination & Financing for the Tea Smallholding Sector in Sri Lanka

Sri Lanka's tea industry is a strategic sector for employment, rural livelihoods and foreign exchange. While large estates receive much attention, smallholders, mostly individual and family-owned holdings, are the backbone of national tea production, supplying a large share of green leaf and shaping social and economic outcomes in the hill country and surrounding areas. Supporting smallholders requires not only agronomic extension and market access, but also predictable finance, investment in processing/aggregation, and coordination between public agencies, donors and the private sector. This essay reviews how development partners and private-sector actors have contributed to coordination and financing for Sri Lanka's tea smallholding sector, assesses strengths and gaps, and offers practical recommendations. Key

projects, programmes and policy instruments are referenced with links to the primary documents.

Smallholder producers form the backbone of Sri Lanka's tea sector, with hundreds of thousands of smallholder households actively supplying tea leaves to factories and buying agents throughout the country. In many production seasons, smallholders are responsible for the majority of national green leaf output, underscoring their central role in the industry.

The smallholder system in Sri Lanka is highly diverse. Some smallholders operate on a commercial scale and are well integrated into factory supply chains, ensuring regular market access and relatively stable incomes. In contrast, a significant proportion of smallholdings are marginal operations characterised by low productivity. These producers often contend with ageing tea bushes, soil degradation, and inconsistent yields, which limit their earning potential. Many smallholders are also reliant on seasonal labour, which further increases their vulnerability. Access to crucial resources such as credit and agricultural inputs remains limited for a substantial segment of these producers.

The Tea Small Holdings Development Authority (TSHDA) and the Sri Lanka Tea Board (SLTB) are the principal agencies responsible for policy direction and extension services for the sector. These organisations strive to oversee the development and support of smallholder producers. However, both agencies face significant capacity constraints that hinder their ability to implement comprehensive outreach programs and to secure the investment needed for widespread smallholder development. (TSHDA, 2023)

Key Financing and Coordination Needs for Smallholder Tea Producers

Smallholder tea producers in Sri Lanka face distinct clusters of needs relating to both financing and coordination. These can be categorised into three primary areas:

1. Working Capital and Seasonal Finance: Smallholders require ongoing access to working capital to cover inputs such as fertilisers, pruning, and seasonal labour. These recurring costs are essential for maintaining healthy tea bushes and ensuring consistent yields throughout the production cycle.
2. Medium-Term Financing for Replanting and Rehabilitation: As tea bushes age and productivity declines, smallholders need medium-term financing solutions to support the replanting and rehabilitation of their holdings. This type of finance typically spans three to eight years and is crucial for rejuvenating plantations and sustaining long-term output.
3. Investments in Aggregation, Smallholder-Owned Processing, and Value Addition: Beyond production, smallholders benefit from coordinated investments in aggregation, which enable collective marketing and supply chain efficiency. Financing is also needed for smallholder-owned processing facilities, packaging operations, and traceability systems, all of which enhance value addition and market access.

Addressing these areas requires an approach that blends different sources of finance, including risk-sharing arrangements and multi-stakeholder coordination. Practical solutions include government programs, donor grants and loans, and private sector capital. Recent donor project documentation consistently highlights these priority needs, underscoring their centrality to smallholder development. (IFAD, 2023)

Major Development Partners and Their Approaches

Several multilateral and bilateral development partners have played a significant role in supporting Sri Lankan smallholder tea producers through project financing, technical assistance, capacity building, and market development initiatives. The leading actors and their approaches are outlined below.

IFAD — Smallholder Tea and Rubber Revitalisation (STaRR) Project

The International Fund for Agricultural Development (IFAD) has been a key partner with a specific focus on smallholder producers. Through the Smallholder Tea and Rubber Revitalisation (STaRR) project, implemented from 2016 to 2023, IFAD combined investment grants, technical assistance, and targeted support to increase the productivity and resilience of approximately 32,000 smallholder households. The STaRR project, which was financed by the World Bank, funded rehabilitation activities, including replanting, promoted the formation of farmer groups, improved access to quality planting material and extension services, and strengthened smallholder connections to factories and markets. A blend of concessional finance and grant components was used to reduce upfront risks associated with replanting and productivity investments. Detailed designs and lessons learned from STaRR are documented in supervision and completion reports. (IFAD, 2025)

Key lessons from the STaRR project include the critical role of farmer organisations in aggregation and creditworthiness, the effectiveness of technical packages when paired with financial support, and the importance of establishing robust post-project transition arrangements to ensure sustainability after donor exit. The project also identified recurring challenges, including targeting, timely disbursement of funds, and coordination with government extension services. (IFAD, 2023)

Asian Development Bank (ADB) and Technical Assistance

The Asian Development Bank (ADB) has historically contributed to enhancing the competitiveness of the tea sector and rural development in Sri Lanka through both project loans and technical assistance. ADB's Tea Development Project and subsequent smallholder-focused initiatives have targeted institutional strengthening, rehabilitation of plantation infrastructure, and stronger market linkages. ADB-supported interventions prioritise policy reform, knowledge transfer, and capacity building at both government and industry levels, thereby fostering an enabling environment for private investment. (ADB,2009)

World Bank and Related Trust Funds

The World Bank and associated trust funds have provided support for broader land-use planning, rural infrastructure improvements, and value chain enhancements that indirectly benefit smallholders. Projects have included the development of roads, market infrastructure, and quality control systems. Evaluations of World Bank interventions in the tea and rubber sectors emphasise the value of integrated approaches that combine productivity improvements, market access, and institutional reform. (World Bank, 1992)

FAO, ILO, Bilateral Donors, and NGOs

The Food and Agriculture Organisation (FAO) and the International Labour Organisation (ILO) have made significant contributions through technical studies and policy guidance, such as labour and decent work audits, value chain diagnostics, and the establishment of market standards. Bilateral donors and non-governmental organisations (NGOs), including European donors and SAPP programs, have implemented area-based support initiatives, farmer training, nutrition, and social development projects that complement productivity-focused investments. The SAPP, a multi-donor program, has been especially active in providing market-oriented support to smallholders in selected regions. These entities often offer grant financing, pilot innovative approaches, and deliver essential social safeguards. (FAO, 2010, ILO,2018)

Private-Sector Contributions: From Leaf Collection to Brand Building

The private sector plays a multifaceted and increasingly significant role in the development of Sri Lanka's smallholder tea industry. This sector comprises a diverse range of actors, including smallholder factory owners, large exporters and packers such as Dilmah and John Keells Group-related entities, buying agents, input suppliers, and banks and microfinance institutions. Their contributions span several critical areas:

a) Aggregation, Processing, and Factory Ownership

Smallholder-owned factories and private companies that aggregate leaf from many smallholders are essential channels for processing and value addition in the tea supply chain. These private entities, including small and medium enterprises (SMEs), have made considerable investments in expanding and modernising smallholder factory capacity. Such investments not only provide smallholders with a stable offtake for their green leaf but also offer technical guidance to improve production practices. Corporate annual reports and public limited company (PLC) filings, such as those from Tea Smallholder Factories PLC, highlight initiatives in factory modernisation, community development programs, and the provision of farmer credit arrangements. These efforts collectively reduce post-harvest losses and establish a foundation for upgrading to higher-value segments within the tea sector. (Tea Smallholder Factories, 2023)

b) Input Supply Credit and Contract Arrangements

Private input suppliers and processors often extend short-term credit or provide in-kind inputs, including fertiliser, agrochemicals, and seedlings, in exchange for future delivery of tea leaves. These arrangements can serve as a valuable source of low-cost working capital for smallholders, yet they may also result in dependency or restrictive offtake terms if not carefully regulated. When combined with transparent pricing mechanisms and clear quality incentives, contract farming arrangements can drive productivity improvements. Project documentation from organisations such as IFAD and ADB, along with reports from the Sri Lanka Tea Board, highlight both the opportunities and risks associated with such private sector involvement. (IFAD,2023)

c) Market Development, Branding, and Export Finance

Private exporters and branded tea companies have invested substantially in promoting “Ceylon Tea” in international markets. Collaborative efforts between the Sri Lanka Tea Board (SLTB) and private brands have led to co-funded promotion schemes, such as the SLTB’s brand promotion program, which allocated LKR 1 billion for brand support in 2022. In addition to marketing, private brands have focused on enhancing traceability and investing in premium packaging, creating the potential for price premiums for higher-quality smallholder leaf. These benefits are most fully realised when supply chains are organised to meet rigorous quality and traceability standards. (SLTB, 2022)

d) Financial Institutions and Blended Finance

Commercial banks, microfinance institutions (MFIs), and emerging fintech lenders provide vital working capital and seasonal loans to smallholders. However, access to these financial services is inconsistent, and high interest rates often pose a barrier to larger investments in rehabilitation and modernisation. Conditional credit lines, sometimes backed by donor guarantees or accompanied by technical assistance, have been introduced to increase the flow of private finance for replanting and factory upgrades. The use of blended finance, combining concessional donor resources with commercial lending to reduce risk, remains relatively limited but is recognised as a promising approach, with its expansion advocated in various donor assessments. (IFAD,2023)

Coordination Mechanisms: Government, Donors and Industry Platforms

Effective coordination is essential to align interventions: donors may fund replanting, private firms buy leaf, and government agencies regulate and promote. Several institutional arrangements structure this coordination:

Sri Lanka Tea Board (SLTB) and Tea Small Holdings Development Authority

The Sri Lanka Tea Board (SLTB) serves as the principal statutory authority overseeing the tea sector, with responsibilities that include promotion, setting and maintaining quality standards, and facilitating branding efforts. The SLTB is instrumental in implementing support schemes for industry and works closely with private firms, as evidenced by its active role in co-financing

brand promotion initiatives. Through these collaborative efforts, the SLTB aims to enhance the global profile of Sri Lankan tea and ensure consistent quality across the sector.

Complementing the SLTB's work, the Tea Small Holdings Development Authority focuses specifically on smallholders, collecting targeted data and offering tailored support to address their unique challenges. This institution plays a vital role in providing information and resources that help smallholders improve their productivity and integrate more effectively into the broader tea value chain.

Annual reports from both organisations highlight their central roles in the sector, particularly in areas such as promotion, enforcement of standards, and the implementation of support programs. However, the effectiveness of these initiatives is not uniform across all regions and is often influenced by the level of funding available. As a result, the impact of SLTB and the Tea Small Holdings Development Authority can vary, depending on regional capacities and resource allocation. (SLTB, 2022)

Project coordination units and donor coordination

Major donor initiatives, such as IFAD STaRR and ADB TA, establish Project Implementation Units (PIUs) that collaborate closely with both line agencies and private-sector partners. The STaRR project included multi-stakeholder steering committees designed to align different objectives; however, supervision reports indicate there is still potential to better align targeting efforts and to ensure a smoother transition of responsibilities to government extension services after project completion. Donor coordination forums, such as the multi-donor SAPP, are used to minimise duplication of effort and help scale successful pilot projects. (IFAD, 2023)

Industry associations and private forums

Trader associations, exporter groups such as the Colombo Tea Traders' Association, and private brand coalitions such as the Ceylon Tea Promoters play a key role in marketing and in upholding standards. These organisations help connect private financing with buyers, although their support for smallholders is inconsistent. Enhancing farmer representation within industry forums can lead to better coordination and stronger negotiating power. (SLTB, 2022)

Financing Instruments and Modalities Observed

Support for smallholders in the tea sector is structured through a diverse range of financing instruments. These modalities are designed to address both short-term production needs and longer-term investment requirements, each with distinct roles and limitations.

Grant Funds and Subsidies

Donors and government agencies frequently utilise grant funds and subsidies to support activities such as seedling distribution, demonstration plots, replanting initiatives, and technical assistance. For example, grants from projects like STaRR have been vital to replanting efforts. Such funding is particularly crucial for interventions characterised by lengthy payback periods or substantial upfront risks, enabling smallholders to undertake improvements that would otherwise be financially out of reach. (IFAD, 2023)

Concessional Loans and Blended Finance

Lower-cost capital is made available through concessional loans from donors such as IFAD and through operations led by entities like ADB and the World Bank. Blended finance structures further enhance impact by leveraging donor resources to cover first-loss positions or provide technical assistance, thereby encouraging commercial banks to participate in medium-term lending for rehabilitation projects. Documentation consistently highlights the need for guarantees and risk-sharing mechanisms to attract private lenders for investments that require multiple years to yield returns. (IFAD, 2023)

Commercial Seasonal Credit and Microfinance Institutions (MFIs)

Commercial seasonal credit is commonly used to meet working capital requirements. Microfinance institutions also serve as important sources of financing. However, in many cases, the interest rates and repayment terms do not align with the longer replanting cycles typical in tea cultivation. Enhancing these products with crop insurance or price-linked repayment mechanisms could make them more suitable for smallholders, providing greater financial stability through the production cycle. (IFAD, 2015)

In-Kind Credit and Offtake Credit

Other modalities include in-kind credit and offtake credit, in which input suppliers or factories provide input on credit against future leaf deliveries. While these arrangements can improve access to necessary resources, they require robust regulatory oversight and transparent contracting to prevent exploitative practices and ensure fair terms for smallholders. (IFAD, 2023)

Private Equity and Corporate Investments

Significant investments, such as factory and packaging plant upgrades and brand development, are typically financed through corporate balance sheets or private equity. These investments are essential for capturing additional value downstream and rely on a consistent supply of high-quality leaf from smallholders. The success of such financing depends on the reliability of supply chains and the ongoing engagement of smallholder producers. (Tea Smallholder Factories, 2023)

Achievements And Gaps — What Has Worked, What Hasn't

Achievements

- Demonstrated productivity gains: Donor projects like STaRR contributed to measurable productivity improvements where replanting and technical packages were implemented alongside farmer groups. (IFAD,2023)
- Improved institutional knowledge and diagnostics: ADB, FAO and ILO studies improved understanding of labour issues, market requirements and institutional bottlenecks. (ADB, 2009)
- Private-sector marketing and brand building: SLTB–private partnerships in brand promotion have supported higher visibility for Ceylon Tea and created opportunities for premium positioning. (SLTB, 2022)

Persistent gaps

Sustained medium-term financing for rehabilitation: Replanting efforts require multi-year financial commitments, as there is a significant lag before yield recovery. Commercial lenders often demonstrate caution in the absence of adequate risk mitigation measures, while concessional and donor funding remains constrained. Several project reports recommend the scaling up of blended finance mechanisms to address these challenges (IFAD,2023).

Coordination and exit/transition planning: Donor-funded projects frequently encounter sustainability challenges when they close out, especially if local organisations lack the capacity to maintain ongoing services. Supervision under STaRR highlighted the need to develop more robust handover plans (IFAD, 2023).

Affordable working capital is limited: Seasonal credit options are inconsistent and often expensive, while better alternatives, such as index insurance or crop-linked loans, remain scarce. (IFAD, 2015)

Inclusion and Representation of Smallholders in Private Forums: Smallholders are frequently underrepresented in industry decision-making processes, limiting their capacity to secure equitable pricing or influence buyer commitments. While initiatives such as strengthening farmer cooperatives and implementing factory shareholding models have shown promise, broader implementation is necessary to achieve significant impact. (TSHDA, 2023)

Recommendations — Practical Models to Scale Coordination and Financing

Building on the lessons from donor-funded projects and private-sector experience, several actionable recommendations can help scale successful financing and coordination models for smallholder tea producers in Sri Lanka.

1. Scale Blended Finance Vehicles for Replanting and Medium-Term Rehabilitation
It is recommended to establish targeted blended finance facilities that utilise concessional donor funds to cover first-loss or provide partial guarantees. These facilities should also bundle technical assistance to ensure agronomic success, while commercial banks contribute term loans. The administration of these structures can be managed through a revolving fund at the Sri Lanka Tea Board (SLTB) or a jointly governed fund that includes representation from donors, private banks, and farmer organisations. This approach helps reduce risk for lenders and aligns incentives for sustainable practices, as demonstrated by the STaRR project and by recommendations from ADB and IFAD. (ADB, 2009; IFAD, 2023)

2. Strengthen Farmer Organisations and Factory Shareholding Models
There is a need to support farmer cooperatives and smallholder factory shareholding models that enhance aggregation, quality control, and creditworthiness. Donor grants and technical assistance should focus on institutional strengthening, including governance, accounting, and business planning. This will enable farmers' organisations to access commercial finance and negotiate improved offtake terms. Evidence from STaRR and sector studies highlights the significant multiplier effect that strong farmer groups can have. (IFAD, 2023)

3. Use Contract Farming and Input-Loan Schemes with Safeguards
Private sector input credit and offtake contracts can address the need for timely working capital among smallholders. However, these arrangements must be standardised, with transparent pricing clauses, well-defined dispute-resolution mechanisms, and oversight by SLTB or industry associations to avoid exploitative terms. Donor programs can play a role by piloting standard contract templates and establishing escrow or payment systems to safeguard participants. (IFAD, 2023)

4. Mobilise Value Chain Finance Tied to Quality Premiums
It is essential to encourage buyers to pay structured quality premiums for traceable, higher-quality smallholder tea leaves. Such premium schemes, supported by buyer commitments and certification or traceability systems, can be directly linked to working capital or rehabilitation loans. This allows smallholders to invest with confidence, knowing that downstream buyers will reward quality. SLTB-led branding initiatives can be leveraged to secure these buyer commitments and further incentivise quality improvements. (SLTB, 2022)

5. Institutionalise Multi-Stakeholder Coordination Platforms
Establishing formal, multi-stakeholder platforms that include SLTB, the Tea Small Holdings Development Authority, donors, exporters, banks, and farmer representatives is critical. These platforms should meet regularly to align programs, share diagnostics, and coordinate blended finance arrangements. While donor project steering committees have provided a model for such collaboration, a permanent mechanism would enhance continuity and enable greater scale. (IFAD, 2023)

6. Improve Monitoring, Value for Money, and Sustainability Planning
Both donors and government agencies require robust exit and transition plans as part of project design. These plans should include clear indicators and dedicated budget lines for

government takeover or private contracting of extension services. Additionally, monitoring systems must track not only yields but also incomes, financial inclusion, and gender considerations to ensure comprehensive and sustainable outcomes. Lessons from STaRR supervision have emphasised the importance of these requirements. (IFAD, 2023)

In Summary

Sri Lanka's tea smallholders serve as the backbone of the country's tea economy and play a vital role in sustaining rural livelihoods. Their significance is underscored by the positive outcomes achieved when technical, institutional, and financial support are effectively combined. Despite these successes, achieving systemic and scalable impact remains a challenge. This requires not only continued support but also improved mobilisation of private finance, establishment of durable coordination mechanisms, and strengthening of farmer organisations.

The private sector is essential in the aggregation, marketing, and investment activities that drive the tea value chain. When private capital is combined with concessional finance and reinforced by regulatory safeguards, it has the potential to accelerate the rehabilitation of smallholder tea lands, encourage value addition, and open access to premium markets. Such alignment ensures that investments are both impactful and sustainable, benefiting smallholders and the broader industry.

To move forward, a pragmatic approach is necessary: mainstream blended finance solutions for medium-term rehabilitation, formalise multi-stakeholder coordination platforms, and foster deeper partnerships. These partnerships should link downstream market incentives, such as branding initiatives and quality premiums, to upstream investments made by smallholders. By doing so, Sri Lanka can convert the successes of past pilot projects into widespread and lasting improvements in productivity, incomes, and resilience for its tea smallholding communities.

Strengthening Tea Smallholder Societies in Sri Lanka: Restructuring, Governance & Services

Tea smallholders account for a large and growing share of Sri Lanka's tea production and rural livelihoods. However, they face persistent problems: fragmented landholdings, weak farmer organisations, uneven access to extension and finance, and limited voice in value-chain decision-making. Strengthening smallholder societies requires deliberate restructuring of organisational forms and service delivery, governance reforms to improve accountability and representation, and targeted upgrades to services (extension, input supply, aggregation, finance, quality assurance, and market linkages). The recommendations below are on national policy, statutory frameworks, donor project experience, and sector studies to propose a practical roadmap for inclusive, productivity-led smallholder development.

Background: Why Smallholder Societies Matter

Smallholder tea growers in Sri Lanka own much of the smallholding area and constitute a critical social and economic constituency: they contribute a significant share of production, sustain rural employment, and are central to the "Ceylon Tea" value proposition. The Tea Small Holdings Development Authority (TSHDA) is the statutory body mandated to support these growers under the Tea Small Holdings Development Law, and recent national plantation policy and development projects have emphasised smallholder resilience, value addition and climate-smart practices.

Smallholder tea growers play a pivotal role in Sri Lanka's tea sector. They own a substantial proportion of the tea smallholding land and form a vital part of the country's social and economic fabric. These growers are responsible for producing a significant share of Sri Lanka's total tea output, which not only supports rural employment but also underpins the renowned "Ceylon Tea" brand in international markets.

The Tea Small Holdings Development Authority (TSHDA) serves as the statutory body charged with supporting the interests and development of these smallholder farmers. Established under the Tea Small Holdings Development Law, the TSHDA provides guidance and oversight for the sector. Recent national plantation policies and development initiatives have increasingly prioritised enhancing the resilience of smallholder growers. These efforts focus on promoting value addition and the adoption of climate-smart agricultural practices to ensure the sustainability and competitiveness of Sri Lanka's smallholder tea sector. (TSHDA,2023)

Key Problems to Address

One of the primary challenges facing Sri Lanka's smallholder tea sector is the fragmented nature of farmer organisations (i.e., Tea Smallholdings Development Societies (TSHDSs)) and the weakness of their institutions. While numerous village-level TSHDSs exist, their capacity varies significantly. Most of these organisations focus mainly on providing agricultural inputs, with limited engagement in more strategic areas such as processing, marketing, and finance. This narrow scope of activities undermines smallholders' bargaining power and restricts their ability to invest in quality improvements.

Another significant issue is the limited and uneven extension and technical support available to smallholders. Various studies and institutional reviews have highlighted persistent gaps in training and the poor adoption of recommended agricultural practices. Access to extension services provided by the Tea Small Holdings Development Authority (TSHDA) is often inconsistent, particularly in remote areas, further impeding the dissemination of vital technical knowledge.

Additionally, smallholders face weak linkages to value chains and markets. Frequently, they are compelled to sell green leaves to intermediaries or distant factories. This situation results in minimal value capture for growers and provides little support for initiatives to improve quality or meet certification standards. In response, recent policy efforts have begun to focus on integrating smallholders into value-added, traceable supply chains, aiming to enhance their market opportunities and share of value. (Perera, 2014, ILO, 2018 and SLTB, 2022)

Restructuring: Organisational Models That Work

To mobilise investment and services on a scale, smallholder societies should be restructured around these principles:

- **Federated, multi-service cooperatives.** Transition Tea Smallholding Development Societies into federated cooperatives (or strengthen existing federations) that combine local aggregation with shared services (input procurement, processing hubs, quality labs, and marketing, etc.). Federations increase scale in finance and bargaining while maintaining local control by members.
- **Professionalised processing/aggregation hubs.** Where feasible, TSHDS should operate or co-own small leaf-collection, leaf-transport, and primary-processing hubs (potentially micro-factories or via contract arrangements) to improve quality control and capture a greater share of value. National policy and the strategic plan encourage value addition for smallholders as a resilience strategy (MPI, 2024 & MPCI, 2025).
- **Clear legal & financial umbrellas.** Strengthening legal registration, accounting and governance standards aligned with TSHDA/TSHDA law or other applicable laws (i.e., Cooperative Societies Act No. 05 of 1972, Companies Act No. 07 of 2007, etc.) so societies can borrow, enter contracts, and access grant / co-financing schemes.

Governance reforms: accountability, representation, and transparency

Good governance is essential to prevent elite capture and to ensure that services match member needs:

- **Democratic bylaws & regular audits.** Societies should adopt standard bylaws with term limits, transparent procurement rules and annual external audits. This builds member trust and unlocks institutional finance.
- **Inclusive representation.** Boards must include women, youth and landless labour representatives; quota systems and gender-sensitive outreach increase participation and strengthen social resilience. Sector reviews emphasise the importance of inclusive farmer organisations for sustainable outcomes.
- **Performance-based partnerships with TSHDA and the private sector.** Establish service-level agreements (SLAs) between TSHDS and TSHDA (for extension), Tea Processing Factories, private buyers (for offtake and quality premiums) and third-party auditors for certification. Pilot SLAs have been effective in other agri-sectors to align incentives. (ILO, 2018)

Services: What Must Improve and How

Strengthening services available to tea smallholders is essential to boosting productivity, ensuring sustainability, and enhancing competitiveness in domestic and export markets. Current service provision, mainly by the Tea Small Holdings Development Authority (TSHDA), the Sri Lanka Tea Board (SLTB), and private buyers, is fragmented and reactive. A modernised system should integrate demand-driven extension, quality assurance and certification, access to finance, and market linkages and value addition, ensuring that smallholders can participate equitably in Sri Lanka's high-value tea economy.

1. Modern, Demand-Driven Extension

Current challenges:

Traditional extension in Sri Lanka's tea smallholder sector remains largely supply-driven and uniform, focusing on classroom or group training sessions that often fail to address local agro-ecological diversity or specific farmer needs. According to the ILO's *Future of Work for Tea Smallholders in Sri Lanka* report and TSHDA evaluations, field officers are overstretched (serving up to 1,500 farmers each), resulting in infrequent visits and limited follow-up. As per the TSHDA annual report, 2023, only 120 tea inspectors/extension officers are available nationwide; each officer is responsible for approximately 2,909 farmers, an unrealistic ratio for effective service delivery. (TSHDA, 2023)

Recommended improvements:

- Blended extension model: Combine farmer field schools (FFS) with mobile advisory systems using SMS, WhatsApp, or interactive voice response to deliver timely agronomic tips, weather alerts, and price updates.
- Participatory learning: Implement FFS tailored to micro-climatic zones (e.g., wet vs. dry mid-country), focusing on soil health, pruning, organic inputs, and regenerative intercropping.
- Commercial extension partnerships: Engage tea buyers and factories to co-finance or co-deliver extension services. For instance, factories can train farmers on plucking standards and green-leaf handling as part of supply-chain quality programs.
- Digital data integration: Develop a central smallholder information management system at TSHDA to track farmer performance, extension visits, and training needs.

Expected outcomes:

- Improved productivity (i.e., over 20% yield increase within two years).
- Faster adoption of climate-smart and regenerative practices.
- Enhanced accountability and traceability of advisory services.

2. Quality Assurance & Certification Support

Current challenges:

Smallholder green-leaf quality is highly variable due to inconsistent plucking intervals, poor transport conditions, and lack of on-site quality control. Few societies have access to testing facilities or certification programs (such as Regenagri, Rainforest Alliance or ISO 22000), limiting their ability to earn price premiums for sustainable or traceable teas.

Recommended improvements:

- Shared testing laboratories: Establish district-level mini-labs or mobile quality-testing units jointly managed by federations and SLTB to measure moisture content, leaf maturity, and chemical residues.
- Training in quality standards: Conduct hands-on plucking and leaf-handling workshops, linked to factory supply requirements and international standards.
- Certification facilitation:
    - Support group certification schemes through federations (to reduce per-farmer cost).
    - Promote sustainability and low-carbon tea programs, aligned with SLSI GAP standards for Tea (SLSI,2025) and partnerships such as Solidaridad–TSHDA's

regenerative tea initiative (History of Ceylon Tea, 2025) and Ethical Tea Partnership – MPCI initiative on “National Framework for Sustainable Biomass Growing & Sourcing for the Tea Industry in Sri Lanka” (ETP, 2024)

- Digital traceability: Pilot QR-coded “smallholder origin” systems to link field data, certification, and factory lots. The QR-code system introduced by MPCI for the fertiliser subsidy program in 2025 can serve as the basis for this initiative.

Expected outcomes:

- Uniform green-leaf quality meeting SLTB export standards.
- Access to high-value certified markets (organic, fair trade, low-carbon).
- Strengthened brand equity for “Ceylon Tea” as a sustainable, traceable product.

3. Access to Finance and Risk Management

Current challenges:

Smallholders struggle with liquidity gaps between planting and harvest, a lack of collateral for loans, and high vulnerability to climate shocks (droughts and heavy rain). Many societies lack registration or audited accounts, preventing access to formal credit lines.

Recommended improvements:

- Group collateral systems: Use federation-level guarantee funds or revolving credit facilities backed by TSHDA and local banks.
- Short-term financing: Societies or federations can use the potential leaf supplies as collateral to access short-term credit from Leaf supplying Tea Factories during price troughs.
- Micro-insurance and climate risk tools: Develop affordable insurance for tea yield losses and landslides. (MPCI, 2025)
- Blended finance mechanisms: Combine small grants (for equipment like portable harvesting machines, weighing machines, or collection sheds) with concessional loans from finance institutions or cooperative banks.
- Digital financial inclusion: Promote mobile payment systems for green-leaf transactions to reduce cash handling and ensure transparency.

Expected outcomes:

- Greater financial inclusion (Enhanced capacity of TSHDS with access to credit).
- Reduced distress selling during lean periods.
- Improved capacity to invest in productivity-enhancing technologies.

4. Market Linkages & Value Addition

Current challenges:

Smallholders often sell unprocessed green leaf through intermediaries, capturing minimal value and facing price volatility. Their products are rarely branded or traceable to origin, leaving them vulnerable to market fluctuations.

Recommended improvements:

- Federated marketing hubs: Support federations to aggregate, grade, and sell tea collectively, increasing bargaining power and access to direct buyers. (MPCI, 2025)
- Speciality and single-origin teas: Promote micro-processing units (co-owned by

federations) for speciality teas, white, green, or artisanal blends, under geographic indication (GI) labels such as *Uva Highlands* or *Kandy Valley*. (MPCI, 2025)
- Domestic value chains: Encourage local tea houses, small packers, and tourism-linked branding ("Tea & Culture Trails") to source from smallholders. (MPCI,2025)
- Public-private branding campaigns: Integrate smallholder supply into SLTB's global "Ceylon Tea – Symbol of Quality" campaigns, highlighting traceability and fair prices.
- Export facilitation: Link societies to exporters and e-commerce channels that sell smallholder teas directly to consumers abroad.

Expected outcomes:

- Increased producer share of final retail value.
- Diversified markets and reduced dependence on bulk exports.
- Enhanced domestic employment in packaging, branding, and logistics

Proposal For a Roadmap for a Pilot Project on Strengthening Tea Smallholder Societies in Sri Lanka

Phase 1 — Diagnostic & Mapping

Objective: Identify the pilot project areas and produce a validated, georeferenced map and capacity profile of all tea smallholder societies and key service points so pilots are targeted at the most promising gaps and opportunities.

IFAD SARP mapping and baseline practices can serve as a guideline. (IFAD, 2025)

Key stakeholders:

- Lead: TSHDA (technical lead), Ministry of Plantations and Community Infrastructure (policy oversight) and TRI (R&D).
- Partners: Selected industrial associations/federation leaders, local agronomists, Local Tea Factories, district-level extension services, and NGOs

Core activities:

- Planning & methodology
    - Establish a Diagnostics Steering Group.
    - Agree on the mapping scope, templates, data protection rules and procurement
- Data collection
    - Compile existing datasets: national plantation registry, IFAD SARP baseline reports, TSHDA farmer lists, national census, tea factory locations, and market nodes. (IFAD, 2024)
    - Field surveys: conduct a short household & society questionnaire for a representative sample (or complete census where possible). Collect GPS points of societies, collection centres, micro-processing units, local roads and water sources.
    - Governance snapshot: checklist on registration status, bylaws, board composition, audit history, and financial records.
    - Service-gap inventory: present extension frequency, access to inputs/credit, proximity to processing, current buyer relationships.
- Analysis & validation
    - Clean and analyse data; produce geospatial maps.
    - Validate results via stakeholder validation workshops (a few district-level workshops and a national-level workshop).
- Deliverables
    - Tea Smallholder Development Societies Maps for identified pilots (preferably a GIS

file + PDF atlas).
    - Society Capacity Profiles.
    - Diagnostics report with recommended priority interventions and M&E baseline indicators.

Proposed minimum outputs & templates:

- Household & Society questionnaire template (inputs, yields, income sources, labour, extension contacts).
- Governance checklist (registration, minutes, bank account, audited accounts, gender representation).
- GIS layers: society point, collection hubs, factory hubs, road access, flood/slope risk.
- Baseline KPI sheet (productivity, green leaf price received, % of certified farmers, % with access to credit, governance score).

Key indicators (baseline to collect):

- Number of societies (formal) and membership count.
- Average yield per ha (kg green leaf/ha/year).
- % of societies with audited accounts/functioning boards.
- Distance to nearest aggregation/processing tea factory.
- % households with a formal buyer contract.

Potential Risks & Mitigation Actions:

- Incomplete records / duplicate lists: mitigate with triangulation (TSHDA records + federation lists + field verification).
- Low survey response: engage TSHDS leaders as enumerator supervisors and offer small participation incentives (mobile top-up).
- Data protection: sign consent forms; anonymise household identifiers in shared datasets.

Phase 2 — Pilot Federations & Service Level Agreements (SLAs)

Objective: Test and refine federated, multi-service models and Service-Level Agreements (SLAs) that link federations, TSHDA extension, private buyers and finance providers; measure changes in productivity, prices, inclusion and governance.

Selection & design:

- Selects & prioritises several TSHDS for pilots, using diagnostic scoring (e.g., governance readiness, geographic representation, value-chain potential), ensuring diversity (Agro-ecological zones; high/low yield zones; varying sizes, etc.).
- Co-design pilots with each TSHDS: define scope (aggregation, micro-processing, QA and buyer link, etc.), financing model, governance strengthening plan, and SLAs.

The proposed SLA design may include the following elements:

- Parties & duration: federation, TSHDA (or contracted extension provider), buyer(s), finance partner. Typical pilot SLA lengths are 12–24 months, with renewal clauses.
- Service commitments: extension visits per season, supplier quality specs (plucking standards), aggregation schedules, and traceability data to be shared.
- Finance terms: pre-harvest finance, warehouse receipt or group collateral arrangements,

and interest subsidies if provided by the project.
- Performance & incentives: price premiums for quality/certified lots, penalties for missed deliveries (force majeure clauses included).
- M&E & reporting: monthly collection reports, quarterly governance scorecard, bi-annual audit.
- Grievance & dispute resolution: local arbitration committee with neutral chairperson.

Core pilot activities:

- Training of boards on governance strengthening, introducing standard bylaws, setting up transparent accounting and procurement, and annual external audit. ILO guidance highlights the need for gender inclusion and for decent work considerations. (ILO,2018)
- Service rollout: establish aggregation points or co-investments (i.e. leaf handling, collection and transport, etc.), deliver blended extension (farmer field schools + digital advisory), set up QA protocols and simple traceability systems (paper or low-cost digital).
- Finance & market linkages: broker buyer offtake agreements (Tea Factories, tea brokers / direct packers, exporters), trial group collateral financing with local banks or microfinance (use IFAD co-financing rules where applicable). Use SARP lessons on blended finance channels. (IFAD, 2025)
- Monitoring & adaptive management: measure KPIs monthly/quarterly; run a midline evaluation to adapt design.
- Upgrade TSHDS to proper enterprises: Transform successful pilot TSHDS into “Tea Village Co-operative Societies” registered under the Department of Co-operative Development or into private companies registered under the Registrar of Companies. (MPCI, 2025)

Intended pilot outputs may include:

- Proper operational SLAs in each pilot TSHDS.
- At least 50% of pilot societies use a shared service.
- Predetermined increase in premium-quality leaf delivered to factories/buyers (target for pilots needs to be adjusted after baseline).
- Adopt appropriate governance reform package tested (new bylaws, external audit and gender quota, etc.).
- Suggestions for Monitoring & evaluation (M&E) framework
- Productivity: kg green leaf/ha (baseline → midline → endline).
- Quality assurance: % of good leaf supplied (baseline → midline → endline).
- Price: average price received (LKR/kg) and % receiving premium.
- Inclusion: % women members on boards; % youth in leadership.
- Finance uptake: No. of societies with access to group loans, the loan repayment rate.
- Decent work: % casual workers with access to statutory benefits

Potential Risks & Mitigation Actions:

- Buyer default or market collapse: include multiple offtake partners and short-term buffer financing.
- Poor governance / elite capture: enforce transparency clauses, audits, and grievance mechanisms; link finance disbursement to governance compliance.
- Operational skills gap: fund technical assistance and attach a professional lead from TSHDA to federations during pilots.

Phase 3 — Scale & Policy Alignment

Objective: Institutionalise successful pilot approaches across the sector via policy instruments, revised by laws/templates, and incentive schemes embedded in the National Plantation Policy (2024) and National Strategic Plan (2026-2030) for the Tea Industry. (MPI, 2024 & MPCI, 2025)

Policy & institutional actions

- Synthesise pilot evidence: produce a concise policy brief and implementation toolkit including model bylaws, SLA template, standard governance checklist, and M&E indicators.
- Stakeholder policy workshop: present pilots to the MPCI, TSHDA Board, SLTB, TRI, Department of Cooperative Development, buyers and banks; agree on recommended national actions.
- Update legal/administrative guidance: revise TSHDA operational guidelines to permit federations to access grants/credit and to recognise federated aggregation hubs as eligible for co-financing.
- Transform TSHDS to "Tea Village Cooperative Societies" registered under the Department of Co-operative Development or Private Companies registered under the Registrar of Companies, Sri Lanka. (MPCI, 2025)

Incentives & financing:

- Create targeted incentive packages: value-add grants for micro-processing, certification subsidies for sustainability/traceability schemes, blended finance windows for group collateral. Link these to measurable governance standards (e.g., audited accounts). IFAD SARP experience suggests blending loans and grants with strong results frameworks. (IFAD, 2025)
- Scale extension models: roll out the blended extension (farmer field schools, mobile advisory, commercial extension on cost-sharing) via TSHDA and private partners.

Scale-up rollout:

- Phased scaling: expand to additional TSHDS in tranches with continuous learning loops.
- National certification & market development: support federations to get sustainability/traceability certifications and link to national "Ceylon Tea" branding campaigns (SLSI, 2025, MPCI, 2025)

Policy deliverables & indicators:

- National toolkit (model bylaws, SLA template, governance manual).
- Ministry circular aligning financing windows to federation standards.
- Ministry circular guiding criteria for Public, Private, and People Participatory initiatives.
- Increase in % of smallholder societies participating in federations and receiving structured extension.
- Measurable improvement in national smallholder yields and share of value-added tea from smallholders.

Potential Risks & Mitigation Actions:

- Policy inertia: use pilot evidence (i.e., quantitative impact & success stories) and build political buy-in via high-level workshops.
- Fiscal constraints: phase incentives and prioritise catalytic grants that unlock private finance. Leverage donor co-financing where possible.

- Elite capture and governance failure: Require transparent procurement, external audits and community grievance mechanisms.
- Market volatility: Encourage contract farming and value diversification (domestic packaged tea, speciality markets).
- Climate shocks: Prioritise regenerative practices, shade trees and micro-insurance supported by donor programs.

In Summary

Strengthening Sri Lanka's tea smallholder societies is both a development imperative and an opportunity to secure higher-quality, more traceable, and climate-resilient "Ceylon Tea." The path forward requires organisational restructuring toward federated, multi-service bodies; governance reforms, inclusion and transparency; and upgraded services (extension, finance, QA and market linkages). By aligning TSHDA's statutory mandate, national plantation policy and donor investments, Sri Lanka can transform smallholder tea into a resilient, value-adding sector that benefits producers and the nation alike.

Public–Private Partnership Models for Extension & Inclusive Finance for Tea Smallholders in Sri Lanka

Tea smallholders are a cornerstone of Sri Lanka's tea industry: they produce a substantial share of national output, but many face low productivity, ageing bushes, limited access to technical advice, and constrained access to finance for replanting, inputs and recovery after shocks. Public–Private Partnership (PPP) models that combine targeted extension services with tailored financial products can help bridge technical and capital gaps while promoting inclusive, resilient livelihoods for smallholders. Empirical studies from Sri Lanka identify several PPP "value-chain" extension models, namely;

- Tea-Factory-Based (FBM),
- Input-Supplier-Based (ISBM)
- Development-Agency-Based (DABM)

That has been piloted and assessed for effectiveness. (Amarathunga & Jayasinghe, 2024)

Tea smallholdings in Sri Lanka are typically small plots served by multiple institutions: the Tea Small Holdings Development Authority (TSHDA), the Tea Board, the Tea Research Institute, private factories and input suppliers, exporters, and donor projects (e.g., IFAD). TSHDA and the Tea Inspectorate historically provided free extensions. Still, resource constraints limit coverage, creating both a need and an opportunity for PPP approaches that leverage private-sector capacity and value-chain incentives. (ILO, 2018)

PPP Extension Models in Practice

Academic and field studies identify three main PPP extension models operating in Sri Lanka's smallholder tea sector:

1. **Factory-Based Model (FBM)**: private tea factories (or factory management) partner with smallholders who supply green leaf. Factories provide extension advice, inputs, and sometimes credit or input-on-credit because improved quality/yield benefits both the farmer and the factory. Evaluations show that FBM often achieves higher satisfaction, closer technical support, and better practice adoption due to strong market incentives. (Amarathunga & Jayasinghe, 2024)
2. **Input-Supplier-Based Model (ISBM):** commercial input suppliers (fertiliser, agrochemicals, planting material) deliver extension bundled with sales, demonstrations,

and sometimes financing for inputs. This model can scale quickly but risks biased advice (toward supplier products) unless quality standards and independent technical oversight are present. (Amarathunga & Jayasinghe, 2024)

3. **Development-Agency-Based Model (DABM):** NGOs, donor projects or development agencies coordinate extension, group formation, and linkages to finance and markets. These interventions often emphasise training, group-level investments (e.g., replanting), and concessional financing or grant support. DABM can be effective at reaching the most vulnerable, but may struggle to sustain itself once donor funding ends. (AESA, 2019),

Comparative appraisals find that FBM tends to deliver higher satisfaction and more regular technical interaction, while ISBM and DABM have strengths in input access and social organisation, respectively. Successful PPPs typically share features: clear roles and incentives, resource-sharing, trust between partners, regular technical communication, and mechanisms to protect smallholders from exploitative finance or low-quality products. (Amarathunga & Jayasinghe, 2024)

Inclusive Finance Instruments for Tea Smallholders

Inclusive finance for smallholders is not one-size-fits-all. Key instruments adapted to the tea context in Sri Lanka include:

- **Value-chain linked credit** (factory or buyer-backed loans and input credit): loan terms linked to harvest cycles, repayable from green-leaf payments, reduce default risk for lenders and facilitate input uptake. FBM PPPs commonly use this approach. (Amarathunga & Jayasinghe, 2024)
- **Microfinance and MNGOs**: Regulated microfinance providers and microfinance NGOs (MNGOs) can supply small loans for working capital or household needs. The Microfinance Act and registration/oversight frameworks in Sri Lanka aim to improve reliability and consumer protection for borrowers. (Dharmawardhana et al., 2019)
- **Revolving funds & targeted schemes**: Pilot schemes and project reports describe revolving microfinance structures and tailored funds for replanting and infilling, often co-funded by government, factories, and donors (e.g., IFAD projects). Results suggest improved access when funds are linked to technical support and monitored for appropriate use. (Dissanayake et al, 2010)
- **Government rural financing programs and grants**: Government-backed rural finance windows and grants (sometimes extended or supported by donors) have been used for estate rehabilitation and smallholder support, important during crisis periods but requiring strong targeting and management to avoid leakage. (IFAD, 2024)

Challenges for inclusive finance include affordability, collateral constraints, irregular incomes, and the proliferation of unregulated lenders in some areas. Strengthening consumer protection, aligning repayment schedules with crop cash flows, and integrating savings mechanisms help manage these risks (Dharmawardhana et al., 2019).

Designing Integrated PPP Models (Extension + Finance)

An effective PPP model that integrates extension and inclusive finance for tea smallholders should combine the following elements:

1. **Market-aligned incentives** — link extension and finance to a buyer (factory/exporter) that benefits from improved leaf quality, so private partners internalise returns on technical support. (Factory-based PPPs are a proven pathway.) (Jayasinghe et al, 2020)
2. **Bundled technical + financial products** — offer packages where technical support (pruning, fertiliser regimes, pest management, replants) is provided alongside a tailored finance product (input credit, replant loans, flexible repayment tied to green-leaf

payments). Bundling raises adoption and reduces misuse of funds. (Dissanayake et al, 2010)

3. **Transparent governance & roles** — formal agreements clarifying contributions (who supplies seedling nurseries, who finances, who monitors outcomes), performance indicators, dispute mechanisms and consumer safeguards to avoid conflicts of interest (e.g., supplier bias). Independent oversight, such as TSHDA, Tea Board or third-party M&E, adds credibility.
4. **Group-based approaches** — farmer groups, producer organisations or societies enable economies of scale for training, bulk input purchase, collateral aggregation (group guarantees) and easier loan delivery. Many development agency-based model (DABM) interventions emphasise group formation for these reasons. (ILO, 2018)
5. **Digital payments and records** — adopting bank or mobile payments for green-leaf transactions and loan/service flows improves transparency, speeds up repayment collection, and opens credit histories for smallholders (helpful for microfinance inclusion). The Central Bank and recent financial technology (fintech) activity in Sri Lanka point to expanding non-bank channels that can be harnessed for this purpose. (CBSL, 2020)

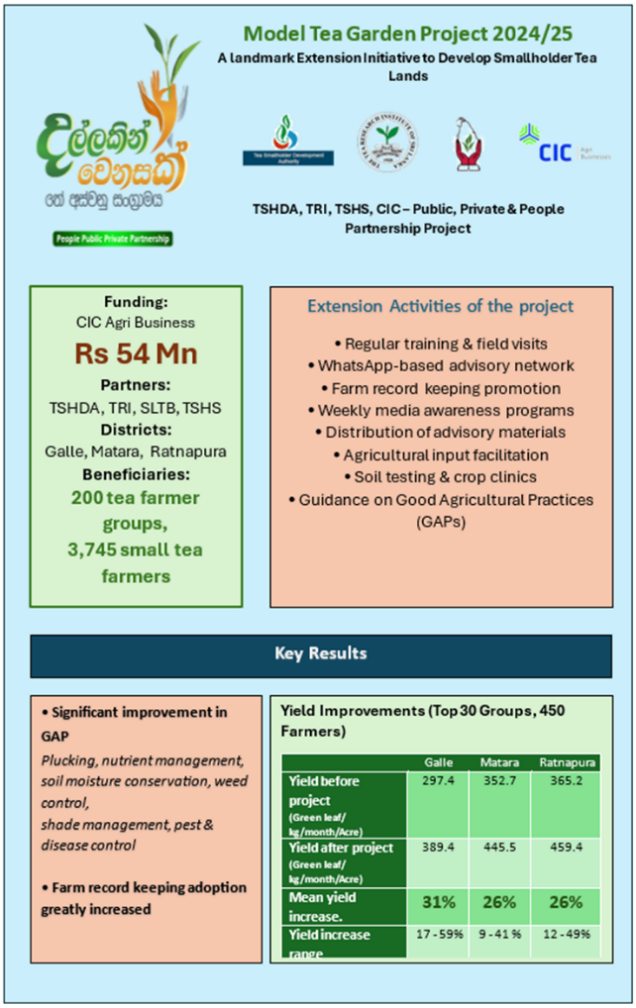


Figure 1: "Dallakin Wenasak" Project

6. **Targeted subsidies & blended finance** — concessional first-loss funding from government or donors (i.e., IFAD, development partners) can de-risk private capital for replanting and long-term investments while requiring co-investment and measurable results. Examples include rural financing projects extended to tea smallholders (LNW, 2022).

Evidence Of Impact and Lessons Learned

Evaluations of PPP extension models in Sri Lanka report improved adoption of recommended practices, higher farmer satisfaction under Factory-Based Models (FBM), and tangible productivity improvements when extension is regular and linked to finance and market incentives. However, sustainability requires continued private-sector buy-in, clear returns for factories/buyers, and regulations to ensure fair financing terms. Studies also highlight the importance of monitoring, capacity building for extension agents, and protecting smallholders from predatory credit. (Amarathunga, 2024)

The recent PPP initiative between TSHDA (Public sector), CIC Agri Business (Private sector), and Tea Smallholding Development Societies (People participation) is a promising success story. The project "*Dallaking Wenasak*", implemented in Galle, Matara, and Ratnapura districts, has provided extensive extension services and generated significant, promising crop improvements, encompassing 3,745 farmers in 200 farmer groups. (CIC, 2024 & CIC, 2025)

In this PPP initiative, CIC Agri Business has invested over LKR 50 million, providing an example for ISBM initiatives. (Daily News, 2024)

Policy And Operational Recommendations

Based on literature and practice, the following can be recommended:

1. **Scale factory-linked PPPs with safeguards**: Encourage more Factory-Based Models (FBM) embedded with consumer protection clauses (interest-rate caps, transparent fees), independent technical validation, and contracts that ensure smallholder bargaining power. (Jayasinghe et al, 2020)
2. **Promote bundled finance + extension pilots**: Use blended finance (donor/government first-loss) to pilot replanting loans and seasonal input credit combined with intensive extension; monitor uptake and ROI before scaling. (Dissanayake et al, 2010)
3. **Strengthen Microfinance Institution (MFI) regulation and linkages**: Continue to implement microfinance regulations that protect borrowers while enabling MFIs to lend productively to smallholders; encourage MFIs to partner with extension providers. (Dharmawardhana et al., 2019)
4. **Support farmer groups and digitalisation: Invest in producer organisations** and digital payment/record systems that reduce transaction costs, create credit histories, and improve transparency across the value chain. (ILO, 2018)
5. **Institutional capacity and Monitoring & Evaluation (M&E)**: Strengthen TSHDA/Tea Board capacities to act as impartial technical validators and to monitor PPPs, ensuring quality of extension content and fairness in finance arrangements. Use independent evaluations before and after scaling.

In Summary

Tea smallholders in Sri Lanka can significantly benefit from PPP models that integrate high-quality extension with inclusive, well-designed finance. Factory-based PPPs show strong potential when properly regulated and paired with bundled finance and group mechanisms. Successful scale-up depends on aligning incentives across the value chain, protecting smallholder interests, and using blended finance and digital tools to reduce risk and cost. Policymakers and practitioners should prioritise pilot investments with rigorous monitoring, scale what works, and maintain institutional oversight to ensure long-term, inclusive impacts.

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9. Gender Inclusion and Youth Retention among Smallholders

By J Natasha Gooneratne

Abstract

Gender equality and youth participation are critical to ensuring the long-term sustainability of Sri Lanka's tea smallholding sector. This paper examines the roles of women and young people in tea production and identifies barriers limiting their participation in decision-making, leadership, and entrepreneurship. Women play a vital role in labour and household management but often face limited access to training, finance, and land ownership. Similarly, many rural youth are leaving the agricultural sector due to limited economic opportunities and low social recognition of farm work. The paper explores strategies to promote gender-inclusive development and youth engagement through targeted training, improved access to finance, leadership opportunities, and digital innovation. Strengthening the participation of women and youth is essential for sustaining the future workforce of the tea sector.

Keywords: Gender inclusion, Youth engagement, Women in agriculture, Rural employment, Smallholder livelihoods, Agricultural workforce

Gender-Responsive Inclusion & Women's Economic Empowerment

Introduction

Women contribute significantly to the productivity and continuity of Sri Lanka's tea smallholding sector, taking on a wide range of responsibilities, including tea plucking, weeding, and managing household and home garden tasks, with some studies noting female labour remains the dominant source of field-level manpower in tea plantations (Rathnayake & Navaratne, 2019). However, their roles often remain informal, with limited participation in decision-making processes at both household and institutional levels (United Nations in Sri Lanka, 2021). Traditional gender roles continue to shape the distribution of responsibilities, with fewer women represented in field supervision, technical operations, and leadership positions within the sector (Finlays, 2020). Working conditions for women can also present challenges, particularly in terms of access to sanitation, maternity support, and childcare facilities, especially in remote or resource-constrained settings where infrastructure and welfare services are minimal (Keerthichandra, 2025). While efforts toward wage parity have been made, variations in earnings and in the distribution of workloads persist, and women's contributions, particularly in quality-related tasks, may not always be fully captured in pricing or recognition mechanisms (Keerthichandra, 2025). In addition, awareness of available support systems, such as legal rights, financial services, or certification programmes, remains limited for many women, which can affect their ability to engage with and benefit from broader institutional resources (The Centre for Child Rights and Business, 2024). These observations highlight areas where targeted support and inclusive programming could further enhance the resilience and equity of the smallholder tea sector.

Root Causes

The underrepresentation of women in leadership and decision-making roles within Sri Lanka's smallholder tea sector is driven by a confluence of structural, institutional, and socio-cultural barriers. Deep-rooted cultural norms continue to shape gender roles both within households and the wider community, dictating the types of labour considered appropriate for women. These expectations often confine women to tasks perceived as low-skilled or "supportive" in

nature, such as tea plucking and weeding, while discouraging or excluding them from supervisory roles or responsibilities that require mobility, public engagement, or access to institutional platforms (Finlays, 2020; United Nations in Sri Lanka, 2021). Institutional frameworks, while occasionally progressive on paper, frequently fail to translate into meaningful practice. Although policies exist around equal pay, maternity rights, and safe workplace environments, their implementation is often inconsistent, particularly among smallholder operations with limited administrative capacity. Many estate managers and tea society leaders lack formal training in gender-responsive management practices, contributing to an environment in which such policies are under-enforced or poorly understood.

A synthesis of previous research (Rathnayake & Navaratne, 2019) indicates that access to critical resources, including land ownership, credit, and agricultural extension services, remains uneven. Structural constraints, such as the absence of formal land titles for women, limited access to banking and collateral mechanisms, and male-dominated extension and training programmes, hinder women's ability to scale their participation beyond subsistence-level activities. The design of many agricultural interventions is often tailored to the schedules and mobility of male participants, inadvertently excluding women whose domestic responsibilities restrict time and travel flexibility. Another key limitation is the scarcity of female role models in the sector. The lack of visible women in technical, managerial, or entrepreneurial positions reinforces the perception that such roles are inaccessible or inappropriate for women. This not only narrows the ambitions of young women entering the sector but also limits the availability of peer mentorship and support systems that could help them navigate existing barriers.

Opportunities and Best Practice Examples

While challenges persist, several innovative interventions and partnerships offer tangible pathways toward improving gender inclusion in the tea smallholder sector. Initiatives led by civil society, development agencies, and private sector actors have demonstrated the effectiveness of targeted, gender-sensitive programming in changing norms and expanding opportunities.

One such initiative is the collaborative programme between Rainforest Alliance, Unilever, and The Centre for Child Rights and Business at Agarapatana Plantations, which developed a cadre of "gender champions" trained in advocacy, grievance redressal, and gender sensitivity. These champions have played a critical role in creating more inclusive workplace cultures, with documented improvements in employee confidence, awareness of rights, and participation in institutional processes.

Similarly, sustainable land management training provided to women in areas such as Pambadeniya has shown measurable success. Through programmes such as the Rural Development and Agricultural Livelihood Project (RDALP), women were equipped with knowledge of soil conservation, organic farming, and intercropping techniques. These interventions not only improved agricultural outcomes but also diversified household income streams and enhanced climate resilience, particularly for families operating home gardens (United Nations in Sri Lanka, 2021). Increasingly, estate companies such as Finlays and Browns Plantations (Finlays, 2020) have begun proactively recruiting women into supervisory and technical roles, thereby challenging entrenched gender hierarchies and expanding professional pathways. Through structured training programmes and the deliberate promotion of female staff, these companies are expanding the career trajectories available to women while also shifting workplace perceptions regarding women's leadership capacity

Certification and compliance mechanisms have also proven to be powerful levers for gender inclusion. Programmes such as the "Mother and Child Friendly Seal" not only incentivise estate and factory management to improve working conditions for women but also foster a culture of accountability and transparency. These efforts often extend beyond compliance,

incorporating initiatives such as on-site childcare, grievance mechanisms, and improved sanitation facilities that are particularly beneficial to female workers and their families (The Centre for Child Rights and Business, 2024).

Strategic Actions to Advance Gender Inclusion in Smallholder Resilience

To institutionalise gender inclusion and strengthen the resilience of Sri Lanka's tea smallholder sector, strategic action must be grounded in systemic thinking and long-term commitment. Interventions should address both immediate constraints and the underlying structures that perpetuate gender inequity. Training, extension services, and financial programmes must be deliberately restructured to accommodate the daily realities of women's lives. This includes offering flexible schedules, decentralising programme delivery to community-level venues, and integrating support systems such as on-site childcare. Such adjustments not only increase women's participation but also enhance the overall efficacy of these interventions (Keerthichandra, 2025).

Efforts to formalise women's leadership within the sector are equally critical. Platforms such as tea societies, cooperatives, and plantation advisory committees must ensure meaningful female representation, supported by mentorship opportunities and the public visibility of women in leadership roles. These structures can play a central role in shifting norms, building networks, and amplifying women's voices in policy and planning decisions.

Strengthening the labour rights infrastructure is another priority. This includes ensuring the availability of clean, safe sanitation facilities, maternity protections, grievance redressal channels, and policies that actively support women during pregnancy and early childcare years. Such measures are not merely welfare concerns; they directly impact productivity, retention, and worker satisfaction, particularly among women in field roles. Robust monitoring and accountability mechanisms are needed to track gender equity outcomes across the sector. Collecting data on wage gaps, role distribution, participation rates, and access to training or finance can provide a clearer picture of where gaps persist and where progress is being made. Integrating gender metrics into broader sustainability and performance assessments will help ensure that inclusion becomes an embedded part of how resilience is measured and pursued.

Finally, digital tools offer an underutilised opportunity to expand awareness, foster peer learning, and democratize access to critical information. Social media platforms, mobile applications, and SMS-based outreach can be used to share success stories, broadcast training opportunities, and provide guidance on legal rights, financial services, and certification programmes. These technologies can help bridge geographic and social divides, especially in remote or marginalised communities.

Reflections and Insights

Inclusion of gender equity is not only a moral imperative but also a pragmatic strategy for resilience. When women are empowered with knowledge, resources, and decision-making power, productivity increases, family incomes stabilise, and smallholder tea systems become more adaptable to climate stressors. However, interventions must guard against unintended burdens, such as increased workload without support, and ensure that gains in equality are institutionalised rather than dependent on individual champions. A systems-oriented approach is required—one that integrates gender into governance, extension, financial access, and market systems simultaneously.

Youth Engagement & Retention (Solution pathways)

Introduction

During discussions and workshops with stakeholders, it was consistently noted that sustaining youth participation in Sri Lanka's tea sector was essential to its resilience, innovation, and continuity. However, many young people viewed tea cultivation and estate labour as unattractive, low in social value, and offering limited prospects. It was noted that education on tea cultivation integrated into the agriculture component of school curricula could introduce students to the industry early, fostering interest through coordinated involvement of the TRI, TSHDA, smallholders, and parents (Nucleus Foundation, 2025).

Concerns persist if the trend of youth non-involvement in the sector threatens the stability of cross-cutting areas through labour losses, erosion of local knowledge, reduced generational renewal, and weakened capacity for adaptation. To reverse this, strategic interventions are needed that respond to the lived realities, aspirations, and constraints of youth. This section examines root causes, policy and practice efforts, and recommended strategies, one of which involves social media campaigns to mobilise youth, which will be further detailed in section 6.5 of this chapter.

Root Causes

Multiple structural, economic, socio-cultural, and perceptual impediments discourage youth from either entering or remaining in the tea sector.

i. Job dissatisfaction, low social recognition, and poor working conditions

A study of 106 young plantation workers at Spring Valley Estate found that 78 % of the youth expressed job dissatisfaction. Key grievances included low wages relative to alternatives, weak residential and social infrastructure, extended working hours without sufficient overtime, and a lack of professional development opportunities. Such internal job factors were strongly correlated with intent to leave plantation roles (Akalanka & Mayoshi, 2025).

ii. Weak Career Progression and Limited Role Diversity

Youth often perceive plantation roles as confined to labour (e.g., plucking, weeding), with little scope for advancement into supervisory, technical, or entrepreneurial roles. Some studies (Akalanka & Mayoshi, 2025) have shown that young people involved in plantation jobs report dissatisfaction with the lack of promotion pathways and weak managerial support structures, which undermines long-term retention.

iii. Infrastructure, Services, and Lifestyle Disincentives

Stakeholders note that such deficits ultimately contribute to youth dissatisfaction and labour losses, as younger generations prefer more attractive non-estate employment and job titles. (Wickramasinghe, 2023). Furthermore, some estates in rural smallholder areas lack adequate housing, sanitation, health services, transportation, or social amenities. Youth are susceptible to quality-of-life factors, and such deficits can drive migration to urban centres.

iv. Disconnect between education and sector needs

Stakeholders further noted (Nucleus Foundation, 2025) that there was a need to engage youth in the sector at a very young age, including at the school level. School-level debates were suggested as a means to foster awareness and participation in the sector.

v. Sector reputation, cultural narratives, and generational change

Tea sector work is often viewed as traditional, low-prestige, and physically demanding. As youth aspire to modern, technology-enabled careers, the tea sector can seem unattractive

and old-fashioned. Stakeholders, including the TSHDA, note that this gap can be addressed through targeted social media campaigns.

vi. Smallholder Agribusiness Partnerships Programme (SAPP)

SAPP offers concessional loans to youth (e.g. Rs. 1–2 million at 6.5 % interest) to engage in agribusiness, together with technical support, training, and market linkages. While not specific to tea, it demonstrates a model for youth-targeted agricultural financing (Ministry of Agriculture, 2023).

vii. Youth statewide events and networking

The First Sri Lanka Young Farmers Camp and Agrilympics (YFCA) brought together 120 youth participants in 2025 for knowledge exchange, innovation contests, and exposure to sustainable agriculture themes (Asian Farmers Association, 2025). While not tea-specific, such platforms can nurture the next generation of agri-entrepreneurs and build networks.

viii. Sustainability & youth training via certification partners

The Rainforest Alliance has trained about 200 youth in estate landscapes to act as biodiversity and sustainability champions, integrating youth into environmental management roles (Wickramasinghe, 2023). Such programs help youth build skills beyond traditional tea production and may provide diversification that, over time, helps address skill fatigue.

Recommendations

To meaningfully engage and retain youth in the sector, interventions may need to be tailored, integrated, and responsive. Below are recommended strategies:

Enhance job quality, career pathways, and recognition

- Implement multi-tiered roles for youth: begin as field operators but with clear criteria and pathways toward supervisory, technical, quality assurance, or agribusiness roles.
- Introduce merit-based incentives, performance bonuses, or profit-sharing for youth taking on quality, innovation, or team leadership tasks.
- Recognise and showcase youth achievements in estates (e.g. “youth innovation awards”) to shift social perception.
- Improve and bring to focus any living infrastructure, health, sanitation, and transport in estates and smallholder communities that make rural work more livable.

Youth-centric training and skills development

- Develop modular training explicitly geared to tea: modern agronomy, climate adaptation, precision agriculture, post-harvest quality, processing, value addition, digital agritech, and business skills.
- Partner with institutions such as the National Institute for Plantation Management (NIPM) to deliver youth-friendly extension modules, supported by Rainforest Alliance–NIPM partnerships.
- Integration of soft skills: leadership, entrepreneurship, financial literacy, digital marketing, and networking.

Innovation incubators and demonstration hubs

- Embed tea-oriented demonstration hubs within Youth Agripreneurship Villages (LNW Lanka News Web, 2024) that test new planting, pruning, pest management, mechanised harvesting, sensor systems, climate-resilient varietals, intercropping, etc.
- Invite private sector partners, startups, and universities to co-locate labs, satellite offices, or support services in these hubs.
- Enable youth to use hubs as a “sandbox” for experimentation and pilot entrepreneurship.

Social media campaigns and youth mobilisation (detailed in 5.5)

Well-designed social media and digital campaigns can help shift perceptions, reach aspirational cohorts, and communicate opportunity. These campaigns can highlight youth success stories, innovation, social impact, and career pathways in the tea industry.

Strengthen institutional frameworks, youth policy integration and data systems

- Establish youth quotas or representation in tea societies, cooperatives, plantation advisory boards, and policy forums to amplify youth voices.
- Incorporate youth retention indicators (turnover, satisfaction, career progression) into monitoring systems for estates, smallholder associations, certification bodies, and development projects, aligned with the ILO's decent work mapping for tea smallholders (ILO, 2018).
- Simplify administrative and procurement barriers for youth: reduce collateral requirements, streamline licensing, certification, registration procedures.
- Promote public–private partnerships (government, donor, private sector, NGOs) to co-finance youth retention programs.

Reflections and Outlook

Youth engagement in the tea sector is not simply a matter of numbers; it is central to unlocking innovation, ensuring generational continuity, and strengthening adaptive capacity. Investments in youth bring returns in productivity, value addition, climate resilience, and social cohesion. However, such interventions must be holistic, sensitive to local contexts, gender inclusive, and sustainable.

In particular, care must be taken that increased youth productivity does not inadvertently increase the burden or exacerbate inequities. For example, youth programming should be gender aware, ensuring that young women have equal access and that migrating youth are supported to return or engage in local enterprise.

Finally, leveraging social media, digital tools, and youth networks is a strategic imperative. As youth increasingly access online platforms for education, social connection, and entrepreneurship, the tea sector must and can meet them where they are. 5.5 of this chapter deals with the social media aspects of this discourse.

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10. Behaviour-Change Communication & Social Media for Smallholder Engagement

By J. Natasha Gooneratne

Abstract

Effective communication strategies play a critical role in promoting the adoption of improved agricultural practices among tea smallholders. This paper explores the potential of behaviour-change communication and digital platforms to influence farmer knowledge, attitudes, and decision-making. Traditional extension systems are increasingly complemented by digital communication tools such as social media platforms, mobile messaging, and interactive voice response systems. These tools enable faster dissemination of information and foster peer learning among farmers. The paper highlights evidence from global development initiatives demonstrating how participatory media, localized video content, and mobile-based advisory services can improve adoption of climate-resilient agricultural practices. Integrating digital communication with conventional extension approaches can strengthen farmer engagement and accelerate sustainable transformation in the tea sector.

Keywords: Behaviour-change communication, Social media outreach, Agricultural communication, Digital extension, Farmer engagement, Climate-resilient practices

Background

Agriculture remains deeply dependent on regional climate conditions, particularly in developing countries that often bear the brunt of global climate change. In such contexts, medium and smallholder farmers, and in the framework of this study, small and medium tea estate owners, are especially vulnerable to shifting weather patterns. Their reliance on natural resources, coupled with limited access to social protection systems, leaves them highly exposed to the impacts of climate change. Building climate resilience is therefore critical to enabling these stakeholders to adapt and sustain production under such conditions. While agricultural responses to climate change encompass both adaptation and mitigation, this chapter focuses on strategies that assist in a) communicating climate resilient products, methods and practices and b) encouraging behavioural changes to consume the communication referred to in a).

The rapid expansion of mobile phone access presents a powerful opportunity to address these challenges. Mobile network operators (MNOs) are increasingly positioned to develop and deliver services that strengthen farmers' resilience to climate risks. The widespread use of agricultural value-added services (Agri VAS) in rural areas has already made weather forecasts more accessible, often via simple SMS messaging. Moreover, growing mobile connectivity enables MNOs to leverage their assets to produce more relevant climate resilience products. These can include hyperlocal services informed by user location data, as well as weather observations gathered through connected devices. There is also a growing body of evidence suggesting that integrating social media into outreach increases climate resilience and builds a sustainable, expanding pool of climate-resilience knowledge that farmers can both use and contribute to.

By integrating mobile-enabled solutions and social media campaigns, there is significant potential to close information gaps, empower farmers with timely and actionable insights, and ultimately safeguard livelihoods in the face of accelerating climate change. Through

assessment of similar projects, social and digital media, when combined with participatory content production, appear to measurably increase farmer knowledge, promote adoption of climate-resilient practices, and strengthen community resilience. Evidence from rigorous pilots and program reviews from global projects shows that short, local-language videos, WhatsApp groups, SMS/IVR and blended digital-human facilitation are particularly effective for smallholders. This chapter briefly synthesises the most relevant findings and translates them into practical guidance for a social media component aimed at small- and medium-sized tea estate owners in Sri Lanka.

Evidence from Past Studies

When viewed collectively, evidence from past studies/projects points to a clear set of strategies that could be highly effective for small and medium tea estate owners in Sri Lanka seeking to adapt to climate change. Evidence from other Global South contexts demonstrates that localised, farmer-led content (especially in visual formats), can increase both comprehension and adoption of climate-smart practices. Notably, mobile-based delivery channels such as SMS, IVR, and WhatsApp have offered scalable ways to provide timely, targeted advice while also linking growers to financial tools and markets that reduce economic risk during transition periods. Interactive Voice Response (IVR) is an automated phone system that plays pre-recorded audio messages in the local language, sometimes allowing the listener to press buttons to select topics or repeat sections. Most Sri Lankans are familiar with IVR during election season, and it is perhaps a good addition to consider alongside the familiar platforms of SMS and WhatsApp. This is especially effective for low-literacy audiences or when tone and nuance matter. Example for tea estates: Farmer receives a call and hears: “Welcome to Tea Climate Tips. Press 1 to learn about drought-resistant tea varieties. Press 2 for soil management tips.”

Past studies also indicate that social media networks, when cultivated as peer-learning communities, can normalise resilient practices and encourage knowledge sharing across estates and regions. Below is a brief overview of such studies and projects, with added emphasis on the final project, which was implemented in Sri Lanka.

Participatory video + mediated extension (Digital Green)

In a Digital Green (2023) project implemented across India, Ethiopia, and other Global South countries, farmers were trained to produce short, locally relevant videos demonstrating climate-smart agricultural practices. These videos were screened to peers by trusted community facilitators. The approach significantly increased adoption rates, particularly among low-literacy audiences, by combining relatable messengers with repeatable and accessible video content.[1]

Social media and resilience evidence

In a peer-reviewed study (Ramavhale, Zwane & Belete, 2024)[2] examining agricultural communities in Southeast Asia and Africa, social media platforms were found to act as informal extension networks, enabling farmers to share real-time climate information, exchange solutions, and develop coping strategies during climate change shocks, such as drought. These online interactions strengthened resilience by normalising climate-adaptive practices within peer networks.

[1] digitalgreen.org (Digital Green Partnership, 2023)

[2] Ramavhale, Zwane & Belete, The Benefits of Social Media Platforms Used in Agriculture for Information Dissemination, 2024, South African Journal of Agricultural Extension (SAJAE). weblink: https://www.researchgate.net/publication/380286953_The_Benefits_of_Social_Media_Platforms_Used_in_Agriculture_for_Information_Dissemination

IWMI 'CultivateX' - Sri Lankan context

Of particular relevance to this white paper is a 2024 IWMI project in Sri Lanka conducted under similar parameters. Using the "CultivateX" [3] Mobile platform, the International Water Management Institute and its partners delivered real-time climate data and agronomic guidance directly to farmers through accessible mobile channels. By capitalising on Sri Lanka's strong digital infrastructure, including high mobile phone penetration, reliable internet access, and comparatively high literacy rates, the initiative sought to bridge persistent information gaps and weaknesses in traditional agricultural extension services. In its pilot phase, 75 farmers received hyperlocal weather alerts twice a week and tailored agronomic recommendations weekly throughout the cultivation season. These interventions were designed to build farmers' capacity to interpret climate variability, adopt climate-smart practices, and strengthen resilience against the growing impacts of climate change.

Areas to note:

It is notable that in many of the projects, a key factor in building trust among farming communities was coupling digital outreach with trusted human facilitators to ensure messages were locally relevant, actionable, and included a trusted human element. A mix of digital and face-to-face engagement fosters both practical skills and long-term trust. Such an integrated model can likely improve yields by driving behavioural changes in farming practices and strengthening community-level resilience to climate shocks by fostering an online community with access to expert and peer-to-peer advice.

Findings through Consultations

Key findings on the role of social media among tea smallholders were discussed with central stakeholders via Q&A sessions and broader discourse at a targeted workshop. Some of the core insights are provided below.

Common Social Media Platforms Utilised for Farming Information

Stakeholders reported that WhatsApp, Facebook, and SMS were the most commonly used platforms among tea smallholders for accessing agricultural and farming-related information. While platforms such as YouTube were recognised for their educational potential, their usage remained limited due to infrastructural constraints in rural areas and generally low levels of digital literacy among older smallholders. However, there has been a growing trend of younger family members, particularly children, assisting elders in accessing online resources. Tea Societies were identified as playing a central role in facilitating this process by acting as intermediaries and disseminators of information.

While most stakeholders ruled out YouTube as a primary platform, it remains a valuable component within this discourse. Its utility lies in its ability to host informative content that can then be redistributed via the more frequently used platforms. Moreover, YouTube can serve as a long-term repository of institutional knowledge, addressing the root causes of low productivity, promoting climate resilience, and supporting TSHDA's broader mission over time.

Trust in Digital Agricultural Advice

A high level of trust was reported in farming advice delivered via digital platforms, particularly when the source was a recognised institution. The Tea Research Institute (TRI) was widely regarded as the "university" of tea farming due to its authoritative technical expertise.

Similarly, the Tea Small Holdings Development Authority (TSHDA) was noted for its grassroots presence and strong community-level integration. Farmers often compared the support received from these institutions to that of consulting a specialist doctor, underscoring

[3] IWMI, Growing the use of real-time digital tools for smarter vegetable farming, 2024. https://www.iwmi.org/blogs/growing-the-use-of-real-time-digital-tools-for-smarter-vegetable-farming/

the perceived reliability and authority of such advice, as well as the continued value placed on in-person relationships.

Engagement in Climate-Smart Practices Through Short-Form Video and Youth Integration

Stakeholders were consulted on their willingness to participate in short educational videos promoting climate-smart agricultural practices, which could be disseminated through TSHDA. Smallholders expressed a willingness to share their before-and-after experiences through short-form video content that could be distributed via social media.

Youth engagement in these activities was strongly emphasised. Participants proposed integrating tea-related agricultural education into school curricula, facilitated by partnerships among TRI, TSHDA, smallholders, and parents. Suggested initiatives included school debates and other participatory formats, designed to foster early exposure to tea culture and sustainable agriculture. This was seen as a scalable model that could be introduced through regional platforms like the Asia Tea Alliance.

Communication of Agricultural Updates, Climate Alerts, and Good Practices

Updates on agricultural practices, climate alerts, and technical guidance were reportedly shared through regular interactions between farmers and institutions such as TRI, often using accessible platforms like WhatsApp. Biannual forums offered a structured space for smallholders to raise concerns and share experiences. Importantly, it was acknowledged that smallholders themselves are often among the most effective researchers, with their practical insights being collected, verified, and shared to support broader community learning.

Effective Channels of Communication and Farmer Engagement

While in-person engagement in the field was recognised as the most effective and trusted form of communication, it was also considered to be the most resource-intensive and logistically complex. Social media was identified as a viable supplement. TSHDA's digital presence on Facebook and YouTube, reaching approximately 200,000 users, was cited as a growing asset. An interactive mobile application, jointly developed by TSHDA and the Tea Board, further enabled two-way communication, allowing farmers to submit queries and receive tailored responses, thereby supporting a continuous exchange of knowledge.

Institutional Support and Future Needs for Social Media Engagement

Despite the growing importance of social media as a communication tool, stakeholders noted that TSHDA currently lacks a dedicated team to manage social media engagement and digital responses. Establishing such a unit was identified as a future priority. Tea Societies were considered well-positioned to support localised communication efforts and could be further empowered by the appointment of dedicated officers responsible for information dissemination and feedback collection. Stakeholders emphasised the need for a structured content development strategy, supported by a dynamic database of common farmer issues. Automation was recommended to ensure efficiency and consistency in messaging.

Insights from Findings

Multi-Layered Digital Ecosystem: The coexistence of low-bandwidth platforms (WhatsApp, SMS) with long-form platforms (YouTube) suggests a layered communication model. YouTube's value lies not just in direct reach but in its role as a repository of institutional memory. A strategic content distribution pipeline can bridge these layers, ensuring technical knowledge is both preserved and easily disseminated.

Trust Anchored in Institutional Credibility: Trust remains a critical determinant of information uptake. The high regard for institutions such as TRI and TSHDA suggests that

digital content should be closely aligned with them. Incorporating their logos, voices, or even field officers into digital formats can reinforce authenticity and acceptance.

Youth as Digital Bridges and Future Stewards: Youth involvement as digital facilitators and content co-creators presents a dual opportunity: improving immediate access to information while also investing in the next generation of tea sector participants. School-based programs and youth-focused media could be structured into formal extension efforts. (It may be noted that this area is elaborated further in the following section of this white paper.)

Smallholders as Knowledge Contributors: Farmers are not just passive recipients of advice but active contributors to agricultural knowledge. Peer-to-peer learning structures, both online and offline, should be formalised. Smallholder experiences could be systematically documented and used to shape broader extension messages.

Hybrid Models for Outreach: A hybrid approach that combines traditional face-to-face interactions with digital tools appears to be the most viable path forward. Social media should not replace fieldwork but rather extend its reach. Local actors, such as Tea Societies, can be empowered to serve as both physical and digital conduits for communication.

Need for Institutional Capacity and Systems Thinking: The effectiveness of social media engagement ultimately depends on institutional readiness. Establishing a dedicated digital communication team under the TSHDA is a sustainable and strategic necessity. A phased investment in human resources, content automation tools, and feedback systems will be essential to build a scalable, responsive communication infrastructure.

Other areas: While gender inclusion was not explicitly covered in discussions on Social Media use, key gaps and issues regarding gender inclusion in tea smallholdings can be effectively addressed within the scope of the Social Media strategy. Content creation and design principles can include a gender element during production (such as the use of female staff and stakeholders to introduce climate-resilient strategies or explain problems and solutions in cultivation) to facilitate a natural gender mainstreaming factor in the work of the TSHDA and beyond.

How social media can improve knowledge and adoption: design principles and possible implementation.

Drawing on existing agri-related climate-resilient projects and stakeholder findings, it is possible to draft a portfolio of social media outputs that can be easily created and used to strengthen small and medium tea estate owners' knowledge and understanding of growing more climate-resilient crops and withstanding climate-related issues.

Local, participatory content

Production of short (1–3 min) videos starring local estate owners or a designated expert serving as a 'climate-resilience influencer' demonstrating resilient practices (shade management, drought-tolerant cultivars, soil conservation, etc). The use of estate owners and related stakeholders is likely to increase credibility, sharing and normalise practice changes when they occur. Such videos can be shared on a dedicated YouTube channel and then shared via WhatsApp and Facebook, depending on the target audience's platform usage.

Human-mediated dissemination

Combine the digital content referred to above with field facilitators or lead farmers who run online sessions, answer questions, and organise demonstrations. This hybrid model, while somewhat challenging to organise, can improve comprehension, increase participation and trust, and provide feedback on where content can be improved. Over time, such sessions can be used to track the relationship between climate-resilient practices implemented and improved crop yields, or vice versa.

Platform mix for reach and retention

The use of WhatsApp groups for peer exchange and quick Q&A, short videos for instruction, SMS/IVR for weather alerts and reminders, and Facebook/YouTube for broader awareness, archiving and institutional memory.

Link knowledge to economic de-risking

Pairing of advisory content with information on micro-finance and market linkages, so that estate owners understand the financial benefits linked to implementing climate-resilient practices.

Possible campaign idea and positioning

Tea Estate Minute (තේ වතු මිනිත්තුව)

60-second practical tips filmed on estates and shared across all social media platforms. Using the simple premise of:

- Listing what the climate-related problem is on the estate, or a problem related to the crop yield
- Tip for managing the issue
- Encouraging the audience to comment/share their experience

A lead expert moderates Weekly WhatsApp advisory groups, and via a WhatsApp survey, the audience votes on a topic they want featured in the coming weeks/months.

Weather + advisory SMS/IVR
Automated localised rainfall forecasts with action prompts (e.g., mulching before dry spells). Perhaps done in collaboration with the national weather department.

Before & After mini-case studies
Short reels showing crop yields/financial outcomes when estates adopt a resilient practice.

Farmer peer-mentor microgrants
To improve participation and increase small grants to lead estate owners who host viewing sessions, share videos and demos.

Enhancing Access to Finance: The Role of Social Media

Financing Barriers in Sri Lanka's Tea Sector: Past Studies

Agricultural credit constraints remain a persistent challenge for tea smallholders in Sri Lanka. Studies indicate that high transaction costs, limited collateral, and the complexity of banking processes significantly restrict borrowing capacity (Zander, 1994). Institutional mechanisms, such as the Comprehensive Rural Credit Scheme, have struggled to provide sufficient loan volumes to small-scale farmers, often leading them to turn to informal lending channels. In a study related to SME's access to credit (Gunathilake, 2020) it was noted that 'only 30 percent of Sri Lankan firms have sufficient access to bank loans and other formal sector financing, evidencing the key barrier of limited access to finance faced by the entrepreneurs in Sri Lanka', and that these restrictions are greater for businesses located in rural areas.

Another study noted that, despite knowledge and training in Climate Smart Agriculture (CSA) practices being available to farmers in Sri Lanka, they encountered numerous implementation gaps, including limited access to finance (Munaweerage; Dharmawardhana *et al.,* 2025). Such constraints may reduce investment in climate-resilient infrastructure, such as nurseries, greenhouses, and improved planting materials, given the costs associated with it. Furthermore, reluctance may also stem from an already accumulated loan burden and a limited understanding of potential returns.

As such, the implementation of climate-resilient practices may not be viewed as relevant only to tea estate small and medium holders, but as a multistakeholder task involving coordination and cooperation among estate owners, relevant government and governing entities, and financial sector players, including banks.

Findings from Consultations

The following findings, derived from stakeholders' discussions and a consultative workshop, provide further clarity on the relationship between tea smallholders and financial institutions, particularly regarding loan access and financial literacy, while reconciling with the limited information available on this subject from previous studies, such as those noted in the above section.

Common Reasons for Loan Application Rejection

It was noted that loan applications submitted by tea smallholders were most frequently rejected due to a lack of formal financial history, insufficient or unverified income documentation, and the absence of acceptable collateral. These were consistently identified as the primary barriers to accessing formal credit.

Misconceptions and Fears Regarding Loans

Stakeholders reported that many smallholders harboured misconceptions and uncertainties about agricultural loans. Notably, some were influenced by politically motivated promises during election periods, such as the proposed waiving of existing loans, promises that proved unfeasible and undermined trust in financial institutions.

To address these challenges, stakeholders proposed implementing a credit guarantee scheme or agricultural insurance to safeguard both lenders and borrowers. Non-performing loans (NPLs) were the highest in the agricultural loan category, contributing to banks' cautious approach. Despite the availability of targeted loan products from all major banks in Sri Lanka, awareness among smallholders remained low. The use of social media was discussed as a promising avenue to increase visibility, build trust, and improve financial education within this group.

Participation of Financial Institutions in Social Media-Based Engagement

It was indicated that financial institutions expressed openness to engage directly with smallholders through digital channels. Specifically, representatives were willing to join moderated WhatsApp or Facebook groups to explain financial services, clarify loan conditions, and respond to queries in real time. This direct interaction was seen as a way to bridge knowledge gaps and foster mutual understanding between lenders and borrowers.

Insights from Findings

Systemic Barriers to Credit Access: The reliance of formal financial institutions on collateral, documented income, and credit history inherently disadvantages smallholders, whose livelihoods are often informal and seasonal. This suggests a misalignment between the design of financial products and the lived realities of smallholders. Developing alternative credit scoring mechanisms, such as community-based assessments or productivity-linked lending, could help bridge this gap.

Political Narratives and Misinformation: The influence of election-period narratives, particularly around loan waivers, has created a culture of hesitancy and misunderstanding among smallholders. This erosion of trust points to a need for consistent, apolitical financial education and transparent communication, ideally managed by a neutral, trusted intermediary such as the Tea Small Holdings Development Authority (TSHDA).

Latent Willingness from Financial Institutions: The readiness of financial institutions to participate in moderated digital forums indicates an opportunity for structured, two-way communication. Establishing verified, moderated groups, possibly managed by TSHDA or Tea Societies, could provide a controlled environment for real-time clarification and education.

Digital Platforms as Financial Literacy Tools: The low awareness of existing loan schemes highlights a significant communication failure. Social media offers a scalable, cost-effective method to disseminate financial information, correct misconceptions, and promote available services. Short explainer videos, testimonials from smallholders who have successfully navigated the loan process, and Q&A sessions with bank officers could be integrated into existing social media outreach strategies.

Opportunity for Public-Private Collaboration: The convergence of public institutions (TSHDA, TRI) and community networks (Tea Societies) and private financial actors presents a unique opportunity for collaborative innovation. Pilot programs could be designed to test social media-based financial literacy interventions, supported by data collection and monitoring to evaluate effectiveness and scale successful models.

How Social Media Can Assist

It is important to note that some, if not most, of the barriers noted in past studies and through stakeholder consultations can be addressed through the strategic creation, planning and amplification of social media campaigns. Possible routes include:

- **Promoting financial literacy and demand generation** by disseminating short, accessible videos and infographics explaining loan terms, repayment cycles, and government-backed credit schemes, in conjunction with multiple stakeholders, including banks.
- **Showcasing peer success stories** through the social media channels suggested via the first section of this chapter, success stories of tea smallholders who adopted climate-resilient practices using formal credit can be shared, or Q&A sessions can be set up.
- **Facilitating interactive Q&A** via WhatsApp or Facebook groups moderated by financial officers, enabling direct engagement and clarification of misconceptions.
- **Social media content that links credit to climate-risk mitigation** by demonstrating how investments in nurseries, climate-resilient tech, and improved soil management can reduce long-term production risks and lead to greater productivity.
- **Blending digital and human facilitation** so that online messages are reinforced through cooperative leaders or Sri Lanka Tea Small Holdings Development Authority (TSHDA) extension agents who provide in-person support.

Conclusion

Findings indicate that harnessing social media as a tool for financial and agricultural empowerment may require more than digital outreach alone. As with the use of social media for sustainable and climate-resilient tea practices, it, too, requires an ecosystem approach that aligns communication with behaviour change, trust-building, and systemic inclusion. If designed strategically, social media campaigns can serve as catalysts that not only inform but also reshape perceptions, build confidence in formal financial systems, and demystify complex agricultural practices. Crucially, this potential lies in integrating narrative, interactivity, and institutional credibility, creating a feedback loop between digital content and real-world outcomes. As such, social media should be viewed not as a standalone solution, but as a connective infrastructure that amplifies existing support systems, enabling smallholders to engage with finance institutions; inform them of climate adaptation so that the institutions themselves can be more technically versed; and for financial institutions to communicate and dispel misconceptions regarding available products and expertise clearly.

Analysis of the Social Media Use Survey Among Tea Smallholders in Sri Lanka

Respondent Numbers and Sample Significance

From a rapid online survey conducted, a snapshot sample of 171 smallholders responded. This represents approximately 0.04% of the total smallholder population. While the number may appear modest, it provides an important signal about the digital readiness and online engagement levels within this demographic. The low response rate is not simply an indicator of disengagement but rather a reflection of broader structural and behavioural realities, perhaps indicative of limited digital literacy, sporadic access to stable internet connectivity, and a historical reliance on in-person communication channels such as local extension officers and tea societies.

This limited digital participation offers a revealing snapshot of the current stage of digital inclusion within Sri Lanka's smallholder tea sector. It highlights a dual challenge: on one hand, the need to increase exposure to digital platforms; and on the other, the need for institutions such as the Tea Small Holdings Development Authority (TSHDA) and the Tea Research Institute (TRI) to combine online engagement with traditional, face-to-face trust-building mechanisms.

The data underscores that social media cannot replace physical interaction at this stage but must be introduced through hybrid models that prime users for digital adoption through familiar interpersonal channels.

Demographic and Structural Observations

The respondent group likely represents the most digitally accessible or socially connected fraction of the smallholder population. Their willingness and ability to complete an online survey imply that they either own smartphones or have access to devices through family members. In fact, 73.1% reported having access to a smartphone.

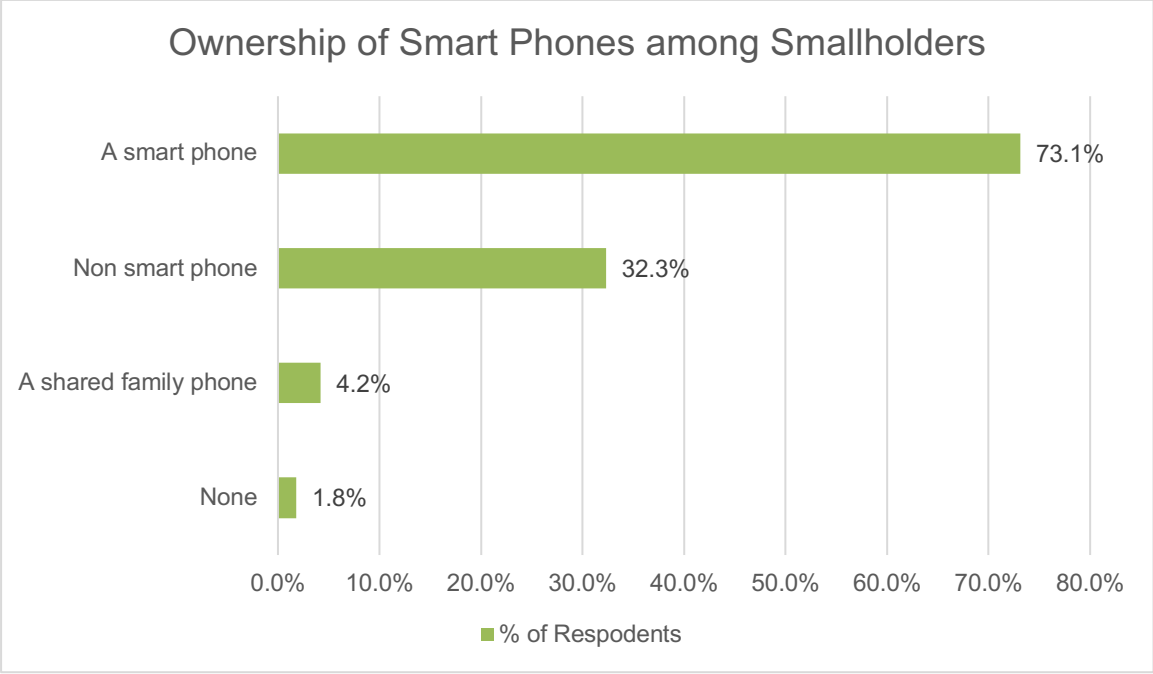


Figure 1: Ownership of Smart Phones among Smallholders

Consequently, this cohort may be viewed as an early adopter group within the broader population. Reaching and empowering them can be a strategic first step in building digital momentum within tea-growing communities. This may also correlate with suggestions in the social media chapter of this white paper to utilise certain smallholders as influencers or focal points to share videos and advice on growing crops and climate resilience with the broader smallholder community.

It is also important to note that most smallholders operate within tight financial margins, with limited time for non-productive activities. Therefore, participation in online forums or surveys may compete directly with daily labour demands. The low response count, in this light, reinforces the necessity for simpler, low-data, and more vernacular digital formats, such as voice messages, WhatsApp broadcasts, or short videos, that reduce the cognitive and technological barriers to participation.

Digital Mediation by Younger Generations

Findings from the survey also indicate the role of youth, particularly children and grandchildren, in helping tea smallholders navigate digital platforms, and may point to an audience stakeholders can focus on in the future. A noteworthy portion of respondents indicated that they depend on younger relatives to varying degrees for smartphones, social media access, or participation in online forums. This intergenerational dynamic mirrors a pattern observed across rural South Asia, where digital adoption among older farmers often occurs through youth intermediaries within the household.

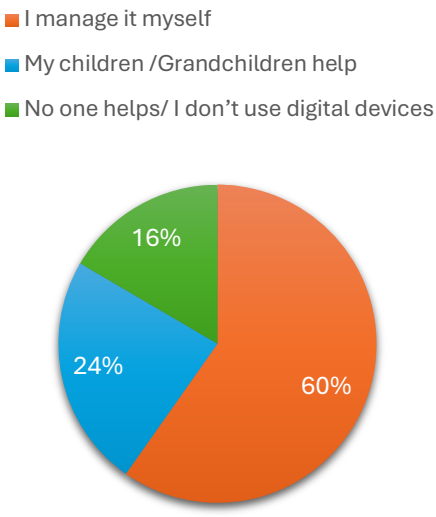


Figure 1: Who usually helps you with using digital devices?

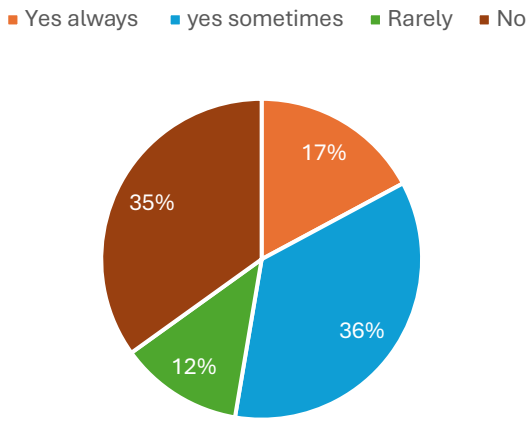


Figure 2: Do younger people (your children, grandchildren, or workers) help you understand or use social media?

This dependency also presents an opportunity. Rather than viewing it as a limitation, institutional stakeholders can strategically leverage it. The TSHDA, for example, can formalise and encourage youth participation through "digital buddy" initiatives, youth ambassador programs, or incentives that reward younger family members for helping elders access official content. Training programs that empower this demographic to serve as community-level digital facilitators could bridge the gap between traditional smallholders and digital agricultural ecosystems. Moreover, integrating tea-related topics into school curricula or organising inter-school tea innovation competitions could nurture sustained youth engagement while strengthening generational continuity in the tea sector.

Preferred Language and Accessibility Considerations

Responses also indicate distinct language preferences for consuming online content. Sinhala and Tamil emerged as the dominant languages, while English remained secondary. This linguistic profile emphasises the need for trilingual or at least bilingual communication strategies across all social media initiatives. Even among respondents who have some familiarity with English, comprehension is often higher when information is presented in the mother tongue, particularly for technical or scientific terms.

These findings are consistent with national data showing that while literacy rates are high, functional English literacy remains uneven in rural areas. For digital campaigns aimed at tea smallholders, this means that visual and auditory content, videos, infographics, or short voice clips, should accompany text posts to ensure inclusivity. Moreover, producing content in everyday use Sinhala or Tamil, using familiar idioms and locally relevant examples, will likely enhance message retention and encourage community sharing.

Trust and Perceived Credibility of Digital Information

A majority of respondents indicated that they would trust information disseminated through official institutions such as the Tea Research Institute (TRI) or the Tea Small Holdings Development Authority (TSHDA). The TRI, in particular, was referred to by respondents during workshop discussions as the “university of tea”, a metaphor that conveys its deep-rooted credibility and technical authority. This strong institutional trust represents a strategic asset in promoting digital communication. However, the same finding also reveals a restrictive trust boundary. Farmers appear selective about whose information they are willing to follow online. They display limited confidence in unverified social media pages or individuals claiming to provide agricultural guidance. This cautiousness reflects both an awareness of the risks of misinformation and an enduring preference for institutional authority. In practical terms, it means that digital engagement strategies will only succeed if they receive explicit endorsement from trusted bodies such as TRI and TSHDA.

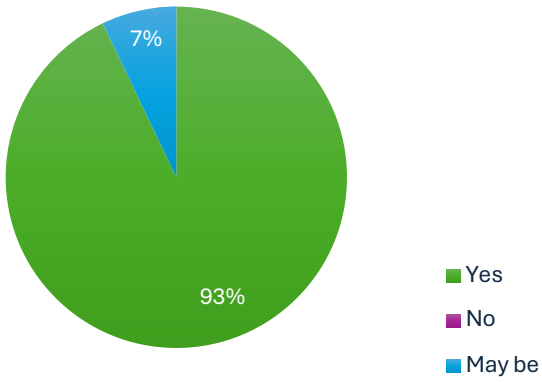


Figure 3: Would you trust content more if it came from a known tea expert or TRI officer?

Branded content, official verification badges, and the visible presence of institutional logos and officials in videos can help preserve that trust. Also, in terms of content, it is noteworthy that 88.1% indicated they would watch videos in their preferred language if it were about growing better crops, and that this question did not specify which body the information would come from, indicating a need for content under this thematic title.

Additionally, the finding indicates that trust cannot be digitally transplanted; it must be cultivated. Farmers associate reliability with face-to-face relationships, familiarity with field officers, and observed results. The level of participation for the online survey itself is indicative of this. Therefore, while online dissemination can amplify reach, it must be anchored in the same relational networks that farmers already depend upon offline.

Social Media Platforms in Use

While the raw dataset records platform-related responses across multiple columns, qualitative inspection, as well as stakeholder consultations conducted before the survey, reveal a consistent pattern: WhatsApp, Facebook, and SMS are the dominant communication channels among tea smallholders. WhatsApp is primarily used for one-to-one or small-group exchanges, often among members of tea societies or local cooperatives. Facebook serves as a platform for passive information consumption, where farmers read and occasionally comment on posts but rarely create their own content. SMS (as discussed during workshop consultations) remains widely used due to its simplicity and compatibility across different phones.

By contrast, YouTube, though recognised as a valuable educational repository, sees limited active use, perhaps due to data costs and the need for higher digital literacy. Nonetheless, it holds potential as a content archive as noted in the social media chapter of this white paper: educational videos hosted there can be redistributed via WhatsApp and Facebook, allowing users to access them in shorter, compressed formats. Similarly, IVR (Interactive Voice Response) systems, familiar to Sri Lankans through election-season messages, could serve as a low-barrier entry point for climate-smart agricultural tips delivered in local languages.

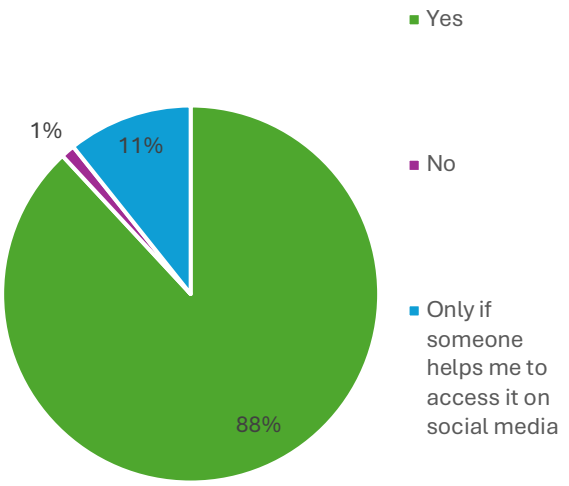


Figure 4: If we created short videos with voice instructions in your language on how to grow better crops would you watch them?

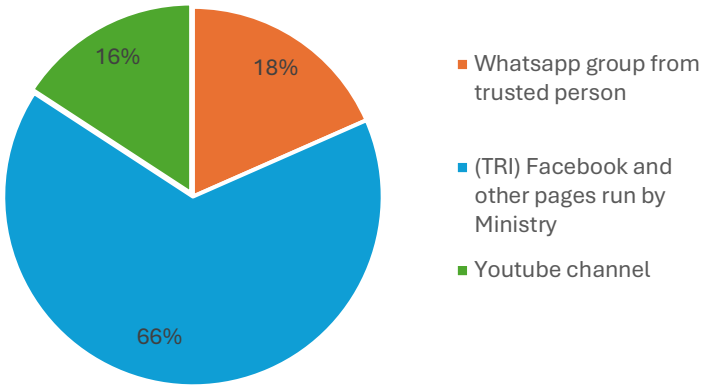


Figure 5: How would you prefer to receive farming tips?

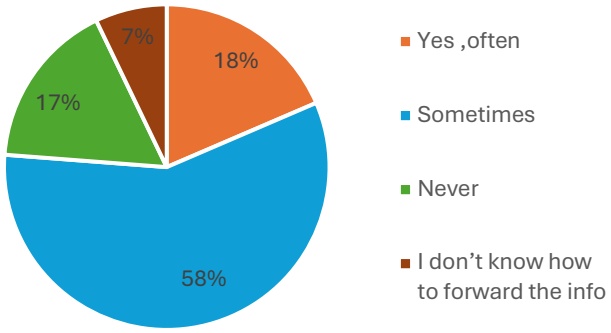


Figure 6: Do you forward or share messages you receive on WhatsApp or Facebook?

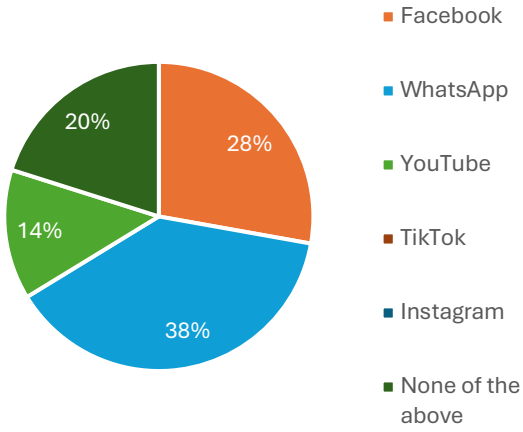


Figure 7: Which of these do you use at least once a week?

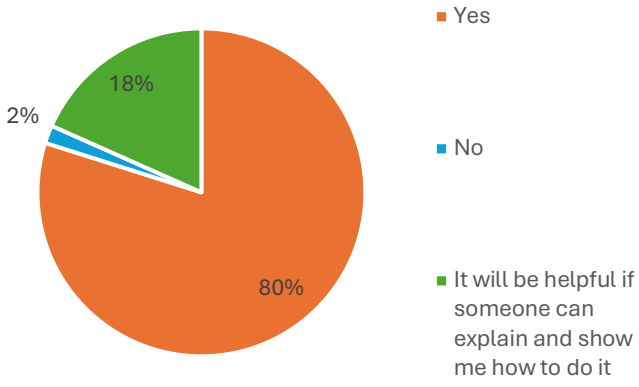


Figure 9: Would you be interested in learning how to access useful tea-farming videos or tips on your phone?

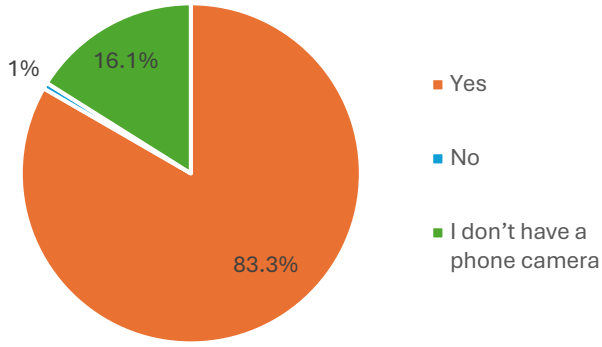


Figure 8: Would you be willing to share a video or photo from your field to show your practices, problems or questions?

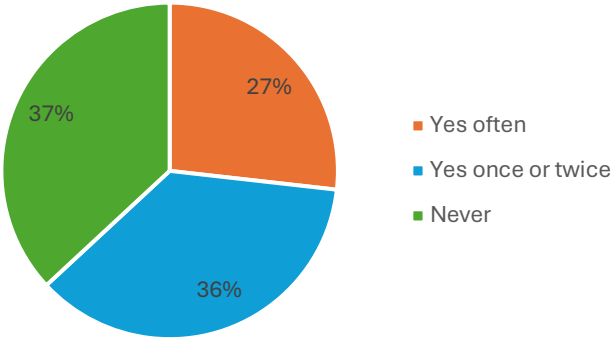


Figure 10: Have you ever watched a video about tea farming, composting, or pruning on YouTube or Facebook?

Patterns of Engagement and Willingness to Participate

Responses suggest that smallholders are open to creating digital content, particularly short videos documenting their own experiences. During workshop discussions, many indicated a willingness to record or participate in “before-and-after” stories that showcase successful farming practices. This willingness further translates into the survey, with over 83% indicating they would be willing to create such content, and 16% noting they do not have a camera phone.

Such participatory models would work best if implemented through institutional facilitation. For instance, the TSHDA could coordinate regional competitions for the best short video on soil management or water conservation, offering recognition and visibility to participants. The dual benefits of this approach could include increased content relevance and authenticity, while also fostering community pride, cross-learning and more productive use of social media. It is important to stress, however, that respondents indicate a need for education on how to receive tips/videos and information, pointing towards the need for more strategically designed campaigns reaching this audience and advancing methodologies to enable them to access those campaigns more easily.

Correlation Between Trust, Youth Mediation, and Platform Choice

When the survey results are read holistically, an interesting triangulation emerges: trust in institutional sources, youth mediation, and platform choice are closely interlinked. Farmers who rely on youth assistance are also more likely to use visually oriented platforms such as WhatsApp and Facebook, which are already familiar to younger users. These same farmers show higher openness to engaging with official institutional content online, provided it is recommended or shared through trusted personal networks.

This underscores the role of social media not just as a broadcast medium but also as a social-validation mechanism. Information spreads most effectively when endorsed by someone in the farmer’s immediate circle, be it a family member, fellow tea society member, or field officer. For institutions, this means cultivating micro-ambassadors or “trusted sharers” within communities may be as critical as producing the content itself.

Barriers and Structural Limitations

Despite positive attitudes toward digital learning, several barriers persist. Many respondents still express low confidence in operating digital tools independently, preferring to seek assistance even for simple actions such as opening links or answering a survey, as evidenced by the number of respondents in this survey. Internet coverage in certain rural or hilly regions may remain inconsistent, and electricity reliability may also vary. These infrastructural challenges mean that digital programs must maintain offline compatibility, for example, by allowing content downloads for later viewing or integrating SMS reminders that summarise key messages from videos.

Another subtle but important barrier is perhaps time poverty. Tea smallholders often juggle multiple tasks, leaving little time for digital engagement. Therefore, digital outreach should fit into existing rhythms, such as short morning or evening audio messages, weekly digest videos, or alerts timed around agricultural activities.

Implications for Stakeholders and Pathways Forward

The survey confirms that social media-based interventions for Sri Lanka's tea sector must be contextually grounded, trust-based, and hybrid in delivery. While digital channels hold immense promise, they may not function effectively in isolation. Instead, they should complement traditional extension systems by digitising and amplifying trusted institutional voices.

Key implications may include:

1. **Building digital trust through institutional identity.** TRI and TSHDA must maintain a strong, verified social media presence. Official WhatsApp broadcast lists or Facebook pages with identifiable officers will likely command high engagement.
2. **Leveraging youth intermediaries as the digital front line.** The existing youth assistance model should be restructured into a structured outreach mechanism through training and incentives.
3. **Prioritising low-data, multilingual formats.** Voice messages, subtitled short videos, and IVR systems can overcome both literacy and connectivity constraints.
4. **Creating feedback loops.** Allowing farmers to respond via voice notes or short messages helps establish a two-way communication flow, strengthening trust and responsiveness.
5. **Phased hybrid rollout.** Initial engagement should combine face-to-face workshops with digital follow-ups. Over time, as familiarity grows, digital channels can take on a more central role.

Concluding Observations

The findings from this limited yet insightful dataset demonstrate that digital readiness within Sri Lanka's tea smallholder community is emerging but uneven. The 171 respondents represent the digitally visible frontier of a much larger and largely offline population. Their patterns of reliance on youth, institutional sources, and trusted networks offer a roadmap for designing effective social media interventions.

Ultimately, social media for tea smallholders should not be viewed as a purely technological solution but as a trust-building and behaviour-changing ecosystem. The journey toward climate resilience in the tea sector will depend not just on the transfer of information but on the creation of relationships between institutions and farmers, between generations, and between digital and physical spaces of learning.

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11. Climate Resilience and Adaptation Strategies & NDC Alignment

By Yajith De Silva

Abstract

Climate change poses significant risks to tea production through rising temperatures, changing rainfall patterns, and increased incidence of pests and diseases. This paper examines strategies to enhance climate resilience within Sri Lanka's tea smallholding sector while aligning with the country's Nationally Determined Contributions (NDCs) under global climate agreements. Adaptation measures include improved soil and water management, diversification of cropping systems, adoption of climate-smart agricultural practices, and restoration of ecosystem services. The paper also highlights the potential for carbon sequestration, sustainable land management, and landscape restoration within tea-growing regions. Aligning smallholder practices with national climate commitments offers opportunities to strengthen resilience while contributing to global climate mitigation goals.

Keywords: Climate change adaptation, Climate-smart agriculture, Tea sector resilience, Nationally Determined Contributions, Sustainable land management, Environmental sustainability

The importance of sustainability in Tea

Tea's legacy, even in casual conversation, "Ceylon Tea" frequently emerges as a hallmark of quality and heritage. Its storied history begins with the earliest British colonisation in the early 19th century. Ceylon, as Sri Lanka was once called, has mountainous landscapes that offer diverse microclimates, a factor that is central to the distinctive aromas, body, and flavour of its orthodox teas. Early planters like James Taylor pioneered tea cultivation in 1867, and by the late 19th century, the island became a crucial source of black tea for the British Empire.

The tea industry in Sri Lanka has been identified as highly vulnerable to climate change. At present, it provides livelihoods for 10% of Sri Lanka's population, in addition to its significant contribution to the country's economy.

Climate change stressors on Sri Lankan Tea: changing temperatures and rainfall patterns. Sri Lanka's topography fosters a range of microclimates, from the high elevations of Nuwara Eliya to the mid-country of Kandy and the low-country of Ratnapura. Historically, these distinct agroclimatic zones have allowed for specialised tea varieties with unique flavour profiles.

However, the climate now reveals unsettling extremes. Higher average temperatures reduce the tea bush's ideal growing windows, while an erratic monsoon threatens a consistent water supply. In some districts, precipitation is delayed, while in others, short bursts of intense rainfall trigger flash floods and soil erosion. Data from local meteorological departments show a 0.016 °C per year increase in the mean annual temperature from 1961 to 2020, with projections indicating accelerated warming.

The pattern is further complicated by shifting monsoon onsets, an outcome that cuts across the entire South Asian region.

Impact on yield and quality

Unlike hardier crops, *Camellia sinensis* (the tea plant) is especially sensitive to even modest changes in temperature or rainfall distribution.

The effects of climate change on tea plantations are already well documented (Wijeratne, 1996; Wijeratne et al., 2007; Eriyagama et al., 2010; Karunaratne et al., 2015). Further, tea has been identified as a vulnerable crop to climate change (Ahmad et al., 2018; Wijeratne, 2018), and tea in Sri Lanka is also predicted to be negatively affected by climate change in the future (Jayasinghe & Kumar, 2019). Tea is a perennial; thus, tea plants experience multi-decadal effects of climate change, which can profoundly affect tea quality and yield (Ahmed et al., 2019). Climate change exacerbates land degradation and soil fertility loss, thereby reducing tea growth, yield, and quality while increasing pest, disease, and weed incidence.

In recent years, short droughts have been observed to alter flush cycles. At the same time, intense rainfall can reduce plucking frequency, degrade leaf quality, and cause soil degradation due to rain erosivity.

Lower-elevation estates are particularly vulnerable to heat stress, leading to leaf dryness and potential changes in chemical composition that reduce the beverage's subtle aroma. As yields and quality drop, one sees a direct correlation with the producer's income. Lower-grade leaves fetch less at auctions, squeezing already tight margins. Combined with the broader discount culture among global retailers, producers often cannot invest in long-term adaptation if immediate profitability is threatened. At the same time, the cost of adopting climate-resilient methods, such as drip irrigation, reforestation, or water-conservation structures, can be high, especially for smallholder farmers.

Climate change and its adverse effects on the global tea industry, particularly in Sri Lanka, are inevitable. It has been predicted that the global demand for tea will increase in future. However, people's actions may determine whether the tea industry remains a sustainable and profitable venture in the future. Hence, immediate, concerted, global action on mitigation and adaptation to climate change and its impacts is required before irreversible environmental effects occur.

NDC Alignment

To address the issues faced by the stakeholders, particularly tea leaf producers and other farmer groups, the country's Nationally Determined Contributions (NDCs) outline several strategies to build climate resilience. As detailed below.

Sri Lanka's NDCs prioritise adaptation efforts in vulnerable sectors like agriculture, water resources, and coastal areas to increase climate resilience. The tea industry can contribute to these efforts by:

Reducing Energy Consumption

Promoting energy-efficient practices and renewable energy sources, such as biogas, to reduce dependence on fossil fuels.

Sustainable Land Use

Implementing sustainable land-use practices, such as agroforestry and conservation agriculture, to reduce deforestation and promote carbon sequestration.

Key Climate Resilience Strategies for Tea in Sri Lanka's NDCs

Agroforestry and Reforestation

Integrating shade trees and reforesting degraded areas helps regulate microclimates, reduce soil erosion, and improve water retention in tea-growing regions.

Soil and Water Conservation

Measures such as terracing, mulching, and rainwater harvesting are promoted to combat soil degradation and ensure sustainable water use, especially in hilly areas where tea is cultivated.

Climate-Smart Agriculture (CSA)

The NDCs encourage drought-resistant tea cultivars, improved pest management, and precision farming techniques to adapt to changing climate patterns.

Research and Capacity Building

Institutions like the Tea Research Institute of Sri Lanka are central to developing and disseminating climate adaptation guidelines, training farmers, and piloting innovative practices.

Early Warning Systems and Risk Management

Enhancing meteorological services and deploying early warning systems for extreme weather events are part of the broader strategy to reduce climate-related risks.

Sustainable Land Use Planning

The NDCs support zoning and land-suitability assessments to prevent overexploitation and ensure the long-term sustainability of tea-growing areas.

Broader Climate Goals Supporting Tea Sector Resilience

Low Carbon Development Pathways

Sri Lanka's NDCs align with its vision for a low-carbon future, integrating tea sector reforms with national goals for emission reduction and sustainable development.

Community Engagement and Livelihood Protection

Climate resilience efforts also focus on empowering smallholder farmers, improving access to finance, and ensuring equitable participation in climate adaptation programs.

Institutional Framework

The National Climate Change Policy (2023) and the National Adaptation Plan (2016-2025) provide a framework for climate action in Sri Lanka. The Climate Change Commission of Sri Lanka will oversee the implementation of NDCs in coordination with relevant ministries.

Climate-Resilient Practices

Agroforestry and Reforestation

This was a prevalent agricultural system in the past. However, with the introduction of the mono-crop systems, this practice has been overlooked by most farmers. Even though tea is a shade-loving crop, after the estate's privatisation, some management companies removed the shade trees, resulting in irrecoverable productivity losses. Poor land productivity in some farmers' fields is mainly due to poor shade management.

Integrating trees into tea plantations to enhance biodiversity, improve soil health, and reduce erosion.

Strategies for adapting to climate change include sustainable, robust infrastructure; ecosystem restoration and conservation; crop diversity in agriculture; innovative solutions to natural disasters; policies and planning; energy-saving attitudes; and waste and food management.

Indigenous knowledge can be a valuable resource in the fight against climate change, and Sri Lanka has many examples of this. Knowledge based on climate literacy, traditional practices and technologies, land management skills and astrological practices is of prime importance. RegenAgri practices focus on restoring ecological balance and promoting sustainable agricultural methods, including the revival of environmentally friendly, resilient traditional cultivation practices. As such, RegenAgri practices could be used to address the challenges faced by the smallholder farmers.

Regenagri

Promotes climate-resilient agricultural practices, such as agroforestry, conservation agriculture, and integrated pest management, to help farmers adapt to climate change.

Sustainable Land Use

Encourage sustainable land-use practices, such as soil conservation and efficient water management, to reduce the environmental impact of agriculture and enhance climate resilience.

Climate Information Services

Provide climate information services, such as weather forecasts and climate advisories, to help farmers make informed decisions and adapt to climate variability.

Capacity Building

Build the capacity of farmers, extension agents, and other stakeholders to implement climate-resilient agricultural practices and adapt to climate change.

Certification and Labelling

Promote certification and labelling schemes that recognise climate-resilient and sustainable agricultural practices and provide incentives for farmers to adopt them.

Supply Chain Resilience

Work with supply chain actors to build resilience to climate-related shocks and stresses, ensuring that farmers have access to markets and can maintain their livelihoods.

Data-Driven Decision Making

Facilitate data and analytics to inform decision-making and support climate-resilient agriculture, including monitoring climate-related risks and impacts and identifying areas for improvement.

Soil enrichment

Shifting away from excessive chemical inputs toward composting and other organic techniques. This can restore topsoil fertility, better retain moisture, and ultimately produce more robust tea leaves over time.

Selective reforestation

Maintaining shade trees and wildlife corridors around estates to preserve biodiversity and stabilise local microclimates.

Soil and Water Conservation

Building small-scale water-harvesting structures is especially relevant for upcountry estates that face cyclical droughts. While these measures do not always come cheaply, they serve a dual purpose of strengthening climate resilience and creating distinct marketing narratives that might justify a premium.

Implementing conservation practices to reduce soil degradation and promote water retention.

Water Management

Efficient irrigation systems and water harvesting techniques to reduce water waste and optimise water use.

Way Forward: Strengthening Climate Resilience in the Tea Sector

To ensure effective implementation of Sri Lanka's Nationally Determined Contributions (NDCs), the Climate Change Commission of Sri Lanka, in coordination with relevant ministries, will play a central oversight role. This institutional framework provides a strategic platform for aligning national climate goals with sector-specific interventions.

In this context, the Tea Smallholders Development Authority (THSDA) is well positioned to lead the adoption of best agronomic practices in collaboration with key stakeholders, including the Tea Research Institute, the Sri Lanka Tea Board, the National Institute of Plantation Management, private sector actors, and international non-governmental organisations (INGOs). These partnerships are essential to address the multifaceted challenges confronting the tea industry, particularly those affecting tea smallholders, who represent the backbone of Sri Lanka's tea economy.

Furthermore, the implementation of integrated programs such as RegenAgri offers a promising pathway to enhance climate resilience. RegenAgri's focus on sustainable land use, climate-smart agriculture, and farmer empowerment aligns closely with national adaptation strategies. By facilitating localised responses to climate change impacts, RegenAgri can help tea farmers adopt practices that improve soil health, conserve water, and mitigate the risks associated with erratic weather patterns.

Collectively, these coordinated efforts will strengthen Sri Lanka's tea sector's adaptive capacity, safeguard rural livelihoods, and contribute to the country's broader climate resilience agenda.

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12. Enabling Institutions and Support Systems in the Sri Lankan Tea Industry

By Yajith De Silva

Abstract

The performance of Sri Lanka's tea sector depends heavily on the effectiveness of institutions responsible for research, extension, regulation, and market development. This paper reviews the institutional ecosystem supporting tea smallholders, including government agencies, research institutes, private sector actors, and development partners. It evaluates the strengths and limitations of existing support systems in delivering technical services, financing, and policy support to farmers. The paper also identifies opportunities for improving coordination among institutions and strengthening public–private partnerships. Enhancing institutional capacity and governance mechanisms is essential for promoting innovation, improving service delivery, and ensuring inclusive growth across the tea value chain.

Keywords: Agricultural institutions, Tea sector governance, Extension services, Public–private partnerships, Smallholder support systems, Policy coordination

Stakeholders and Current Status

The Sri Lankan tea industry, a cornerstone of the nation's economy, faces modern challenges including climate change, low productivity, and market volatility. This paper examines the critical role of enabling institutions and support systems in addressing these issues to ensure the industry's long-term sustainability and competitiveness. By fostering innovation, improving productivity through research and extension services, and strengthening public-private partnerships, Sri Lanka can solidify its position as a global leader in high-quality tea production. This document outlines the key contributions of the Ministry of Plantation Industries, institutions such as the Tea Research Institute (TRI) and the Tea Smallholder Development Authority (TSHDA), and other government and private-sector actors, highlighting their collaborative efforts to modernise the sector and empower its most vital asset: the smallholder farmer.

The beginning of the tea industry in Sri Lanka is credited to James Taylor, a Scottish planter now regarded as the 'Father of the Tea Industry in Sri Lanka', who planted the first experimental commercial tea field at the "Loolecondera" estate in Kandy in 1867. Since then, tea cultivation in Sri Lanka has been owned and managed by foreign and local companies for over 150 years.

Nationalisation of the plantations

A significant reform in the management of tea plantations took place from 1972 to 1975 with the introduction of the Land Reforms Act of 1972, which restricted ownership of private agricultural landholdings to a maximum of 20 hectares per person, enabling the state to acquire extents exceeding the limit.

The new initiative was known among the public as the "Nationalisation of Plantations." The land reform act implemented from 1972 to 1975 allowed the government to nationalise (acquire) 62% of the tea land, 32% of the rubber land, and 11% of the coconut land, distributed across 500 estates in Sri Lanka. Thereby, approx. 158,000 ha of tea cultivation out of the total tea extent of 242,000 ha, reported in 1975, were taken under state control.

The acquired tea, rubber, and coconut estates were vested with government agencies, principally the Sri Lanka State Plantations Corporation (SLSPC), the Janatha Estates Development Board (JEDB), the Udarata Cooperative Estates Development Board and the Coconut Cultivation Board for management.

However, in 1977, mainly the tea and rubber plantations managed by different agencies were vested with the SLSPC & JEDB, making them two of the world's largest agricultural corporations, which they managed for about two decades since 1972.

Privatisation of the Plantations

These two organisations reported heavy losses during this period. With national economic policy shifting to an open-market system after the 1977 general election, the government took a novel approach to managing the heavily loss-making state-owned plantations.

Thereby, in 1992, the plantations managed by the two government agencies were separated into twenty-three clusters, each consisting of tea and rubber lands with varied productivity. Then, the management of each cluster, known as the Regional Plantation Companies (RPCs), was handed over to the private sector through five-year lease agreements, awarded through a competitive bidding process.

However, because the lease term was too short, it did not help managing agents attract new investment to the industry. Therefore, the leasehold term was extended to 53 years in 1995. Later, the government decided to privatise the state-owned plantations, and the 23 Regional Plantation Companies (RPCs) mentioned above were sold through the Colombo Stock Exchange during 1996-97.

During this process, the government sold the majority shares to the private sector in January 1996, 20% to the public in September 1997 and gifted 10% of the shares to the employees of the respective RPCs in December 1997, while the government retained one 'Golden Share' with special rights. Since then, the Regional Plantation Companies have managed privatised state-owned plantations.

Formation of Tea Small Holding Authority (TSHDA)

Due to land reform laws that limited privately owned land to 20 hectares or less, the growth of the estate sector, with large-scale new tea plantations, was further constrained. Poor performance of the estate sector, due to ageing tea lands and the inability to expand production to meet increased demand, prompted the government authorities to pay greater attention to smallholder expansion. The attractive prices received for low-grown tea in the 1980s helped immensely to develop the tea smallholder sector in Sri Lanka. The significant expansion of the smallholder sector occurred between 1984 and 2005.

Considering the socio-economic benefits of tea smallholdings, the Tea Small Holdings Development Act, No.35, was passed in 1975, and the "Tea Small Holdings Development Authority" was established on 01st February 1977 to provide the necessary advisory services to develop the smallholdings sector.

According to the Tea Control Act No. 51 of 1957, tea holdings between twenty perches (0.05ha) and ten acres (04ha) are categorised as tea smallholdings. However, since 01 January 1978, the Tea Smallholder Development Authority has been assigned to assist in the development of tea lands (estates) of an extent of 10-50 acres (04 to 20ha) as well. The tea smallholding sector accounts for 59.2% of the total tea extent in Sri Lanka, while the medium-scale tea estates account for 14.3% of the tea extent, as of 2021. Thereby approx. 74% (196,000ha) of tea cultivation in Sri Lanka is under the purview of the Tea Smallholder Development Authority (TSHDA) (Anon, 2021).

Contribution to the Tea Industry by Different Segments

The tea industry in Sri Lanka is categorised into two central production systems based on scale of operation: the smallholdings sector and the plantations sector. In Sri Lanka, a tea smallholding is defined as a tea land extending up to ten acres (4 ha). The tea smallholders' sector has played a significant role in the tea plantation sector, accounting for 70% of national production. Therefore, the future of the tea industry largely depends on the smallholder sector and its production systems.

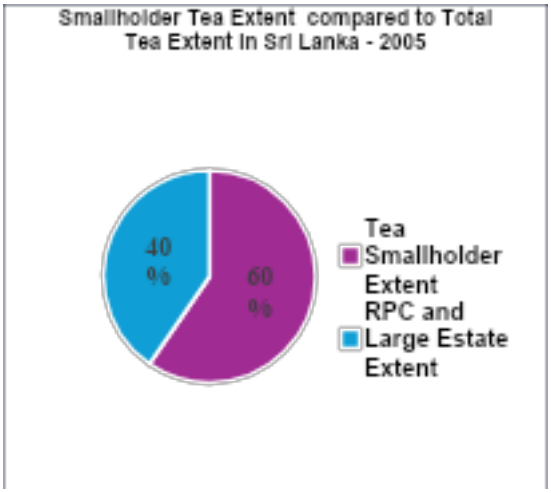
Given the steady income from tea cultivation, many villagers and small landowners in tea-growing districts have cultivated tea for their livelihoods. Currently, approximately 371,000 smallholders (owners) with a population of around 1.5 million manage around 400,000 tea smallholdings island-wide. In 2021, smallholders produced 75% of the national tea output. Hence, the tea smallholder sector is a vital component of Sri Lanka's rural economy. It is noteworthy that 77 per cent of the tea smallholdings in Sri Lanka are less than 0.4ha and are primarily operated by family members (Anon, 2021).

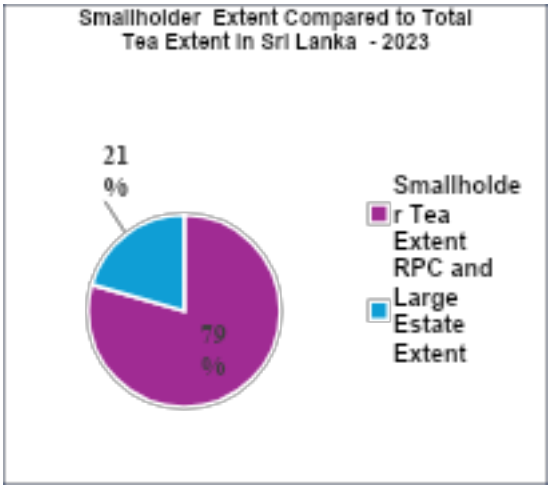
The table below (Table 1) shows a shift in tea area from state/corporate holdings to small and medium sectors since 2004.

Change in Tea Extent by Ownership					**Hect.**
Year	**State Sector**	**%**	**Smallholding Sector**	**%**	**Total**
2004	91,348	50	91,668	50	183,016
2005	95,288	45	116,492	55	211,780
2006	97,587	45	117,992	55	215,579
2007	90,752	43	119,492	57	210,244
2008	92,108	43	119,798	57	211,876
2009	88,264	42	120,009	58	208,633
2010	84,119	41	120,500	59	204,619
2011	85,440	41	120,664	59	206,664
2012	82,065	40	120,955	60	203,020
2013	81,141	40	121,267	60	202,408
2014	81,684	40	121,429	60	203,113
2015	81,099	40	121,740	60	202,839
2016	80,055	40	121,967	61	202,022
2017	78,968	39	122,169	61	201,137
2018	77,553	39	122,169	61	200,001
2019	76,231	32	158,770	68	235,001
2020	70,447	27	157,910	59	265,750
2021	70,453	26	157,907	59	266,606
2022*	70,547	26	158,315	59	267,179

*Table 1: Planation Sector Tea Statistical Book. *Provincial*

**Note- During the years 2020,2021, and 2022, the medium sector estates have contributed 14 and 15 per cent, respectively.*





Comparison of Tea Extents by Ownership 2005 to 2023

The change in ownership has significantly increased the smallholding sector's contribution to the nation's production from 40 per cent in 2005 to 79 per cent in 2023.

As the tea production landscape in Sri Lanka evolves with smallholders playing a more prominent role, it is crucial to focus on capacity building, technology adoption, and market access for smallholder farmers to boost national tea production.

The Stakeholders of the Tea Industry Value Chain

Stakeholders	Role
Tea Growers (Planters)	Cultivate and supply tea leaves to factories, ensuring quality and volume
Medium Estate Owners	Manage estates between 10 and 50 acres, contributing to innovation and quality enhancement.
Smallholder Farmers	Representing over 75% of national output, managing small plots and playing a critical role in rural livelihoods.
Tea Manufacturers	Process raw leaves into black, green, and white tea varieties.
Tea Exporters	Facilitate global trade by purchasing from manufacturers and accessing international markets.
Tea Traders	Function as intermediaries in bulk transactions between producers and exporters
Auction Centres	Provide structured platforms for transparent tea trade.
NGOs & Civil Society Organisations	Promote sustainable practices, labour welfare,

Table 2: Tea Industry Stakeholders

These stakeholders play essential roles in the tea industry, including:

- **Production and Supply**: Tea growers, manufacturers, and exporters work together to produce and supply high-quality tea.
- **Regulation and Policy**: Government agencies develop and enforce policies and regulations to ensure the industry's sustainability and competitiveness.
- **Market Development**: Tea exporters, traders, and the Sri Lanka Tea Board promote Ceylon Tea globally, enhancing its reputation and demand.
- **Research and Development**: Research institutions and universities conduct research to improve tea cultivation, processing, and quality.
- **Social and Environmental Responsibility:** NGOs, civil society organisations, and some companies promote sustainable tea production practices and labour welfare.

Key Stakeholders

Sri Lanka’s tea sector is supported by a robust network of institutions and systems designed to facilitate growth and ensure quality. These entities operate in a coordinated manner to address challenges from cultivation to export.

The Ministry of Plantation Industries

Plays a significant role in the institutional framework of the Sri Lankan tea industry. Some key aspects of their involvement are Policy Development, Collaboration with the Private Sector, Regulatory Frameworks that support research initiatives to improve tea productivity, quality, and sustainability, and International Cooperation. Some notable initiatives include the National Standard for Sustainable Tea Production: The Ministry has undertaken many projects to improve tea production and is currently developing a national standard for sustainable tea production to enhance the industry's global competitiveness and a strategic plan to

Sustainable Tea Production Practices: The Ministry promotes sustainable tea production practices, such as regenerative agriculture, minimising environmental impact, and ensuring fair labour practices. Roadmap for Sourcing and growing of fuel wood in partnership with Ethical Tea Partnership to meet the challenges faced by the tea industry to have a sustainable source of fuel wood supply.

The Ministry’s priorities include improving productivity, enhancing quality standards, and boosting global competitiveness through technology adoption, research support, and promotion of value-added tea products. Sustainability remains a key focus, with initiatives that promote environmentally responsible practices and long-term sector resilience.

Supporting smallholder tea farmers is a significant component of the Ministry’s work. Through training, advisory services, and improved access to markets and resources, the Ministry helps strengthen livelihoods and drive inclusive growth. Institutions such as the National Institute of Plantation Management play an essential role in delivering these capacity-building programs.

The Ministry also oversees export regulations, quality assurance, and certification to protect Sri Lankan tea's reputation. Working with the Sri Lanka Tea Board and industry partners, it promotes Sri Lankan tea in global markets while supporting policies that encourage continued innovation and development.

Through these initiatives, the Ministry ensures that the tea industry remains competitive, sustainable, and aligned with national economic goals.

Tea Research Institute of Sri Lanka (TRI)

The Tea Research Institute of Sri Lanka (TRI) serves as the national authority for tea research, development, and innovation. Its core mission is to generate and transfer scientific knowledge and practical technologies that enhance the productivity, quality, and sustainability of Sri Lankan tea. The Institute plays a central role in supporting evidence-based improvements to the sector, ensuring that research outcomes are accessible and beneficial to all stakeholders.

Through its network of regional centres in Passara, Kandy, Ratnapura, Galle, Deniyaya, and Kalutara, TRI provides localised technical support tailored to the distinct conditions of each tea-growing region. These centres facilitate field-level research, extension activities, and advisory services, thereby strengthening the link between scientific innovation and practical application. TRI's work in agronomy, plant breeding, climate resilience, pest management, and sustainable cultivation practices contributes significantly to the long-term development of the industry.

TRI places strong emphasis on technology dissemination and capacity building. It offers farmer training programs, field demonstrations, mobile advisory services, and a range of publications designed to support growers, estate managers, and smallholders. Its contributions to processing innovation—such as improvements in machinery and quality assessment techniques—help enhance manufacturing efficiency and ensure that Sri Lankan tea maintains its high international standards.

The Institute also provides specialised laboratory services, industry data, consultancy support, and opportunities for knowledge exchange through national and international events, including the International Tea Symposium. By creating platforms for collaboration among researchers, industry leaders, and policymakers, TRI contributes to a more informed and forward-looking tea sector.

Overall, the Tea Research Institute continues to play a vital role in advancing research, promoting innovation, and strengthening the long-term sustainability and competitiveness of Sri Lanka's tea industry. Its commitment to scientific excellence and stakeholder engagement ensures that the sector remains resilient and well-equipped to meet emerging challenges and opportunities. (Tea Research Institute of Sri Lanka, 2024).

Sri Lanka Tea Board (SLTB)

The Sri Lanka Tea Board (SLTB) serves as the primary regulatory and promotional authority for Ceylon Tea, playing a leading role in maintaining quality, strengthening brand identity, and expanding Sri Lanka's global market presence. As custodian of the internationally recognised Lion Logo, the SLTB ensures that tea exported under this mark meets stringent standards of origin, authenticity, and quality. The Board works closely with the Ministry of Plantation Industries and industry stakeholders to support growth, modernisation, and market diversification across the tea sector.

The SLTB's mandate centres on regulating the industry, promoting sustainable development, and enhancing Sri Lanka's competitive position in global tea markets. Its objectives include guiding policy implementation, supporting improvements in tea cultivation and manufacturing, and providing technical support, training, and access to relevant market information to growers and manufacturers, especially smallholders. The Board also plays an essential role in facilitating tea exports, advocating for Ceylon Tea at international trade events, and conducting promotional activities that reinforce the brand's global reputation.

A wide range of services supports these objectives. The SLTB oversees registration and certification processes for factories, manufacturers, and exporters, ensuring adherence to national standards. Its quality control services include testing, tasting, and certification to maintain the high standards associated with Ceylon Tea. The Board also provides market

intelligence through research reports, statistical updates, and global trend analysis, enabling stakeholders to make well-informed decisions.

In addition to regulatory functions, the SLTB manages international and domestic promotion of Ceylon Tea, utilising advertising campaigns, trade fairs, and branding initiatives to strengthen global visibility. Training programs, capacity-building efforts, and export facilitation services are also provided to support growers, manufacturers, and exporters in adopting best practices and accessing new markets. Through these combined functions, the Sri Lanka Tea Board plays a vital role in safeguarding the integrity of Ceylon Tea and advancing the continued development and international success of Sri Lanka's tea industry. (Sri Lanka Tea Board, 2024).

Tea Smallholder Development Authority (TSHDA)

The Tea Small Holdings Development Authority (TSHDA) plays a central role in strengthening Sri Lanka's smallholder tea sector, which contributes more than 75% of the country's total tea production. The Authority works to enhance the productivity and quality of smallholder tea lands while supporting the livelihoods of rural farming communities. Through technical assistance, financial facilitation, and improved market access, the TSHDA empowers smallholders to contribute more effectively to national economic development. Recent initiatives, including the "Pivithuru" national program developed in collaboration with Regenagri, reflect the Authority's commitment to promoting quality enhancement and sustainable production through a value-chain approach.

The mandate of the TSHDA is to support and uplift tea smallholders by providing technical guidance and financial support to improve cultivation practices, ensure quality, and foster sustainable community development. Its objectives include raising productivity through training and advisory services, improving the quality of green leaf supplied to factories, and supporting the well-being of tea-growing communities. These efforts strengthen both the resilience and the economic viability of the smallholder sector. *(Source: TSHDA Annual Report, 2023.)*

To achieve these goals, the TSHDA coordinates several key support systems. Its collaboration with the Tea Research Institute enhances research and development, particularly in areas such as climate-resilient cultivars and integrated pest management. Extension services ensure that modern technologies and good agricultural practices reach smallholders, with initiatives such as the "Dallakin Wenasak" program demonstrating measurable productivity improvements. Financial support systems, including credit access through state and private banks and microfinance institutions, enable smallholders to invest in replanting, field development, and modernisation.

Through these integrated services and partnerships, the TSHDA continues to strengthen the smallholder tea sector and contribute meaningfully to the long-term sustainability and competitiveness of Sri Lanka's tea industry.

Tea Exports Association (TEA)

The Tea Exporters Association (TEA), established in 1999, represents the collective interests of Sri Lanka's tea exporters and plays a key role in supporting the continued growth and competitiveness of the country's tea sector. The Association brings together exporters, producers, and industry stakeholders to promote a unified approach to export development, market expansion, and global branding. By providing market intelligence, advocacy, and industry coordination, TEA helps strengthen Sri Lanka's position as a leading supplier of high-quality tea to international markets.

A core function of the TEA is to support export performance by providing members with timely market research, analysis, and insights into global trends, prices, and consumer preferences.

The Association also promotes Ceylon Tea internationally through participation in trade fairs, global expos, and industry conferences, including major events such as the World Tea Expo. These initiatives help expand market opportunities, connect exporters with international buyers, and enhance the visibility of Sri Lankan tea in emerging and established markets.

TEA contributes to industry development by encouraging sustainable practices, enhancing quality, and promoting the adoption of modern technologies. Its efforts include supporting Good Agricultural Practices and Good Manufacturing Practices, advocating for policies that improve industry efficiency, and promoting value-added tea products. The Association also works to advance digital transformation in the sector, encouraging the adoption of e-commerce, digital traceability, and modern certification methods that strengthen global confidence in Ceylon Tea.

Through capacity-building programs, TEA offers training for exporters and smallholders in areas such as packaging, international standards, and quality management. It also supports innovation by partnering with universities and research institutions to foster new product development and modern market strategies. Additionally, the TEA plays a supporting role in key industry functions, such as the weekly Colombo Tea Auctions, which remain central to global tea trading.

Overall, the Tea Exporters Association plays an important role in promoting Sri Lankan tea, supporting export-led growth, and contributing to the broader development of the tea industry and the national economy. (Institute of Policy Studies, 2023 and Tea Research Institute of Sri Lanka, 2023)

Modernising the Tea Value Chain

Factory and Exporter Roles

The journey from leaf to cup involves a complex value chain where institutions and private-sector actors must collaborate to maintain quality and market competitiveness.

Factory Enabling Institutions

Tea factories are central to value addition. Institutional support focuses on:

- **Certification and Quality Control:** The Sri Lanka Tea Board mandates strict quality standards, ensuring that Ceylon Tea maintains its premium reputation. Factory-level training programs on processing, food safety, and compliance with international standards (e.g., ISO, HACCP) are critical.
- **Capacity Building:** Training programs, often supported by institutions like the TRI, NIPM and TSHDA, help factory staff adopt new processing technologies and sustainable practices, which are increasingly demanded by international markets.
- **Market Engagement:** Exporters are the primary link to global markets. Their role extends beyond simple logistics to include branding, market research, and product differentiation. Exporters are at the forefront of identifying and capitalising on new market trends, such as the growing demand for organic, fair trade, and single-origin teas.

The Exporter's Strategic Role

Exporters are key to unlocking higher value for Sri Lankan tea.:

- **Develop International Market Linkages:** By participating in global trade shows and building relationships with international buyers, they secure new markets and diversify revenue streams.
- **Invest in Product Differentiation:** This includes developing speciality teas, creating unique blends, and pursuing certifications like **Rainforest Alliance** and **RegenAgri**, which enhance traceability and appeal to environmentally conscious consumers.

- **Enhance Sustainability Credentials:** A focus on sustainability from the field to the factory allows exporters to position Ceylon Tea as a premium, ethical product, commanding higher prices and building brand loyalty.

Public-Private Partnerships and Development Contributions

The success of the Sri Lankan tea industry is increasingly dependent on the synergy between the public and private sectors. This collaboration is essential for tackling systemic challenges that a single entity cannot solve alone.

Donor and Development Partner Contributions

- International agencies, including the **World Bank**, **Asian Development Bank**, and the **United Nations Development Programme (UNDP)**, are significant contributors. They provide funding and technical assistance for:
- **Climate Resilience:** Funding projects for climate adaptation, such as improved water management and the promotion of agroforestry models, which increase biodiversity and soil health.
- **Technological Innovation:** Supporting research and the adoption of modern agricultural technologies, including precision agriculture and the mechanisation of harvesting to address labour shortages.
- **Capacity Building:** Funding training programs for smallholders and factory staff to improve skills and knowledge.

Private Sector Contributions

The private sector, comprising large plantation companies, input suppliers, and exporters, invests heavily in modernising the industry. Their contributions include:

- **Capital Investment:** Funding for the modernisation of processing facilities and the introduction of mechanisation.
- **Sustainability Initiatives:** Leading projects that aim for environmental and social certifications, often in collaboration with NGOs and government bodies.
- **Technological Adoption:** Introducing advanced fertilisers, machinery, and digital tools for farm management.

Tea Production from 2005 to 2023

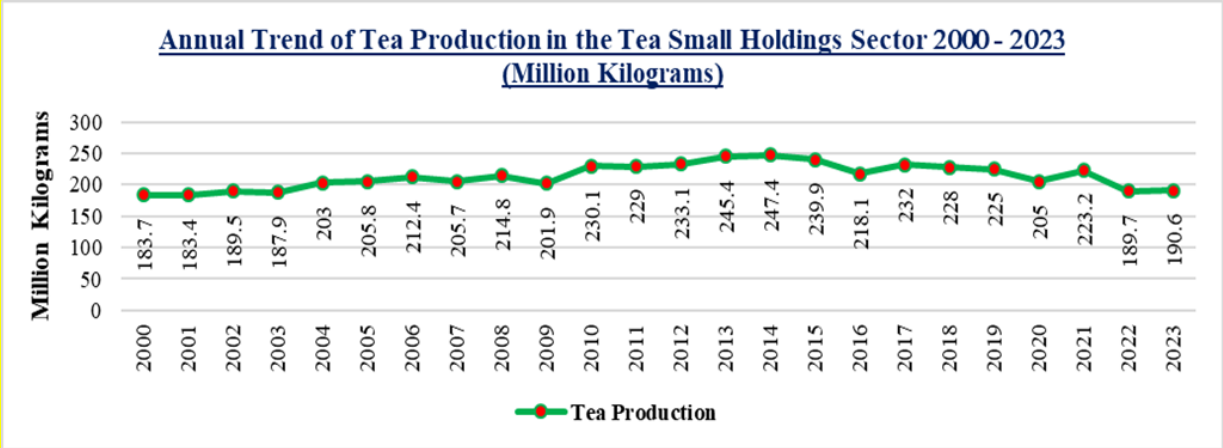


Figure 2: Annual Trend of Tea Production (TSHDA Annual Report, 2023)

The above graph shows that, despite all support systems and institutional efforts, Sri Lanka's tea production has been declining year by year due to several constraints, including poor soil health, failure to adopt good agronomic practices due to a lack of awareness among smallholders, and the effects of climate change.

The tea smallholder sector in Sri Lanka is facing significant challenges related to land productivity and environmental sustainability. Most smallholder farmers are not adopting optimal agricultural practices, resulting in subpar yields and decreased land productivity.

Furthermore, the excessive and often uninformed use of fertilisers has led to soil degradation, compromising soil health and fertility. This not only affects tea production but also has far-reaching environmental implications, including potential water pollution and biodiversity loss.

The indiscriminate application of fertilisers pose a significant threat to the long-term sustainability of tea production in the region.

Smallholders have limited access to assessing field nutrient levels beyond pH values, except through TRI and some private tea factories that provide extension services. Under such circumstances, when there is a nutrient imbalance in the soil, the smallholders complain about the quality of the fertiliser and continue to apply excessive amounts of inorganic fertiliser at increasing cost, which makes their lands even less productive. However, in the corporate sector, the situation is quite different due to the competencies of the managers and management.

Tea Manufactures

The industry is struggling with labour shortages, particularly in rural areas where tea plantations are located. This has resulted in increased labour costs and reduced productivity. Tea plantations require skilled labour to ensure quality, but the younger population is migrating to urban areas in search of better opportunities.

Shortage of high-quality tea leaves is one of the significant constraints faced not only by the manufacturers but also by the tea industry. An insufficient supply of quality tea leaves affects production and quality. In most regions, the percentage of good-quality leaves is below 30%.

Manufacturing poor-quality green leaves can have several adverse effects on tea factory owners, including an impact on Tea Quality: poor-quality green leaves can result in lower-grade tea, tea that is not made, and a higher percentage of refuse tea, affecting the flavour, aroma, and overall quality of the final product. This can lead to reduced customer satisfaction and loyalty, in turn, lower-quality tea fetching lower prices in the market, directly impacting the profitability of tea factory owners. Consistently producing low-quality tea can lead to a loss of market share and damage to a company's reputation. Poor-quality leaves may lead to higher waste generation during processing, exacerbating environmental concerns and increasing waste management costs. Tea processing already generates significant environmental impacts, including energy consumption and pollution. Inefficient processing due to poor-quality leaves can exacerbate these issues, and the factories may struggle to meet international quality and safety standards, limiting their access to global markets.

Knowing the importance of the outcome of manufacturing inferior-quality leaves, some factories are patronising superior-quality leaves. In contrast, some factories accept the poor-quality leaves at the same or a higher price.

Tea Small Holders

Even though the Tea smallholders play a vital role in Sri Lanka's tea industry, accounting for a sizable portion of the country's tea production. The smallholders face numerous challenges that affect their livelihoods and the overall sustainability of the industry, including low prices for green leaves, making it difficult for them to maintain a sustainable livelihood, limited market

access, making it challenging for them to sell their tea at competitive prices, and being vulnerable to climate change, which affects tea yields and quality.

Smallholders also lack access to modern technology, hindering improvements in tea quality and productivity, and they face challenges in accessing finance, which limits their ability to invest in their tea estates.

To address the challenges they face, action should be taken to strengthen market links between smallholders and buyers to ensure fair prices and stable markets.

Promote climate-smart agriculture practices, such as RegenAgri, that focus on soil health and environmental factors to help adapt to climate change.

Provide access to modern technologies, such as precision agriculture and digital tools, to improve tea quality and productivity; enhance access to finance for smallholders through microfinance programs and other financial instruments; and provide training and capacity-building programs to enhance their skills and knowledge in tea production and management.

Incorporating the challenges faced by tea smallholders into the industry's development plans is crucial for ensuring the sustainability and competitiveness of Sri Lanka's tea industry. By working together, stakeholders can address the challenges faced by tea smallholders and promote a sustainable and competitive tea industry in Sri Lanka.

Regional Office	Number of Societies		Membership	
Galle	217	219	49,230	43,714
Matara/Hambantota	192	192	53,978	54,263
Kalutara	116	119	23,217	23,464
Kegalle	148	150	28,903	29,589
Kandy/ Matale	227	227	22,231	22,306
Nuwara Eliya	127	127	14,837	14,137
Rathnapura	291	291	88,893	88,893
Uwa(Badualla and Monaragala)	166	167	24,447	24,340
Total	**1,484**	**1,492**	**305,736**	**300,706**

Table 3: Tea Smallholder Societies (TSHDA Progress Report, 2023)

As per the table above (Table 3), the number of societies increased marginally in 2023. However, membership decreased in 2023. The highest number of members is in the districts of Galle, Matara, and Ratnapura.

TSHDA was instrumental in establishing smallholder societies. The membership of these societies ranges from 80 to 900. The TSHDA Act governs societies. Collecting green leaves is the key function of these smallholder societies. Another function of these societies is supplying green leaves to factories that offer the best prices, providing microcredit, and distributing fertilisers. However, there are no supply contracts between smallholders and their society; as a result, smallholders are not obliged to supply green leaves to their society.

Remedial Measures to Enhance Smallholder Societies

Smallholders are the backbone of the Sri Lankan tea industry, yet they face challenges related to low productivity and fragmented value chains. Therefore, it is essential to look after their interests by taking necessary steps such as;

- **Improving Access to Inputs and Technology:** Organising smallholders into cooperatives and clusters, these groups gain collective bargaining power for purchasing inputs and accessing advanced technologies.
- **Enhancing Bargaining Power:** Cooperatives allow smallholders to sell their green leaf at fairer prices, and jointly invest in community-level processing facilities.
- **Promoting Sustainable Practices:** Government and private sector initiatives encourage the adoption of sustainable and organic farming methods, which can lead to higher-value products and greater income stability.
- **Increasing Income Stability:** The development of premium products and efficient value chains helps stabilise and increase the income of smallholder families, reducing poverty and strengthening rural economies.
- **Strengthen Governance and Transparency:** Introduce mandatory governance training for society leaders, Digitise member records, and financial transactions.

The tea value chain is highly interdependent but remains fragmented. The tea value chain, from smallholder cultivation to export, is deeply interconnected, yet suffers from weak coordination among stakeholders. The collection of green leaves for factories varies by growing region. In the mid-grown region, leaf collectors supplied the majority of green leaves. In the high-grown region, licensed leaf collectors and factory agents bring in the leaves required for processing. In the low-grown region, different collection methods are used, including factory agents, smallholder societies, licensed collectors, and direct supply of green leaves to factories by smallholders.

Unorganised green-leaf supply chains, lack of capital for expansion, smallholder indebtedness to leaf collectors, poor cash flow in the supply of green leaves, and uncertainty for workers at smallholders' operations are key issues in the green-leaf supply chain.

Smallholder indebtedness mainly results from low land productivity, climate change effects, poor soil health, poor adherence to sound agronomic practices, and poor household cash management. They are compelled to sell their green leaves to collectors at the price set by the collectors.

Even though Sri Lanka Tea Board regulations prohibit transporting green leaf across districts without prior approval, and mandate that the leaf be delivered to a registered factory within a defined radius to ensure freshness and traceability. Green leaf cannot be transported from one administrative district to another without written permission from the Sri Lanka Tea Board (SLTB) to prevent unauthorised trade and blending of leaf from different agro-climatic zones, protect the integrity of regional tea profiles, and maintain traceability.

The regulation also requires that green leaf be delivered to a registered tea factory within a specified radius, within 5–10 kilometres for smallholder green leaf collection to minimise leaf damage and fermentation during transit, ensure timely processing to maintain quality standards, promote local factory utilisation, and reduce transport costs.

Compliance Requirements such as transporters must carry SLTB-issued permits indicating the source location (estate or smallholder cluster), destination factory, quantity and time of dispatch, and factories must reject leaf delivered from outside their approved catchment area unless prior SLTB clearance is obtained.

The regulations are not in force as expected for several reasons, including limited manpower at the tea board, limited stakeholder awareness, and short-term benefits sought by interested personnel.

Suggestions for Improved Compliance

- As a remedy for this situation, a supply chain model highlighting contractual relationships between farmers and their farmer company, value addition for the products and services and state support is proposed. This would improve bargaining position, enhance profitability and access to capital, eliminate smallholder indebtedness to leaf collectors, improve smallholders' creditworthiness, and support training and skills development for youth.
- Digitise transport permits and factory logs to improve traceability.
- Use GPS-enabled transport monitoring to verify route adherence.
- Establish cluster-based collection centres with SLTB oversight to streamline logistics.

Strategic Recommendations for Improvement

- **Strengthen Institutional Coordination**: Establish a central coordinating body to align efforts across ministries, research institutions, and private actors. Promote stakeholder forums for inclusive decision-making and feedback loops.
- **Enhance Financial Resilience**: Expand access to tailored financial services for smallholders and SMEs. Introduce financial literacy programs and digital finance platforms to improve uptake and transparency.
- **Modernisation of Production and Processing:** Adopt precision agriculture and climate-smart practices to improve yield and sustainability. Upgrade processing facilities with automated systems and quality assurance processes.
- **Improve Logistics and Traceability**: Digitise supply chain tracking to ensure transparency and compliance with international standards. Streamline export procedures and reduce bottlenecks in transport and warehousing.

Short-term (1-2 years)

- Formation of a vocational research and plantation management university amalgamating research institutes as a pragmatic and essential approach to establish effective R&D as well as to produce productive extension staff. The National Institute of Plantation Management could be used for this purpose.
- Provide support to smallholders through policies and programs that promote sustainable tea production and improve market access.
- Engage with smallholders through inclusive business models that provide fair prices and stable markets.
- Organise technical assistance and capacity-building programs for smallholders to improve their skills and knowledge in tea production and management, in collaboration with the people/ public/private sectors.
- Establishment of a reliable, dynamic database with updated information. Non-availability of accurate data is a drawback in the sector.
- If we rely on the existing system to produce advanced R&D and effective extension, it will be a failure. All of you have a good understanding of the pathetic situation of crop Research institutes and unproductive extension service.
- Launch pilot projects focusing on high-yield cultivars. These projects should incorporate sustainable practices, including organic farming, integrated pest management (IPM), and regenerative agricultural techniques to restore soil health and increase biodiversity.
- Develop and implement national sustainability standards to ensure environmentally responsible and socially equitable cultivation practices. These standards will help align Sri Lanka with global market requirements while protecting local environmental and social contexts.
- Initiate partnerships with international supermarket chains and speciality stores that prioritise sustainably produced and certified products, with an emphasis on Sri Lanka’s unique offerings like organic and fair-trade certified spices.

- Develop and implement digital marketing campaigns that highlight the unique qualities of our tea. Set up a comprehensive e-commerce platform to cater to both domestic and international markets, ensuring easy access to high-quality Sri Lankan products.
- Invest in Market Intelligence and Branding: Conduct competitor and trend analysis to reposition Ceylon Tea globally.
- Encourage production of speciality teas, extracts, and wellness products.
- Support R&D for product innovation and packaging tailored to emerging markets.
- Develop unified branding strategies that highlight origin, sustainability, and health benefits.
- Promote Value Addition and Diversification.

Medium-term (3-5 years)

- Scale up successful pilot projects by expanding sustainable and regenerative agriculture practices across all regions.
- Increase market presence by securing more shelf space in international markets, particularly in regions with high demand for organic and sustainably produced goods. Actively participate in international trade fairs and exhibitions to promote Sri Lankan products and establish a more substantial global footprint.
- Achieve major quality certifications such as organic, fair-trade, and sustainability certifications. Enhance branding efforts by leveraging these certifications to differentiate Sri Lankan products in the global market.
- Continue the development and refinement of national sustainability standards, ensuring they remain aligned with international benchmarks while being tailored to Sri Lanka's unique environmental and socio-economic contexts.

Long-term (5+ years)

- Continuously innovate and adapt to changing market trends and consumer preferences by investing in research and development, particularly in areas such as climate-resilient crop varieties, regenerative agriculture practices, and advanced processing technologies.
- Strengthen the supply chain and infrastructure to support large-scale operations, ensuring efficient transportation, storage, and distribution of products. Focus on reducing post-harvest losses, maintaining product quality, and integrating sustainability practices across the supply chain.
- Expand into new markets by exploring opportunities in emerging economies and diversifying product offerings to include high-value, health-oriented, and organic products. Ensure sustained growth and profitability by continuously improving production methods, enhancing sustainability, and staying ahead of global market trends.
- Fully integrate regenerative agriculture practices into the national sustainability standards, ensuring that Sri Lanka's agricultural practices not only maintain but actively improve the environmental health and biodiversity of farming areas.
- By integrating advanced agricultural techniques, sustainable practices, and a robust marketing strategy, the country can maximise yields, enhance profitability, and establish a strong presence in the global market for tea.

The Sri Lankan tea industry is at a critical juncture. The path to a sustainable and prosperous future lies in continued collaboration among government institutions, private-sector companies, and development partners. By leveraging the scientific expertise of the TRI, the smallholder outreach of the TSHDA, the regulatory strength of the SLTB, and the market acumen of private exporters, the industry can overcome its challenges. A focus on public-private partnerships, investment in climate resilience, and the empowerment of smallholder societies is not just a strategic choice; it is essential to ensuring that Ceylon Tea continues to be a source of national pride and economic strength for generations to come.

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Smallholder Tea Farmers in Sri Lanka: A Study of Livelihoods and Challenges"* by the International Labour Organization (ILO)

Climate Change and Tea Smallholders in Sri Lanka"* by the Sri Lanka Tea Research Institute discusses the impacts of climate change on tea smallholders and proposes adaptation strategies.

Value Chain Development for Smallholder Tea Farmers in Sri Lanka"* by the Asian Development Bank (ADB) outlines a value chain approach to improve the livelihoods of smallholder tea farmers.

Future of Work for Tea Smallholders in Sri Lanka / International Labour Organization (ILO)

Yajith De Silva

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13. Case Study: The Pivithuru green tea leaves initiative of the TSHDA

By Saman Priyantha Rathnayake

Abstract

The *Pivithuru (Immaculate)* Green Tea Leaves Initiative is a pilot program implemented by the Tea Small Holdings Development Authority (TSHDA) of Sri Lanka to improve the quality and quantity of green tea leaves supplied by smallholder farmers while strengthening the sustainability and profitability of the smallholder tea sector. The initiative addresses long-standing challenges related to the limited adoption of Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) recommended by the Tea Research Institute of Sri Lanka. Implemented through partnerships with bought-leaf tea factories across eight major tea-growing regions—Ratnapura, Uva, Kalutara, Kandy, Kegalle, Matara, Nuwara Eliya, and Galle—the project engages clusters of smallholder farmers through structured training, collaborative problem solving, and continuous monitoring. The approach includes cluster formation, the appointment of trained cluster leaders as para-extension workers, baseline assessments of farming practices, in-situ farmer field school–type training, and digital monitoring through the *Pivithuru* dashboard. Key interventions focus on improving harvesting standards, soil fertility and conservation practices, shade management, sanitary pruning, and minimizing post-harvest losses. Early results indicate improvements in green leaf quality, more consistent plucking rounds, enhanced farmer knowledge of GAPs and GMPs, and stronger linkages between farmers, factories, and extension officers. Despite ongoing challenges such as ageing tea bushes, labour shortages, climate impacts, and uneven technology adoption, the initiative demonstrates a promising integrated model for improving productivity, quality standards, and farmer incomes. The Pivithuru initiative offers a scalable framework for strengthening Sri Lanka's smallholder tea sector and supporting a more resilient and competitive tea industry.

Keywords: tea smallholders, Sri Lanka tea sector, green leaf quality, Good Agricultural Practices (GAPs), Good Manufacturing Practices (GMPs), extension services, farmer clusters, factory–farmer partnerships, tea productivity, sustainable tea production.

Introduction

The Pivithuru green tea leaves initiative is a pilot intervention launched by the TSHDA to enhance the standard of green tea leaves, increase productivity and elevate the income of tea Smallholder farmers across all tea growing regions of Sri Lanka. This initiative addresses the long standing challenges of adopting Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) recommended by the Tea Research Institute of Sri Lanka. .

This initiative has been implemented through partnered bought tea leaf factories across eight regions representing all tea growing districts of Sri Lanka and the initiative engages with selected tea Smallholders in proper selection, formation of clusters for effective monitoring, identification and recognition of cluster leaders as Para extension workers, Baseline study with a pre-tested questionnaire, identification of knowledge and adoption of GAPs, reasons for gaps in poor/average adoption of GAPs, structured in-situ field trainings as per farmer school method, collaborative problem solving among the group (tea Smallholder farmers, TSHDA Officers and Factory staff), digital record keeping through Pivithuru dash board and continuous on and off field monitoring .

This case study is compiled based on presentations made by the Regional managers representing of eight regions of the TSHDA under whose supervision and guidance the *Pivithuru* initiative is being implemented.

Objectives of the Initiative

- Enhance the standard of green leaves supplied to factories.
- Increase productivity and consistency of green leaf yield.
- Promote GAPs and GMPs across participating tea Smallholders and bought leaf factories
- Strengthen the collaboration between bought leaf factories, tea smallholders and TSHDA extension staff
- Elevate the income of both the tea Smallholder farmers and the bought leaf tea factories through guaranteed premium prices of pure Ceylon teas sold and consumed over mass and niche markets
- Sustenance to achieve the Sri Lankan Government status of “Thriving Nation: Beautiful life” through a resilient tea industry.

Geographic Coverage & Scale

- This pilot project was implemented with multiple factories covering all tea growing regions across Sri Lanka namely Ratnapura, Uva, Kalutara, Kandy, Kegalle, Matara, Nuwara Eliya and Galle.
- Selected tea smallholder farmers ranged from 350 to 400 per factory.
- Farmer clusters varied from 6 to 30 groups.
- Majority (more than 50%) of the tea lands are in between ½ ac to 1acre
- More than 20% vacancies in terms of bush density available in these tea lands (low bush density)
- Average monthly Green leaf supply varied significantly by region (15000 to 30000 kg)
- Factory trough capacities ranged from 800 to 1400 kg depending on factory scale.
- Poor to average level of adoption observed out of the 05 basic GAPs measured (harvesting, pruning, soil conservation, soil fertility management and shade management)
- More than 50% of the labour hired for harvesting (nevertheless, the same gang of Pluckers being sought out consecutive rounds of plucking)
- Wide variation of harvested leaf standards among each region (Best, Below best and poor category taken as bench mark for each region)

Key strategies of the Pivithuru green tea leaves initiative

GAPs and GMP Promotion

- Top priority on proper harvesting and keeping at least a 07day plucking round
- Proper execution of soil conservation practices and soil fertility management via incorporation of organic and green manure.
- Timely application of balance inorganic fertilizers on demand

- Proper management of low and high shade for providing a conducive micro environment and continuous supply of green matter
- Execution of proper sanitary pruning (manual and machine) followed by block infilling with Jumbo nursery plants

Post-Harvest damages minimization

- Reducing damage to leaves during transport.
- Mandatory use of leaf baskets and standardized bags.
- Establishing leaf sheds for temporary storage.
- Conducting random inspections of leaf standard at collection points.

Farmer and worker capacity Building

- Demonstration plots for practical training.
- Formation of worker gangs (harvesting and pruning specially on manual and machine) and continuous Training of Trainees (TOTs) sessions for the cluster leaders on para extension
- Orientation for Cluster leaders and factory coordinators.
- Continuous TOTs on GAPS and GMPs

Farmer and Factory integration

- Conducting baseline study survey of selected tea Smallholder lands which supply green leaves to the factory
- Recording and reporting daily and monthly data on leaf quantity and green leaf standards
- Offering price incentives for higher standard green tea leaves
- Supporting rehabilitation and replanting of poor productive tea lands

Green tea leaves quantity and standard Monitoring

- Leaf quantity and standard are being assessed daily and monthly, in each factory.
- Bench marks identified for each factory on leaf standards in terms of Best, Below best andPpoor category

Regional Highlights

Ratnapura (Sisiramba Factory)

Focus on minimizing post-harvest losses, soil conservation and soil fertility management

and TOTs on harvesting

Bandarawela (Aruna Factory)

Strong emphasis on soil enrichment via organic/green manure and establishment of proper transportation for harvested green leaves to minimize damages

Kalutara (Aruna Factory)

Strategies include TOTs on GAPs and GMPs, facilitation on raising standard nursery plants, attractive competitive prices for Best category green leaves and ensuring the supply of recommended tea fertilizer mixtures

Kandy (Pallegama Factory)

Focus on legal enforcement existing rules and regulations

Kegalle (Broadland Factory)

Focus on to minimize post harvesting losses, TOTs on plucking and pruning, introducing sprinklers and drip irrigation supported by fustigation

Matara (Nilgiri Factory)

Focus on TOTs on GAPs and GMPs, trained gangs on plucking and pruning, initiatives by the factories on infilling and rehabilitation of low productive tea lands

Nuwara Eliya (Broadland Factory)

Focus on GAPs and GMPs

Galle (Rekadahena Tea factory)

Focus on minimizing post-harvest losses, monitor the process of leaf suppliers and trained pluckers through field based training programs facilitated by farmer Cluster leaders

Outcomes and Early Results

Although the pilot is being executed, early observations highlighted across regions as below:

Improved green leaf standards

Adhering to proper harvesting principles

At least 04 rounds of plucking/month, proper removal of immature pluckable shoots, proper removal of mature banji (dormant leaves on the plucking table) and stalks, minimize damage in keeping short time in hands, using proper leaf collecting sacks, proper leaf dispatching to the factory minimizing post harvesting losses

Increased Productivity

Timely harvesting assuring the maintenance foliage (minimum of 04 plucking rounds per month), proper attention on soil health (soil conservation and nutrient management), proper sanitary pruning, low and high shade management in short run seem a positive impact on productivity.

Enhanced Farmer and Factory awareness

Greater adoption of GAPs and GMPs

Improved knowledge on GAPs and GMPs

Establishment of Para Extension workforce, professional workforce on skill operations, viz, harvesting, pruning (manual and machine)

Strengthened Farmer – Factory Linkages

Improved cooperation on competitive pricing, quantity and green leaves standard monitoring, and tea land productivity improving measures

Regular feedback loops established through cluster leaders and data reporting.

Challenges Observed

Low productivity and declining trends in yield mainly due to over aged vegetative propagated tea, skill labour shortages (requiring formal leaf-picking teams as tea being very labour intensive), poor/average adoption of GAPs and GMPs, high cost of replanting, negative impacts of climate change, weaknesses of extension services in technology dissemination, lack in Research and Development for addressing burning ground level issues, ever changing Government policies and non or poor compliance of existing regulations.

Success Factors

- Strong involvement of factory management.
- Use of model plots and demonstrations.
- Continuous monitoring and monthly reporting.
- Incentive structures (e.g., higher prices for standard green tea leaves).
- Integrated and continued support soughed from regional TSHDA extension staff
- Facilitate the process by adopting six sigma and lean by revisiting the whole value chain

Conclusion

The *Pivithuru Tea Leaf Initiative* has demonstrated significant potential in improving both the standard and **quantity** of green leaf supplied by Smallholder farmers. It is an integrated model comprises of Smallholder farmer training, cluster formation, cluster leader operation in terms of Para extension, tea factory collaboration, GAPs and GMPs adoption, structured and continuous monitoring offers a scalable framework for nationwide implementation.

With continued investment, policy support, and expansion to more factories, this initiative could play a pivotal role in revitalizing Sri Lanka's Smallholder tea sector, ensuring competitiveness, sustainability, and improved livelihoods for tens of thousands of rural families.

Saman Priyantha Rathnayake

Saman Priyantha Rathnayake is an agriculture and tea extension specialist with extensive experience in Sri Lanka's smallholder tea sector. He is currently reading for a PhD at the Postgraduate Institute of Agriculture, University of Peradeniya. He holds an MBA with merit from Wuhan University, China, and a B.Sc. in Agriculture (Special, Second Class Upper) from the University of Ruhuna. Saman has 22 years of experience in tea technology dissemination at the Tea Research Institute of Sri Lanka and currently serves as Deputy General Manager (Extension) at the Tea Small Holdings Development Authority, with three years of additional experience in smallholder-focused extension



14. Agri-Digital Systems and Data-Driven Agriculture

By Rosmin Varghese and Pramod John

Abstract

Digital technologies are increasingly transforming agricultural systems by enabling data-driven decision-making and improving efficiency across value chains. This paper explores the role of agri-digital solutions in strengthening Sri Lanka's tea smallholding sector. Technologies such as mobile advisory platforms, farm management applications, digital traceability systems, and sensor-based monitoring tools offer new opportunities to improve productivity and transparency. Data analytics and machine learning applications can help farmers and policymakers better understand production trends, manage resources efficiently, and respond to climate risks. However, challenges such as limited digital literacy, connectivity gaps, and financial barriers must be addressed to ensure widespread adoption. Strengthening digital infrastructure and farmer training is essential to harness the potential of digital agriculture.

Keywords: Digital agriculture, Agri-digital systems, Data-driven farming, Precision agriculture, Agricultural technology, Tea value chain

1. Introduction: The Data Gap in Climate Resilience

The Problem

For generations, farmers have relied on traditional wisdom to cultivate tea, but this knowledge system now struggles to keep pace with the accelerating impacts of climate change. Smallholder farmers who sustain the global tea sector and contribute as much as 60% of production in some regions confront complex threats from erratic weather, extended droughts, and declining soil health. These pressures directly cut tea yields and quality, trapping farmers in cycles of shrinking income and growing vulnerability (Softweb Technologies, 2024).

The root of the challenge lies in a severe data gap. Many farmers lack the timely, hyper-local information needed to make daily decisions about irrigation, pest management, and fertiliser use. Without this data, they often misuse resources, spend more, and become more exposed to the impacts of climate change (Softweb Technologies, 2024). Digital transformation remains expensive, especially in remote highland regions where tea thrives, making it difficult to close this information divide. The agricultural sector often struggles with a lack of expertise in agri-system design and management, which complicates efforts to create accessible digital tools (Cob-Parro , Lalangui, & Lazcano, 2024).

The Opportunity

Agri-digital systems offer a powerful way to close the existing data gap. Technologies such as the Internet of Things (IoT), satellite imagery, mobile platforms, and data analytics actively gather, interpret, and convert environmental data into actionable insights (How, Chai, Phang , Yeo , & Ngu, 2022) (Ready for Tea, 2024). Precision agriculture tools, for example, help farmers use water and fertilisers more efficiently, lowering input needs while boosting productivity. By delivering real-time insights to farmers' mobile devices, these systems build a proactive "digital shield" that strengthens the tea industry's resilience to climate risks. This transformation is already underway evidence from Rwanda demonstrates that adopting smart

farming and traceability tools can raise yields by 30–40% and reduce input costs by 15% (Softweb Technologies, 2024). Machine learning further fortifies this digital layer by predicting pest and disease outbreaks, optimising supply chains, and improving both productivity and sustainability (Rwanda Mountain Tea Limited, 2024); (Gao, Wang, & Yu, 2025).

2. The Integrative Role of Agri-Digital Systems

Agri-digital systems provide targeted, data-driven guidance. Without this guidance, farmers make other resilience efforts less effective and inefficient. These efforts include implementing new irrigation, planting shade trees, or adopting new crop varieties. Data ensures that people apply these interventions where and when they need them most. A structured AI digital architecture makes the entire agricultural value chain more efficient, equitable, and environmentally sustainable by ensuring that data is systematically transformed into reliable, actionable intelligence (Cob-Parro , Lalangui, & Lazcano, 2024). Therefore, farmers and policymakers must now integrate these systems. It is no longer a luxury but a prerequisite. This integration makes climate resilience actionable, efficient, and scalable for the fragmented smallholding sector. It transforms climate resilience from a theoretical concept into a set of daily, data-informed practices.

3. Key Digital Solutions for the Tea Value Chain

Digital solutions are pivotal in translating climate resilience from theory into practical, data-driven actions for tea smallholdings. The technologies outlined in the table below directly address specific climate vulnerabilities by providing timely, localised data and actionable advisories to stakeholders across the value chain.

Solution Name	Technology Type	Climate Resilience Application & Value	Evidence/Impact
AgriMet (Hyper-local Weather Station)	Hardware with integrated software	Captures real-time weather parameters, soil conditions, and pest data. Provides 7-day weather forecasts to guide tactical farming decisions such as irrigation and pest management.	Enables proactive risk management; similar agro-weather tools help farmers manage climate variability
Soil Probe (Instant Soil Analyser)	IoT Hardware with software bundle	Measures comprehensive soil parameters (moisture, temperature, NPK, pH, salinity).	Prevents resource waste.
AgriBot (AI-Powered Chatbot)	Stand-alone software and plugin	Offers personalised, real-time assistance in local languages using Natural Language Processing (NLP). Helps farmers optimise crop production decisions and access climate-smart practices.	AI-driven platforms enhance accessibility for low-literacy farmers and provide tailored, context-specific guidance.
Ballotronix (Instant Tea Leaf Analyser) – Patent No. 425340	Hardware with bundled software	Automates the quality grading of tea leaves against factory standards using AI.	Consistent grading of tea leaves.
Agri-Trail (Traceability Solution)	Software application	Tracks leaf collection, delivery, and manufacturing using cryptographic hash codes and QR codes. Provides consumers with sustainability and production data, fostering supply chain accountability.	Cloud-based traceability enhances transparency and can reduce operational costs.

Table 1: Digital Agriculture Solutions for Climate Resilience in Tea Smallholdings

4. Implementation Insights for Stakeholders

Effective deployment of these technologies requires strategic planning informed by field evidence.

1. **Advisory Delivery and Farmer Engagement**
   Advisory systems using Interactive Voice Response (IVR) and SMS are most effective when messages are concise (under 75 seconds) and delivered at optimal times, such as 12:30 PM or 5:30 PM, when farmers are more likely to be available (IDinsight- Singh, Rupika; Jalote, Sumedha; Adlakha, Raghav, 2019). Pilots show that three callbacks can increase engagement rates by over 30% (IDinsight- Singh, Rupika; Jalote, Sumedha; Adlakha, Raghav, 2019). However, for complex new practices, video has proven superior to IVR or SMS for enabling knowledge retention and driving behaviour change. (ICT Works, 2024)
2. **Addressing Literacy and Access**
   A key to adoption is designing for inclusivity. This involves using multilingual IVR systems that operate in local languages and platforms designed for users with low digital literacy. (BMZ-Digital.Global, 2024). Evidence suggests that peer-to-peer communication within farmer networks significantly reinforces sustained adoption of climate advisory services. (Rohit, et al., 2024).
3. **Data Integration for Decision Support**
   The most excellent resilience benefits are realised when tools are integrated. For example, combining hyper-local weather data with soil analytics allows for the generation of composite advisories on irrigation and nutrient management, creating a powerful "digital shield" for farmers. (Singh, 2017).

5. Addressing Stakeholder-Specific Benefits and Roles

The transition to a digitally enabled, climate-resilient tea sector requires the concerted effort of all value chain actors. The strategic integration of agri-digital systems offers distinct benefits and mandates specific roles for each key stakeholder group, moving from theoretical advantages into tangible, on-the-ground impacts. A summary of these benefits and roles is presented in the table below (Table 2).

Stakeholder	Primary Benefits	Critical Roles
Government Agencies	Evidence-based policymaking and efficient resource allocation	Develop national digital agriculture strategies; subsidise IoT infrastructure; create open-data platforms for weather and soil health
Tea Manufacturers & Factory Owners	Secured supply chain, consistent quality, and verifiable sustainability for market claims (Rainforest Alliance, n.d.)	Invest in farm management software; use historical and satellite data for supply chain monitoring; implement a hash chain/blockchain for traceability.
Tea Farmers & Smallholders	Reduced climate risk, higher productivity, and better income stability	Adopt mobile apps for advisories; participate in digital data collection; use data to optimise inputs (water, fertiliser).
Certification Agencies (e.g., Rainforest Alliance, Fairtrade)	More robust, efficient, and fraud-resistant auditing processes.	Integrate farm practice management and digital records into standards; allow for digital compliance monitoring.

Table 2: Stakeholder-Specific Benefits and Roles in Agri-Digital Transformation

6. Detailed Analysis of Stakeholder Dynamics

(a) For Governments of Tea Producing Countries

Governments are pivotal enablers of the digital transformation. Their key benefit lies in moving from reactive policy measures to proactive, evidence-based policymaking. By leveraging aggregated, anonymised data from digital platforms, governments can identify regional climate vulnerabilities, track the adoption of sustainable practices, and allocate subsidies and resources with unprecedented precision (dhis2, 2025).

Their role is to create a conducive environment for technological adoption. This includes developing national digital agriculture strategies that prioritise climate resilience in key tea-growing regions. Furthermore, governments should subsidise IoT infrastructure, such as hyper-local weather stations and soil sensors, in these regions to overcome initial cost barriers. Finally, establishing open-data platforms for weather and soil health data can democratize access, prevent data silos and ensuring that smallholders, manufacturers, and researchers can all benefit from the same foundational information.

(b) For Tea Manufacturers & Factory Owners

For manufacturers, digital systems directly address core business risks and market demands. A primary benefit is a more secure and predictable supply chain. Satellite and drone monitoring allow manufacturers to assess crop health across their supplying smallholders in near-real time, enabling early intervention for pests, diseases, or drought stress. This leads to more consistent green leaf quality and volume. Furthermore, digital traceability systems provide the data needed for verifiable sustainability claims, which consumers and regulators increasingly demand. (Rainforest Alliance, n.d.).

Their role is operational and strategic. Manufacturers must invest in and deploy farm management software to their outgrower schemes, providing farmers with tailored advisories. They should actively use satellite data to monitor the health of their supplying smallholders, moving from transactional relationships to supportive partnerships. Implementing technologies like blockchain for traceability from farm to final package enhances transparency, reduces the risk of fraud, and strengthens brand credibility. (Tridge, 2023).

(c) For Tea Farmers & Smallholders

Smallholders, who form the backbone of the tea sector, stand to gain significantly in their daily lives and livelihoods. Adoption of agri-digital tools directly reduces risk from climate volatility and pests through early warning systems. This proactive management, in turn, supports higher productivity and better income stability through improved crop quality and yield (Rohit, et al., 2024)

The role of farmers is centred on engagement and adoption. This involves adopting simple mobile applications that deliver actionable advisories on irrigation and fertilisation in their local language. Farmers are also encouraged to participate in digital data collection, for instance, by using instant soil analysers or providing ground-truthing information, which enriches the system for all. Finally, they must act on the provided data to optimise inputs, leading to cost savings and more sustainable farming practices.

(d) For Certification Agencies

Certification agencies like the Rainforest Alliance and Fairtrade can enhance the credibility and efficiency of their programs. A significant benefit is the ability to conduct more robust and fraud-resistant audits. Remote sensing data provides an objective, time-stamped record of farm practices, making it harder to falsify compliance information. This also makes the audit process more efficient, potentially reducing the cost and burden of frequent physical audits.

Their role is to evolve certification standards for the digital age. This requires agencies to formally integrate remote sensing data and digital records into certification standards as acceptable forms of evidence of compliance. Furthermore, they should develop protocols to allow for digital compliance monitoring, creating a system of continuous, data-driven assurance that complements traditional audit cycles. This approach aligns with advanced fraud control systems that use risk-based audits and secure documentation to uphold integrity.

7. A Call to Action: Implementing a Digital Resilience Framework

The transition to a digitally-resilient tea sector demands a coordinated, multi-stakeholder approach. Moving from theoretical benefits to tangible impacts requires a concrete framework for action. The following plan outlines a phased strategy for piloting, governance, capacity building, and financing digital transformation across Sri Lanka's tea smallholdings.

(a) Pilot Projects: De-risking Adoption through Public-Private Partnerships

Initial deployment should focus on high-risk tea-growing districts to demonstrate value and de-risk broader implementation. Public-private partnerships (PPPs) are crucial for pooling resources and expertise and for mitigating investment risks. These pilot projects should deploy integrated sensor networks for hyper-local weather and soil monitoring alongside user-friendly mobile applications that deliver actionable advisories to farmers (Singh, 2017).

A hybrid, phased implementation strategy is recommended, beginning with digitising standard verifications and basic compliance checks where patterns are well-established. This approach allows for iterative learning and process refinement before scaling. Success hinges on defining clear escalation triggers—specific criteria such as high asset values, repeat data discrepancies, or unusual climate patterns—that determine when issues should escalate from fully digital monitoring to manual, expert-led intervention. This ensures efficient resource allocation and builds stakeholder confidence in the system.

(b) Data Governance: Building Trust through Transparency and Ethics

Clear data governance protocols are the foundation of trust in a digital ecosystem. Farmers must be assured that their data is used ethically and in their best interests. Policies must explicitly address data ownership, privacy, security, and benefit-sharing arrangements.

Modern digital tools can incorporate tamper-proof audit trails that exceed traditional paper-based documentation standards, ensuring data integrity from the farm to the end-buyer. A centralised, secure data management platform is essential. Such a system automatically maintains detailed logs of data history, including creation, modification, and access, simplifying compliance and protecting confidential information through robust security measures. Establishing these protocols upfront prevents exploitation and encourages sustained farmer participation in digital schemes.

(c) Capacity Building: Ensuring Technology Adoption and Use

Technology is only as effective as the people using it. A comprehensive capacity-building program must target all value chain actors. For tea farmers, training should focus on practical, hands-on use of mobile apps and interpreting advisory alerts. Participatory methods, such as Farmer Field Schools (FFS), are highly effective. The FFS approach is an innovative, participatory, and interactive learning approach that emphasises problem-solving and discovery-based learning, where farmers learn by doing. (Rohit, et al., 2024).

For extension officers and factory managers, training must equip them with the skills to interpret complex data analytics, manage digital platforms, and support the farmers in their networks. This involves training on digital tools while updating procedures to integrate remote and on-site workflows. Emphasising change management is critical, as shifting to hybrid

digital-physical workflows represents a significant cultural transformation that requires clear communication of benefits and comprehensive support. (BMZ-Digital.Global, 2024).

(d) Financial Models: Leveraging Blended Finance for Inclusive Investment

The upfront cost of digital technology is a significant barrier for smallholders. Innovative financing models are essential to make these tools accessible. Blended finance, the strategic use of public or philanthropic funds to mobilise private capital for development outcomes, is a powerful solution for this challenge.

Blended finance can use concessional capital from public or philanthropic donors, such as grants, guarantees, or first-loss capital, to reduce the risk for private investors, thereby attracting commercial investment into projects with high social impact. By funding the development of a shared, open-source digital infrastructure, donors can drastically lower the entry costs for agribusinesses and technology providers committed to smallholders. This approach avoids vendor lock-in and creates a competitive market for service provision, thereby driving down costs and fostering innovation. Furthermore, working with impact-focused funds ensures investments deliver social and environmental good, often through technical assistance that strengthens an agribusiness's capacity to grow. (Cob-Parro , Lalangui, & Lazcano, 2024).

This creates a self-sustaining model in which philanthropic capital is used to build foundational technology, which is then leveraged by private-sector capital to deliver tailored services at scale. A similar model can be tailored for the Sri Lankan tea sector's digital transformation.

Action Pillar	Key Activities	Primary Stakeholders & Roles
Pilot Projects	● Identify high-risk districts ● Deploy sensor networks & farmer apps ● Use phased, hybrid implementation ● Define digital-to-manual escalation triggers	1. Governments: Facilitate PPPs, provide funding 2. Manufacturers/Factories: Co-invest, host infrastructure 3. Farmers: Participate, provide feedback
Data Governance	● Establish clear data ownership & privacy rules ● Create secure, centralised data platforms ● Implement tamper-proof audit trails	1. Governments: Set regulatory standards 2. All Parties: Adhere to protocols, ensure ethical use. 3. Certification Agencies: Verify data integrity for standards
Capacity Building	● Conduct Farmer Field Schools (FFS) for hands-on training ● Train officers & managers on data interpretation ● Implement change management programs.	1. Extension Officers: Facilitate FFS, provide ongoing support 2. Farmers: Engage in continuous learning 3. Factories: Train managers and field staff
Financial Models	● Structure blended finance vehicles ● Attract private impact investors. ● Provide technical assistance to agri-SMEs.	1. Governments/Donors: Provide catalytic, first-loss capital 2. Private Sector: Provide commercial capital for scale 3. Financial Institutions: Design and manage funds

Table 3: Summary of the Digital Resilience Implementation Framework

Implementing this digital resilience framework is not a one-time initiative but an ongoing process of adaptation and learning. By starting with targeted pilots, establishing a foundation

of trust through robust data governance, investing in human capital, and leveraging innovative finance, the Sri Lankan tea sector can build a future that is not only more productive and profitable but also fundamentally more resilient to the challenges of a changing climate. The time for coordinated action is now.

8. Potential Challenges and Mitigations

The successful integration of agri-digital systems in Sri Lanka's tea smallholding sector is not without significant hurdles. Acknowledging and proactively addressing these challenges is critical for designing realistic and inclusive implementation strategies. The most prominent barriers, digital literacy, connectivity, and cost, can be effectively mitigated through targeted, evidence-based approaches.

(a) Digital Literacy: Designing for Inclusivity

A substantial portion of the target user base, including many smallholder farmers, may have low literacy or limited experience with complex digital interfaces. Nearly half of the population in some countries faces challenges with everyday reading tasks, underscoring the scale of this barrier. When users with low literacy encounter complex navigation or unexplained acronyms, they are likely to close the application simply (TTC GLobal, 2024).

Mitigation Strategies:

- Implement Voice-Based Interfaces: Voice-enabled technology, powered by Natural Language Processing (NLP), offers an intuitive alternative to text-heavy apps. It allows users to interact with devices through natural speech, which is particularly beneficial for users with low literacy or those who are more comfortable with oral communication (rinf.tech, n.d.). These systems can be designed to provide alerts, deliver weather forecasts, and accept verbal data input.
- Adopt Easy English and Local Languages: All text-based content should be delivered in "Easy English", using short sentences, familiar words, and active voice, with translations into local languages like Sinhala and Tamil (TTC GLobal, 2024). Accompanying text with literal, uncluttered images that support the meaning can significantly enhance comprehension and recall. (TTC GLobal, 2024).
- Provide Multi-Modal and Offline Support: A multi-modal interface that combines voice, text, and visual cues ensures that information is accessible through multiple channels (rinf.tech, n.d.). Furthermore, businesses must recognise that a segment of the population will remain digitally excluded; for them, providing offline backups, such as phone-based support and printed Easy English fact sheets, is not just beneficial but essential (TTC GLobal, 2024).

(b) Connectivity: Ensuring Functionality in Remote Areas

Unreliable or non-existent internet connectivity in rural tea-growing regions can render cloud-dependent digital tools useless. This directly impacts the reliability of data collection and the utility of real-time advisory services.

Mitigation Strategies:

- Leverage Low-Power Wide-Area Networks (LPWAN): LPWAN is a wireless technology ideal for IoT applications in agriculture due to its long-range communication and minimal power requirements. Sensors using LPWAN can operate for years on a single battery, transmitting small amounts of data over vast distances, making them perfect for large, remote farms (Newton, 2024).Technologies like LoRaWAN can function effectively in areas with limited cellular coverage (Klaina, et al., 2022).
- Adopt an Offline-First Mobile App Design: An "offline-first" application is designed to function fully without an internet connection. Users can view cached content, enter data, and save progress locally. Once a connection is re-established, the app seamlessly

synchronises the data with the cloud (Quokka Labs, 2025). This approach requires a robust local database (e.g., SQLite, Realm) and a smart sync engine that can handle data conflicts (Quokka Labs, 2025).

(c) Cost: Developing Sustainable Financial Models

The initial setup and ongoing maintenance costs for IoT sensors, weather stations, and digital platforms can be prohibitively high for individual smallholders, creating a significant barrier to adoption.

Mitigation Strategies:

- Promote Shared-Service and Cooperative Models: A highly effective strategy is to pool resources through farmer cooperatives or groups. For example, a single, high-quality weather station can serve multiple fields and farmers within a cooperative, distributing the cost and maximising data coverage. This model of community ownership not only reduces individual financial burden but also fosters collaboration and collective resilience (Diverse Daily, n.d.).
- Utilise Hybrid Monitoring Approaches: To reduce costs further, a hybrid approach can be deployed. This involves supplementing a central weather station with a network of lower-cost, single-function sensors distributed across individual plots. This strategy balances data fidelity with affordability, making precision agriculture more accessible.

Challenge	Key Mitigation Strategy	Supporting Evidence and Implementation
Digital Literacy	Voice-enabled interfaces and Easy English design	Use Voice User Interfaces (VUI) and Natural Language Processing (NLP) for intuitive access - present text in short, simple sentences with supporting images (rinf.tech, n.d.).
Connectivity	LPWAN and Offline-First Apps	Deploy long-range, low-power sensors (Newton, 2024). Design apps with local data storage and background syncing (Quokka Labs, 2025).
Cost	Shared-service and cooperative models	Establish farmer cooperatives to share infrastructure costs, such as weather stations. Use a hybrid approach with central stations and low-cost sensors.

Table 4: Summary of Key Challenges and Proposed Mitigations

The path to digital transformation in Sri Lanka's tea sector requires a clear-eyed view of these implementation challenges. By prioritising inclusive design through voice technology and simplified language, leveraging robust technical solutions like LPWAN and offline-first apps, and fostering economic viability through cooperative models, stakeholders can build a digital resilience framework that is not only technologically sound but also equitable and scalable for all smallholders.

9. Conclusion

The integration of agri-digital systems has shifted from being an optional innovation to a core necessity for ensuring climate resilience within Sri Lanka’s tea smallholding sector. These systems now function as the industry’s digital nervous system, a dynamic network of sensors, analytics, and communication tools that collectively enable timely, data-driven responses to environmental stress. By capturing hyper-local weather, soil, and crop health data and processing it with machine learning (ML) algorithms, this digital infrastructure transforms data into actionable insights accessible across the value chain.

The transformative power of this system lies in its capacity to turn raw data into decisive, daily actions. For the smallholder farmer, this translates to receiving timely advisories on irrigation and pest management, directly mitigating the risks posed by unpredictable rainfall and temperature shifts. For processors and manufacturers, it ensures a more secure, high-quality supply of green leaf through enhanced traceability and precision in quality assessment, safeguarding product consistency despite climatic variability. (Gao, Wang, & Yu, 2025). For policymakers and certification bodies, the data generated provides an evidence base for targeted resource allocation and robust, verifiable sustainability credentials. (dhis2, 2025).

While digital literacy, network connectivity, and affordability remain structural challenges, the strategic approach outlined—anchored in pilot deployments, transparent data governance, skill development, and innovative financing—presents a scalable pathway for sector-wide adoption. Emerging advances, including refined ML pipelines for quality assessment and cost-effective Low-Power Wide-Area Network (LPWAN) sensor technologies, continue to expand the feasibility and impact. (Gao, Wang, & Yu, 2025).

By embedding intelligence and foresight at every operational layer, Sri Lanka’s tea sector can transition from reactive adaptation to proactive resilience. This transformation positions all stakeholders, from smallholders to global consumers, to participate in a tea economy that is not only sustainable but strategically equipped to thrive amid a changing climate.

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15. Regenagri: From Soil Health to Stable Yields

By Dr Rajesh Dubey

Abstract

Regenerative agriculture is gaining global attention as an approach that restores soil health, enhances biodiversity, and improves farm resilience. This paper examines the principles and applications of the regenagri framework within tea smallholding systems. Core practices include increasing soil organic matter, reducing chemical inputs, integrating cover crops, and promoting biodiversity through agroforestry and diversified farming systems. The paper also discusses certification mechanisms that support sustainable supply chains and provide incentives for farmers adopting regenerative practices. Evidence from pilot initiatives demonstrates that regenerative approaches can improve soil fertility, stabilise yields, and reduce production costs over time. By aligning environmental sustainability with economic benefits for farmers, regenagri offers a viable pathway for transforming tea smallholdings into resilient and sustainable production systems.

Keywords: Regenerative agriculture, Regenagri certification, Soil health, Sustainable tea production, Biodiversity, Climate-resilient farming

Context

The Intergovernmental Panel on Climate Change (IPCC) reports that current agricultural practices are causing soil to erode several times faster than it can naturally replenish itself. This trend poses a serious risk to long-term soil productivity and food security. In 2017, the Food and Agriculture Organisation (FAO) of the United Nations estimated that approximately one-third of the world's topsoil has already been degraded (Arsenault, 2014). The FAO further warned that, if soil degradation continues at the current rate, the world may have only about sixty years of productive harvests left.

Agriculture also plays a significant role in the global climate crisis. The IPCC estimates that agriculture and land use account for approximately 23% of all human-induced greenhouse gas emissions each year (Intergovernmental Panel on Climate Change [IPCC], 2019).

Echoing these concerns, Philip Lymbery, in his book Sixty Harvests Left: How to Reach a Nature-Friendly Future, reinforces the FAO's warning. He argues that without a shift towards more sustainable, nature-friendly farming practices, the world could face only 60 harvests left due to declining soil health.

Some effects of climate change, such as extreme weather, heat and drought pressure, migrating pests, and shorter growing seasons, pose serious risks to the global food supply. Smallholder farmers, who provide over 80% of the food supply in Asia and Africa, are particularly vulnerable, as they are both highly exposed and less equipped to adapt (Food and Agriculture Organisation of the United Nations [FAO], 2012).

At the intersection of sustainability, conservationism, and climate action, regenerative agriculture offers a solution that can help mitigate climate change while improving soil productivity. With core tenets emphasising building soil, minimising inputs, and enhancing biodiversity, regenerative agriculture offers farmers an opportunity to shift their mindset from working against nature to working with it, supporting the health and productivity of their farms.

In this backdrop, Regenagri CIC (Regenagri), the world's most extensive 'third-party' regenerative certification programme, has been promoting Regenerative Agriculture (RA) as an approach that enhances soil health and makes farms climate resilient. Increasing the amount of soil organic carbon (SOC) makes the soil healthier, richer and better able to hold water and nutrients. This not only supports stronger and more stable crop yields but also makes farming systems more climate-resilient.

Regenagri's Unique Value Proposition: Carbon Insetting

Regenagri's carbon insetting programme helps businesses reduce Scope 3 emissions while rewarding farmers for adopting regenerative practices. Producers earn carbon-insetting units by lowering their carbon footprint and receive financial incentives for their improvements. Businesses that purchase these units from within their own supply chain not only support farm-level sustainability but also reduce their Scope 3 emissions, creating value for both the planet and the supply chain.

This paper explains how Regenagri contributes to transforming farms into regenerative ecosystems by restoring soil fertility, supporting biodiversity, reducing chemical dependency and creating landscape-wide benefits such as improved watershed health and climate resilience. Shares real examples of their impact on crop yields and the ecosystem at large. In addition, an attempt has been made here to provide clear and practical recommendations to help a range of stakeholders, right from farmers to policymakers, to shift towards regenerative farm practices to make agriculture sustainable and climate resilient.

Introduction to Regenagri

Regenerative agriculture encourages farmers to invest their time and resources into restoring their most valuable asset: their land. While transitioning a farm to regenerative practices takes considerable planning and deep local knowledge, it provides farmers with the tools to plan for long-term success and mitigate future threats to their livelihoods.

Soil should be seen as a living ecosystem, not just a "growing medium". Therefore, soil health is about the capacity of soil to function as a living thing that sustains plants, animals, and humans and underpins agricultural productivity and resilience. We have witnessed that intensive, extractive farming has depleted soil organic matter (SOM), reduced biodiversity, and increased vulnerability to droughts and pests. As per the report by FAO, "Soil is the life support of our food and agriculture. We rely on soils for 95% of the food we consume. However, by 2050, 90% of all soils are set to be degraded. Without change, degrading soils will put our ecosystems, our climate and food security in jeopardy." (Food and Agriculture Organisation of the United Nations [FAO], 2022)

Regenerative agriculture promotes rebuilding soil function by adopting practices such as cover cropping, residue retention, reduced tillage, diverse rotations, agroforestry and integration of livestock. These practices work together to restore biological activity, improve soil structure and enhance nutrient and water cycling. (Khangura et al., Jat et al., and review the literature.)

Mechanism To Improve Soil Health

The Regenagri practices help to improve the soil in the following ways:

- Cover cropping: Prevents erosion; adds organic matter; fixes nitrogen; improves water retention
- Conservation tillage: Preserves soil structure; reduces erosion; builds carbon; lowers fuel use
- Crop rotation: Breaks pest cycles; balances nutrients; improves yield
- Multi/ intercropping: Increases biodiversity; multiple incomes; improves fertility; reduces pests

- Perennial cropping: Continuous cover; reduces erosion; supports biodiversity; stores carbon
- Natural fertilizer integration: Enhances organic matter & microbes; boosts fertility; reduces chemical need
- Synthetic fertilizer reductions: Cuts emissions; prevents pollution; saves costs; promotes nutrient cycling
- Natural crop protection: Biological pest control; safer for pollinators; reduces residues
- Synthetic pesticide reduction: Reduces contamination; protects biodiversity; improves health

Evidence from global reviews, synthesising numerous field trials and meta-analyses, demonstrates that these mechanisms boost soil health and support higher, more resilient crop yields (Khangura, R. et al, 2023).

Evidence On Yields and Yield Stability

High-level syntheses reveal that the link between regenerative practices and yields is highly context dependent. The same practice can significantly increase yields on one farm and have little effect on another.

Essentially, Regenagri works best when it is adapted to local conditions, rather than applied uniformly everywhere.

- Cover crops help to promote healthier soils, reduce fertiliser needs, improve resilience and often increase SOC and can boost subsequent cash-crop yields.
- No-till / reduced tillage enhances soil fertility, carbon sequestration, and reduces costs
- Integrated systems (crop diversification, agroforestry, livestock integration) frequently show ecological resilience and comparable or improved yields over time.

Crucially, Regenagri tends to reduce interannual yield variability by improving soil water storage and nutrient buffering, a key resilience benefit for smallholders and commercial farms alike.

Climate Mitigation and Ecosystem Co-Benefits

Soils represent a central terrestrial carbon pool, and their improved management can increase SOC. Evidence shows cover crops and residue retention reliably raise SOC in many systems, while no-till often increases surface SOC but may need complementary practices for whole-profile gains. Agroforestry and integrated systems often show higher SOC accrual and stronger biodiversity co-benefits. However, SOC gains vary by baseline conditions and can plateau; Hence, carbon claims should be conservative. (See References: IPCC reports and recent meta-analyses)

Adoption Constraints

The adoption of Regenagri practices is often slowed by key constraints that largely fall into:

- Financial pressures on farmers: Farmers face short-term risks and financial pressures as the benefits of it typically accrue over seasons, while upfront costs are immediate.
- Lack of technical knowledge with farmers: there are also significant gaps in knowledge and technical support, such as farmers may lack guidance on how to implement practices effectively under local conditions.
- Weak market incentive: As we have been witnessing across various sectors, where sustainably produced crops are not being rewarded suitably, this does not motivate farmers to switch from conventional farming to regenerative agriculture. To address these challenges, farmers need financial support and technical guidance. Close handholding and strong extension services, along with collaboration across the supply chain, may derisk and benefit each supply chain actor. This will give farmers confidence, knowledge,

and incentives to adopt regenerative practices. Such support will help the broader adoption of regenerative agricultural practices.

Practical Recommendations

FOR FARMERS:

1. Start with small-scale cover cropping and residue management through legume-based mixes for specific areas

- The first step involves selecting a small section of land to implement cover crop and residue management techniques. Testing new practices occurs in a controlled area that protects the entire farm from potential adverse outcomes.
- The selection of cover crops should match the local environmental conditions and soil characteristics. The soil benefits from natural fertility improvement through nitrogen fixation when farmers plant legumes such as cowpea, clover, and sunn hemp.
- The field benefits from improved soil organic matter, moisture retention, and microbial activity when farmers choose to leave crop residues instead of burning them.

2. Introduction of new crops in rotation through test plots

- The introduction of new crops should occur through a gradual process which avoids complete system changes. The introduction of new crops through a controlled process helps farmers avoid crop failures and market disruptions.
- The evaluation of new crops through small test areas enables farmers to discover optimal cultivation methods before expanding their operations.
- The practice of crop rotation creates multiple benefits, which include pest and disease control, better soil health, and enhanced farm stability.

3. Pair reduced tillage with residues and rotation to limit early penalties

Reduced or no tillage helps preserve soil structure and retain organic matter. This, along with diverse rotations, helps to maintain fertility and moisture. Continuing with this enhances soil health and reduces erosion.

4. Combine organic inputs with livestock integration where suitable

Application of organic inputs, such as compost and farm manure, improves nutrient availability, water retention, and soil microbial health. Furthermore, integrating livestock provides manure, which helps control weeds and supports a circular farm system.

FOR SUPPLY-CHAIN ACTORS

1. Risk reduction

Buyers/companies may consider offering multi-year contracts to secure farmers' access to the market. In addition, the financial support may be extended in the form of cost-sharing to reduce the upfront investment. The pre-financing arrangement will help farmers manage cash flow and adopt new farm practices with confidence.

2. Local capacity and demonstrate impact

In addition to financial support and risk management, efforts should be made to develop local agronomy teams to deliver tailored services for regenerative practices.

- Promotion of demo plots for first-hand learning
- Organise capacity enhancement sessions regularly to build farmers' technical capacity.

3. Track outcomes

- Closely monitor and measure agronomic indicators, for instance, yield, inputs, water efficiency, etc. Monitor and measure relevant metrics on environmental impact- water, energy efficiency
- To foster trust and continuation of long-term collaborations, the initiative should closely monitor the outcomes which align with farmer benefits and business.

FOR POLICY MAKERS

1. Design incentives for early adoption

- For promotion and early adoption, the scheme should be designed in such a way that it offers support to access inputs to help in the transition.
- Consideration should also be given for low-interest credit or tax incentives
- Initiative should be inclusive in nature, and for that purpose, smallholder and marginal farmers must be targeted as their overall contribution to the national production is quite significant.

2. Invest in research, extension and monitoring

- Support region-specific research
- Provide advisory extension services for early adoption, and should be accessible to all
- Setting up robust mechanisms to monitor some of the key parameters kike soil health, water retention and yield improvements.

3. Align carbon-market rules with local realities

The carbon rules should be set up to account for the local realities of small and large farms, so that farmers have confidence in the system and remain engaged. Furthermore, monitoring and verification mechanisms that are accurate yet practical from an implementation perspective. In addition, the carbon incentives must support long-term soil health and environmental sustainability.

Case study: Sri Lanka — Regenerative transition in the smallholder tea sector (E.g., Lumbini)

Sri Lanka's smallholder tea sector is vital to rural livelihoods but faces challenges in productivity and sustainability. Recently, targeted regenerative initiatives have been introduced to improve soil health and value-chain resilience.

In 2024–2025, Lumbini Tea Factory and its contract farmer network received group 'Regenagri' certification, a first-of-its-kind recognition for regenerative management in tea. The program combined farmer training, soil and landscape practices and value-chain partnerships to support soil health, biodiversity and farmer incomes. Coverage included >1,500 contract farmers under a group certification model, supported by partners and market actors. (See FT coverage and related reports.)

Lessons learned: Group certification models, technical assistance and buyer engagement reduce individual farmer risk while enabling measurable improvements in soil management and market access for regenerative tea.

Tracking, Assessment and Verified Outcomes

Robust monitoring is essential for both farmer learning and credible corporate sustainability claims.

1. Monitoring at the farm level

Farmers would be able to easily track indicators such as cover crops, farm residues, and yield patterns. This will guide them in daily decisions on these practices.

2. Soil testing

Soil tests should be conducted in selected fields to assess SOM, bulk density, and overall soil structure.

3. Carbon claims and risk management

- Setting up realistic carbon baselines.
- Long-term collaborations to ensure practices continue.
- Involve independent/third-party verifiers to verify results.

Why does this matter?

- Farmers get valuable data to improve productivity and resilience.
- Brands and companies get trusted data for sustainability and carbon reporting.
- Policymakers get region-specific evidence on soil, water and yield impacts of regenerative practices.

Conclusion

Regenagri is a holistic, systems-based approach designed to restore soil health, enhance farm resilience and stabilise crop yields.

Context-aligned success: There is no fit-for-all approach within Regenagri, and hence, outcomes vary from one place to another. Local conditions, crop types, and farm practices largely determine that. It has been observed that adoption is most successful when farmers implement integrated practices over time. This gets buttressed by a secure market and a price premium in terms of reward.

Benefits for brands and supply chains: Brands and companies that support farms with context-specific technical guidance and long-term sourcing arrangements may achieve multiple returns, such as improved, stable yields and reduced production costs. In addition, brands/companies will get responsibly produced products, which will help them make sustainability claims and align with ESG/climate targets, including reducing emissions.

Knowledge and Transparency: Scaling up involves ongoing research, collecting verified data from demo plots, and sharing impact data. Also, transparency with data, tracking and measurement of key regenerative practices may help with carbon and sustainability reporting.

Long-Term Vision: The combination of on-farm interventions with market uptake, handholding, and close, rigorous monitoring ensures a pathway to resilient agriculture that benefits supply chain actors alike.

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16. Agroforestry Approaches for Sustainable Nitrogen Management

S.P. Nissanka* and N. C. Hadigalla

Abstract

Tea smallholdings are the backbone of Sri Lanka's tea industry, contributing over 70 % of national tea production and supporting the livelihoods of more than 1.5 million individuals. However, smallholder systems face persistent sustainability challenges, including soil degradation, nutrient losses, low nitrogen-use efficiency (NUE), rising input costs, and yield variability. Fertilizer use in Sri Lanka's tea smallholding sector primarily involves chemical fertilizers, though some growers use organic methods as well. Nitrogen (N) is the most critical nutrient governing tea growth, shoot production, and biochemical quality and application rates are vary and depend on the green leaf production potential which varies from <800 to >2000 made tea kg/ha/year. However, conventional fertilization practices often result in sub-optimal uptake, economic inefficiency, and environmental losses. Agroforestry the deliberate integration of trees with crops offers a promising strategy to enhance nitrogen management and overall system sustainability. This review synthesizes recent findings from Sri Lankan field trials, national surveys, and pilot projects to evaluate the potential of agroforestry in smallholder tea landscapes. Evidence shows that incorporating shade and nitrogen-fixing trees improves soil fertility, enhances nutrient cycling, reduces erosion, buffers microclimates, and sequesters carbon. Multi-strata and alley-cropping systems optimize vertical space and resilience, while boundary and contour plantings stabilize slopes and provide additional income from timber, fruit, and fodder. Agroforestry also supports yield stability, improves tea quality, and contributes to climate-smart agriculture and carbon-credit opportunities. Overall, integrating agroforestry into smallholder tea systems presents a viable, evidence-based approach to enhance nitrogen-use efficiency, restore soil health, diversify livelihoods, and strengthen resilience, aligning with national sustainability frameworks and global climate and biodiversity goals.

Keywords: Reactive Nitrogen, Nitrogen management, Nitrogen Use Efficiency (NUE), Tea smallholdings, Agroforestry, Soil fertility, Sustainable agriculture

Role of Nitrogen in ensuring food and nutrition security of growing human population

The global population is projected to reach nearly 10 billion by 2050, driving a demand for food and feed. To meet this growing need, fertilizers play an indispensable role in agriculture by supplying essential nutrients such as nitrogen (N), phosphorus (P), and potassium (K), which are critical for crop growth and development. By replenishing depleted soil nutrients, fertilizers enhance soil fertility and help bridge yield gaps, leading to increased crop productivity, improved crop quality, and higher farm income while enhancing global food, nutritional, and economic security (Vijayakumar Shanmugam, et al., 2025). Reactive nitrogen (Nr) entering in to ecosystems, especially to agroecosystems has increased dramatically with the green revolution in 1960s led to nearly triple global food production since the mid-20th century, supporting the current global population (Vijayakumar Shanmugam, et al., 2025). Malik et al., 2022 and Galloway et al., 2021, reported that the Nr production mainly through anthropogenic activities (primarily the Haber-Bosch process) has increased from <60 Tg N yr.$^{-1}$ in 1961 to 226 Tg N yr.$^{-1}$ in 2020. Shanmugam, et al., 2025 reported that N fertilizers alone are estimated to account for 40–60 % of the world's food production, with countries like China and India relying on millions of tons annually to sustain their large populations and agricultural sectors. This highlights the vital role of fertilizers in addressing escalating food needs, especially in regions heavily dependent on staple crops such as wheat, rice, and maize.

Types of fertilizer use and application rates vary significantly by region, with **Asia and the Americas showing the highest consumption per hectare,** while **Africa generally records the lowest rates.** Developed countries often have more precise application methods, while some developing nations face challenges with overuse or underuse. Compared to other region, the amount of Nr fertilizers added to agricultural land increased sharply in Asia (Begho et al., 2022). For instance, there was a 370 and 3,932% increase in total nitrogen (N) inputs in Sri Lanka and in India, respectively, in 2013 relative to 1961 (Raza et al., 2018).

Nitrogen Use Efficiency (NUE) of cropping systems, and sustainable ways of enhancing it

Several factors influence the NUE in agricultural systems, ranging from environmental conditions and soil characteristics to crop variety and farming practices. Key determinants of NUE include: Soil types and it fertility status, climatic condition, crop genotypes, fertilizer management (nitrogen fertilizers, their application rate, timing, and method can determine how efficiently plants utilize the nitrogen). Strategies for Improving NUE requires a holistic approach that combines agronomic practices, technological advancements, soil management techniques, and genetic improvements (Sanjay Koushal, 2025). The important specific strategies include;

Optimized Fertilizer Management (Soil Testing and Precision Fertilizer Application, Integrated Nutrient Management (INM), Fertigation and Controlled-Release Fertilizers);

Crop Selection and Breeding (NUE-Enhanced Crop Varieties, Crop Rotation and Diversification, Genetic Engineering);

Soil Health Management (Increase Organic Matter, Agroecological Practices, Water and Irrigation Management, Soil pH Optimization);

Efficient Irrigation Management (Drip Irrigation, Irrigation Timing);

Biological Nitrogen Fixation (Inoculation with Nitrogen-Fixing Bacteria, Integrating Legumes in Cropping Systems, Mycorrhizal Fungi);

Technological Advances (Nutrient-Sensing Technologies, Slow-Release and Controlled-Release Fertilizers, Nitrogen Inhibitors); and

Agroecological and Integrated Approaches (Agroforestry and Crop Rotation, and Integrated Nutrient Management).

Overview of the Tea Industry and the Tea Smallholding Sector

The Sri Lankan tea industry is a major global player, known for its "Ceylon Tea" brand and supplying about 10% of the world's tea exports. The industry is a significant part of the national economy, contributing billions of foreign exchange earnings (earnings from tea was **$1.43 billion** with the export of 245.5 million kilograms in 2024 (CBSL. 2025)) and providing employment for over a million people. Tea cultivation is concentrated in the central highlands and southern parts of the island and is the world's largest producer of orthodox tea.

Tea smallholdings constitute the backbone of Sri Lanka's tea industry, accounting over 70 % of national tea production and 59% of the total tea-growing land. The sector comprises approximately 500,000 individual landowners in 14 districts. Socio-economically, smallholdings underpin rural livelihoods in more than 5,000 villages, supporting around 1.5 million individuals—including family members, dependents, and laborers—whose livelihoods are directly linked to tea production (Eyeview Sri Lanka, 2021).

Agronomically, the smallholder landscape is highly heterogeneous. A survey of 300 low-country smallholders revealed that technical efficiency averaged 68.8 %, with a wide range (~15 % to ~93 %), indicating potential yield increases of roughly 30 % under improved management practices without increasing input levels. Fertilizer and chemical inputs, alongside labor and management practices, remain key determinants of productivity variation (Shyamalie *et al.,* 2020). Tea smallholders contribution is critical in supplying quality tea, particularly from the wet low and mid-country regions, where favorable agroclimatic conditions prevail. Productivity varies widely between regions and management practices, with yields ranging from 800 kg to 1600 kg of made tea per hectare annually (Sri Lanka Tea Board, 2025). Variations are linked to differences in soil fertility status, input use, age and pruning cycle, bush densities, and smallholders' access to extension services.

Smallholders also face considerable challenges regarding input costs. For instance, the average price of a bag of fertilizer exceeded LKR 40,000 by July 2022, and even after subsequent declines, costs remained LKR 9,000–10,000 higher than previous norms (Rajawasam, 2023). Total nitrogenous fertilizer consumption in Sri Lanka's tea sector was reported at approximately 51.9 million kg N from urea and ammonium sulfate in 2018 (Chathumini *et al.,* 2021). Collectively, these data highlight both the scale of the smallholder sector and the urgent need for improved nutrient-use efficiency, cost-effectiveness, and sustainability.

Importance of Nitrogen for Tea Production

Nitrogen (N) is the single most critical nutrient for vegetative growth, shoot production, and yield in tea (*Camellia sinensis*). Harvested shoots remove substantial quantities of macronutrients, with N being the most abundant. Nitrogen is central to amino acid (including theanine) and protein synthesis, as well as chlorophyll formation, all of which influence both yield and quality of tea (Zhang *et al.,* 2023).

Magnitude of N Demand and Removal

Tea is a regularly harvested perennial, and shoot removal continuously depletes soil N. Smallholders use a blend of urea, ammonium sulfate, and compound NPK fertilizers, but actual application rates vary due to financial constraints, seasonal timing, and knowledge gaps. Over- and under-fertilization are common, affecting soil health and yield consistency. Excessive N leads to nutrient imbalances and losses leading to environment pollution, while insufficient N limits yield potential. Studies report N removal rates ranging from 40–160 kg N ha^{-1} yr^{-1} for made-tea yields of ~1–4 t ha^{-1}. These removal rates underscore the necessity for regular N replenishment to avoid progressive soil nutrient mining (Kamau, 2008).

Nitrogen Fertilization and its Responses

Research indicates that N application rates of ~200–350 kg N ha^{-1} yr^{-1} typically sustain high yields, with experimental trials testing rates up to 360–450 kg N ha^{-1}. Field experiments evaluating 0, 120, 240, and 360 kg N ha^{-1} yr^{-1} showed higher yield and leaf-N contents, although cultivar-specific differences in N-use efficiency (NUE) were noted. National advisory guidelines from the Tea Research Institute of Sri Lanka (TRI) recommend 2-4 split applications per year which depends on yield classes, age of the crop, soil status etc., (Amali *et al.,* 2020). For mature tea in Sri Lanka, a common recommendation is to apply a total of **150-250 kg of Nitrogen (N) per hectare annually**, often using specific NPK blends recommended by the Tea Research Institute. However, the exact recommendation depends on factors like yield potential, with a basic "replacement ratio" of 10kg N per 100kg of made tea for sustained productivity, and higher rates up to 12kg N per 100kg for higher-yielding fields.

Effect on Nitrogen Fertilization on Quality of Tea

Appropriate N fertilization enhances leaf production and yield, while also influencing biochemical composition. Adequate N increases free amino acids (notably theanine), improving umami and sweetness in made tea, whereas excessive or imbalanced N may alter polyphenol to amino-acid ratios, sometimes reducing marketable outturn and quality (Cai *et al.,* 2024).

Nitrogen Forms, and Timing of Application

Tea plants exhibit a preference for ammonium (NH_4^+) over nitrate (NO_3^-), with optimal growth observed at an NH_4^+:NO_3^- ratio of ~25:75. Physiological studies confirm faster uptake and assimilation of NH_4^+, aligned with tea's adaptation to acidic soils (Tang *et al*., 2020; Enomoto *et al*., 2025). Synchronizing fertilizer applications with critical growth stages, particularly shoot

initiation, enhances NUE and reduces losses (Qiu *et al*., 2023; Ruan *et al*., 2007; Zhang *et al.,* 2023).

Recommended Rates and Nitrogen Use Efficiency

Despite high demand, NUE in tea systems is often sub-optimal. Significant proportions of applied N can be lost via leaching, runoff, or gaseous emissions, particularly in acidic, weathered soils. Long-term intensive inorganic N use has also been associated with soil acidification and altered microbial communities, motivating integrated approaches such as combining organic inputs, optimized timing, and system-level measures including agroforestry (Yu *et al.,* 2024).

Sri Lankan Context: Recommended N Rates

According to TRI (2023) following rates were recommended different potential yield classes based on annual made tea production.

- Yield < 900 kg made tea ha^{-1} yr^{-1} → ~90 kg N ha^{-1} yr^{-1}
- Yield 900–1,300 kg ha^{-1} yr^{-1} → ~140 kg N ha^{-1} yr^{-1}
- Yield 2,000–2,500 kg ha^{-1} yr^{-1} → ~270 kg N ha^{-1} yr^{-1}
- Yield > 3,000 kg ha^{-1} yr^{-1} → ~360–400 kg N ha^{-1} yr^{-1}

Clone-specific variations in uptake efficiency have been observed. The total nitrogen content in **made tea leaves** typically ranges from **2.95% to 5.18%** on a dry weight basis, but the specific amount can vary based on factors like the grade of tea, nitrogen fertilization levels during cultivation, and processing method. Considering above made tea N contents, under higher yield class of 3000 kg of made per year, amount of N recover with yield vary from 88.5 kg (content is 2.95%) 155.4 Kg (content is 5.18%) per year indicating overall less than 24% and 43% recovery rate with made tea, respectively. Krishnapillai and Pethiyagoda, 1978 reported that with vigorous clones (TRI 2023, TRI 62/9) recovering 75–85 % of applied N, whereas slower-growing clones (DT 1, T 9) recovered only 50–55 %.

Nitrogen Fertilizer Management in Smallholder Tea Sector

Smallholders typically follow TRI advisory schedules linking N rates to yield class, often using split top-dressings of urea, ammonium sulfate, and NPK blends, sometimes supplemented by organic manures or foliar urea sprays. Recommended annual N rates vary from 90 kg N ha^{-1} for low-yielding fields to 360 kg N ha^{-1} for high-yield targets (TRI, 2016).

Recommended rates are vary based on the soil types, clones, altitude and crop type whether VP or seedling.

- **Soils & Altitude:** Acidic, strongly weathered soils across low-, mid-, and up-country smallholdings influence N dynamics. Deficiencies in N, S, and Mg are common, requiring site-specific adjustments (TRI, 2016).
- **Clones:** Modern clonal cultivars exhibit higher N uptake and yield responses than older seedling populations (Amali *et al.,* 2022).

- **VP vs. Seedling Tea:** VP blocks generally yield more predictably and respond better to N, whereas older seedling stands often require renovation and exhibit lower NUE (Shyamalie *et al.,* 2014).

Many smallholdings operate below yield potential, with TRI analyses indicating gaps of ~30–50 % compared to attainable yields under improved management. Low NUE due to inefficient N use compounds these productivity deficits.

Emerging Sustainability Concerns

Soil Degradation and Erosion

Soil erosion is a major constraint in Sri Lanka's smallholder tea lands, particularly in upland areas. Studies in the Uva highlands reported annual soil losses of 25.52 t ha^{-1} yr^{-1} in old seedling tea fields versus 3.41 t ha^{-1} yr^{-1} in vegetatively propagated (VP) tea fields, with corresponding N losses of 29.34 kg N ha^{-1} and 4.80 kg N ha^{-1} (Dharmasena and Bhat, 2011). Older up-country plantations reported soil loss up to 115 t ha^{-1} yr^{-1}, compared to a tolerable limit of 9 t ha^{-1} yr^{-1} (Illukpitiya *et al.,* 2004). Persistent topsoil loss diminishes organic matter, rooting depth, water-holding capacity, and fertility, reducing long-term productivity.

Nutrient Losses and Declining Soil Fertility Status

Runoff and nutrient loss are exacerbated by steep slopes and poor ground cover. TRI experiments showed that terraces with vetiver grass reduced runoff by ~80 % and soil loss by ~78 % compared with unprotected lands (TRI, 2022). Assessments indicated widespread low pH, low organic matter contents, and eroded soils, decreasing fertilizer use efficiency and increasing input demand (FAO, 2021). UN-supported assessments found ~50 % of agricultural lands in select districts degraded and in need of sustainable management (UN, 2021).

Rising Input Costs and Economic Pressure

Sharp input cost increases have coincided with declining productivity. Smallholders reported yield drops of ~30 % during banning of inorganic fertilizer importation to the country, with rising costs for fertilizer, labor, and transport threatening production viability (LOAM, 2022; Bolton, 2022). Degraded soils, high input costs, and low incremental yields form a feedback loop reducing profitability and sustainability.

Agroforestry as a Sustainable Land Use System, and Rationale for Exploring Agroforestry for Tea Smallholding Sector

An agroforestry system is a land-use method that combines woody perennials (like trees and shrubs) with crops and/or animals on the same land unit, either simultaneously or sequentially. The goal is to create sustainable, productive systems that provide environmental, economic, and social benefits, such as increased income, food security, soil health, and resilience to climate change. Thus, deliberate integration of agroforestry principles and its components in to farming systems offers solutions to key sustainability challenges: soil conservation, nutrient recycling, microclimate moderation, carbon storage, and income diversification.

Agroforestry involves integrating trees with tea to create multifunctional landscapes. Common compatible models include intercropping tea with shade trees (*Gliricidia sepium*, *Albizia* spp.), fruit trees (Jackfruit, mango), spices (Cinnamon, pepper), and nitrogen-fixing species (*Acacia* spp., *Casuarina* spp.). Such systems enhance biodiversity, provide additional income, and improve microclimate conditions for tea (World Agroforestry, 2025).

Agroforestry systems contribute to nitrogen cycling through biological nitrogen fixation by leguminous trees, litterfall decomposition enriching soil organic matter, and moderated soil temperatures reducing mineralization losses. These processes reduce dependency on synthetic fertilizers, improve soil structure, and mitigate erosion on steep tea smallholdings. Consequently, agroforestry enhances long-term yield stability and resilience to climate variability by maintaining nutrient and moisture balances (Tea Research Institute, 2023). Economic and Policy Dimensions Economic analyses show that agroforestry with improved N management can increase net incomes by diversifying products and reducing fertilizer costs over time. However, initial establishment requires knowledge and capital investment, underscoring the need for supportive policies. Current Sri Lankan plantation policies and subsidies partially support fertilizer use but lack sufficient incentives for agroforestry adoption. Integration within the National Policy on Plantation Sector and alignment with environmental regulations could foster sustainable tea smallholdings (Ministry of Plantation Industries, 2023). Key Constraints and Knowledge Gaps Challenges include limited access to extension services, inconsistent soil testing, financial barriers to adequate fertilization, and lack of widespread agroforestry promotion tailored to tea systems. More research on localized nitrogen cycling and long-term economic impacts of agroforestry in diverse Sri Lankan conditions is needed. Recommendations Tea smallholders should adopt agroforestry with nitrogen-fixing trees to improve soil health and reduce fertilizer dependence, supported by proper nutrient monitoring (soil and leaf analysis) to optimize N inputs. The Tea Small Holdings Development Authority should strengthen extension programs focusing on integrated nutrient and agroforestry management. The Ministry of Plantation Industries must enhance policy frameworks to provide subsidies and technical support for agroforestry adoption, incorporating environmental sustainability as a priority.

Studies conducted by TRI, University of Peradeniya, and field evaluations demonstrate following measurable benefits justifying agroforestry adoption in smallholder tea landscapes.

- **Soil Protection:** Hedgerows, terraces with vetiver, and shade trees reduce runoff and soil erosion by over 70–80 %, retaining nutrient-rich topsoil (TRI, 2019).
- **Nutrient Recycling:** Leaf litter, root turnover, and organic inputs from companion trees improve soil organic matter and N availability, particularly with N-fixing species like *Gliricidia sepium*, *Derris microphylla*, and *Albizia spp.* (TRI, 2025).
- **Microclimate Buffering:** Shade trees moderate radiation and canopy temperature, maintaining favorable humidity and reducing stress, which supports shoot quality and stabilizes yield (TRI, 2020).
- **Carbon Sequestration and climate resilience:** Tree integration increases above- and below-ground carbon stocks, providing climate mitigation benefits and potential carbon credits (Mutuo, 2005; Hayleys Plantations, 2025).
- **Income Diversification:** Multi-purpose trees provide timber, fuelwood, fodder, or fruit, enhancing smallholder income and resilience (Mahendrarajah, 2023).

- **Biodiversity enhancement:** Although literature specific to tea smallholdings is limited, agroforestry in Sri Lanka has been identified as a means to support ecosystem services and biodiversity in plantation and estate contexts (Mahendrarajah, 2023).
- **Reduced reliance on synthetic fertilizers:** By improving organic matter and nutrient cycling via trees, agroforestry systems may reduce fertilizer dependency, thereby reducing input cost burdens for smallholders.
- **Long-term productivity:** By buffering microclimate, reducing erosion, improving soil structure and maintaining fertility, agroforestry enhances the long-term resilience of tea bushes, which is critical for smallholders with constrained resources.
- **Policy and sustainability alignment:** Agroforestry supports national goals (forest cover, climate resilience) and aligns with global frameworks (SDGs). It therefore has potential for integration into extension, subsidy and certification schemes.

Agroforestry Models Suitable for Tea Landscapes

1. **Shade Tree Systems:** Partial canopy coverage improves soil structure and microclimate (Ahamed *et al.,* 2021).
2. **Boundary Planting / Hedgerows / Contour Trees:** Reduce runoff, stabilize slopes, and provide timber or fruit (Mahendrarajah, 2023).
3. **Alley-Cropping / Intercropping:** Integrates short trees or shrubs, particularly nitrogen-fixing species, enhancing nutrient cycling and providing secondary products (Nuwarapaksha *et al.,* 2023).
4. **Multi-Strata Systems:** Tiered arrangement of canopy, mid-story, and tea crop optimizes vertical space and resilience, currently piloted in degraded Belipola tea plantations.

Companion and shade trees commonly used by smallholders include *Caryota urens*, *Michelia champaca*, *Swietenia macrophylla*, *Artocarpus heterophyllus*, and *Areca catechu*. Large plantations typically rely on a narrower range of species such as *Albizia moluccana* and *Grevillea robusta*. Pre-planting rehabilitation and invasive species management (e.g., *Imperata cylindrica*) are achieved through targeted tree species such as *Calliandra calothyrsus* and *Inga edulis*. Contour, hedge, and boundary planting species include *Tephrosia vogelii*, *Cinnamomum zeylanicum*, *Bohmeria nivea*, *Morus alba*, and others (Mahendrarajah, 2023).

Conclusion

Integrating agroforestry into Sri Lankan smallholder tea systems offers a promising pathway to enhance nitrogen-use efficiency, restore soil health, stabilize yields, and diversify farmer incomes. By combining trees with tea, smallholders can mitigate soil erosion, improve nutrient cycling, moderate microclimates, and sequester carbon, while generating additional ecological and economic benefits. Evidence from local trials and pilot projects demonstrates that well-designed agroforestry systems not only address current sustainability challenges rising input costs, degraded soils, and low NUE but also contribute to long-term resilience and climate-smart agriculture.

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Editors



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Saman Priyantha Rathnayake is an agriculture and tea extension specialist with extensive experience in Sri Lanka's smallholder tea sector. He is currently reading for a PhD at the Postgraduate Institute of Agriculture, University of Peradeniya. He holds an MBA with merit from Wuhan University, China, and a B.Sc. in Agriculture (Special, Second Class Upper) from the University of Ruhuna. Saman has 22 years of experience in tea technology dissemination at the Tea Research Institute of Sri Lanka and currently serves as Deputy General Manager (Extension) at the Tea Small Holdings Development Authority, with three years of additional experience in smallholder-focused extension.



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Solidaridad Asia Tea Team



Ranjan Circar

Ranjan Circar is a tea professional, bringing over 50 years of experience spanning plantation management, sustainable development, and regulatory engagement. He has contributed significantly to aligning the tea sector with national and international sustainability goals. Ranjan has played a key role in implementing certification standards and advancing Voluntary Sustainability Standards (VSS) that support compliance, traceability, and social responsibility within the sector. He has collaborated extensively with government agencies, policymakers, and regulatory bodies to build capacity and design inclusive programs that benefit both producers and the environment. From 2006 to 2013, he led the India program of the Ethical Tea Partnership as the Regional Manager, and since 2013, he has served as the Global Lead for Tea Programmes at Solidaridad Asia, working closely with national governments across the region to promote climate-resilient and economically viable tea landscapes.



Gangan Boriah

Mr. Gangan Boriah is a tea sector expert with 50 years of experience in production, smallholder development, value addition, and industry regulation. As former Director of Tea Development, Tea Board of India he led major policy initiatives and pioneered the Small Growers' Development Directorate, contributing to the rise of small tea growers who now produce over half of India's tea. He has represented India in key tea-producing countries and introduced the price-sharing formula inspired by best practices in Sri Lanka and Kenya. Since 2015, he is with Solidaridad Asia, as Senior Advisor (Tea)



Ramanand Tiwari

Ramanand Tiwari brings over two decades of strategic leadership in sustainable development, CSR, public health, supply chain transformation, donor engagement, and large-scale programme management across South Asia.

Currently serving as General Manager, Programme Systems and Coordination at Solidaridad, he successfully delivered India's Sustainable Tea Initiative, Trustea, until 2018 and leads cross-sector collaboration to implement development programmes that create measurable economic, social, and environmental outcomes. His portfolio includes digitally enabled supply chains, inclusive skill development, job creation models, climate resilience, and ethical trade.

He has a distinguished track record in mobilising resources and fostering partnerships with CSOs, government bodies, and corporate actors. He has stewarded multi-country initiatives in Sri Lanka, India, Nepal, and Bangladesh, ensuring timely execution, stakeholder satisfaction, and optimal resource utilisation.

Ramanand is recognised for high ethical standards, purpose-led leadership, building resilient systems, and converting complex challenges into scalable, sustainable solutions. He is a trusted advisor to executive teams and a passionate advocate for inclusive growth and sustainability.

Solidaridad Sri Lanka



Joseph Elston Malory David
Country Manager, Sri Lanka
Seasoned financial management professional with over 20 years of experience across international development, humanitarian aid, and private sector organizations. Last served as the Chief Accountant/Deputy Office Director at USAID/Sri Lanka, leading the Office of Financial Management and overseeing multimillion-dollar administrative and program budgets. Proven expertise in financial planning, internal controls, audit management, and capacity development, particularly in strengthening local partner systems in line with procurement reform initiatives.

Demonstrated ability to lead cross-functional teams, manage high-volume financial operations in risk-based environments, and support donor compliance and reporting. Extensive experience working with international NGOs and donor-funded programs, including managing large-scale grants, conducting partner capacity assessments, and developing financial and operational systems.

Strong track record in training, mentorship, and institutional strengthening, complemented by solid academic credentials including an MBA and currently reading for a PhD in Management and Finance. Recognized for enhancing internal controls, improving financial systems, and driving effective grant and audit management across diverse and complex settings.

Nucleus Foundation



Dave Maurice – Director Programmes

Dave is a development professional with two decades of experience in financial services, marketing, SME development, private sector engagement and project management. He began his development career with ADB's Business Support Services Facility and later served as National Coordinator of an MSME promotion project with GIZ. He played a key role in establishing the Nucleus Foundation and, as is its Executive Director, has managed over 100 assignments. Dave also works as an international consultant, with experience in Pakistan, the Philippines, Vietnam and Malawi. He holds an MBA from the University of Leicester, an MSc in Sustainable Management from the University of Bedfordshire and a Postgraduate Diploma in Marketing from the Chartered Institute of Marketing (UK).



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Amina is a development practitioner with nearly 30 years of experience in programme design, monitoring and evaluation, and strategic communication. She is the Director Services of the Nucleus Foundation and serves as the reporting specialist for its research and evaluation assignments. Amina previously worked as a Senior Advisor to the GIZ Economic Strategy Support Program. She has undertaken international consulting assignments across South and Southeast Asia. Amina has authored and edited over twenty publications, including policy reviews, sector studies, training manuals and research articles. She holds Master's and Bachelor's degrees in Sociology from the University of Peradeniya.



Sushila Samarakone – Research Coordinator

Sushila is an experienced field coordinator and project support specialist with extensive exposure to baseline surveys, impact assessments, qualitative field research and database management. She has contributed to numerous development studies through field coordination, key informant interviews, focus group discussions, data entry, and preparation of field reports. Sushila has supported a wide range of assignments in the areas of tea sector certification, livelihood development, migration, vocational training and community governance. She holds professional qualifications in Microsoft systems engineering and secretarial practice.



Sazna Fariz – Program Coordinator

Sazna is a Program Coordinator at the Nucleus Foundation, supporting its initiatives in the regenerative agriculture sector. She has contributed to research activities for this policy document, assisting with data compilation, field coordination and review of secondary data. Prior to joining the Foundation, she supported research at the National Institute of Fundamental Studies, focusing on food chemistry and applied agricultural studies. She holds an undergraduate degree in agriculture with a specialisation in postharvest technology from the Wayamba University and a postgraduate degree in food science and technology from the University of Peradeniya.



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