SUPPORTING SUSTAINABLE LIVELIHOODS THROUGH TRAINING: SMALLHOLDER TEA FARMERS AND CLIMATE-SMART AGRICULTURE

Case Study Final Report

Sri Lanka

This research was conducted by:

RICHARD PIERIS & COMPANY PLC

This research was made possible with funding from:

MECCE
MONITORING AND EVALUATING CLIMATE COMMUNICATION AND EDUCATION PROJECT

SEPN
SUSTAINABILITY AND EDUCATION POLICY NETWORK

MECCE Project Funded Case Study

Supporting Sustainable Livelihoods Through Training | Smallholder Tea Farmers and Climate-Smart Agriculture[1]

EXECUTIVE SUMMARY

Climate change is exacerbating the already significant economic challenges faced by Sri Lankan tea farmers, such as low productivity, income limitations, and high costs for input such as fertilizers. The Alliance for Sustainable Landscapes Management (ASLM), the local partner of Rainforest Alliance in Sri Lanka, launched the *Empowering Tea Smallholders through Climate-Smart Agriculture Practices* program (hereafter referred to as the '*Climate-Smart Agriculture Program*' or 'program') to address the limited resources, knowledge, and technology available to smallholder tea farmers for managing climate change. This program targets smallholder farmers in the Ceylon tea industry, which supports over 2.5 million people and is vital to national tea production. The program has trained more than 63,000 tea farmers in climate-responsible farming methods to date.

The *Climate-Smart Agriculture Program* acknowledges that economically disadvantaged farmers may have difficulty prioritizing climate change and sustainability due to survival pressures. The program has a strong commitment to climate justice, social equity, and economic empowerment through its focus on economically marginalized smallholder farmers, the majority of whom are women, in rural areas of the country.

The program follows an action-learning approach to address the hardships the farmers face, delivering benefits such as cost savings, increased yields, and improved market access. Farmers participate in four key modules: soil health and environmental richness, tea bush productivity, land and labour productivity, and environmental conservation. The farmers are introduced to the theoretical aspects in community centres or local meeting halls. The next phase of training takes place on-site on the farmers' plantations. Here, they practice climate-smart agricultural methods which help improve the crop health and long-term sustainability of the tea plantations. The program also fosters peer learning, collaboration, and reflection to support farmers in adjusting their practices. Participant feedback is regularly analyzed and used to iteratively improve the program.

This case study explores the research question: "How has *Climate-Smart Agriculture Program* empowered smallholder farmers in the Sri Lankan tea sector?" Data were collected through four field visits to smallholder farmers in the Southern, Sabaragamuwa, and Western provinces of Sri Lanka. Semi-structured interviews were conducted with 23 smallholders and 14 tea factory personnel. Further insights were obtained through field visits to tea estates, collection centres, and factories. A thematic analysis of the interview transcripts and field observations was supplemented with document analysis.

[1] The views in the report are not necessarily endorsed by the MECCE Project, which funded the research.

Recommended Citation: Gunaranthne, N., Cooray, T., & Peiris, M. (2025). Supporting Sustainable Livelihoods Through Training: Smallholder Tea Farmers and Climate-Smart Agriculture. MECCE Project Funded Case Study. Retrieved from https://mecce.ca/publications/training-smallholder-tea-farmers.

The researchers extend special thanks to Wathma Dimalka & Giri Kadurugamuwa for their contributions to the case study.

This case study highlights the importance of holistic, locally, regionally responsive training in addressing resistance to climate-smart agriculture. For example, some participants initially display a lack of enthusiasm due to financial constraints and skepticism about the program's long-term benefits. Some farmers also conveyed their uncertainty about the effectiveness of adaptation and mitigation strategies in addressing severe climate impacts. However, the case study emphasizes the psychological transformations that climate change training can bring. For instance, the program directly addresses the challenges faced by farmers, making learning immediately applicable and blending expert knowledge, peer learning, and farmers' lived experiences. This practical, collaborative, and reflective approach reinforces farmers' learning and inspires others within the community.

The case study also underscores the value of multiple modes of learning when training farmers to practice climate-smart agriculture. For instance, expert guidance provides farmers with both observational learning and hands-on practice to develop skills such as producing organic fertilizer and conserving soil. By using locally relevant techniques such as water conservation and natural pest control, farmers learn firsthand the benefits of climate-smart agriculture in building more resilient farms.

The study has broader implications for smallholder tea farmers and tea factories, as well as government and international stakeholders. For example, assessment methods such as field officer visits and Rainforest Alliance Certification audits emerged as important for ensuring that tea smallholder farmers and factories effectively and continuously maintain climate-smart agricultural practices. Governments can use the study findings to inform policies that empower smallholder farmers, improve agricultural productivity, and enhance food security, while helping the farmers and the tea industry to withstand climate change impacts. International certification bodies such as the Rainforest Alliance can learn from the *Climate-Smart Agriculture Program*'s approach by aligning with sustainability standards, helping farmers meet certification requirements, and promoting resilient, eco-friendly supply chains worldwide. Additionally, the findings have relevance for tea-growing regions worldwide, particularly in Asia and Africa, where smallholder farming is prevalent.

CCE PROGRAM OVERVIEW

The Alliance for Sustainable Landscapes Management (ASLM), registered as a non-governmental organization, is the local partner of the Rainforest Alliance in Sri Lanka. A key focus of this partnership is training and mobilizing tea smallholders, producers, and suppliers to achieve the Rainforest Alliance Sustainable Agriculture Certification. Together with the Rainforest Alliance, ASLM launched the *Empowering Tea Smallholders through Climate-Smart Agriculture Practices* program in 2018 to address smallholder tea farmers' limited resources, knowledge, and technology for coping with climate change. The program targets the smallholder segment of the Ceylon tea industry, which plays a vital role in national tea production and supports over 2.5 million people.

The program is grounded in a theory of change focused on empowering smallholders through comprehensive training and education which provides them with the skills, knowledge, and technology needed to practice climate-smart agriculture. The program's goals include equipping smallholders with the tools to make informed decisions, adopt sustainable farming practices, adapt to climate change, practice agroforestry, and maximize profits while enhancing quality and productivity.

The program exemplifies quality climate communication and education (CCE) by adopting a holistic and culturally responsive approach. This means learning extends beyond simply teaching scientific principles to include socio-emotional and action-based elements that are critical for meaningful change. In the context of CCE, climate-smart agriculture involves equipping farmers with both technical skills and a sense of environmental responsibility, fostering a transformation across spheres

of practical agricultural practices and personal values. Through a combination of practical and socially conscious training methods, this approach enables farmers to understand and actively address climate challenges, while practicing sustainable agriculture that aligns with local needs and values.

The program consists of four modules: soil health and environmental richness, tea bush productivity, land and labour productivity, and environmental conservation. These modules cover areas such as soil health, erosion control, plant nutrition, composting, tea bush productivity, land and labour efficiency, pest management, and forest conservation. Each module has three sessions, one indoor session for theory and two follow-up on-site sessions for hands-on learning. The training for tea smallholder farmers takes place over multiple 2–3-hour sessions, beginning with an introductory group meeting that discusses theory, often in local venues such as community centres, farmer organizations, or even farmers' houses. The farmers then continue learning through group-based, on-site sessions directly in the fields. These modules cover multiple skills through a mix of activities, such as interactive discussions, demonstrations, and hands-on practices directly in the field.

The program and its modules for tea smallholders in Sri Lanka were developed through consultations with a range of stakeholders, including local smallholder tea farmers, tea factories, tea exporters, and local Rainforest Alliance representatives. These discussions helped shape and refine the modules to ensure they were locally relevant and practical. The program also incorporates local farmers' knowledge, particularly when addressing challenges like pest control, or dealing with monkeys, where different regions use varying methods. Additionally, crop improvement practices are tailored to suit regional conditions to improve their effectiveness.

To recruit participants, farmer organizations, tea development societies, tea factories, and the Tea Smallholder Farmer Development Authority provide the program's trainers with contact information for local farmers. The trainers invite farmers to join in small groups, which create a collaborative learning environment that enhances peer support during the training. So far, more than 63,000 tea farmers have been trained in climate-smart tea farming methods, creating more sustainable livelihoods and improving resilience for smallholder tea farmers across Sri Lanka.

The program collects feedback through farmer surveys conducted after training sessions, direct interviews with participants during field visits, group discussions, and direct consultations with trainers. This information is regularly analyzed and used to make iterative improvements to the program modules, ensuring they remain relevant and effective in meeting the needs of the farmers.

METHODS

Research Questions

The case study explores quality climate change training through its main research question: "How has *Climate-Smart Agriculture Program* empowered smallholder farmers in the Sri Lankan tea sector?" This research question aims to explore how climate-smart agriculture training empowers farmers through improvements in tea land productivity, income, and quality of life (e.g., improved nutrition, health, housing, access to energy, drinking water), access to agricultural inputs, and climate resilience. The research also has two sub-research questions:

1. <u>What challenges and opportunities exist for sustaining climate-smart agriculture practices?</u> This research question attempts to identify a) technical, socio-economic, and other challenges that the tea farmers encounter in sustaining the program's activities and b) the possible remedial actions needed to address these challenges.

2. What are the other societal and ecological benefits of this program? This research question explores the wider benefits of the project, such as community benefits and impacts on the surrounding environment (e.g., water quality, biodiversity).

Data Collection

Data were collected during field visits to tea farms, tea estates, tea collection centres, and factories in the Southern, Sabaragamuwa, and Western provinces of Sri Lanka, where most tea farmers are based.

Semi-structured face-to-face interviews were conducted with 23 tea smallholders and 14 tea factory personnel (37 respondents in total). The smallholder farmer interviews explored experiences with the *Climate-Smart Agriculture Program*, the adoption of climate-smart practices, and the program's impact on their farming methods, productivity, and climate resilience. The interviews also examined the economic and environmental outcomes and collected farmers' reflections on the training sessions.

The factory personnel interview examined the efforts of smallholder tea factories to support their smallholder tea suppliers across environmental, social, financial, and farm management aspects, while also identifying the motivations behind, and challenges to, such support. These interviews provided insights into the operational and managerial aspects of implementing climate-smart agriculture practices. Both interview guides were reviewed by an industry expert with decades of experience to ensure they comprehensively covered sustainable practices among tea farmers (see Appendix 1 & 2). The interviews, which lasted between 20 minutes and one hour, were audio-recorded with the participant's consent and later transcribed for analysis.

Detailed field notes and photographs of climate-smart agricultural practices were also created and transcribed for analysis.

Document analysis supplemented the interview and field visit data. Document data included records and reports on production procedures and compliance with sustainability standards, as well as the Record Book of Small Tea Planters,[2] which offer first-hand accounts from farmers. Additionally, tea businesses' project reports on sustainability activities were reviewed to analyze methods and outcomes of the agricultural practices used. Industry-wide sustainability reports were also examined for insights into best practices and their impact on community welfare and the environment. Factory websites were also analyzed for information on their sustainability practices. The document analysis also reviewed materials related to the *Climate-Smart Agriculture Program*. This included examining reports, training modules, and other documents provided by stakeholders like the Rainforest Alliance and tea factories. Table 1 outlines the types of documents analyzed, their sources, and their purposes.

Table 1: Summary of Documents

Document Name	Purpose of Reference
Record Book of Small Tea Planters	To gain first-hand accounts from farmers regarding their production procedures and sustainability practices.
Reports on sustainability activities	To understand the methods and outcomes of agricultural practices and their alignment with sustainability standards.
Industry-wide sustainability reports	To extract best practices and their impact on community welfare and environmental conservation.
Training modules on CCE	To examine the content and structure of the program for small tea farmers.

[2] There are several types of record books, including the Diriya Aruna Record Book and Rainforest Alliance Record Book, but their content is largely the same. Six books from two factories were analyzed (three books from each factory).

Reports on the CCE program	To understand the objectives, methods, and results of the program as part of the sustainability efforts.
Project reports on sustainability activities	To review specific sustainability projects and evaluate their effectiveness in addressing farmer challenges.

Data Analysis

A thematic analysis of the interview and field note data used a combination of deductive coding (in alignment with the research questions) and inductive coding (to respond to emergent themes). The data were thoroughly examined to code challenges and opportunities for sustaining climate-smart agriculture (e.g., technical, socio-economic), potential solutions, and the program's broader societal and ecological benefits. We also examined psychosocial and action-learning aspects, climate justice, cultural, regional, and Indigenous/traditional knowledge influences, program impacts, and lessons learned.

Field observation data were used to triangulate and enhance the interview and field note analysis, to credibility and depth to the overall results. Relevant information was also extracted from documents and linked to the thematic analysis, helping to triangulate the data collected from other sources.

This comprehensive analysis of multiple sources provided a thorough understanding of the topic and enhanced the reliability of the information gathered.

Study Participants

The study participants include including 23 tea smallholder farmers and 14 tea factory personnel across four provinces were interviewed. Tea factory personnel included managing directors and field officers. In total, 9 women and 28 men were interviewed.

As presented in Table 1, in the Sabaragamuwa province, six smallholder farmers and five factory personnel (the factory's Managing Director and four field officers) from the Hidellana Factory in Rathnapura were interviewed. Also, in the Sabaragamuwa province, five smallholder farmers and one field officer associated with the Hidellana Factory in Awissawellah were interviewed. In the Western province, 7 smallholder farmers and 4 representatives from the Aruna Tea Factory in Meegahaathana were interviewed. Finally, in the Southern province, five smallholder farmers and four factory officers from the Evergreen Tea Factory in Yakkatuwa were interviewed.

The participants were identified and recruited through consultation with Rainforest Alliance local agents, who helped select factories that were part of the program. From these factories, the farmers who had participated in the training program were recruited to participate in the study.

Table 2: Summary of Data Collection

Province	Factory	Smallholder Farmers	Factory Personnel
Sabaragamuwa	Hidellana Tea Factory, Rathnapura	6	5
Sabaragamuwa	Hidellana Tea Factory, Awissawella	5	1
Western	Aruna Tea Factory	7	4
Southern	Evergreen Tea Factory	5	4
	Total	**23**	**14**

FINDINGS

Most Important and Interesting Findings

Engagement in community-based approaches to address shared challenges

Importantly, the program encouraged farmers to work together to address shared challenges, such as water management and soil conservation. This community-based approach created a network of support, empowering farmers to share knowledge and resources. For example, community meetings and farmer field schools became platforms for discussing solutions to challenges. One farmer shared,

> *"The program encouraged us to work together to solve problems like managing water and conserving soil. For example, we worked on setting up rainwater harvesting systems and shared tips on improving soil health. It made a big difference when we teamed up instead of working alone." – Farmer 7, Aruna Tea Factory, Western*

Relatedly, the program also significantly influenced farmers' values and beliefs by embedding principles of environmental protection, social cohesion, and economic stability into their daily practices. Farmers began to prioritize sustainability in their decision-making, viewing it as essential for long-term community engagement and agricultural health. This shift in mindset promoted practices like composting waste and reducing the overuse of agrochemicals. Farmer highlighted,

> *"I used to throw away waste without thinking. Now, I compost everything and see it as giving back to the land." – Farmer 5, Evergreen Tea Factory, Southern*

Additionally, factory officers highlighted the importance of the program in improving relationships between factories and farmers. They observed increased trust as farmers implemented sustainable practices and adhered to Rainforest Alliance guidelines, which positively impacted tea quality and marketability. Factory officers also noted how the program enabled them to provide better support to farmers. Factory officers supported this view by stating,

> *"The program bridged the gap between us and the farmers. We see them adopting better practices, and it's improving the quality of the tea we produce together." – Factory Personnel 1, Aruna Tea Factory, Western*

> *"My job involves delivering training to farmers on climate-smart practices, like soil conservation and sustainable farming. It's essential to empower them with the knowledge to adapt to changing conditions, ensuring that they can increase yields while protecting the environment." – Factory Personnel 2, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

Supporting livelihoods while improving climate resilience

Study participants noted that the program improved farmers' knowledge of climate-smart agricultural practices, such as water conservation and organic farming, which are very useful in addressing climate-related challenges. Farmers expressed how these teachings were practical and applicable:

> *"The training showed us how to improve the water retention of the soil. These were methods I hadn't tried before but were easy to implement in my tea fields." – Farmer 2, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

> *"We learned about composting organic waste, which saved costs and improved soil health." – Farmer 2, Aruna Tea Factory, Western*

The farmers also reported improved productivity and reduced input (e.g., fertilizer and pesticide) costs, which contributed to better livelihoods and economic stability. Farmers related,

> *"By using climate-smart techniques, I reduced my expenses on fertilizer and pesticides. This made a big difference in how much I could save each season." – Farmer 3, Hidellana Tea Factory (Awissawella), Sabaragamuwa*

> *"We were encouraged to adopt practices that required fewer inputs but still produced higher yields. It was a win for both our income and the environment." – Farmer 4, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

The program encouraged farmers to adopt innovative climate-smart agricultural practices, fostering long-term sustainability. A farmer explained how the program motivated him to try new methods,

> *"The training introduced us to stone terracing and contour draining, which I had never thought of before. These methods helped prevent soil erosion on my sloped fields." – Farmer 3, Evergreen Tea Factory, Southern*

The program also helped reduce reliance on chemical/unhealthy inputs, supporting more sustainable agricultural practices. Farmers reflected on the shift to more environmentally friendly methods,

> *"I used to apply a lot of pesticides, but after the training, I started using integrated pest management methods. It reduced chemical use and improved soil health." – Farmer 4, Aruna Tea Factory, Western*

> *"Switching to organic fertilizers was a game-changer. It helped me cut costs and gave me peace of mind knowing my crops were healthier." – Farmer 2, Hidellana Tea Factory (Awissawella), Sabaragamuwa*

<u>Fostering connections with environment through climate-smart agricultural practices</u>

The program fostered a sense of ownership and responsibility among farmers toward their environment. By participating in hands-on training and field mapping, farmers became more aware of the impact of their actions on the environment and the long-term sustainability of their land. This sense of responsibility encouraged them to adopt climate-smart practices like water conservation, crop diversification, and reducing chemical inputs. In supporting this, a farmer said,

> *"After the training, I realized how my actions were harming the soil. Now, I take care of my land like it's part of my family." – Farmer 3, Evergreen Tea Factory, Southern*

Psychosocial Aspects

Many participants in the training program faced psychosocial challenges related to climate change. Many farmers experienced anxiety due to unpredictable weather patterns and financial stress from crop failures. Some had already abandoned their cultivations, while others were considering it. The program addressed these difficulties by providing extensive education and hands-on training in climate-smart agriculture. By equipping farmers with the necessary knowledge and skills to adapt to climate change, the program reduced their fears and improved their confidence. One farmer shared,

> *"Before the program, I was worried about the future of my farm with the changing weather patterns. But after the training, I felt more confident. For example, learning how to improve soil health and manage water more efficiently has made a big difference. Now, I feel I can handle whatever comes." – Farmer 4, Hidellana Tea Factory (Awissawella), Sabaragamuwa*

The case study highlights the interactions between economic empowerment and reduced anxiety. For example, participants related that cost-cutting measures and increased yields gave them a sense of

security, which significantly alleviated their stress and improved their overall well-being. Farmers said the program provided a sense of financial security through practical cost-saving strategies. One farmer shared,

> *"By reducing the amount of chemical fertilizer I use, I saved money, and my yields improved. This made me feel more secure about the future." – Farmer 7, Aruna Tea Factory, Western*

The motivation to continue climate-smart agricultural practices often stemmed from both economic benefits and the visible improvements in crop health. A farmer shared:

> *"Since adopting organic composting, I've seen a huge improvement in my soil, and my crops are healthier. I've cut back on using chemical fertilizers, which is saving me money." – Farmer 6, Aruna Tea Factory, Western*

> *"The increased yield from using climate-smart practices helped cover my expenses and gave me peace of mind. I no longer stress about how to make ends meet." – Farmer 1, Aruna Tea Factory, Western*

As a result of the program, farmers experienced a notable psychological shift. A farmer mentioned:

> *"I used to feel overwhelmed by the challenges of farming, but now I feel empowered. Learning how to protect the environment made me proud of what I'm doing for my land and my community." – Farmer 2, Evergreen Tea Factory, Southern*

In other words, farmers have become more environmentally conscious, recognizing the harmful effects of chemical fertilizers on the environment, adopting effective waste management practices, and producing tea that is both flavourful and safe for consumers. Another farmer supported this view by stating,

> *"I Didn't Realize How Much Harm Chemical Fertilizers Were Doing To Our Soil And Water. Now, We've Switched To Organic Methods, And I Can Already See A Difference In The Health Of Our Land." – Farmer 3, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

This increased interest fostered a stronger sense of environmental responsibility. Moreover, the program promoted social responsibility and unity among farmers. By collaborating, sharing knowledge, and supporting one another, they reinforced their community bonds and collectively contributed to a more sustainable and socially cohesive farming environment. In supporting this, a farmer said,

> *"We've formed a farmers' community group to help each other with water conservation and organic farming techniques. Together, we are learning faster and supporting each other." – Farmer 2, Aruna Tea Factory, Western*

Although this program enhanced farmers' agricultural practices and shifted their mindset toward a more sustainable and cooperative way of life, it also led to some challenges among the farmers. First, some farmers have exhibited a lack of enthusiasm for sustainable practices, mainly due to the lower crop level initially or higher initial costs of labour-intensive processes due to manual weeding. A farmer expressed,

> *"At first, I wasn't sure if the changes would actually help. It's hard to believe in long-term solutions when the immediate struggles are so overwhelming. When we first started the climate resilience initiatives, trained by the Rainforest Alliance, our crop yields actually decreased before improving. Some of us gave up before seeing the benefits, thinking the new practices weren't working."– Farmer 5, Hidellana Tea Factory (Awissawella), Sabaragamuwa*

Resistance to change is another obstacle, as many farmers prioritize short-term financial gains over long-term benefits, making the shift to sustainable practices less appealing. Some farmers also struggled with technical issues in adopting sustainable agricultural practices.

Action-learning Aspects

The program utilizes action-oriented learning through hands-on training, demonstration plots, and field visits, ensuring that farmers gained practical experience alongside theoretical knowledge of climate-smart agriculture techniques. This engaging approach proved essential for effective knowledge transfer and the long-term adoption of sustainable practices. A farmer noted,

> *"The training was practical and relevant to what we deal with on our farms every day. The techniques we learned were something we could immediately put into practice, like improving soil retention, which made a real difference for us." – Farmer 3, Evergreen Tea Factory, Southern*

> *"Seeing the demonstration plots and visiting other farms gave me confidence. It showed me that these techniques work, and I can apply them to improve my yields."- Farmer 4, Evergreen Tea Factory, Southern*

> *"The hands-on training sessions were really helpful. They showed us how to make changes step by step, and now I can see the difference in my crops." – Farmer 1, Aruna Tea Factory, Western*

This participatory approach not only enhances technical skills but also fosters peer learning and collective action among tea farming communities. The program also promotes community-led programs, which empower farmers to lead projects and share knowledge within their communities. This in turn ensures continuous learning and improvement. A farmer shared,

> *"The program encouraged us to take the lead in our villages. Now, we organize meetings to share knowledge and help each other solve problems." – Farmer 2, Evergreen Tea Factory, Southern*

Climate Justice and Other Social Justice Issues that Intersect with Climate Change

By strengthening community resilience to climate impacts, the program reduces vulnerability and fosters social cohesion. Empowering farmers with sustainable practices and economic opportunities not only improves their livelihoods but also advances broader social justice goals, ensuring all participants benefit from climate change adaptation efforts.

The program demonstrates a strong commitment to climate justice and social equity by focusing on economically marginalized smallholder farmers, the majority of whom are women, in rural areas of the country. By offering accessible training and resources, the program promotes equality and inclusivity within the tea farming sector. Given that most tea smallholders are women, the program plays a vital role in empowering them to support family income and ensure food security. Female farmers said,

> *"As a woman, I never thought I would be able to contribute so much to my household's income. With the knowledge from the program, I am growing better crops and saving money. I feel proud that I can now support my children's education and contribute to my family's well-being." – Farmer 6, Aruna Tea Factory, Western*

> *"Before the program, I struggled to make ends meet, especially with my husband being ill. After the training, I learned how to improve my crop yields. Now, I can sell more produce and earn a better income, which has really helped support my family." – Farmer 1, Aruna Tea Factory, Western*

Cultural and Regional Contexts

The case study highlights the importance of using local contexts to shape the design, development, and implementation of the *Climate-smart Agriculture Program*. The program was developed in response to the significant economic challenges faced by Sri Lankan tea farmers, such as low productivity, income limitations, and high input costs like fertilizers. Recognizing that financially constrained farmers might struggle to prioritize climate and sustainability goals, the program integrated economic empowerment as a core element. By addressing economic issues first, the program makes it easier for farmers to adopt sustainable practices, offering immediate benefits such as cost savings and increased yields, which, in turn, boosted their financial stability and resilience. One farmer stated,

> *"At first, I was more focused on making enough money to survive. But through the program, I learned how to save costs on things like fertilizers and increase my yields. Now I can see that taking care of my land is not only good for the environment but also my wallet. It's helping me and my family to be more stable." – Farmer 2, Aruna Tea Factory, Western*

In addition, the program incorporates climate-smart approaches, while still acknowledging and respecting the valuable aspects of traditional agricultural knowledge. While many tea growers globally avoid using chemicals, Sri Lankan farmers frequently rely on pesticides, driven by local practices and business interests. The program's success was further enhanced by aligning it with regional traditional cultivation practices, incorporating local agricultural methods and geographical contexts to ensure relevance. By tailoring the program to fit regional needs, it effectively addressed local challenges, fostered greater commitment among farmers, leading to successful outcomes. A field officer shared,

> *"We made sure the program aligned with the farming practices that farmers already knew. This approach not only made the training more relevant but also ensured they were more committed to using what they learned on their farms."- Factory Personnel 2, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

> *"We made sure the training focused on practices that were already familiar to the farmers. By aligning it with the regional cultivation methods, we could ensure they didn't feel overwhelmed by new concepts. It was about enhancing what they already knew." – Factory Personnel 1, Evergreen Tea Factory, Southern*

Sri Lanka's cultural context also plays a role in agricultural practices. Rooted in Buddhist beliefs, the country has a non-hunting culture. However, maintenance of agricultural productivity and crop protection requires control of certain agricultural pests such as wild pigs, peacocks, monkeys, and deer. To avoid the conflict the farmers had due to this religious influence, Rainforest Alliance standards promote the habitat conservation of natural predators such as foxes and fishing cats. Accordingly, Rainforest Alliance standards invariably allow agricultural pest control and educate farmers on the importance of environmental equilibrium in training programs, aligning with the cultural norms of the country. A factory personnel explained,

> *"Sri Lanka's culture plays a big role in how farmers approach pest control. With Buddhist teachings influencing a non-hunting mindset, we had to find a balance. We guided farmers to understand that controlling pests like wild pigs and monkeys was crucial for protecting their crops, but at the same time, we emphasized the importance of maintaining environmental balance." – Factory Personnel 1, Hidellana Tea Factory (Awissawella), Sabaragamuwa*

Moreover, Rainforest Alliance standards, on which the program is based, allow for some flexibility in ethical labour practices to align with the agricultural calendar. For example, the standards include guidelines on labour rights, such as limiting work hours and ensuring rest periods. However, deviations are permitted during peak crop seasons, provided fair conditions are maintained. This

flexibility recognizes the seasonal nature of agriculture and ensures that labour practices are adapted to meet increased demands while protecting workers' rights. Accordingly, the program has been designed by considering the local labour availability within the parameters set by the Rainforest Alliance's global standards. A field officer asserted,

> *"In Sri Lanka's tea industry, labour needs vary depending on the season. The Rainforest Alliance standards offer flexibility during peak times, allowing extended work hours, but we make sure that labour practices always respect workers' rights. We educate farmers about the importance of maintaining fair conditions, even when work demands increase." – Factory Personnel 1, Aruna Tea Factory, Western*

Influence of Indigenous Knowledges

Tea farming is not Indigenous to Sri Lanka, having been introduced by the British around 150 years ago as a commercial crop. Over the last five decades, it has gained popularity among smallholder farming communities. As a result, Indigenous agricultural practices have not become an integral part of tea cultivation in the smallholder sector, unlike other crops like rice, which have been grown in the country for millennia. Consequently, the role of Indigenous knowledge in the design, development, and implementation of this project is minimal. However, over the past 150 years, a traditional form of tea farming has evolved from the British introduction, heavily influenced by input dealers such as fertilizer and chemical suppliers. Nevertheless, the program aims to promote beneficial practices while reducing the harmful ones introduced through these various influences. The program mitigates the drawbacks of traditional practices by integrating sustainable, climate-smart approaches while recognizing and respecting the valuable aspects of traditional agricultural knowledge. Its success was further strengthened by aligning with regional cultivation practices, incorporating local agricultural methods, and geographical contexts to enhance relevance. By adapting to regional needs, the program effectively addressed local challenges and fostered greater farmer commitment, leading to successful outcomes.

Geography and Place

The *Climate-smart Agriculture Program* takes geographical factors into account, acknowledging that tea cultivation varies by terrain. In hilly areas, water conservation is essential for maintaining soil moisture, whereas in lowlands, improving drainage to prevent water stagnation is critical. These geographical considerations ensure the program's practices are relevant and effective across different regions of Sri Lanka. A field officer revealed,

> *"In my role as a field officer, I emphasize the importance of tailoring farming practices to the region. For example, I explain to farmers in hilly areas the importance of water conservation to retain soil moisture, while in lowland areas, I focus on improving drainage systems to avoid water stagnation. This regional approach ensures the program's relevance and effectiveness."- Factory Personnel 3, Aruna Tea Factory, Western*

Additionally, government regulations influence the program design. For instance, the Sri Lankan government banned Glyphosate in 2018, although it was not initially restricted by Rainforest Alliance standards. Consequently, the program had to incorporate regional regulations in its design. A factory-affiliated trainer highlighted,

> *"Government regulations, such as the Sri Lankan ban on Glyphosate in 2018, significantly influenced the program's design, requiring the integration of regional policies into its framework, even when these regulations were not initially part of the Rainforest Alliance standards." – Factory Personnel 3, Hidellana Tea Factory (Rathnapura), Sabaragamuwa*

CASE STUDY IMPACTS

Influence of the Case Study on Conceptualizations of Quality CCE

Overall, the case study has advanced the *Climate-Smart Agriculture Program*'s understandings of the quality of CCE as a holistic, practical, inclusive, and locally relevant training strategy that addresses the multifaceted challenges of climate change.

Ultimately, the program equips farmers to address climate challenges while fostering a sense of ownership and responsibility toward their environment. The program nurtures a deep respect for environmental conservation, leading to improved soil and water management practices that protect natural resources. By demonstrating the financial advantages of climate-smart agriculture, such as reduced input costs and increased productivity, the program instils confidence in sustainable practices as viable means for improving livelihoods. By connecting farmers with their local environment and attending to climate justice, social justice, economic development, and equitable resource access, farmers are able to maintain their livelihoods.

The study also underscores the importance of supporting farmers' psychological transformations through climate change training and highlights how such training can influence farmers' values and beliefs while fostering collective action and promoting behavioural change. The program's action-learning components, including hands-on technical instruction and field visits, demonstrate the critical role of experiential learning in making climate-smart practices both comprehensible and actionable. The program's design, heavily influenced by Sri Lanka's cultural and geographical context, underscores the importance of localized, culturally appropriate teaching. In addition, by promoting community participation and collaboration, the program helps participants build a collective sense of responsibility and strengthening social bonds. Farmers recognize the direct benefits of incorporating sustainability into their routines, aligning their personal values with broader environmental and community objectives.

This integrated approach ensures that the tea sector reduces its environmental impact, adapts to climate change, and supports broader climate mitigation efforts.

Implications and Impacts at Different Levels

This study offers broader implications and impacts for local smallholder tea factories, as well as government, and international certification providers.

Local smallholder tea factories: Factories should invest in training programs to equip field officers with knowledge and skills to support smallholder farmers in implementing climate-smart agricultural practices. This could include "train the trainer" programs, regular training sessions, and a focus on providing higher-level knowledge on climate change. These programs should cover both theoretical concepts and practical skills, ensuring that field officers have a deep and broad understanding of climate change and sustainable agricultural practices. The knowledge imparted should be comprehensive, enabling field officers to effectively teach and guide farmers with both depth and breadth of expertise.

Factories can also implement several best practices to engage smallholder farmers in quality climate change training. First, financial support and continued encouragement can support farmers to adopt sustainable agricultural practices, particularly since there can be an initial decline in crops when farmers switch from conventional to sustainable agricultural practices. Establishing demonstration plots within farming communities would provide smallholders with practical, hands-on experience in effective farming techniques.

The above recommendations would provide numerous positive impacts for smallholder factories. For instance, complying with environmental standards enables factories to meet regulatory requirements and avoid penalties while benefiting from a steady supply of high-quality raw materials, lower input costs, and access to premium markets. This also positions factories as preferred buyers of green leaf from smallholder farmers, allowing them to offer premium prices. Furthermore, by fostering strong relationships with smallholders and supporting sustainable practices, factories can enhance community ties and contribute to a positive business environment. Engaging in socially responsible activities can also improve employee morale and attract those who value sustainability. Such supplier development programs boost the reputation of smallholder factories among tea buyers, farming communities, the government, and the general public. Ultimately, investing in sustainable and regenerative agricultural techniques ensures the long-term viability of tea production, preserves soil and water resources, and improves the overall environmental health of tea-growing regions.

Government: Governments can promote climate-smart agriculture training among smallholder farmers by developing policies that support lower-tier smallholder tea farmers. Such policies would ensure smallholders receive the assistance they need to succeed in the transition to climate-smart agriculture such as providing favourable tax conditions and offering accessible loans to both farmers and factories. These measures would help overcome financial constraints, enabling farmers to invest in sustainable practices and strengthen the tea sector's resilience and productivity. Additionally, the government could organize competitions to recognize innovative and exemplary practices among smallholder farmers and factories, with awards for adherence to quality standards.

Supporting lower-tier suppliers can have profound micro and macro-level impacts. Economically, government support can boost productivity, create employment opportunities, and expand markets, driving broader economic growth. By enhancing smallholder farmers' productivity through infrastructure development, favourable tax policies, and financial assistance, governments can stimulate local economies and reduce poverty. Furthermore, reducing reliance on imported synthetic agrochemicals would lower foreign currency outflows, improve exports, and reduce greenhouse gas emissions. Government support can also improve livelihoods, foster community development, and strengthen social bonds, contributing to a more cohesive and stable society. Programs aimed at empowering women within lower-tier supply chains can further promote gender equality and inclusive development, resulting in enhanced economic and social well-being across communities.

International Certification Providers (e.g., Rainforest Alliance): Partnering with certification providers such as the Rainforest Alliance enhances the role of international non-governmental organizations in promoting sustainable agriculture in marginalized communities in developing countries. This case study highlights effective practices for engaging factories in climate-smart agriculture training for certification providers involved in establishing robust continuous monitoring mechanisms to ensure that certified factories comply with sustainable practices. Additionally, creating a platform for international tea-buying firms to offer higher premiums to factories that meet Rainforest Alliance certification standards would incentivize sustainable agricultural production. To effectively engage smallholder farmers in climate-smart agriculture training, certification standards should be shared in simple, clear language that even new farmers can easily understand, and should be tailored to their specific needs. Ongoing education and support are also important. Finally, certification providers can make their guidance more practical and useful for farmers and factories.

Scaling and Applicability of the CCE Program to Other Contexts

International tea-growing regions: Countries such as India, China, Kenya, Rwanda, and Malawi have a high proportion of smallholder farmers. These areas, with their strong reliance on smallholder tea farming, also face climate-related challenges that affect productivity, profitability, and sustainability. By applying the approaches of the *Climate-smart Agriculture Program*, these smallholder farming

communities can benefit from climate-smart, regenerative agricultural practices that enhance productivity, profitability, climate resilience, and sustainability. Farmers in these countries could see improved tea land productivity, reduced costs, increased income, and an overall better quality of life.

Scaling the climate-smart agriculture program to different countries requires integrating local contexts. Nations like Kenya and India, with large tea smallholder farming sectors, can benefit from similar programs. However, training content must be adapted to reflect local agricultural practices, environmental conditions, and cultural contexts. Collaboration with local governments is also essential to align the program with national agricultural policies and secure support for scaling efforts. Engaging local communities and stakeholders is equally important to ensure the training programs are relevant and culturally appropriate, and to foster local ownership and active participation.

Climate-smart agriculture in other industries: Empowering lower-tier suppliers in industries such as coffee, cocoa, bananas, and palm oil requires adapting the climate-smart agriculture model to meet the unique needs and challenges of each sector. For example, similarly to the tea industry, coffee farmers face issues such as soil fertility, pest management, and climate resilience. Climate-smart agriculture programs must provide tailored training, address the specific challenges of lower-tier suppliers, and ensure access to essential resources, including sustainable farming inputs, funding, and ongoing monitoring and evaluation.

Organizations like the Forest Stewardship Council (FSC) and other certification bodies are key to scaling sustainable practices. They offer frameworks for certification and monitoring, ensuring programs comply with international standards. Their involvement boosts the credibility and marketability of products produced under these programs.

In summary, applying the climate change education program to other contexts requires a comprehensive approach involving tailored training, local adaptation, and collaboration with relevant organizations. By addressing the specific needs of various industries and regions, and leveraging the support of certification bodies and governments, the program can empower lower-tier suppliers globally, fostering sustainability and resilience across sectors.

APPENDIX 1 – SUMMARIZED INTERVIEW GUIDE FOR SMALLHOLDER FARMERS

General questions on trainees and training details:

- Name, age, gender, district, family dependents, land area under tea
- Is this your primary income or not?
- How old is the tea block?
- Have you participated in the training program conducted in RA certification? How long have you been practicing, what have you learned from this program?
- Do you continue these practices? If not, what are the major reasons to give up these practices?
- How was the training conducted? Can you describe the methods or formats used to deliver the information?
- In which year did you undergo the Rainforest Alliance training?

Specific questions:

- How did this program improve your farm management and cultivation knowledge and skills?
- Has this program increased your crop yield and reduced the expenditure of farm management? (e.g., pest management, crop management, efficient use of resources, etc.)? If so, how?
- Could you shed light on how the program affects your living conditions? (e.g., Housing conditions and sanitary facilities, house electrification, improved affordability of child education, easy access to water, improvement of transportation facilities, nutritious meals, and access to health facilities)
- What specific strategies have been implemented to address environmental protection, as a result of this program? (e.g., proper usage of agrochemicals, waste management, soil conservation, environmental resource preservation, and soil erosion prevention)
- What are the (technical, social, economic, and environmental) challenges you encountered when adopting the new techniques?
- What potential corrective measures are required to tackle these challenges effectively?
- What are the (technical, social, economic, and environmental) benefits that have arisen as a result of this program?
- What positive social and environmental outcomes have emerged in the broader community, extending beyond you and your family up to the national level? (e.g., Water quality, biodiversity)
- What are the social and environmental challenges your farmer society encountered following these practices?

APPENDIX 2 – SUMMARIZED INTERVIEW GUIDE FOR SMALLHOLDER FACTORIES

General questions on factory and operations:

- Main manufacturing processes, capacity (full or under), leaf standard followed?
- How many smallholder farmers do you have?
- What are the general challenges you face in the business?

Specific questions:

- What do you do to develop your leaf suppliers? What are the aspects (environment, social, farm management, financial) you cover/focus on?
- Why do you want to develop your leaf suppliers?
- How do you think the leaf suppliers' quality of life is improved due to your programs?
- What are the challenges you face when developing leaf suppliers? (e.g., resistance to change, lack of leaf suppliers' commitment and support, anti-sustainability campaigns, economic, climatic, and marketing challenges)