YANGON UNIVERSITY OF ECONOMICS

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A STUDY ON SUSTAINABILITY OF TEA INDUSTRY

(CASE STUDY: PINDAYA TOWNSHIP)

HLA MOE

EMPA – 5 (19th BATCH)

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A STUDY ON SUSTAINABILITY OF TEA INDUSTRY (CASE STUDY: PINDAYA TOWNSHIP)

This thesis is submitted in partial fulfillment of the requirement for the degree of Master of Public Administration (MPA)

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This is to certify that this thesis entitled "**A Study on Sustainability of Tea Industry, Case Study: Pindaya Township**" submitted as a partial fulfillment toward the requirements for the Degree of **Master of Public Administration**, has been accepted by the board of examiners.

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ABSTRACT

This study examines the obstacles to achieving sustainability in Pindaya Township's tea industry, vital to Southern Shan State. Improving this industry is crucial for local tea growers' socioeconomic status. A survey of 285 households shows most own small plantations with aging trees, affecting production. Traditional methods limit productivity, but modern techniques could improve yields. Farmers avoid chemicals but lack certifications, restricting premium market access. Low education levels hinder the adoption of new farming techniques. Tea farming earnings barely cover basic needs, reflecting uncertain to improve socio-economic conditions. Women play a significant role in tea plucking, supporting gender equality, but youth disinterest challenges sustainability. Firewood use raises environmental concerns. The industry faces technology and innovation challenges, supply chain issues, labor shortages, inadequate infrastructure, energy constraints, and market connectivity issue. While tea farming poses minimal environmental risks without chemicals, reliance on firewood threatens ecosystems. Government support is essential for overcoming these barriers and integrating economic, social, and environmental strategies for sustainable development.

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LIST OF ABBREVIATIONS

AD	Anno Domini
ASEAN	Association of Southeast Asian Nations
BC	Before Christ
CSO	Central Statistical Organization
CTC	Crush, Tear, Curl
FAO	Food and Agriculture Organization
FDA	Food and Drug Administration
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
MTA	Myanmar Tea Association
NGO	Non-Governmental Organization
S. D	Standard Deviation
SAZ	Self-Administered Zone
SDGs	Sustainable Development Goals
TBL	Triple Bottom Line
UAE	United Arab Emirates
UK	United Kingdom
US	United States

CHAPTER I

INTRODUCTION

Global economic development is greatly aided by agriculture, which is sometimes seen as the foundation of many economies. Agriculture is a vital engine of growth and development because its effects reach far beyond the production of food and affect many aspects of a country's economy. Agriculture is also a significant source of employment, particularly in developing countries. Therefore, the agriculture sector is the lifeblood of many developing countries, where the majority of the population depends on it for their livelihoods.

Agriculture is the backbone of Myanmar's economy, employing a significant portion of its workforce. It stands as the primary source of food production, supporting the country's food security and offering livelihoods to a vast number of its population, especially in rural areas. Rice, pulses, and other crop farming are integral parts of the country's economy. The agricultural sector's contribution to Myanmar's economy is substantial. It serves as a source of income for a significant portion of the population, fostering rural development and supporting the overall economy. Exporting agricultural products, such as rice and pulses, also plays a critical role in generating foreign exchange earnings for the country. According to CSO data (2023), the share of agriculture in Myanmar's GDP is 22.3%. These factors indicate the importance of the agricultural sector.

Widespread development of long-term sustainable agricultural practices also plays an important role. Agricultural is at the center of many global concerns in a world that is always evolving. The Sustainable Development Goals (SDGs) emphasize to solve urgent problems and promote a more sustainable future by providing a visionary framework for global development. Especially, SDG (2) focus on end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Accordingly, the idea of sustainability in the agricultural sector is essential to achieving

these objectives since it helps to solve a variety of environmental, social, and economic issues.

In agriculture sector, growing perennial crops has many advantages. Perennial crop production is fundamental to the endeavor of developing resilient, sustainable, and commercially successful agricultural methods. With their long lifespans, perennial crops are known for their many advantages that not only improve agricultural landscapes but also promote economic stability and environmental sustainability. Their support of biodiversity, soil health, water conservation, and carbon sequestration highlight how important it is for them to promote sustainable farming methods. Adopting perennial crops is a commitment to protecting ecosystem health, maintaining natural resources, and guaranteeing farmers' financial stability as much as it is a shift in agriculture. There are various type of perennial crops like that coffee, tea, orange, lemon/lime, lychees, mango and rubber, etc.

Among these, tea as a perennial crop, can be grown cheaply. Raw tea leaves can also be used to make a wide range of goods, including beverages, tea extracts, tea powder, foods flavored with green tea, soaps, skincare and makeup products, supplements, essential oils, scented candles, and more. Tea, one of the world's most widely consumed beverages, plays a significant role in the economies and cultures of many nations, and also the second most-consumed beverage globally after water. Many people drink tea because it is one of the most widely consumed and least expensive drinks in the world. Tea is one of the key elements of the global beverage market because of its rising demand. It has been found that the worldwide demand for tea is increasing every year. In 2022, global consumption of tea amounted to about 6.7 billion kilograms and is estimated to reach to 7.4 billion kilograms by 2025 (Statista).

1.1 Rationale of the Study

Regarding tea production in Myanmar, Chin State, Kachin State, Sagaing Region and Mandalay Region produce a little while Shan State has the highest cultivation and production of tea. Eighty-five percent of Myanmar’s tea cultivation takes place in Shan State, at altitudes in excess of 1,500 meters above sea level. The conditions for tea-growing there are seemingly ideal due to the high altitude, hilly

slopes and good soil quality. In Shan State, it was found that the northern part of Shan State has the highest production of tea and the southern part has the second highest.

The most well-known tea-producing area in Southern Shan State is Pindaya Township, which is a part of the Danu Self-Administered Zone. Pindaya Township has a long history of producing tea. There are over 8,300 acres of tea plantations and 18 village tracts that grow tea. These plantations are situated approximately 1,150 meters above sea level. According to data from the Agriculture Department of Pindaya Township, it was showed that approximately 3500 metric tons of raw tea leaves were produced during 2022-2023 fiscal year.

Enhancing the tea industry in Pindaya Township is necessary to raise the socio-economic status of each individual tea growers and producers who depends on it. Their socio-economic situation will improve as the tea industry grows, bringing in more revenue. The tea produced from Pindaya Township is mostly sold as raw materials in the local markets. Although the tea industry has the potential to improve, due to insufficient financial resources and lack of technology of the tea farmers, the tea produced in the region remains only at the raw level and does not become high-value products. The tea produced in this region is good quality, but it has also been discovered that many conditions need to upgrade for international markets. The tea industry in Pindaya Township is totally dependent on cheap and readily available fire-wood, which is contributing to the problems of deforestation on a daily basis. It is inevitable that there will be a huge impact on the environment in the long run.

Therefore, the tea industry in Pindaya Township is facing many challenges related to social, economic, and environmental impacts. If the tea industry is sustainable, the socio-economic life of the local tea growers and producers will be improved. That's why this study mainly focus to examine the obstacles that need to be overcome in order to be sustainability of tea industry in Pindaya Township, Danu Self-Administered Zone.

1.2 Objective of the Study

The objectives of the study are as below:

(1) To study the current situation of tea industry in Shan State of Myanmar.

(2) To examine the needs and challenges facing for the sustainability of tea industry in Pindaya Township.

1.3 Methods of Study

This study was mainly used the descriptive analysis method. Both quantitative and qualitative approaches used to achieve the study's objectives. And also, primary data and secondary data were used. Primary data was collected through field surveys and interviews with relevant stakeholders in Pindaya Township, Danu Self-Administered Zone. Secondary data was gathered from the Danu Self-Administered Zone Office, Department of Agriculture, Department of Planning, Settlement and Land Records Department, General Administrative Department, Statistical Yearbooks, websites, and other research papers.

1.4 Scope and Limitation of the study

This study was mainly focused to examine the tea productivity and potentiality within the defined geographic area in Pindaya Township, Danu Self-Administered Zone. The study period was during from (2012-2013) to (2022-2023) fiscal year. The survey was collected from 285 tea farmers in Pindaya Township, Danu Self-Administered Zone.

1.5 Organization of the study

The thesis is organized into five chapters. Chapter one is the introduction of the thesis, which includes the rationale of the study, objectives of the study, method of the study, scope and limitation of the study as well as the organization of the study. Chapter two is the literature reviews related on the study topic. Chapter three is the overview of tea industry in Myanmar and Danu Self-Administered Zone. Chapter four is analyzed on the sustainability of tea industry in Pindaya Township. Finally, Chapter five is the conclusion with the findings and suggestions from the study.

CHAPTER II

LITERATURE REVIEW

2.1 The Role of Agriculture in Economic Development

Agriculture, often regarded as the backbone of many economies, plays a pivotal role in fostering economic development across the globe. “Traditionally in economic development, agriculture has been assumed to play a passive and supportive role” (Todaro & Smith, 2020, p. 448). Beyond the provision of food, the agriculture sector's impact extends to various facets of a nation's economy, making it an indispensable force for growth and development.

One of the fundamental pillars of agriculture's significance is food security. Agriculture is the primary source of food production, ensuring a consistent supply of food to meet the nutritional needs of a nation's population. A nation's ability to feed its citizens is not just a matter of sustenance; it is essential for stability and well-being. A well-developed agriculture sector reduces the risks of food shortages and famine, ensuring that the population is adequately nourished (Pawlak & Kolodziejczak, 2020). According to Food and Agriculture Organization (FAO) data, between 702 and 828 million people in the world were still hungry in 2021. Emphasizing agriculture is an essential step toward ensuring food security.

Agriculture is the lifeblood of many developing countries, where the majority of the population depends on it for their livelihoods. Approximately 50% of workers in developing countries are engaged in the agriculture industry. However, in developed countries, the agricultural sector employs little over 4% of the labor force (David, et al., 2013). Today, the majority of development economists agree that the agricultural sector, in particular, and the rural economy in general, must play an indispensable role in any overall strategy of economic progress, especially for the low-income developing countries, rather than taking a passive, supporting role in the process of economic development (Todaro & Smith, 2022). Agriculture plays a crucial role in economic, social, and environmental development by triggering economic growth, reducing

poverty, narrowing income disparities, providing food security, and delivering environmental services (Byerlee, et al., 2009).

Apart from employment, agriculture is a significant source of income for millions of people, particularly in rural areas. Small-scale farmers, in particular, depend on agriculture as their primary source of livelihood. The growth of the agriculture sector contributes into increased rural income, which, in turn, contributes to poverty alleviation (Mellor & Malik, 2017). The additional income generated through agriculture enhances the living standards of rural communities, promoting economic development in these regions. “One of the findings is that the average level of happiness or satisfaction increases with a country’s average income” (Todaro & Smith, 2022, p. 14).

Agriculture's contribution to Gross Domestic Product (GDP) is substantial in many developing countries. According to the world bank (2024), agriculture is also crucial to economic growth, accounting for 4% of global gross domestic product (GDP) and in some least developing countries, it can account for more than 25% of GDP. A thriving agriculture sector forms the bedrock for overall economic growth. Moreover, agricultural products often constitute a significant portion of a nation's exports. Earnings from agricultural exports generate foreign exchange, which can be channeled to finance imports, invest in infrastructure development, and fund other development projects (Nugroho, et al., 2021).

Agriculture is not solely responsible for food production; it also provides essential raw materials for various industries. Essential components of the world economy are raw materials. Manufacturing is impossible without raw material availability (Zimmermann, et al., 1941). Steel, coal, and minerals are examples of non-agricultural raw resources. Nonetheless, agriculture is the source of many raw materials, including herbs that give food flavor and timber used in construction. For instance, maize is utilized in the production of food and as the starting point for the fuel known as ethanol. Sectors such as textiles, food processing, and agro-based industries also depend on agricultural products. Therefore, a well-developed agriculture sector supports the growth of these downstream industries, ultimately promoting industrialization and diversification of the economy (Roest, et al., 2017).

Agriculture serves as a catalyst for infrastructure development, particularly in rural areas. The need for transportation, storage facilities, and irrigation systems arises from the agriculture sector's requirements. The development of infrastructure in rural regions not only benefits agriculture but also contributes to overall rural development. Agriculture development is significantly impacted by infrastructure, especially when it comes to lowering agricultural input costs and withstanding natural disasters (Wu, et al., 2019). It enhances the quality of life for residents, providing them with better access to education, healthcare, and economic opportunities.

Agriculture promotes innovation and technology adoption. Advances in agricultural practices, machinery, and biotechnology can enhance productivity, reduce waste, and improve overall efficiency in the sector (Ruzzante, et al., 2021). These innovations translate into higher yields and more sustainable practices, ensuring that agriculture remains a driving force in economic development. Many developing countries possess vast natural resources. Emphasizing sustainable agricultural practices ensures the responsible management of these resources. Sustainable agriculture mitigates the risk of resource depletion and environmental degradation, contributing to long-term environmental sustainability (Gomiero, et al., 2011). Farmers who adopt eco-friendly practices not only protect their lands but also safeguard biodiversity and reduce the negative environmental impact of agriculture.

Climate change poses a growing threat to agriculture. Emphasizing agriculture is critical for adapting to changing weather patterns and unpredictable climates. Sustainable farming practices and investments in climate-resilient crops and technologies enable communities to withstand and recover from climate-related disasters, reducing the risk of food shortages and economic instability (Altieri, et al., 2015). The commitment of the agriculture sector to eco-friendly methods contributes to environmental conservation and long-term economic stability.

Therefore, the agriculture sector is not just about farming; it is a foundation of economic development. Its role in providing food security, generating employment, contributing to GDP, and fostering innovation cannot be overstated. A thriving and sustainable agriculture sector is essential for overall economic growth, poverty reduction, and the long-term prosperity of a nation. Recognizing and supporting the significance of agriculture in economic development is a fundamental step towards building resilient and prosperous societies.

Agriculture plays a crucial role in economic development and sustaining livelihoods, particularly in rural areas. It provides a primary source of income and employment, laying the foundation for economic stability and growth. Enhancing agricultural productivity through sustainable practices ensures food security, generates income, and builds economic resilience. Sustainable agriculture practices, such as improving soil health, conserving water, and promoting biodiversity, support the long-term viability of farming communities. These efforts not only meet immediate livelihood needs but also contribute to broader economic development, reducing poverty and fostering sustainable growth. Investments in agriculture, including infrastructure, education, and technology, further stimulate economic progress, create jobs, and enhance the overall well-being of populations.

2.2 Sustaining Livelihoods

The concept of sustainable livelihoods represents a dynamic approach to ensuring the well-being of individuals and communities, without compromising the ecological, social, and economic systems on which they depend. To put it the sustainable livelihoods approach aims to simply improve understanding of the livelihoods of the impoverished (Serrat, 2017). In a world where social injustice, economic inequality, and climate change are major concerns, finding sustainable ways to make a living has become critical. Sustainable livelihoods are rooted in the fundamental idea of securing not only immediate income and well-being but also long-term prospects (Baffoe & Matsuda, 2017).

Fundamentally, a sustainable livelihood is based on five essential pillars: diversification, the development of social capital, the enhancement of human capabilities, the sustainable utilization of natural resources, and the facilitation of access to opportunities and assets (Bebbington, 1999). Having a diverse range of sources of income and means of subsistence helps protect against threats and weaknesses. Resilience and solidarity are supported by social capital, which includes support systems and community networks. Individuals are empowered when human capabilities are developed through education and skill development. While access to resources and opportunities creates avenues for economic growth, the sustainable use of natural resources ensures continuity.

Sustainable methods of subsistence have numerous advantages. Communities are protected by them from external shocks, be they social, economic, or environmental. Communities can secure stable income and food security by becoming less dependent on a single source of income. This makes communities more resilient to challenges and fluctuations. Sustainable livelihood practices encourage responsible resource management and conservation by fostering environmental stewardship (Gutierrez-Montes, et al., 2009). However, the adoption of sustainable livelihood practices is not without challenges. Inadequate access to resources, technological constraints, and policy limitations hinders the transition toward sustainability. In order to attain livelihood outcomes, livelihood strategies are used (Serrat, 2017). A comprehensive strategy that combines policy support, education, technological innovations, and a shared commitment to change is required to overcome these obstacles.

A sustainable way of life is not just a desirable goal; it is essential to the welfare of both the current and coming generations. Degradation of the environment and the inability to sustain livelihoods are closely related because the depletion of natural resources can result from a lack of viable livelihood options (Rawat, 1995). A multifaceted approach is needed to embrace sustainable livelihood practices: education, innovation, policy support, and a fundamental shift in societal paradigms (Ramos, 2019). The ability of people, communities, governments, and the private sector to work together can foster resilient livelihoods and protect the environment. It may coexist peacefully with the environment and enjoy the advantages of prosperity, resilience, and environmental care by taking the sustainable route (Marchese, et al., 2018).

Perennial crops are integral to sustaining livelihoods, especially in agricultural communities. Their long-term economic benefits stem from reduced maintenance costs and less frequent replanting needs. Once established, these crops require minimal inputs, lowering operational expenses for farmers. This economic stability is further reinforced by the consistent yields perennial crops provide, ensuring a reliable source of income and reducing the vulnerability associated with the variable yields of annual crops. By offering a steady income stream, perennial crops contribute to the financial resilience of farming households, enabling them to invest in their communities and improve their quality of life.

Beyond economic benefits, perennial crops also support environmental sustainability, which is crucial for long-term livelihood security. They enhance soil

health by preventing erosion and promoting nutrient cycling, which are essential for maintaining productive farmland. Additionally, perennial crops foster biodiversity and improve water conservation, creating more resilient ecosystems. These environmental benefits help mitigate the impacts of climate change, ensuring that agricultural systems remain viable in the face of increasing environmental challenges. By integrating perennial crops into farming practices, communities can achieve a more sustainable and resilient agricultural future, safeguarding their livelihoods for generations to come.

2.3 Benefits of Growing Perennial Agriculture

Since the introduction of agriculture, more than one-fourth of Earth's land surface has been converted for agricultural purposes (Zhang, et al., 2011). In a world where resources are limited, planting perennial crops would help address the various issues pertaining to food security and environmental conservation. Nowadays, annual crop monocultures occupy more than two thirds of the world's cropland, and the production of nonfood products (like biofuels) is competitively using land that could be used for food production.

Cultivating crop species that can survive for more than two years without requiring annual replanting is known as perennial agriculture. Compared to conventional agriculture, perennial agriculture uses less labor, less pesticides, and relatively less cultivating, all of which contribute to maintaining or even improving the health of the soil (Uellendahl, et al., 2008). Worldwide, perennial crops that are adapted to local environmental stresses are grown in a variety of climates as part of perennial agriculture. Perennial agriculture may be regarded as a type of sustainable agriculture, depending on the techniques employed (Krug, 2023). Perennial crops, with their innate ability to sustain ecosystems and provide long-term benefits, stand as an integral solution to the challenges faced in modern agricultural systems (Zhang, et al., 2012).

One of perennial crops' main benefits is that it helps maintain sustainable land use. Perennial crops provide long-term cultivation with less soil disturbance than annual crops, which require yearly replanting. Their constant growth prevents soil erosion and maintains the health and structure of the soil. Perennial crops improve soil stability, water infiltration, nutrient retention, and soil stability with deep root systems, promoting long-term soil health (Vico & Brunsell, 2018).

In agricultural landscapes, perennial crops serve as a refuge for a wide variety of plants and animals. They provide a variety of ecosystem services, including pollination, pest control, and carbon sequestration, by imitating natural ecosystems. Agricultural resilience is further enhanced by perennial crops' ability to withstand climate variability, which acts as a buffer against the damaging effects of extreme weather events (Sanford, et al., 2021).

Perennial crops require less frequent irrigation because their deep root systems allow them to reach deeper soil moisture. This capability helps to stabilize water tables in addition to conserving water. Furthermore, one important tool in reducing climate change is their capacity to sequester carbon. Perennial crops, especially trees and woody plants, help to reduce greenhouse gases in the atmosphere by absorbing and storing carbon.

Perennial crops offer long-term economic benefits. Once established, they need less maintenance and fewer inputs, reducing farmers' operating costs. They also provide stable yields over time, ensuring a consistent income and reducing the impact of yield fluctuations seen with annual crops. Transitioning to more perennial cropping systems requires overcoming challenges like initial investments, spreading knowledge, and obtaining policy support. Educating farmers on the benefits, supporting research and extension services, and providing incentives for adopting perennial crops are essential steps to facilitate this transition.

Perennial crops have benefited humans by requiring less labor and lasting longer than annual plants, providing food for many years from a single planting. Adopting perennial crops represents a significant shift toward sustainable and resilient farming practices. They play a crucial role in preserving soil health, fostering biodiversity, enhancing water conservation, and mitigating climate change, addressing the complex challenges of modern agriculture. Cultivating these long-lasting crops is not just an innovation but a commitment to a sustainable and resilient agricultural future.

Tea, a type of perennial crop plant, offer significant advantages due to their low cultivation and maintenance costs. Once established, tea trees require minimal inputs and upkeep, making them economically viable for farmers. Their long lifespan ensures consistent production and reduces the need for frequent replanting, contributing to

sustainable agricultural practices. The low maintenance requirements and longevity of tea trees make them an efficient and cost-effective choice for tea production.

2.4 Tea Industry and the Triple Bottom Line

The triple bottom line (TBL) is a framework that assesses an organization's performance in three key dimensions: economic, social, and environmental. It reflects a comprehensive approach to business, emphasizing the importance of sustainable practices and ethical responsibility. The triple bottom line, often abbreviated as TBL or 3BL, was introduced by John Elkington in 1994 as a new approach to measuring business success. It goes beyond the traditional focus on profits (the "bottom line") to include two additional "bottom lines": people (social) and planet (environmental). “The “People” part of the triple bottom line looks at how socially responsible the organization is in terms of fair labor practices, diversity, supplier relationships, treatment of employees, contributions to the community, and so forth. The “Planet” aspect measures the organization’s commitment to environmental sustainability. The third P, of course, looks at the organization’s profit, the financial bottom line” (Daft, 2018, p. 155).

The Triple Bottom Line (TBL) and the sustainability of the tea industry are intimately connected, as the TBL provides a comprehensive framework for evaluating and advancing sustainability in businesses, including those in the tea sector.

The economic dimension of the TBL focuses on the financial viability and economic performance of businesses. In the tea industry, this translates to the profitability of tea plantations and companies. Sustainable practices in tea cultivation and processing can contribute to long-term economic viability by improving efficiency, reducing production costs, and enhancing market competitiveness. The need for a more sustainable production system has grown over the past few decades due to negative social and environmental effects. Converting conventional farming methods to organic ones is one way to achieve such long-term production with negligible environmental impact (Doanh, et al., 2018).

The social dimension of the TBL addresses the well-being of individuals and communities associated with the tea industry. This includes workers on tea plantations. Sustainability in the tea industry involves ensuring fair wages, safe working conditions, and social benefits for tea plantation workers. According to International Labor

Organization (ILO), unskilled workers from rural areas make up the agro-based plantation industries in developing nations, especially those that produce bananas, tea, and strawberries in South Asia, Africa, and Latin America. Labor rights violations and wage exploitation are commonplace in these workplaces. Following social responsibility guidelines benefits the industry's general social wellbeing.

The environmental dimension of the TBL focuses on minimizing the ecological footprint of business operations. In the tea industry, this involves adopting sustainable farming practices. Sustainability is rising to the top of the food and beverage industry's priority list as consumers become more conscious of the effects of their decisions on the environment. The production of tea is expected to reach 7.2 million tones worldwide by 2027, so it's critical to know what can be done to lessen the beverage's negative environmental effects (Boris, 2023). Sustainable tea cultivation includes practices that conserve natural resources, prevent deforestation, and promote biodiversity. Organic tea cultivation, without synthetic fertilizers and chemical additives, is a sustainable and eco-friendly approach for producing healthy tea, despite environmental constraints and climate change (Hajiboland, 2017).

The TBL recognizes the interconnectedness of economic, social, and environmental factors. In the tea industry, decisions that benefit one dimension may have repercussions on the others. For example, adopting environmentally friendly practices may initially increase costs but contribute to long-term economic and social sustainability. The TBL encourages businesses to engage with various stakeholders, including communities, workers, consumers, and environmental groups (Westerman, et al., 2020). In the tea industry, engaging with stakeholders helps to address concerns, build trust, and ensure a more holistic approach to sustainability.

The TBL's emphasis on the long-term perspective aligns with the goals of sustainability in the tea industry. Sustainable practices, such as organic farming, agroecology, and soil conservation, aim to secure the health of tea plantations for future generations (Chowdhury, et al., 2021). Considering the TBL in the tea industry involves anticipating and adapting to changes, whether they be economic shifts, social dynamics, or environmental challenges. Sustainable practices contribute to the resilience of the tea industry in the face of uncertainties.

The Triple Bottom Line (TBL) provides a strong framework for evaluating and enhancing sustainability in the tea industry. By focusing on economic, social, and environmental aspects, tea businesses can build a more balanced and resilient sector that serves current needs while preserving resources for future generations. TBL encourages a comprehensive approach to sustainability, aligning corporate activities with broader societal and environmental goals.

2.5 Review on Previous Study

In 2008, the study by Sanne van der Wal from the Centre for Research on Multinational Corporations (SOMO) highlighted major sustainability problems in the tea industry. These included environmental damage from poor farming practices, bad labor conditions with low pay and poor living standards, economic inequality from big corporations' control, and social issues like gender inequality and weak worker representation. It was also found that the certification schemes like fair trade have little impact due to high costs for small producers. The study suggested that using better farming practices, improving labor conditions, ensuring fair economic practices, and enhancing certification schemes through cooperation between governments, corporations, NGOs, and local communities to make the tea industry more sustainable and fairer.

Thiri Khit Oo (2011) analyzed the livelihood of people in Namhsam township through tea plantation and production. The study found that boosting the tea business can benefit residents, the region, and the country. Despite 80 percent of residents depending on this business, it operated mostly in a traditional, small-scale manner with only 50 to 80 employees, producing about 24,000 to 30,000 viss per year, which only meets local market demand. The author recommended that adopting modern, scientific methods could improve livelihoods, increase employment opportunities, and expand the market.

The study conducted by Sita, K. (2015) investigated the influence of socio-economic characteristics on tea farming management behavior among smallholders in West Java Province. Findings revealed that demographic factors such as age, education level, household size, and income significantly affect the adoption of sustainable farming practices, with younger, more educated farmers being more inclined towards

innovative techniques. Limited access to resources, including credit and technical assistance, poses challenges to smallholders in implementing best management practices, while socio-economic constraints like land tenure insecurity and market access barriers hinder overall improvement. The study suggested interventions such as investing in education and training, enhancing resource access, promoting collective action, and providing policy support to address these challenges and fostered sustainable tea farming practices among smallholders in West Java Province.

Hsu Pyae Htwe (2016) examined the challenges of tea cultivation and production in Zayan Gyi village tract. The study found that factories with larger workforces have higher production and profit, directly related to the amount produced. Labor shortages are the primary issue, followed by outdated technology in most factories and farms. Additionally, only about 1,000 tea plants are grown per acre, yielding about 250 viss per acre. The study also found that 60% of the tea plants are over 60 years old, resulting in lower yields. None of the farmers use chemical fertilizers, highlighting the potential for creating an organic market that could increase income for the Zayan Gyi region.

Pyay Nyein (2017) examined tea plantations and production in Namhsan Township within the Palaung Self-Administration Zone (SAZ). The study aimed to identify challenges in the tea industry and propose strategies for sustainable community livelihoods. It found that 80% of households in Namhsan rely on tea as their primary income source, with the SAZ cultivating 56,149 acres of tea, comprising nearly a quarter of Myanmar's total tea acreage. Challenges faced by tea farmers include high production costs, inconsistent quality and quantity of outputs, and declining market prices. Additionally, the study highlighted variations in tea leaf prices from previous years. It also revealed that improving tea plantations could contribute to peace and tranquility in the region, but 88% of the tea production workforce struggles to secure labor. Developing the tea industry in the SAZ is crucial not only for boosting production but also for enhancing the local economy and creating sustainable livelihoods in an economically disadvantaged area.

In 2017, the study by Mohan Munasinghe and his colleagues examined the economic, social, and environmental impacts of the tea sector in Sri Lanka, aiming to assess its overall sustainability. The findings revealed that while the tea industry significantly contributes to the economy and provides vital employment, it faces

economic challenges like fluctuating global prices. Socially, the sector supports many livelihoods but struggles with poor working conditions and low wages. Environmentally, tea cultivation has led to deforestation, soil erosion, and pollution from chemical use. The study recommended diversifying income sources, improving labor practices, and adopting sustainable farming methods to enhance the sector's economic stability, social equity, and environmental health.

The study " Sustainable tea production through agroecological management practices in Vietnam" was conducted in 2021 by Viet Sam Le and his collogues. The study aimed to assess the effectiveness of agroecological management practices in promoting sustainable tea production in Vietnam. The study examined various agroecological strategies and their impact on environmental sustainability, productivity, and socio-economic factors within the Vietnamese tea industry. Through a comprehensive review of existing literature and case studies, the paper identifies key findings regarding the benefits of agroecological approaches in tea cultivation. These findings included improved soil health, biodiversity conservation, reduced chemical inputs, increased resilience to climate change, and enhanced socio-economic outcomes for tea farmers and local communities. Based on these findings, the paper provided recommendations for policymakers, tea producers, and other stakeholders to promote the adoption of agroecological management practices in Vietnam's tea sector. These recommendations emphasize the importance of policy support, capacity building, knowledge sharing, and market incentives to facilitate the transition towards more sustainable and resilient tea production systems in Vietnam.

CHAPTER III

OVERVIEW OF TEA INDUSTRY IN MYANMAR AND DANU SELF-ADMINISTERED ZONE

3.1 Historical Background of Myanmar Tea

Tea is perennial crop, well-known across the world as a famous raw material for beverages. Myanmar is one of the tea-growing countries in Southeast Asia, but very few people know and record the history of Myanmar tea. According to the history of world tea, China is the oldest country in which tea was commercially cultivated around 2500 BC. According to the study of Japanese tea researcher Dr. Matsushita Satoru (1930), it is believed that the beginning of the tea tree started in the mountainous areas bordering Yunnan Province of China. The mountainous areas bordering it are Myanmar, Laos, Vietnam, Thailand and Assam in eastern India. Myanmar is also among the original countries that grow tea, but in the world's history of tea, it describes that the oldest is China (2500 BC) and the second oldest is Japan (1200 AD).

According to U Ponnya's tea *Myittaza*[1] (an ancient famous poet) (19th century), there was a claim that the people of Danu-palaung planted tea trees to serve as a meal to the King of Dwaddapaung (AD 739). According to other records, it was noted that during the reign of the King Alaungsithu (AD 1092), the people of Palaung were given tea seeds and planted. According to the historical records of Southern Shan State, the records of tea cultivation in the Palaung Danu area, which are mentioned that tea cultivation seems to have started in the 11th century AD.

Tea cultivation in Myanmar may have predated that of Japan, as tea began being used as a royal accompaniment in the 11th century AD. By 1706 AD, Myanmar tea was extensively depicted in Myanma literature, and there were established regulations

[1] Myittaza is a type of group poetry in Myanmar literature, written in the Lankar style or a blend of Lankar and prose.

governing its production and consumption. According to U Ponnya, tea had been a beverage enjoyed by royalty since the times of King Duttabaung and King Alongsithu, spanning from the Bagan Dynasty to the Innwa Dynasty. By the 18th century, tea cultivation in Myanmar had started evolving into a commercially produced commodity.

From the age of the tea tree, it is possible to estimate the year of the tea tree in Myanmar. According to Myanmar Tea Producers and Exporters' Association (MTA), it is known that the oldest tea tree in Myanmar is a thousand years old and is preserved in the Wa Self-Administered Region. The age of the thousand-year-old tea tree in Wa State indicates that tea trees have been present since the 10th century AD.

Japan, which is the second oldest tea history in the world, adopted the Japanese word (Ocha) from the Chinese term (Cha) because it had to plant seeds from China. However, in Myanmar, the existence of a special name called Laphat, tea has been evident that it has a true culture of Myanmar.

3.2 Tea Culture and Type of Tea in Myanmar

In Myanmar, tea has a very long history. Tea leaves had been consumed by the people of Myanmar for a long time. In ancient times, Burmese kings practiced serving tea to guests during royal ceremonies. The pickled tea lacquer container was a royal accessory during the Innwa, Taungoo, and Konbaung eras. It was used by members of the royal families and their entourages. King Bodawpaya later strongly supported the tea leaves trade, and King Thibaw was also involved in the tea leaves trade.

During the reigns of Myanmar kings, pickled tea (fermented tea) symbolized a peace offering after legal disputes. It was a main dessert at weddings, spiritual donations, and special ceremonies. Before invitation cards, serving pickled tea packs served as an invitation to ceremonies and weddings.

Among green tea leave products, pickled tea is unique to Myanmar and vital for traditional ceremonies. It plays a significant role in Myanmar society and tea culture has become widespread. Today, pickled tea is as popular a dessert as Mohinga. Many street stalls sell pickled tea salad with assorted fried beans, served with rice.

Tea and pickled tea are commonly served as snacks during social gatherings, highlighting their significance in Myanmar culture. Given this, it is clear that tea plays

an important role in Myanmar society. Therefore, the tea sector must prioritize meeting domestic market needs.

There are three main groups of tea, which are grown commercially. They consist of China type (Camellia sinensis), Assam type (Camellia assamica) and Indo-China type. Two varieties of tea, Assam type and China type are grown in Myanmar with the Assam type occupying 95% of the share. It was found that three main types of tea products are produced in Myanmar. They are laphet-so (pickled tea), Laphet-chauk (green tea) and black tea (Acho Chauk). There is only one type of Laphet-so (pickled tea), but the type called Laphet-chack includes many types such as traditional roasted tea, sun dried tea, dried fermented-tea, green tea, old-tree tea, herbal tea, red tea and white tea. It was found that there are two types of black tea, Orthodox black tea and CTC black tea.

As production, Laphet-chauk accounted for 20% of production, black tea (Acho Chauk) 70% and Laphet-so (pickled tea) 10%. Laphet-chauk and Laphet-so (pickled tea) are consumed widely in Myanmar and black tea (Acho Chauk) is mostly consumed in teashops.

3.3 Tea Cultivation and Production in Myanmar

The US, UK, China, Vietnam, Saudi Arabia, Iran, Morocco, Germany, and the United States are the nations that import the most tea globally. The top exporting nations of tea worldwide are China, India, Sri Lanka, Kenya, Poland, and Germany. UAE, UK, China (Taipei), and Japan. The top producing nations for tea include China, India, Japan, Kenya, Turkey, Myanmar, Indonesia, Vietnam, Sri Lanka and Iran.

Myanmar is one of the nations with the highest tea production worldwide. Except from Bago, Ayeyarwaddy, Yangon regions, and Ra Khine state, all regions and states in Myanmar cultivate tea, especially in the hilly regions. According to CSO Data, Myanmar's tea cultivation area in the 2022-2023 fiscal year is 242,121 acres, with a production of 108,477 tons. Shan state, which cultivates tea on the largest acreage and makes up 85% of Myanmar's total tea-cultivating area, produces the highest-quality tea.

Table (3.1) Sown Acreage of Tea by State and Region (2013 to 2023)

No.	State and Region	Sown Acrage (2013 to 2023)											Percent (%) 2023
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
1	Kachin	3,706	3,772	3,501	3,525	3,525	3,526	3,316	3,322	3,355	3,357	3,361	1.39
2	Kayah	21	26	47	52	52	53	53	53	53	57	52	0.02
3	Kayin	1,134	1,138	1,138	1,138	1,138	1,138	1,195	1,195	1,195	1,195	1,203	0.50
4	Chin	1,955	1,955	1,957	1,957	1,439	1,442	1,452	1,452	1,424	757	652	0.27
5	Sagaing	9,163	9,189	9,230	9,216	11,191	11,192	11,333	11,427	11,427	11,946	11,994	4.95
6	Taninthayi	1	1	1	-	-	-	-	-	-	17	30	0.01
7	Magway	1,187	1,187	1,187	1,187	1,187	1,187	318	320	320	320	320	0.13
8	Mandalay	9,200	13,514	18,513	17,126	17,426	17,426	17,519	17,519	17,519	17,520	17,520	7.24
9	Mon	340	340	349	333	333	333	333	333	333	333	333	0.14
10	Nay Pyi Taw	-	-	-	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537	0.63
11	Shan	197,351	199,919	200,419	200,505	200,540	200,684	200,940	201,599	202,378	203,536	205,119	84.73
Total		**224,058**	**231,041**	**236,342**	**236,576**	**238,368**	**238,518**	**237,996**	**238,757**	**239,541**	**240,575**	**242,121**	**100**

Source: Central Statistical Organization, 2023

Table (3.1) illustrates tea sown acreage in Myanmar from 2012-2013 to 2022-2023 fiscal years. In 2012-2013, Myanmar had 224,058 acres of tea across 10 states and regions. By 2022-2023, tea cultivation had expanded to 11 states and regions, including Nay Pyi Taw, totaling 242,121 acres, an increase of over 18,000 acres in 10 years. Shan State has the largest tea cultivation area, making up more than 80% of the country's total. Mandalay Region has the second largest area, followed by Sagaing Region. Other states and regions each have less than 4,000 acres.

The following Table (3.2) illustrates the sown acreage, harvested acreage and production of tea in Myanmar from 2012-2013 to 2022-2023 fiscal year.

Table (3.2) Sown Acreage, Harvested Acreage, and Production of Tea in Myanmar

Year	Sown Acreage	Harvested Acreage	Production (Ton)	*Change (%)*[2] (Production)
2012-2013	224,058	197,845	94,595	2.2
2013-2014	231,041	202,151	96,347	1.85
2014-2015	236,341	206,954	98,571	2.3
2015-2016	236,576	208,930	99,672	1.12
2016-2017	238,368	213,051	102,407	2.74
2017-2018	238,518	219,448	104,746	2.28
2018-2019	237,996	220,723	143,571	37.1
2019-2020	238,757	222,083	132,494	-7.71
2020-2021	239,541	223,621	112,404	-15.16
2021-2022	240,575	225,174	99,199	-11.74
2022-2023	242,121	227,995	108,477	9.35

Source: Central Statistical Organization, 2023

The number of tea plantations in Myanmar has also expanded due to the growing market demand since 2007. In 2022-2023 fiscal year, total sown area of tea

[2] Change (%) = ((Current year – Previous year) ÷ Previous year) × 100

was 242,121 acres and 108,477 tons of tea was produced. Usually, the tea picking period is from mid-March to the end of November.

According to Table (3.2), it can be seen that tea-cultivating acreage in Myanmar is increasing year after year. The land used for tea farming grew from 224,058 acres in 2012–2013 to 242,091 acres in 2022–2023. Over ten years, more than 18,000 acres were added. Tea production also increased from 94,595 tones to 108,477 tones during the same period, a rise of over 13,000 tones. Tea production has gradually increased since 2015-2016. The opening of green tea factories in 2018-2019 boosted production further. It has been found that production capacity has improved further in the fiscal year 2018-2019. One of the reasons for the increase in production that year was the formation of tea clusters such as the Tea Cycle Development Group to improve tea production. As a result, small family-owned green tea factories have emerged and produced more than before. However, it was found that tea production was affected by the Covid-19 pandemic that started at the end of 2019 and the political instability that occurred in 2021.

Like marine goods and other commodities, tea products also earn foreign revenue annually through exports. According to the statement from the Ministry of Information, in 2020–2021 fiscal year, it is estimated that 4,900 tones of tea were exported. Over 4,000 tones of tea were exported from land border gates, and over 200 tones were shipped via waterways. Green tea from Shan State is exported to China, the EU, and certain ASEAN nations, while Myanmar pickled tea is being tested on the markets in Korea and Germany. About 2.5 million US dollars were earned from the export of tea from Myanmar, in 2021 (Su, 2023).

3.4 Policy Guidelines and Strategic Actions of Department of Agriculture

Myanmar's agricultural sector comprises the agriculture, livestock, and forestry sectors, and the agriculture sector contributes 22.3% of the gross domestic product (GDP) value in 2023. Therefore, the agricultural sector is crucial in Myanmar. Ministry of Agriculture, Livestock, and Irrigation is establishing policies and procedures in order to identify good opportunities in the agricultural sector. Consequently, good quality agricultural and fish products could be exported not only to domestic market but also to foreign markets, and the country's income could be improved.

The Department of Agriculture has established its vision, mission, objectives, policies, activities, and procedures with the aim of fulfilling the vision and policies of the Ministry of Agriculture, Livestock, and Irrigation. This is being carried out by fifteen DoA divisions, the Union Territory (Nay Pyi Taw), and Regions/States.

The vision of the Department of Agriculture is to achieve food self-sufficiency, increase farmers' incomes, and reduce poverty by enhancing the cultivation and production of crops that are safe, full of nutrients, and of good quality, which will be competitive in the domestic/foreign market.

Although there is no separate division for the tea sector, tea is a perennial crop, so it is included in the perennial crop division. The Perennial Crops Division is a department under the Department of Agriculture that conducts perennial plant research and technology development.

The objectives of the Perennial Crops Division based on the expectations of the Department of Agriculture are as follows.

(1) In order to increase the income of farmers and reduce poverty, to expand the cultivation of marketable perennial crops. To produce and distribute pure seeds of good quality and yield that are suitable for our water and soil climate.
(2) To continuously carry out human resource development and research activities in order to increase the production of perennial crops and improve the production of high-quality value-added products that can compete in the market.
(3) To effectively carry out agricultural education activities in order to follow good practices in sustainable perennial crop production.
(4) To support the private entrepreneurs who grow oil palm in order to be able to produce palm oil of good quality that is compatible with health and good yield in order to be self-sufficient in domestic consumption oil.
(5) To provide technical supervision for the success of research activities

The Department of Agriculture is working to issue the Myanmar Good Agricultural Practices (GAP) certification in order to produce safe and high-quality agricultural products from Myanmar and export them to the market. In doing so, the

relevant GAP Inspector Teams from division, district, township have been formed and are conducting field inspections.

As per the Ministry of Planning and Finance, during the present timeframe, the government has initiated financial assistance by establishing the National Economic Development Fund in the fiscal year 2022-2023. It is intended to provide financial support for the production of agricultural and livestock-based products with modern methods for the development of the national economy. The national economic development funds are used mainly for the development of agriculture and livestock sector and regional economic development. First, the Ministry of Agriculture, Livestock, and Irrigation received 230 billion kyat from the 400-billion-kyats fund. Moreover, Kachin State, Karen State, Tanintharyi Region, Mon State, Shan State, and Kayah State, each received 10 billion kyats, and Kayah State, Chin State, and Rakhine State received 8 billion kyats. Each of the six self-administered divisions and zones received five billion kyats.

As a non-governmental organization, Myanmar Tea Producers and Exporters' Association (MTA) has been established since 2013 as a group of Myanmar Tea Associations. In 2018, it became an official organization representing the Myanmar tea industry. MTA is organized with 20,000 members consisting of tea growers, producers, traders and exporters. The association's mission is to cooperate with tea growers and producers to increase the production of high-quality Myanmar tea. In order to determine the various qualities of Myanmar tea, research on the tea has been conducted. In addition, there are also regional tea clusters in the tea growing regions of Myanmar. MTA stands as the mother association of all Myanmar Tea Associations. It also serves as a place for tea traders to expand domestic and overseas markets.

3.5 Tea Cultivation and Production in Shan State

In Myanmar, Shan State is the primary tea-growing region. Traditional farming techniques, including terraced planting, are used to grow tea trees in Shan State's hilly regions. Major tea producing regions are Namhsan, Manton, and Kyaukme in Northern Shan State, and Pinlaung, Pindaya, and Yatsauk in Southern Shan State. It can plant tea from seeds or seedlings, and the best time to plant is in May or June.

Tea leaves can be harvested several times a year, depending on the climate, type of weather, and location where tea trees are grown. Depending upon the plucking times, there are different qualities on production of tea. The tea picked in March and May, is called 'Shwe Phi Oo' and, if picked in June and July, it is called 'Khar Kant'. The tea picked in September and October is called 'Moe Nyunt' and, if it is picked in November and December, it is also called 'Nin Teck'.

The following table illustrates the sown acreage, harvested acreage and production of tea in Shan State from 2012-2013 to 2022-2023 fiscal year.

Table (3.3) Sown Acreage, Harvested Acreage, and Production of Tea in Shan State (2012-2013 to 2022-2023)

Year	Sown Acreage	Harvested Acreage	Production (Ton)	*Change (%)*[3] (Production)
2012-2013	197,351	178,603	83,883	
2013-2014	199,919	180,904	84,635	0.9
2014-2015	200,419	181,268	84,863	0.3
2015-2016	200,505	183,081	85,817	1.1
2016-2017	200,540	185,048	86,732	1.1
2017-2018	200,684	185,858	85,665	-1.2
2018-2019	200,940	186,944	124,325	45.1
2019-2020	201,599	187,935	113,114	-9.0
2020-2021	202,378	188,727	92,664	-18.1
2021-2022	203,536	190,696	79,613	-14.1
2022-2023	205,119	192,870	88,595	11.3

Source: Central Statistical Organization, 2023

Shan State's tea production essentially represents Myanmar's tea production, accounting for 85% of the nation's total. According to Table (3.3), the land used for tea farming in Shan State increased from 197,351 acres in 2012-2013 to 205,119 acres in

[3] Change (%) = ((Current year – Previous year) ÷ Previous year) × 100

2022-2023, adding over 7,700 acres in ten years. Tea production has been on the rise since 2015-2016, with a significant boost in 2018-2019 due to the opening of green tea factories. The establishment of tea clusters like the Tea Cycle Development Group further enhanced production capacity. Consequently, small family-owned green tea factories emerged, increasing output. However, tea production faced challenges from the Covid-19 epidemic starting in late 2019 and political instability in 2021.

The table mentioned below shows the current status of tea cultivation and production by district and autonomous region in Shan State.

Table (3.4) Current Status of Sown Acreage, Harvested Acreage, and Production of Tea in Shan State

No.	District/Township	Sown Acreage	Harvested Acreage	Raw Tea Leaf Production (Viss)
1	Taunggyi District	2,088	2,088	609,957
2	Kalaw District	1,819	1,819	438,067
3	Pa-Oh SAZ	17,458	17,458	5,727,495
4	Danu SAZ	12,696	9,367	3,086,643
5	Loilem District	11,288	8,905	2,991,049
6	Namsang District	1,498	1,493	443,228
7	Mong Hsu District	11,968	11,968	3,548,280
8	Langkho District	47	47	8,610
Southern Shan State		**58,862**	**53,145**	**16,853,329**
9	Lashoe District	1,278	1,008	289,399
10	Tangyan District	4,909	4,176	1,484,259
11	Mu Se District	17,284	16,533	4,726,701
12	Kutkai District	4,401	3,498	947,411
13	Kyaukme District	42,534	41,874	10,540,898
14	Palaung SAZ	61,176	59,976	12,930,709

15	Moe Mate District	2,190	1,920	509,368
16	Koekhant SAZ	6,983	6,983	2,913,775
17	Wa SAZ	737	652	189,173
Northern Shan State		**141,492**	**136,620**	**34,531,693**
18	Keng Tung District	2,670	1,057	304,595
19	Mongla District	203	126	28,991
20	Mongyang District	1,974	936	276,120
21	Mong Hsat District	550	400	92,249
22	Mongton District	45	45	11,790
23	Tachileik District	689	664	201,802
24	Mongyawng District	103	103	40,578
Eastern Shan State		**6,234**	**3,331**	**956,125**
Shan State		**206,588**	**193,096**	**52,341,147**

Source: Department of Agriculture in Shan State, 2024

The study of tea cultivation and production in Shan State is divided into three parts: Southern, Northern, and Eastern. Southern Shan State includes six districts and two autonomous regions, with a total of 58,862 acres of tea cultivation. It produces over 16 million viss of raw tea leaves, accounting for 32% of Shan State's total production. Northern Shan State includes six districts and three autonomous regions, with a total of 141,492 acres of tea cultivation. It produces over 34 million viss of raw tea leaves, accounting for 66% of Shan State's total production. Eastern Shan State has seven districts, with a total tea cultivation area of only 6,234 acres. It produces 0.9 million viss of raw tea leaves, which is just 2% of Shan State's total production.

This paper focuses on tea cultivation in southern Shan State because there is little research on this area, the region is stable and peaceful, and its natural forests and wetlands offer good conditions for tea cultivation. Pindaya Township in the Danu Autonomous Region (Danu Self-Administered Zone) within Southern Shan State was selected for study due to its significant historical presence, particularly in the tea industry. The region's tranquil environment and promising potential for the tea industry were key factors in its selection for this study.

3.6 Tea Cultivation and Production in Danu Self-Administered Zone

The Danu Self-Administered Zone is located in Southern Shan State bordering with Mandalay Region. It consists of Pindaya and Ywangan townships with a population of 175,968. The Danu ethnic group has a degree of autonomy in their self-administered zone, as they can elect their own representatives and carry out public affairs. The area of Danu Self-Administered Zone is 1280.85 square miles and 3880 feets above sea level. It has a moderate climate with a maximum temperature at 32° C and a minimum temperature at 4° C. The zone is characterized by mountainous forests and valleys.

Over 75% of the population in the Danu Self-Administered Zone relies on agriculture for their livelihoods. They grow subsistence crops as well as cash crops for sale such as tea, orange, avocado, ginger and vegetables. Tea industry is one of major industry in this region. It has around 13,000 acreage of tea plantations across 44 tea-growing village tracts. The altitude of these plantations reaches around 5,000 feets above sea level. The following table (3.5) illustrates tea cultivation and production in this region during 2012-2013 to 2022-2023 fiscal year.

Table (3.5) Sown Acreage, Harvested Acreage, and Production of Tea in Danu Self-Administered Zone (2012-2013 to 2022-2023)

Year	Sown Acreage	Harvested Acreage	Raw Tea Leaf Production (Viss)	*Change (%)*[4] (Production)
2012-2013	12,549	8,861	2,864,200	
2013-2014	12,598	8,969	2,896,100	1.1
2014-2015	12,696	9,159	2,921,000	0.9
2015-2016	12,696	9,155	2,922,541	0.1
2016-2017	12,696	9,163	2,884,773	-1.3
2017-2018	12,696	9,163	2,882,391	-0.1
2018-2019	12,696	9,160	2,896,176	0.5
2019-2020	12,696	9,036	2,997,108	3.5

[4] Change (%) = ((Current year – Previous year) ÷ Previous year) × 100

2020-2021	12,696	8,854	2,941,288	-1.9
2021-2022	12,696	9,263	3,061,167	4.1
2022-2023	12,696	9,295	3,063,093	0.1

Source: Department of Agriculture (Danu SAZ), 2024

The Danu Self-Administered Zone is the second largest tea-producing area in southern Shan State, contributing about 22% of the total production in this region. The tea from this region is naturally grown, chemical-free, and well-regarded in the market. According to Table (3.7), tea cultivation in the Danu SAZ increased from 12,549 acres in 2012-2013 to 12,696 acres in 2022-2023, adding only 147 acres over ten years. Since 2014-2015, there has been no further expansion in tea plantations due to the scarcity of vacant land. After 2016, government encouragement and NGO support helped local tea clusters provide training and necessary assistance to farmers, leading to better yields and increased production of raw tea leaves since 2018. However, the Covid-19 pandemic that began in late 2019 has slightly impacted the tea industry in the Danu region.

The table below presents the current status of tea cultivation and production in two townships within the Danu Self-Administered Zone.

Table (3.6) Current Status of Sown Acreage, Harvested Acreage, and Production of Tea in Danu Self-Administered Zone

Part of Danu SAZ	Sown Acreage	Harvested Acreage	Raw Tea Leaf Production (Viss)	% of Raw Tea Leaf
Pindaya Township	8,325	6,087	2,164,963	70
Ywarngan Township	4,371	3,280	921,680	30
Total	**12,696**	**9,367**	**3,086,643**	**100**

Source: Department of Agriculture (Danu SAZ), 2024

In 2023-2024, Pindaya Township in Danu SAZ had 8,325 acres of tea cultivation, producing 2,164,963 viss of raw tea leaves. Ywarngan Township had 4,371 acres of tea cultivation, producing 921,680 viss of raw tea leaves. Therefore, Pindaya

Township produces 70% of Danu SAZ's total raw tea leaf production, while Ywarngan Township contributes only 30%. Those raw tea leaves are mostly produced as green tea, sun-dried tea and pickled tea respectively. The tea products produced in Pindaya Township are sold to brokers as well as sold in the township market. Mostly, the products are delivered to and sold by major merchants in large cities such as Yangon, Bago, Mandalay, and Monywa. Most of the products are primarily targeted at the domestic market.

3.6.1 Tea Cultivation and Production in Pindaya Township

Pindaya township is the most well-known tea-growing region in Southern Shan Stat and has a long history of producing tea. It has around 8,400 acres of tea plantations across 18 tea-growing village tracts. These plantations are situated at an elevation of approximately 4,000 feets above sea level. Because tea plants in Pindaya Township are naturally cultivated, the resulting tea products are well-known in the local market for being chemical-free and consistently high in quality and reliability.

In Pindaya Township, Maw Shan, Taung Tan Ni, and See Kya Inn Kyal Zin are the three main tea producers. The biggest company is Maw Shan, its factory processed more than about 1,400 viss of raw tea leaves per day in peak season. It is known that the tea products produced by the Maw Shan factory are exported to the UK and Germany as well as the domestic market. In 2022-2023 fiscal year, the tea production of Pindaya region is more than 530,000 viss, which is about 13% of the tea production in Southern Shan State. The following table (3.7) illustrates tea cultivation and production in Pindaya Township during 2012-2013 to 2022-2023 fiscal year.

Table (3.7) Sown Acreage, Harvested Acreage and Raw Tea Leaf Production in Pindaya Township (2012-2013 to 2022-2023)

Year	Sown Acreage	Harvested Acreage	Yield per Acre	Raw Tea Leaf Production (Viss)	*Change (%)*[5] (Production)
2012-2013	8,184	5,891	337.00	1,984,900	
2013-2014	8,227	5,975	337.00	2,013,600	1.4
2014-2015	8,325	5,991	336.48	2,015,852	0.1
2015-2016	8,325	5,995	336.50	2,017,317	0.1
2016-2017	8,325	5,996	330.14	1,979,549	-1.9
2017-2018	8,325	5,996	330.16	1,979,669	0.01
2018-2019	8,325	5,995	355.61	2,131,895	7.7
2019-2020	8,325	6,012	355.62	2,137,987	0.3
2020-2021	8,325	6,012	355.62	2,132,987	-0.2
2021-2022	8,325	6,023	355.64	2,142,020	0.4
2022-2023	8,325	6,045	355.64	2,149,843	0.4

Source: Department of Agriculture in Pindaya Township, 2023

Table (3.7) shows that tea cultivation in Pindaya Township increased from 8,184 acres in 2012-2013 to 8,325 acres in 2022-2023. Over ten years, only 141 acres were added. Since 2014-2015, there has been no expansion in tea plantations. The scarcity of vacant land is recognized as a major constraint to expanding new tea plantations. It is known that after 2016, with the encouragement and support of the government, NGOs have cooperated with local tea clusters to provide training on how to maintain tea plants and provide necessary assistance to tea farmers. This support has led to better yields per acre and more production raw tea leaves since 2018.

There are 137 villages in Pindaya Township, organized into 27 village tracts. There are 18 village tracts that grow tea out of these 27 village tracts. The following table illustrates the current status of tea cultivation and production by village tracts from Pindaya Township.

[5] Change (%) = ((Current year – Previous year) ÷ Previous year) × 100

Table (3.8) Current Status of Sown Acreage, Harvested Acreage, Yield and Production of Tea by Village Tracts in Pindaya Township

No.	Village Tracts	Sown Acreage	Harvested Acreage	Yield per Acre	Raw Tea Leaf Production (Viss)
1	Mine Li	3	3	341.12	1,023
2	Inn Ngwe	42	42	355.67	14,938
3	Naung Woon	545	390	355.69	138,719
4	Naung Kauk	330	268	355.57	95,293
5	Pann Sit	1,267	897	355.13	318,552
6	Taung Shae	4	4	349.45	1,398
7	Taung Paw Gyi	1,647	995	355.12	353,344
8	Maenel Taung	1,238	917	355.49	325,984
9	Theinn Kone	250	189	355.12	67,118
10	Shwepahtooe	305	235	355.41	83,521
11	Yae Phyu	788	635	355.19	225,546
12	Htwe Ni	804	708	358.11	253,541
13	Kyauk Su	111	78	354.78	27,673
14	Htwe Thoon	12	12	354.42	4,145
15	Thayetkone	75	75	354.12	26,559
16	Myo Ma	115	102	355.14	36,224
17	Kookaw	785	533	356.41	189,967
18	Pway Hla	4	4	354.41	1,418
Total		**8,325**	**6,087**	**355.67**	**2,164,963**

Source: Department of Agriculture in Pindaya Township, 2024

According to Table (3.8), among the 18 village tracts that cultivate tea in Pindaya Township, 3 village tracts cultivate more than 1000 acres. It was found that 4 village tracts have between 500 and 1000 acres, and the remaining village tracts have less than 500 acres.

3.6.2 Tea Cultivation and Production in Ywarngan Township

Ywarngan township, part of the Danu Self-Administered Zone, is well-known in Myanmar for its coffee cultivation. Despite this, it also has around 4,000 acres of tea plantations spread across 64 villages. Situated at altitudes of up to 4,800 feet, farmers often grow tea alongside coffee and avocado. Due to financial constraints, farmers typically avoid chemical fertilizers and pesticides, making the region suitable for organic tea and coffee production. Ywarngan's proximity to Mandalay, a major tea trading center, is advantageous for trade.

Table (3.9) Sown Acreage, Harvested Acreage, and Yield of Tea in Ywarngan Township (2012-2013 to 2022-2023)

Year	Sown Acreage	Harvested Acreage	Yield per Acre	Raw Tea Leaf Production (Viss)	*Change* (%)[6] (Production)
2012-2013	4,365	2,970	296	879,300	
2013-2014	4,371	2,994	295	882,500	0.4
2014-2015	4,371	3,168	286	905,148	2.6
2015-2016	4,371	3,160	286	905,224	0.01
2016-2017	4,371	3,167	286	905,224	0.01
2017-2018	4,371	3,167	285	902,722	-0.3
2018-2019	4,371	3,165	241	764,281	-15.3
2019-2020	4,371	3,024	284	859,121	12.4
2020-2021	4,371	2,842	284	808,301	-5.9
2021-2022	4,371	3,240	284	919,147	13.7
2022-2023	4,371	3,250	281	913,250	-0.6

Source: Department of Agriculture in Ywarngan Township, 2023

According to Table (3.9), Ywarngan Township had 4,365 acres of tea cultivation in 2012-2013, increasing slightly to 4,371 acres in 2022-2023. Over the 10 years, only 6 additional acres were cultivated. Since 2013-2014, there has been no

[6] Change (%) = ((Current year – Previous year) ÷ Previous year) × 100

expansion in tea plantations. Raw tea leaf production has been unstable over this period, with total production remaining below 0.9 million viss. It is well known that this region is concentrating more on the coffee industry than on tea.

There are 125 villages in Ywarngan Township, organized into 28 village tracts. There are 26 village tracts that grow tea out of these 28 village tracts. The following mentioned table (3.10) illustrates the current status of tea cultivation and production by village tracts from Ywarngan Township.

Table (3.10) Current Status of Sown Acreage, Harvested Acreage, Yield and Production of Tea by Village Tracts in Ywarngan Township

No.	Village Tracts	Sown Acreage	Harvested Acreage	Yield per Acre	Raw Tea Leaf Production (Viss)
1	Du Tal Yae	222	124	280.50	34,782
2	Kyauk Pa Za	175	118	281.66	33,236
3	Kyauk Ku Pyin	182	130	281.92	36,650
4	Nwar Ban Gyi	36	21	279.05	5,860
5	Kyauk Myaung	202	129	279.20	36,016
6	Thein Kone	650	550	284.54	156,497
7	Linn Way	254	153	278.50	42,611
8	Tapin Pyaw	136	85	279.20	23,732
9	Kyauk Nage	224	150	282.97	42,446
10	Saetan	1	1	278.00	278
11	Ywar Ma	2	2	279.00	558
12	Myoe Kone	1	1	278.00	278
13	Inn Kone Ngarsu	10	10	279.10	2,791
14	Lae Kyine	42	37	280.95	10,395
15	Kyauk Ponn	145	120	280.96	33,715
16	Shart Kyaun	32	20	278.20	5,564
17	Nyaung Eine	45	38	279.97	10,639

18	Kyaung Taw	376	280	280.10	78,428
19	Myaing	349	275	281.80	77,495
20	Shin Kaung	223	171	280.00	47,880
21	Alaechaung	337	285	281.34	80,181
22	Myinn Kya Toe	102	85	279.18	23,730
23	Pyar Gyi Kone	85	62	278.98	17,297
24	Ya Gyi	265	220	278.77	61,330
25	Myinn Twine	245	195	278.30	54,269
26	Nan Khone	30	18	278.94	5,021
Total		**4,371**	**3,280**	**281.00**	**921,680**

Source: Department of Agriculture in Ywarngan Township, 2024

Above table shows that 26 village tracts in Ywarngan Township produce tea. However, the cultivated area is smaller than in Pindaya Township. This region is known to focus more on coffee than tea. Only 4,371 acres are used for tea, producing about 900,000 viss. Most village tracts have less than 400 acres for tea, with only one having more than 600 acres. There are only a few tea plantations spread across nine village tracts.

The Danu Self-Administered Zone includes Pindaya and Ywarngan Townships, where tea is cultivated at altitudes exceeding 4,000 feets. Local tea from this region is renowned for its high quality in the local market. This area plays a significant role in tea production, accounting for about 22% of the total output in Southern Shan State. Currently, most tea products are sold domestically, but there's a need to explore foreign markets. Analyzing tea cultivation in both townships, Pindaya has more tea acreage than Ywarngan. Since Pindaya Township contributes 70% of the region's tea production, it's logical to focus on studying its tea industry.

CHAPTER IV
SURVEY ANALYSIS

The sustainability of the tea industry in Pindaya Township is a critical issue that effects on the local economy, environment, and socio-cultural fabric. This chapter aims to provide an in-depth analysis of a survey conducted to explore from the different features of this industry. The survey's purpose is to gain a comprehensive understanding of the current practices in tea cultivation and production, assess the socio-economic conditions of tea farmers, identify the environmental challenges associated with tea production, and propose actionable recommendations for improvement.

4.1 Profile of Survey Area

In order to fulfill the objective, the study was conducted in Pindaya Township, the Danu Self-Administered Zone, located in southern Shan State. It has a moderate climate and fertile land, ideal for agriculture. It is situated at an elevation of 3,880 feet and covering 254.89 square miles, bordered by Kalaw Township to the east, Ywarngan Township to the west, and Yatsauk Township to the north. The local population mainly works in agriculture, producing tea, mangoes, oranges, corn, potatoes, sunflower seeds, sesame seeds, cabbage, and cauliflower. These products are typically sent to major regions like Mandalay and Yangon via the Aung Pan warehouse.

The following table presents the detailed demographic information of Pindaya Township.

Table (4.1) Wards, Houses, Households, Village Tracts, Villages and Population

Description	Urban	Rural
No. of House	2,474	17,155
No. of Household	2,594	17,089

No. of Wards	13	-
No. of Village Tracts	-	27
No. of Villages	-	137
Total Population	10,613	76,380

Source: General Administrative Department of Pindaya Township, 2023

According to Table (4.1) Pindaya Township is composed of 13 urban wards and 27 village tracts, which include a total of 137 villages. According to the Pindaya Township General Administrative Department report (2023), the total population of the township is 86,993, with 87.8% residing in rural areas. The population is predominantly Buddhist, with around 99% of the people following this religion.

Pindaya has a long history of tea cultivation, with over 8,300 acres of tea plantations across 18 village tracts. Tea farming in Pindaya has been part of the local culture and economy for many decades. Traditional methods, like terraced planting on hills, have been used for generations. The tea grown in this region is famous for its special taste and high quality, which is due to the favorable climate of the region.

In Pindaya Township, there are 27 village tracts in total, with 18 involved in tea cultivation. However, only a few village tracts have significant tea plantations. The six major tea-producing village tracts selected for this study—Htwe Ni, Taung Paw Gyi, Yae Phyu, Pann Sit, Maenel Taung, and Kookaw—are shown in Table (4.2) below. These tracts were chosen due to their substantial contribution to tea production, accounting for a significant portion of the township's total tea output.

Table (4.2) Current Status of Sown Acreage, Harvested Acreage and Production of Tea by Six Major Tea-Producing Village Tracts in Pindaya Township

No.	Village Tracts	Sown Acreage	Harvested Acreage	Raw Tea Leaf Production (Viss)	Production (%)
1	Htwe Ni	804	708	253,541	12
2	Taung Paw Gyi	1,647	995	353,344	16
3	Yae Phyu	788	635	225,546	10
4	Pann Sit	1,267	897	318,552	15

5	Maenel Taung	1,238	917	325,984	15
6	Kookaw	785	533	189,967	9
Study Area (6 Village tracts)		**6,529**	**4,685**	**1,666,934**	**77**
7	Other (12 village tracts)	1,796	1,402	498,029	23
Total		**8,325**	**6,087**	**2,164,963**	**100**

Source: Department of Agriculture in Pindaya Township, 2024

According to the table above, the tea production in the six village tracts included in the study area amounted to 1,666,934 viss in 2024, whereas the remaining twelve village tracts produced only 498,029 viss. Consequently, the tea production from the six village tracts in the study area represents 77% of the total tea production in Pindaya Township.

Understanding the profile of Pindaya Township, including its geographical, demographic, and historical context, is crucial for interpreting the survey results. It provides a backdrop against which the current practices, socio-economic conditions, and environmental challenges faced by tea farmers can be better understood and addressed.

4.2 Survey Design

The survey data was collected by simple random sampling method with a structure questionnaire for this study. This method was chosen to ensure that every household involved in tea farming in the major tea-growing village tracts of Pindaya Township had an equal chance of being selected. The target population comprised households engaged in tea farming within the six major tea-producing village tracts: Htwe Ni, Taung Paw Gyi, Yae Phyu, Pann Sit, Maenel Taung, and Kookaw. The survey was based on the face-to-face interview with tea farmers/producers in March and April, 2024 for this study.

The survey questionnaire organized into five sections: (a) characteristics of respondents, (b) tea cultivation and production, (c) social status, (d) economic status and (e) environment issue. This questionnaire is used multiple choice and five-point Likert scale. For the interpretation of the five-point Likert scale, the mean values were

interpreted as follows: strongly disagree is the range of 1.00 – 1.80, disagree is the range of 1.81 – 2.60, neutral is the range of 2.61 – 3.40, agree is the range of 3.41 – 4.20, and strongly agree is the range of 4.21 – 5.00 (Pimentel, 2010). These scales made it possible to measure respondents' opinions and views in a more detailed way.

Using the *Raosoft*[7] sample size calculator, 285 households out of 1,100 in the Pindaya Township's major tea-growing village tracts made up the sample size. These village tracts' sample of the study is shown in Table (4.3).

Table (4.3) Sample of the Study

No.	Name of Village Tract	No. of Respondents
1	Htwe Ni	55
2	Taung Paw Gyi	53
3	Yae Phyu	44
4	Pann Sit	46
5	Maenel Taung	42
6	Kookaw	45
Total		**285**

Source: Survey data, 2024

4.3 Survey Result

The survey result is showed on characteristic of respondents, tea cultivation and production, social status, economic status and environment issue.

4.3.1 Characteristics of Respondents

The survey gathered detailed demographic information about the respondents, providing insights into their backgrounds and household facts. This section presents the findings on demographics, educational background, family size, and labor

[7] The sample size, $n=N\ x/((N-1)E2 + x)$, $x=Z(c/100)^2\ r(100-r)$
Where: n is the sample size,
N is the population size (1100 households)
E is the margin of error (0.05 for 5%)
Z(c/100) is the critical value for the confidence level c (0.95 for 95%)
r is the fraction of respondents

involvement. Table 4.4 presents the demographic characteristics of respondents in the study area, including age, gender, educational qualifications, number of family members, number of graduates in the family, and number of family members working in the tea industry.

Table (4.4) Characteristics of Respondents

Description	No. of Respondents	Percentage (%)
Age group (Years)		
21 to 30	31	10.9
31 to 40	58	20.4
41 to 50	88	30.9
51 to 60	73	25.5
Above 60	35	12.3
Total	**285**	**100**
Gender		
Male	217	76.1
Female	68	23.9
Total	**285**	**100**
Educational Qualification		
Primary School	66	23.2
Middle School	104	36.5
High School	73	25.6
Graduate	32	11.2
Other	10	3.5
Total	**285**	**100**
Family Size		
2 to 4	134	47.0
5 to 7	138	48.4
8 to 10	11	3.9
Above 10	2	0.7
Total	**285**	**100**

No. of graduates in family		
None	182	63.9
1	70	24.6
2	19	6.7
3	12	4.2
4	2	0.7
Total	**285**	**100**
No. of family workers in tea industry		
1	20	7.0
2	130	45.6
3	65	22.8
4	46	16.1
5	16	5.6
6	4	1.4
8	4	1.4
Total	**285**	**100**
Monthly Income for Family Expenses		
Not Enough	140	49.1
Enough	144	50.5
Excess	1	0.4
Total	**285**	**100**

Source: Survey data, 2024

The above table (4.4) displays the demographic profile of the respondents. Most of the respondents are aged between 41 to 50 years (30.9%), followed by those aged between 51 to 60 years (25.5%). The gender distribution is predominantly male (76.1%), with females comprising 23.9% of the respondents.

The educational qualifications of the respondents reveal that a significant proportion have only completed middle school (36.5%). High school graduates account for 25.6%, while primary school education is 23.2% of respondents. A small percentage (11.2%) have obtained higher education, and 3.5% fall into other categories.

Family size among the respondents varies, with most households comprising 5 to 7 members (48.4%). Families with 2 to 4 members account for 47%, while larger families (8 to 10 members) represent 3.9%, and only a few households (0.7%) have more than 10 members.

The involvement of family members in tea industry is crucial for understanding labor dynamics. Most families (45.6%) have two members working in the tea industry. This is followed by families with three members (22.8%), and those with four members (16.1%). A smaller percentage have one, five, six, or eight family members involved in tea farming. Family members are the labor assets in the family that can support farming and other income-generating activities. Therefore, most of the respondents answered that their monthly income has enough for the family expenses.

In summary, the survey reveals that most tea farmers in Pindaya Township are middle-aged males with a moderate level of education. Most households have between 5 to 7 members, with significant involvement of family members in tea industry. These characteristics provide a foundational understanding of the respondents, which is essential for interpreting the subsequent survey results on tea cultivation practices, socio-economic conditions, and environmental issues.

4.3.2 Tea Cultivation and Production

The table mentioned below provide detailed information about tea plantations and production. The topics related to tea cultivation include plantation ownership, plant age, cultivation methods, maintenance conditions, the expansion of new plantations, the use of fertilizers and pesticides for yield improvement, GAP certification status and labor conditions in tea plucking. Regarding tea production, the tables also address the types of tea products and the energy usage involved in production.

Table (4.5) Ownership of Tea Plantations and Respondent's Cultivation Activities

Description	No. of Respondents	Percentage (%)
Ownership of tea plantations		
Under 5 acres	210	73.7
Between 5 and 10 acres	66	23.2
Between 10 and 15 acres	8	2.8
Between 15 and 20 acres	1	0.4
Between 20 and 50 acres	-	-
Over 50 acres	-	-
Total	**285**	**100**
Age of plants		
Under 5 years	2	0.7
Between 5 and 30 years	104	36.5
Over 30 years	179	62.8
Total	**285**	**100**
Cultivation methods		
Traditional way	274	96.1
Modern way (with Contour line)	11	3.9
Total	**285**	**100**
Tea plant maintenance/soil preparation activities		
Done every year	252	88.4
Not done every year	33	11.6
Total	**285**	**100**
Expansion of new plantations		
Not expanded	260	91.2
Expanded	25	8.8
Total	**285**	**100**

Fertilizer use status		
No use	168	58.9
Use (Natural fertilizer)	117	41.1
Total	**285**	**100**
Pesticide use status		
No use	285	100
Use	-	-
Total	**285**	**100**
GAP certificate		
No	281	98.6
Have	4	1.4
Total	**285**	**100**

Source: Survey data, 2024

According to Table (4.5), the survey results reveal various aspects of tea cultivation practices among the respondents. The majority (73.7%) own less than 5 acres of tea plantations, while only 2.8% own between 10 and 15 acres, and 23.2% own between 5 and 10 acres. This is showed that the majority of tea farmers are small-scale farmers which owned less than 5 acres. The majority of the plants on their plantations are older than 30 years. A tea plant's most productive life spans are 5 to 30 years. After age 30, tea productivity starts to decrease. The current tea plantations are plantations cultivated according to traditional agricultural methods that have been cultivated for generations. There are only about 2000 tea plants per acre.

Maintenance activities are performed annually by 88.4% of respondents, while expansion of new plantations is minimal, with 91.2% not expanding. The scarcity of vacant land is recognized as a major constraint to expanding new tea plantations. Natural fertilizers are used by 41.1% of respondents, and none reported using chemical pesticides. It is also recognized that chemical fertilizers can enhance tea yield, but their purchase can be expensive. As a result, natural fertilizers, which are affordable and readily accessible, are preferred. Only 1.4% have GAP certification. The primary limitations in obtaining the GAP certificate include a lack of awareness regarding the

working methods and the perceived unattractiveness in terms of pricing, even if the certificate is acquired.

Table (4.6) Labor Force Usage in Tea Plucking

Description	No. of Respondents	Percentage (%)
Only Family Members	161	56.5
Hire Workers	124	43.5
Total	**285**	**100**

Source: Survey data, 2024

Regarding the labor force involvement in tea plucking, majority (56.5%) rely solely on family members for tea plucking, while 43.5% hire external workers. Family members serve as the labor force within the family, providing support for farming activities. The detail is shown in above Table (4.6).

The following Table (4.7) provides insights into the types of tea products produced and the energy sources used in production. In tea production, some households produce only a single type of product from the raw tea leaves they obtain, while others produce multiple types of tea products. The main products are green tea, sun-dried tea, and pickled tea, with these being the most commonly produced. The production of all types of tea products is primarily carried out by traditional small and medium enterprises, producing less than 30 viss.

Table (4.7) Status of Tea Production and Energy Usage

Description	No. of Respondents	Percentage (%)
Tea Products		
Pickled tea	138	48.4
Sun-dried tea	160	56.1
Green tea	168	58.8
Black tea (Acho Chauk)	6	2.1
Tea Oil	19	6.7

Usage of Energy in Tea Production		
Electricity	86	30.2
Fire-wood	282	98.9
Gas	5	1.8
Fuel Pellet	-	-
Coal	-	-

Source: Survey data, 2024

According to Table (4.7), most respondents processed the raw tea leaves they received into the following products: green tea (58.8%), sun-dried tea (56.1%), and pickled tea (48.4%). However, the type of product produced varies depending on market demand and the season[8]. The primary energy source for tea production is firewood, used by 98.9% of respondents. Tea production relies entirely on firewood for energy due to several factors: insufficient electricity, the lack of alternative energy options, and the easy availability and low cost of firewood.

Table (4.8) Earning from Tea Industry

Description	No. of Respondents	Percentage (%)
Decreased than previous year	32	11.2
No change	154	54.0
Increased than previous year	99	34.7
Total	**285**	**100**

Source: Survey data, 2024

Regarding the earning from the tea industry, the above table (4.8) shows that 34.7% of respondents reported an increase in earnings compared to previous years, while 54% saw no change and 11.2% experienced a decrease. The inability to expand new plantations and enhance the yield of existing ones is among the various factors contributing to the challenge of improving the income of the tea industry. Furthermore, the earning from the tea industry has not improved because it has been unable to penetrate the premium market due to traditional production methods.

[8] During the rainy season, only a small amount of sun-dried tea is produced, and more green tea and pickled tea are produced.

4.3.3 Social Status

The initial step in analyzing the sustainability of tea industry in the Pindaya township was measuring social indicators. The following criteria to guide for inquiries regarding social issues: family income and social status conditions; health and safety; gender discrimination and issues; community impacts and cultural practices. The data present in table (4.9) represents the respondents' social aspect information.

Table (4.9) Social Status

Description		Mean	S.D
Family's Social Status			
1	The income generated from the tea business adequately covers the family's needs for food, clothing, and housing.	2.95	0.51
2	Due to the earning from the tea industry, the standard of living has improved significantly.	3.18	0.42
Overall Mean Score		**3.06**	**0.46**
Health and Safety			
1	It have understand that the knowledge of health and safety related to tea production.	3.65	0.75
2	As our product is a food item, it is crucial to ensure clean production.	4.51	0.64
3	The use of wood fire as the primary energy source in tea production could potentially pose health risks.	3.15	0.72
Overall Mean Score		**3.77**	**0.70**
Discrimination and Gender Issues			
1	In tea production, both female and male workers enjoy equal employment opportunities, including rights such as access to training and fair wages.	3.96	0.71
Overall Mean Score		**3.96**	**0.71**

Community Impact			
1	Tea plantation and production can contribute to the social life of the local community.	4.09	0.62
2	Youth in the region show keen interest in tea cultivation and production.	3.11	0.54
3	Improper disposal of waste from pickled tea production results in unpleasant odors in the environment and could potentially pose health risks.	3.49	0.56
Overall Mean Score		**3.56**	**0.57**
Cultural Practices			
1	It is our desire to preserve the extensive history of the tea industry to ensure its sustainability.	4.11	0.87
Overall Mean Score		**4.11**	**0.87**

Source: Survey data, 2024

Table (4.9) illustrates the respondents' perceptions regarding their family's social status. Regarding the respondents' views on family's social status, the mean value of 2.95 indicates that respondents are neutral regarding whether the income earned from the tea business is adequate for their family's food, clothing, and living expenses. The mean value of 3.18, which also indicates neutrality, suggests that the respondents do not perceive a significant improvement in their standard of living due to earning from the tea industry. This suggests that while the tea industry supports a basic level of sustenance, it does not notably improve the living standards of most families. This is a critical finding, as it implies that the current income from tea farming is barely sufficient to meet essential needs, highlighting a potential area for economic intervention.

Regarding the respondents' views on health and safety related to tea production, the mean value of 3.65 shows agreement that respondents have knowledge of health and safety related to tea production. This awareness is crucial as it indicates that farmers understand the importance of maintaining safe practices to ensure the quality of their products and the health of workers. The high mean value of 4.51 indicates strong agreement that tea products are crucial to ensure clean production because they are food

products. This finding underscores the respondents' commitment to maintaining high hygiene standards in tea production, which is essential for consumer safety and market competitiveness. On the other hand, the mean value of 3.15 suggests neutrality regarding the health hazards of using firewood as an energy source. This neutrality may reflect a lack of awareness about the potential long-term health risks associated with firewood smoke or an acceptance of firewood due to its accessibility and cost-effectiveness.

Regarding the respondents' views on gender issues in tea production, the mean value of 3.96 indicates agreement that female workers have the same employment opportunities as male workers, including access to training and fair wages. Given the labor-intensive nature of tea farming, where women play a vital role, this positive opinion reflects a generally equitable work environment in the tea business.

Regarding the respondents' views on the impact of tea production on the community, the mean value of 4.09 shows agreement that tea production contributes positively to the social life of the local community. This positive impact includes economic contributions through job creation and income generation, as well as social benefits such as community cohesion and cultural preservation. The mean value of 3.11 indicates that young people are moderately interested in tea cultivation and production. This moderate interest could be due to various factors, such as the perceived profitability of the industry, availability of alternative employment opportunities, or migration trends. The mean value of 3.49 reflects agreement that the improper disposal of waste from pickled tea production causes environmental issues, including bad odors and potential health risks. This finding highlights the need for improved waste management practices in the tea industry. Implementing better waste disposal methods and raising awareness about the environmental impact of improper waste management could mitigate these issues.

Regarding the respondents' desire to maintain the long history of the tea industry, the mean value of 4.11 indicates agreement with the importance of sustaining the tea industry's historical legacy. Tea cultivation has a strong cultural tie, and this shows that it is recognized for its contribution to the history and character of the community.

The following Table (4.10) summarizes the overall mean values for the different aspects of social status measured in the survey. The mean values show that respondents have a neutral stance on family income and social status, agree on the importance of health and safety practices, recognize gender equality, appreciate the community impact of tea production, and value the cultural heritage of the tea industry.

Table (4.10) Overall Social Status

Description	Mean	S.D
Family's Social Status	3.06	0.46
Health and Safety	3.77	0.70
Discrimination and Gender Issues	3.96	0.71
Community Impact	3.56	0.57
Cultural Practices	4.11	0.87
Overall Mean Value	**3.69**	**0.66**

Source: Survey data, 2024

Regarding family's social status, the overall mean value of 3.06 reflects a general sense of family's economic status. The overall mean value of 3.77 for health and safety suggests a general agreement with the importance of health and safety practices in tea production. However, there is still challenges for improvement in educating farmers about the health risks associated with traditional energy sources and promoting the adoption of cleaner, more sustainable alternatives. The agreement with gender equality in employment opportunities and rights is a positive indicator of social progress within the community. The overall mean value of 3.56 for community impact suggests that tea production generally has a positive effect on the local community, despite some environmental concerns.

The overall mean value for social status is 3.69, suggesting a generally positive perception of the tea industry's social impact. However, the neutrality regarding family's social status indicates a need for economic improvements. The positive perceptions of health and safety, gender equality, community impact, and cultural

practices highlight strengths that can be built upon to enhance the overall sustainability of the tea industry in Pindaya Township.

4.3.4 Economic Status

The sustainability of the tea industry in Pindaya Township can also be evaluated by examining economic data. Five key areas were used as the basis for the questions regarding economic status: supply chain and market challenges, smallholder challenges, technological and innovation challenges, policy and governance challenges, and value distribution and market prices. The respondents' information about economic status is shown in the table below.

Table (4.11) Economic Status

	Description	Mean	S.D
Supply Chain and Market Challenges			
1	It is difficult to obtain high-quality raw tea leaves.	3.5	0.91
2	It is well known that growing tea with an organic certification increases the price, but getting the certification presents challenges. (For instance, financial or procedural)	4.02	0.74
3	It is well known that having an FDA certification will make our tea product better, however getting the certification presents challenges. (For instance, financial or procedural)	4.04	0.65
4	Connecting to foreign markets to export tea products presents challenges.	4.0	0.74
5	Technology is required to establish an effective packaging system for tea products.	4.13	0.74
	Overall Mean Score	**3.93**	**0.75**
Smallholder Challenges			
1	It is difficult to obtain the skilled workers needed for the tea production sector.	3.85	0.75

2	In the tea production sector, there exist limitations on energy sources, particularly regarding substitutes for wood fire. (eg. electricity)	4.14	0.85
3	It is necessary to construct a separate building to produce tea, but there are difficulties in doing so. (eg. land difficulty, financial difficulty to construct)	4.0	0.77
	Overall Mean Score	**4.00**	**0.79**
Technology and Innovation Challenges			
1	To enhance production and transition conventional products into value-added ones, it's imperative to have access to financial capital, technology, and market opportunities. (eg. consumer products made with tea leaves, beauty products, etc.)	4.15	0.68
2	The current machinery and production techniques are limited to small-scale production, making large-scale production unfeasible.	4.04	0.64
3	Concerns arise regarding the potential collapse of the market due to incorrect production methods and unverifiable quality in the tea industry. For instance, using improper manufacturing techniques for producing green tea.	4.19	0.74
4	To maintain quality when exporting tea products to other countries, techniques and technologies are necessary.	4.23	0.72
	Overall Mean Score	**4.15**	**0.7**
Policy and Governance Challenges			
1	Additional investment is required to expand the tea industry.	4.02	0.71
2	The tea industry requires financial and technical support from both the government and other organizations.	4.06	0.73
	Overall Mean Score	**4.04**	**0.72**
Value Distribution and Market Prices			
1	The demand for green tea/ pickled tea has increased more than the previous five years.	4.09	0.75

2	Comparing the prices of tea products with those from neighboring countries, our tea products are relatively inexpensive.	4.02	0.72
3	Compared to tea products from neighboring countries, our tea products are weak in terms of technique, packing and production.	4.02	0.75
Overall Mean Score		**4.04**	**0.74**

Source: Survey data, 2024

Table (4.11) illustrates the respondents' perceptions regarding their economic status. According the table, regarding the supply chain and market challenges, the mean value of 3.50 indicates that respondents agree it is difficult to obtain high-quality raw tea leaves. This challenge could be caused by poor agricultural techniques, lack of access to quality seeds, or environmental conditions that degrade the quality of tea leaves. The mean values of 4.02 and 4.04 indicate that respondents agree obtaining organic and FDA certifications presents significant challenges. These certifications can increase product value, but the financial and procedural complicates can be prohibitive for many smallholders. Additionally, a mean value of 4.00 reflects agreement that exporting tea products is obstructed by market connectivity issues, likely due to limited infrastructure and logistical challenges. The highest mean value of 4.13 indicates strong agreement on the necessity of advanced packaging technology to improve product marketability.

Regarding the challenges faced by smallholders, the mean value of 3.85 indicates that respondents agree, it is difficult to obtain skilled workers for tea production. This labor shortage could be due to outmigration, lack of training programs, or the seasonal nature of tea plucking. The high mean value of 4.14 indicates agreement that energy constraints, particularly the reliance on firewood, pose significant challenges. This reliance on traditional energy sources is not only inefficient but also has negative environmental and health impacts. The mean value of 4.00 shows agreement that constructing separate facilities for tea production is necessary but challenging due to land and financial constraints.

Regarding the technological and innovation challenges in the tea industry, the mean value of 4.15 indicates agreement that financial capital, technology, and market access are necessary to increase production of value-added products. The mean value

of 4.04 suggests agreement that current machinery and production techniques limit large-scale production, which is necessary for market competitiveness. A mean value of 4.19 indicates concern that small-scale producers using improper methods could harm the market. The highest mean value of 4.23 reflects strong agreement on the need for techniques and technologies to maintain quality when exporting tea products internationally.

Regarding the policy and governance challenges, the mean values indicate strong agreement on the need for additional investment and financial and technical support from the government and other organizations. The mean value of 4.04 suggests a strong consensus that effective policy and governance frameworks are crucial for the sustainable development of the tea industry. This includes increased investment and support from governmental and non-governmental organizations to address financial and technical barriers.

Regarding the value distribution and market prices, the mean value of 4.09 indicates agreement that the demand for green tea and pickled tea has increased over the past five years. However, the mean value of 4.02 suggest that while the price of domestic tea products is relatively low compared to neighboring countries, these products are weak in terms of technique, packing, and production.

The following Table (4.12) summarizes the overall mean values for the different aspects of economic status measured in the survey. The mean values show that respondents recognize significant challenges across all areas, with the highest concern being technological and innovation challenges.

Table (4.12) Overall Economic Status

Description	Mean	S.D
Supply Chain and Market Challenges	3.93	0.75
Smallholder Challenges	4.00	0.79
Technological and Innovation Challenges	4.15	0.7
Policy and Governance Challenges	4.04	0.72
Value Distribution and Market Prices	4.04	0.74
Overall Mean Value	**4.03**	**0.74**

Source: Survey data, 2024

Respondents face significant challenges in tea industry, including difficulty obtaining high-quality raw tea leaves, which stems from agricultural techniques, seed quality, and environmental factors. Obtaining organic and FDA certifications is also challenging, posing financial and procedural barriers for smallholders. Market connectivity issues hinder tea exports, compounded by infrastructure limitations. Advanced packaging technology is seen as crucial for improving product marketability. Smallholders struggle to find skilled workers and face energy constraints due to reliance on firewood, impacting efficiency and environmental health. Technological challenges include the need for financial capital and modern machinery to enhance production capabilities. Strong agreement exists on the necessity of sustainable policy frameworks and increased governmental support to address industry barriers. Despite increasing demand for green and pickled tea, domestic products lag behind in quality compared to regional competitors.

According to Table (4.12), the overall mean value of 4.03 shows that respondents perceive significant economic challenges affecting the sustainability of the tea industry in Pindaya Township. Technological and innovation challenges rank highest among economic challenges for tea industry sustainability. Next are policy and governance challenges, along with issues regarding value distribution and market prices. Smallholders also face challenges in sustaining their businesses. Addressing these issues through targeted interventions could enhance the economic sustainability of the tea industry, ensuring its long-term viability and profitability.

4.3.5 Environmental Issue

Environmental issue is also necessary to consider while assessing the sustainability of the tea industry in Pindaya Township. Since the whole southern Shan State tea sector depends on easily accessible firewood to make tea products, deforestation is a significant problem. In order to analyze the environmental issue for the tea industry's sustainability, it was concentrated on four main things: agrochemical usage, energy consumption and sustainability, biodiversity loss and soil degradation, and climate change. The information of the respondents regarding the environmental issue is shown in the table (4.13).

Table (4.13) Environmental Issue

	Description	Mean	S.D
Biodiversity Loss and Soil Degradation			
1	During tea production and cultivation, precautions should be taken to prevent environmental harm.	4.14	0.75
2	Uncontrolled land clearing can harm the environment and lead to the extinction of local plant and animal species.	4.09	0.91
3	Maintaining soil health is essential during tea cultivation.	4.36	0.7
4	It's recognized that adopting a contour system for planting tea trees offers advantages like preventing soil erosion, but transitioning to this system poses challenges, such as financial, labor, or technological constraints.	4.09	0.73
	Overall Mean Score	**4.17**	**0.77**
Climate Change			
1	Tea production is being impacted by climate change.	3.99	0.88
2	It is necessary to cultivate with agricultural techniques that adapt to changing climate.	4.10	0.76
	Overall Mean Score	**4.04**	**0.82**
Agrochemical Use			
1	There are difficulties in obtaining GAP (Good Agricultural Practices) certification. (eg. Money/Knowledge/Method)	4.13	0.75
2	Organic tea cultivation minimizes its impact on the environment.	4.16	0.83
	Overall Mean Score	**4.14**	**0.79**
Energy Use and Sustainability			
1	Renewable energy sources should be utilized in the tea production process as part.	3.78	0.66
2	There is a concern that the excessive use of firewood in tea production may contribute to deforestation.	4.32	0.86
	Overall Mean Score	**4.05**	**0.76**

Source: Survey data, 2024

Table (4.13) illustrates the respondents' views on the environmental issue. According to the table, regarding biodiversity loss and soil degradation, the mean value of 4.14 indicates that respondents agree on the importance of taking care to avoid harming the environment during tea production and cultivation. The mean value of 4.09 indicates that respondents agree uncontrolled land clearing can damage the environment and lead to the extinction of local species. The high mean value of 4.36 indicates strong agreement on the importance of maintaining soil health during tea cultivation. Additionally, respondents recognize the benefits of using a contour planting system to prevent soil erosion but acknowledge the financial, labor, and technological challenges in transitioning to this system. Overall, the respondents' agreement on the importance of avoiding environmental harm and maintaining soil health highlights the need for sustainable practices in the tea industry.

Regarding the respondents' views on climate change, the mean value of 3.99 indicates agreement that tea production is impacted by climate change. The mean value of 4.10 indicates agreement on the necessity of adopting agricultural techniques that adapt to changing climate conditions. This highlights the need for climate-resilient farming practices to sustain tea production amidst climate variability. Implementing adaptive agricultural techniques, such as efficient water management systems, is crucial for mitigating the adverse effects of climate change on tea production.

Regarding the respondents' perspectives on agrochemical use, the mean value of 4.13 indicates agreement on the challenges associated with obtaining GAP certification, such as financial, knowledge, and methodological barriers. The high mean value of 4.16 indicates strong agreement that organic tea cultivation has the least environmental impact. This underscores the importance of promoting organic farming practices to minimize environmental harm.

Regarding the respondents' views on energy use and sustainability, the mean value of 3.78 indicates agreement that renewable energy sources should be utilized in the tea production process as part. The mean value of 4.32 indicates strong agreement on the concern that firewood use in tea production leads to deforestation.

The following Table (4.14) summarizes the overall mean values for the different aspects of environmental issues measured in the survey. The mean values indicate that respondents recognize significant environmental challenges across all areas.

Table (4.14) Overall Environmental Issue

Description	Mean	S.D
Biodiversity Loss and Soil Degradation	4.17	0.77
Climate Change	4.04	0.82
Agrochemical Use	4.14	0.79
Energy Use and Sustainability	4.05	0.76
Overall Mean Value	**4.1**	**0.78**

Source: Survey data, 2024

Respondents strongly agree on the importance of avoiding environmental harm and maintaining soil health during tea production. They recognize the environmental damage caused by uncontrolled land clearing and the benefits of contour planting to prevent soil erosion, despite financial and technological challenges. Climate change is seen as a significant impact on tea production, with a consensus on the need for climate-resilient agricultural techniques. Challenges in obtaining GAP certification are acknowledged, and there is strong support for organic tea cultivation due to its minimal environmental impact. Additionally, respondents agree on the necessity of using renewable energy sources and express strong concern about the deforestation caused by firewood use in tea production.

According to Table (4.14), the overall mean value of 4.1 shows that respondents perceive significant environmental challenges affecting the sustainability of the tea industry in Pindaya Township. The highest concern is for biodiversity loss and soil degradation (mean value 4.17), followed by agrochemical use (mean value 4.14), energy use and sustainability (mean value 4.05), and climate change (mean value 4.04). These high mean values indicate strong recognition of the need for sustainable practices to address these environmental issues. By focusing on biodiversity conservation, climate-resilient farming practices, organic cultivation, and renewable energy adoption, the tea industry in Pindaya Township can enhance its environmental sustainability and mitigate negative impacts.

CHAPTER V
CONCLUSION

Myanmar is one of the nations with the highest tea production worldwide. Except from Bago, Ayeyarwaddy, Yangon regions, and Ra Khine state, all regions and states in Myanmar cultivate tea, especially in the hilly regions. Three main groups of tea are grown commercially: China type, Assam type, and Indo-China type, with the Assam type (Camellia assamica) and China type (Camellia sinensis) being the most widely grown. The Assam type occupies 95% of Myanmar's tea cultivation. Due to increasing market demand since 2007, the number of tea plantations in Myanmar has expanded, producing three main types of tea products: laphet-so (pickled tea), laphet-chauk (green tea), and black tea (Acho Chauk).

Shan State is Myanmar's primary tea-growing region, using traditional farming techniques like terraced planting in its hilly areas. Shan State accounts for 85% of Myanmar's total tea-cultivating area and produces the highest-quality tea, with major producing regions including Namhsan, Manton, Kyaukme in Northern Shan State, and Pinlaung, Pindaya, Yatsauk in Southern Shan State. Pindaya Township, part of the Danu Self-Administered Zone in Taunggyi District, is renowned for its long history of tea production. It has over 8,300 acres of tea plantations across 18 village tracts, situated at approximately 1,150 meters above sea level.

This study mainly focuses to examine the obstacles that need to be overcome in order to be sustainability of tea industry in Pindaya Township. Out of the 27 village tracts in Pindaya, 18 have tea plantations, but only a few village tracts have significant tea cultivation. Six major tea-producing village tracts were selected for this study.

5.1 Findings

The survey was conducted among 285 households involved in tea industry from six selected village tracts in Pindaya Township. Most of these households own less than

five acres of tea plantations, with tea trees having a lifespan over 30 years. Although the majority of respondents perform annual tea plant maintenance and soil preparation, it is important to note that the plants are over thirty years old, which may impact production levels. The existing tea plantations are cultivated using traditional agricultural methods passed down through generations, containing only about 2,000 tea plants per acre. The potential for increasing yield exists if contoured planting methods, which can support 5,000-7,000 tea plants per acre, are adopted.

Traditional farming methods and the lack of expansion limit productivity and economic growth. The current practices restrict the potential for increasing tea yield per acre. Transitioning to contoured planting and incorporating modern agricultural practices could significantly enhance productivity and sustainability. Most of tea farmers do not use chemical fertilizers or pesticides yet lack recognized Good Agricultural Practices (GAP) or organic certifications, limiting access to premium markets.

Educational levels among the respondents are relatively low, with 64% of families having no graduates. This lack of education impacts the ability to adopt new farming techniques and improve productivity. Economically, the earning from tea industry is barely sufficient to cover basic needs such as housing, food, and clothing, with little improvement in living standards. Therefore, the socio-economic conditions of tea farmers reveal uncertain condition.

Socially, the tea industry supports gender equality, with women playing a significant role in tea plucking. However, the tea industry's long-term sustainability faces challenge, as young people appear uninterested in pursuing jobs in tea farming. The community's involvement in tea production contributes positively to social life, but the environmental impact of traditional practices, particularly the use of firewood for energy, raises significant concerns.

Economically, the tea industry struggles with supply chain inefficiencies, labor shortages, and inadequate infrastructure. Producers face difficulties in obtaining high-quality raw materials and necessary certifications such as organic and FDA. Market connectivity issues further hinder their ability to export products. Smallholders struggle with energy constraints, reliance on firewood, and the need for improved production facilities. Technological challenges also retard progress, with current machinery and

techniques limiting large-scale production and quality control. Financial and technical support from the government and other organizations is crucial to overcome these barriers.

Environmental considerations are crucial when assessing the sustainability of the tea industry in Pindaya Township. According to the research on tea plantations, most of tea farmers are not expanding new plantations. Traditional farming methods have been impacted by water erosion, making it necessary to adopt contour farming systems to reduce soil erosion. Most tea plantations in Pindaya Township do not use pesticides or chemical fertilizers, so tea cultivation does not pose significant environmental risks. However, the tea production sector has faced environmental challenges. The industry's reliance on firewood as an energy source poses a serious threat to the environment. The use of firewood for energy presents a serious risk to ecosystems due to deforestation. The survey indicates a strong awareness among farmers of the need for sustainable practices, yet significant barriers remain. Widespread use of fuel pellets to replace firewood, along with a shift to renewable energy sources and improved agroforestry practices, can reduce environmental impacts.

5.2 Suggestions

To improve tea cultivation practices, it is suggested that farmers adopt best practices and modernize farming techniques to increase yield per acre. Transitioning to contoured planting methods can significantly reduce soil erosion and improve productivity. This transition requires support from the government and non-governmental organizations (NGOs) in the form of technology, equipment, and financial assistance. Additionally, promoting organic farming and achieving GAP certification can help farmers access international markets and improve their economic prospects.

Improving cleanliness standards and infrastructure in tea production is important. The survey revealed that many small-scale producers lack separate production facilities, leading to challenges in meeting cleanliness standards and obtaining FDA certification. Local governments should take necessary actions to support these producers, including providing financial assistance and facilitating access

to better infrastructure. Strengthening tea-related organizations and ensuring cooperation among them can help maintain product quality and market reputation. Encouraging the production of value-added tea products with the support of financial, technological, and market resources from the government and relevant organizations is also suggested. Additionally, fostering entrepreneurship and conducting research on consumer preferences in international markets can drive innovation and growth in the tea industry. Addressing energy challenges by promoting the use of fuel pellets and renewable energy sources can further support sustainable tea production.

To improve the social conditions of tea farmers, it is essential to implement educational programs that enhance literacy and skills. Promoting gender equality initiatives and community engagement can strengthen social cohesion and support the sustainability of the tea industry. Increasing awareness about the importance of clean working practices in the food industry is also crucial for ensuring product safety and quality.

Encouraging investment opportunities and providing government and NGO support are critical for enhancing the economic viability of the tea industry. Improving market connectivity and promoting technological advancements can help farmers compete with neighboring countries and improve their production techniques. Focusing on quality control and packaging can further enhance the marketability of tea products and increase profitability.

Adopting eco-friendly practices to prevent deforestation and promote biodiversity is essential for the long-term sustainability of the tea industry. Implementing proper waste management techniques to minimize environmental pollution and using renewable energy sources in tea production can reduce the industry's environmental impact. Promoting agroforestry practices and ensuring that tea cultivation coexists with environmental preservation efforts can support sustainable development.

In summary, the sustainability of the tea industry in Pindaya Township depends on multidimensional approach that integrates economic, social, and environmental strategies. The findings indicate that while there are significant challenges, there are also substantial opportunities for improvement. By adopting modern farming techniques, improving educational levels, and enhancing market access, the tea industry

can achieve greater productivity and economic growth. Additionally, addressing environmental concerns through sustainable practices and transitioning to renewable energy sources will mitigate the ecological impacts and ensure the long-term viability of tea production.

Future research should focus on innovative farming techniques, market trends, and the long-term impacts of climate change on tea production. Continued efforts in these areas will support the development of a sustainable and prosperous tea industry in Pindaya Township, benefiting both the local community and the broader economy of Myanmar. Ensuring the sustainability of the tea industry is not only crucial for the economic well-being of tea farmers but also for the preservation of the local environment and the cultural heritage of tea production in this region.

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APPENDIX (A)

Section A

Characteristics of Respondents

1. Please tick the village tract you live in-

   Htwe Ni village tract ☐ Taung Paw Gyi village tract ☐

   Yae Phyu village tract ☐ Pann Sit village tract ☐

   Maenel Taung village tract ☐ Kookaw village tract ☐
2. Respondent's Age ( )
3. Gender

   Male ☐ Female ☐
4. Education level of the respondent

   Primary ☐ Secondary☐ High☐ Graduate☐

   Other☐
5. Family Members ( )
6. Number of graduates in the family ( )
7. Number of family workers in tea industry ( )
8. Monthly income for family expenses

   Not enough ☐ Enough ☐ Excess ☐

Section B

Tea Cultivation and Production

1. Ownership of tea plantations-

   Under 5 Acres ☐ Between 5 Acres and 10 Acres ☐

   Between 10 Acres and 15 Acres☐ Between 15 Acres and 20 Acres ☐

   Between 20 Acres and 50 Acres ☐ Over 50 Acres ☐
2. Age of existing plants in the tea plantation

   Under 5 Years ☐ Between 5 Years and 30 Years☐ Over 30Years
3. The current plantations are cultivated according to the traditional agricultural methods that have been cultivated for generations

   Tradinal way ☐ Modern way ☐

4. Tea plant maintenance/soil preparation activities

   It is done every year ☐ Not done every year☐

5. Are new tea plantations being expanded?

   No☐ There was ☐

6. Fertilizer use status

   No use ☐ Use ☐, If use, (Natural fertilizer☐, Chemical fertilizer☐)

7. Pesticide use status

   No ☐ Use☐

8. Does your farm have a GAP (Good Agricultural Practices) certificate?

   No ☐ Have☐

9. The situation of labor force use in tea plucking

   Plucked only by family members☐ Plucked hire workers ☐

10. Describe the type of tea product produced

    Pickled tea☐ Simple sun-dried tea☐ Green tea☐

    Black tea (Acho Chauk)☐ Tea Oil☐ Other☐

11. Status of energy consumption in tea production

    Use electricity☐ Wood fire☐ Gas☐

    Fuel pellets☐ Coal☐

12. The earning from the tea industry is -

    Decreased than previous year☐ No change☐

    Increased than previous year ☐

Section C

Social Status

1. Tick your opinion in the table below. The numbers in the grid means:

   (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

	concerned with social status	1	2	3	4	5
	Family's Social Status					
1	The income generated from the tea business adequately covers the family's needs for food, clothing, and housing.					
2	Due to the earning from the tea industry, the standard of living has improved significantly.					
	Health Status					
3	It have understand that the knowledge of health and safety related to tea production.					
4	As our product is a food item, it is crucial to ensure clean production.					
5	The use of wood fire as the primary energy source in tea production could potentially pose health risks.					
	Discrimination and Gender Issues					
6	In tea production, both female and male workers enjoy equal employment opportunities, including rights such as access to training and fair wages.					
	Community Impact					
7	Tea plantation and production can contribute to the social life of the local community.					
8	Youth in the region show keen interest in tea cultivation and production.					
9	Improper disposal of waste from pickled tea production results in unpleasant odors in the environment and could potentially pose health risks.					
	Cultural Practices					
10	It is our desire to preserve the extensive history of the tea industry to ensure its sustainability.					

Section D

Business Status

1. Tick your opinion in the table below. The numbers in the grid means:

   (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

	concerned with business status	1	2	3	4	5
	Supply Chain and Market Challenges					
1	It is difficult to obtain high-quality raw tea leaves.					
2	It is well known that growing tea with an organic certification increases the price, but getting the certification presents challenges. (For instance, financial or procedural)					
3	It is well known that having an FDA certification will make our tea product better, however getting the certification presents challenges. (For instance, financial or procedural)					
4	Connecting to foreign markets to export tea products presents challenges.					
5	Technology is required to establish an effective packaging system for tea products.					
	Smallholder Challenges					
6	It is difficult to obtain the skilled workers needed for the tea production sector.					
7	In the tea production sector, there exist limitations on energy sources, particularly regarding substitutes for wood fire. (eg. electricity)					
8	It is necessary to construct a separate building to produce tea, but there are difficulties in doing so. (eg. land difficulty, financial difficulty to construct)					
	Technology and Innovation Challenges					
9	To enhance production and transition conventional products into value-added ones, it's imperative to have access to financial capital, technology, and market opportunities. (eg. consumer products made with tea leaves, beauty products, etc.)					
10	The current machinery and production techniques are limited to small-scale production, making large-scale production unfeasible.					
11	Concerns arise regarding the potential collapse of the market due to incorrect production methods and unverifiable quality in the tea industry. For instance, using improper manufacturing techniques for producing green tea.					

12	To maintain quality when exporting tea products to other countries, techniques and technologies are necessary.					
	Policy and Governance Challenges					
13	Additional investment is required to expand the tea industry.					
14	The tea industry requires financial and technical support from both the government and other organizations.					
	Value Distribution and Market Prices					
15	The demand for green tea/ pickled tea has increased more than the previous five years.					
16	Comparing the prices of tea products with those from neighboring countries, our tea products are relatively inexpensive.					
17	Compared to tea products from neighboring countries, our tea products are weak in terms of technique, packing and production.					

Section E

Environmental Issue

1. Tick your opinion in the table below. The numbers in the grid means:

   (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

	concerned with social	**1**	**2**	**3**	**4**	**5**
	Biodiversity Loss and Soil Degradation					
1	During tea production and cultivation, precautions should be taken to prevent environmental harm.					
2	Uncontrolled land clearing can harm the environment and lead to the extinction of local plant and animal species.					
3	Maintaining soil health is essential during tea cultivation.					
4	It's recognized that adopting a contour system for planting tea trees offers advantages like preventing soil erosion, but transitioning to this system poses challenges, such as financial, labor, or technological constraints.					

	Climate Change					
5	Tea production is being impacted by climate change.					
6	It is necessary to cultivate with agricultural techniques that adapt to changing climate.					
	Agrochemical Use					
7	There are difficulties in obtaining GAP (Good Agricultural Practices) certification. (eg. Money/Knowledge/Method)					
8	Organic tea cultivation minimizes its impact on the environment.					
	Energy Use and Sustainability					
9	Renewable energy sources should be utilized in the tea production process as part.					
10	There is a concern that the excessive use of firewood in tea production may contribute to deforestation.					

Section F

Recommendations for the sustainability of the tea industry in the Pindaya

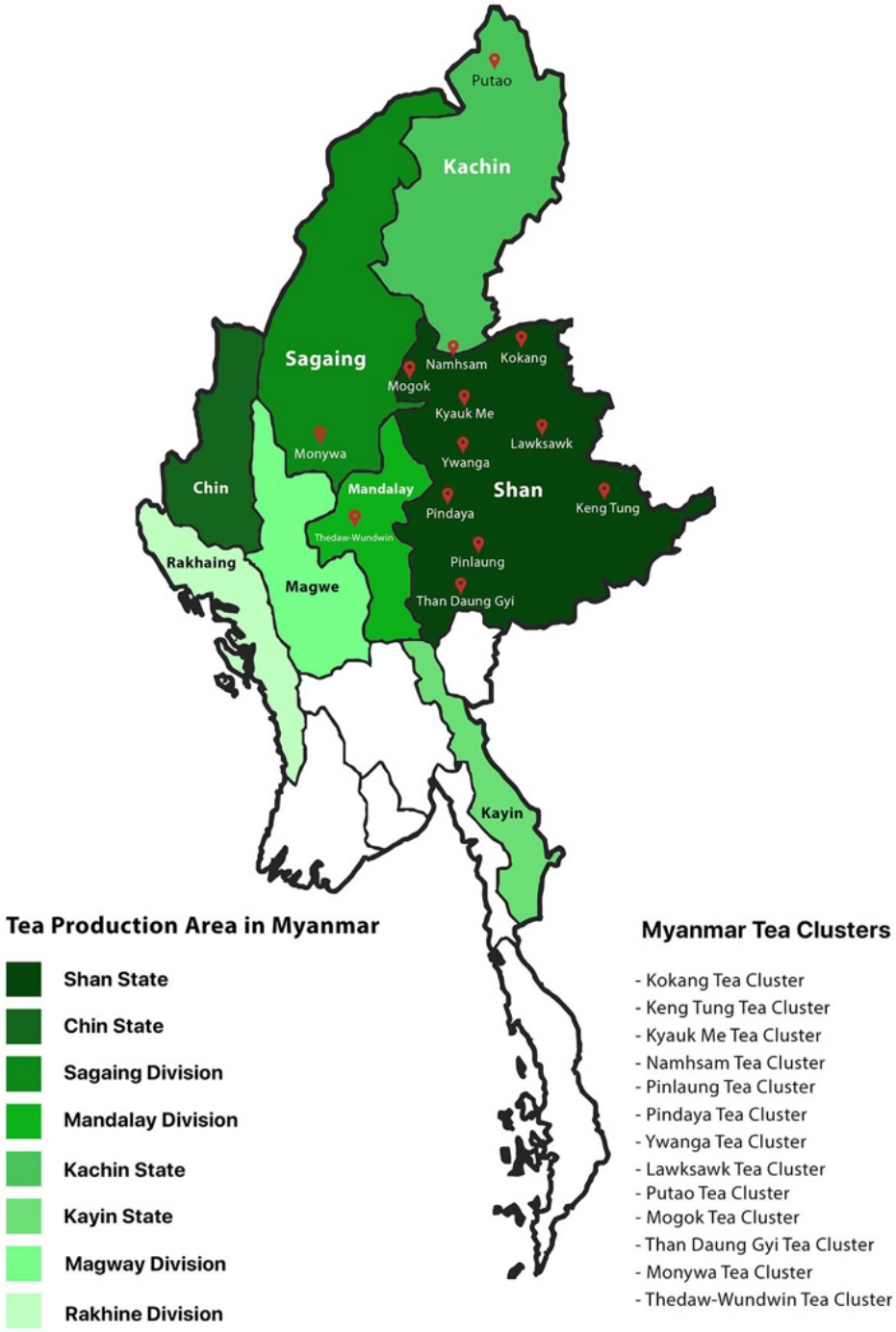
1. Advice for Cultivating Tea

2. Advice for Tea Production

3. Recommendations for penetration of the region's tea products into foreign markets

Thank you very much for your cooperation.

APPENDIX (B)



Source: Myanmar Tea Producers and Exporters' Association (MTA)

Figure (1) Myanmar Tea Production Area

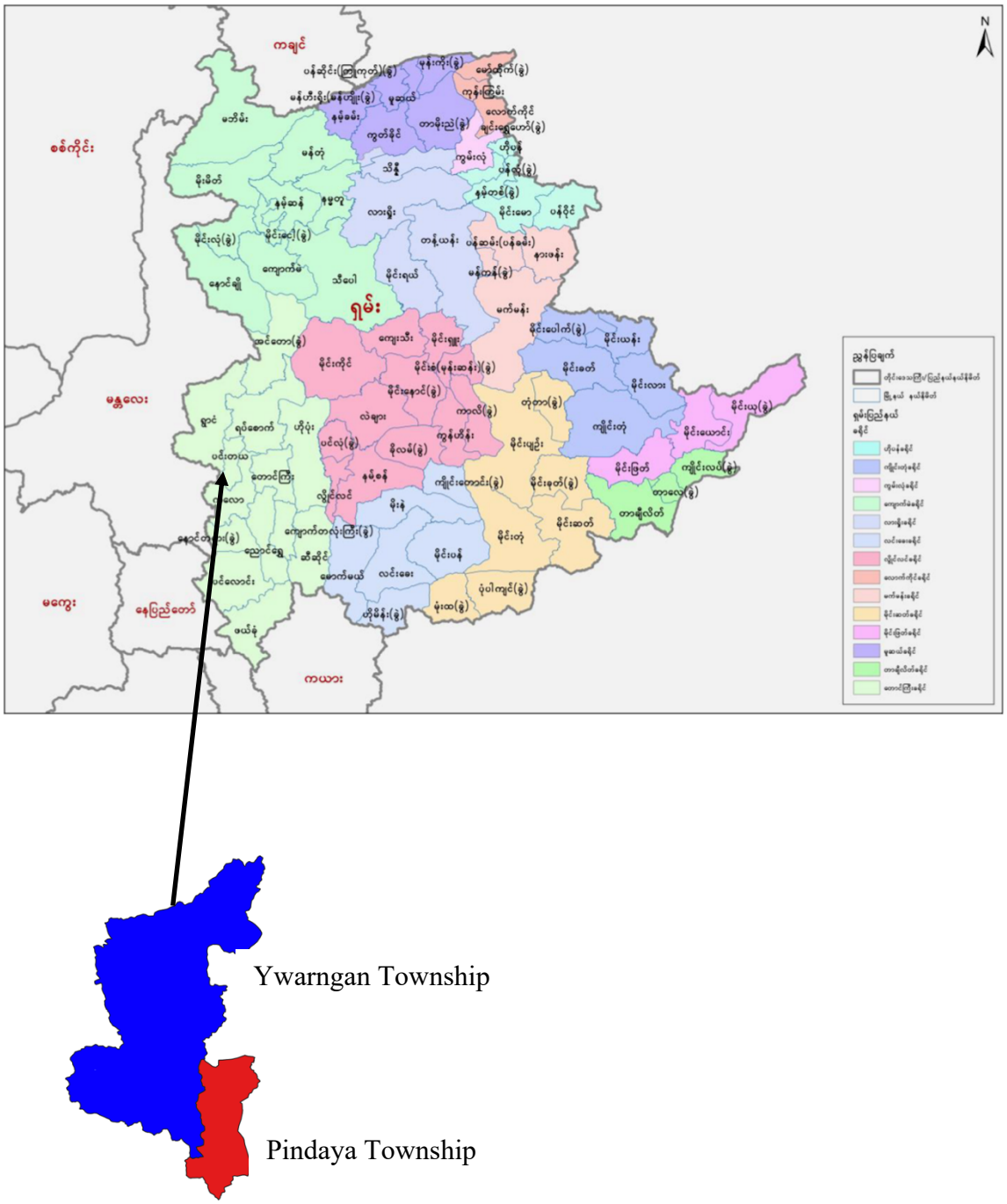
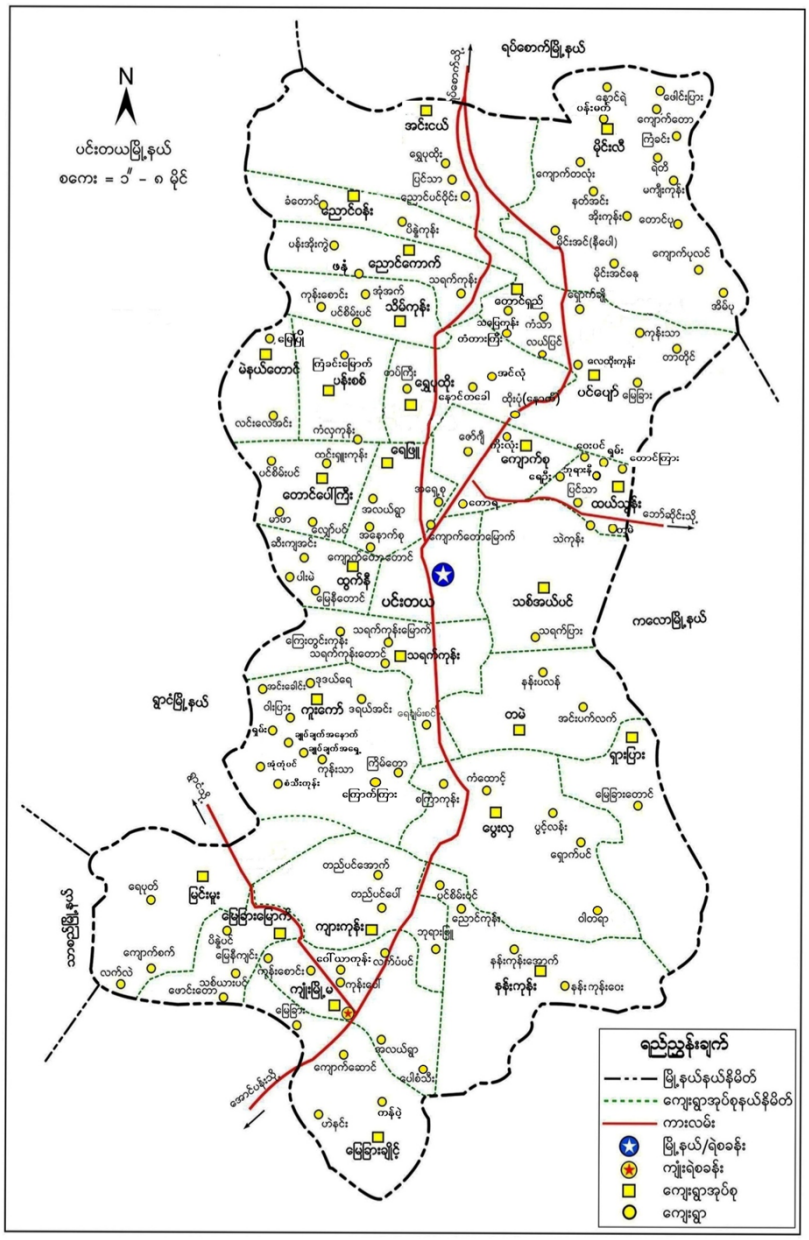


Figure (2) Map of Shan State and Danu Self-Administered Zone

APPENDIX (D)



Source: General Administrative Department of Pindaya Township

Figure (3) Map of Pindaya Township

Descriptive Statistics

Social Status

	N	Minimum	Maximum	Mean	Std. Deviation
C1	285	1	5	2.95	.51
C2	285	1	5	3.18	.42
C3	285	1	5	3.65	.753
C4	285	1	5	4.51	.648
C5	285	1	5	3.15	.178
C6	285	1	5	3.96	.716
C7	285	1	5	4.09	.693
C8	285	1	5	3.11	.54
C9	285	1	5	3.49	.56
C10	285	1	5	4.11	.875
Valid N (listwise)	285				

Economic Status

	N	Minimum	Maximum	Mean	Std. Deviation
D1	285	1	5	3.50	.911
D2	285	2	5	4.02	.743
D3	285	2	5	4.04	.651
D4	285	1	5	4.00	.748
D5	285	1	5	4.13	.746
D6	285	1	5	3.85	.754
D7	285	1	5	4.14	.852
D8	285	1	5	4.00	.778
D9	285	1	5	4.15	.685
D10	285	2	5	4.04	.641
D11	285	1	5	4.19	.744
D12	285	1	5	4.23	.727
D13	285	1	5	4.02	.719
D14	285	1	5	4.06	.736
D15	285	1	5	4.09	.757
D16	285	1	5	4.02	.724
D17	285	1	5	4.02	.754
Valid N (listwise)	285				

Environmental Issue

	N	Minimum	Maximum	Mean	Std. Deviation
E1	285	1	5	4.14	.749
E2	285	1	5	4.09	.912
E3	285	1	5	4.36	.707
E4	285	1	5	4.09	.733
E5	285	1	5	3.99	.880
E6	285	1	5	4.10	.760
E7	285	1	5	4.13	.751
E8	285	1	5	4.16	.839
E9	285	2	5	3.78	.665
E10	285	1	5	4.32	.860
Valid N (listwise)	285				