YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF APPLIED ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME

A STUDY ON COFFEE INDUSTRY IN MYANMAR

(Case Study in Pyin Oo Lwin Township, Mandalay Region)

AYE AYE THANT
EMPA - 2 (19th BATCH)

JUNE, 2024

YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF APPLIED ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME

A STUDY ON COFFEE INDUSTRY IN MYANMAR

(Case Study in Pyin Oo Lwin Township, Mandalay Region)

A thesis submitted as a partial fulfillment towards the requirement for the degree of Master of Public Administration (MPA)

Supervised by

Dr. Su Su Myat
Professor/Head
Department of Applied Economics
Yangon University of Economics

Submitted by

Aye Aye Thant
Roll No. 2
EMPA (19th Batch)
(2022-2024)

June, 2024

YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF APPLIED ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME

This is to certify that this thesis entitled **"A STUDY ON COFFEE INDUSTRY IN MYANMAR"**, submitted as a partial fulfillment towards the requirements for the degree of Master of Public Administration has been accepted by the Board of Examiners.

Board of Examiners

Dr. Khin Thida Nyein
(Chairperson)
Pro-Rector
Yangon University of Economics

Daw N Khum Ja Ra
(Examiner)
Associate Professor
Department of Applied Economics
Yangon University of Economics

Dr. Su Su Myat
(Supervisor)
Professor/Head
Department of Applied Economics
Yangon University of Economics

Dr. Khin Thu Thu Thein
(Examiner)
Lecturer
Department of Applied Economics,
Yangon University of Economics

Dr. Thet Mon Soe
(Examiner)
Lecturer
Department of Applied Economics,
Yangon University of Economics

June, 2024

ABSTRACT

This study explores the perceptions and practices of coffee farmers regarding sustainable agriculture in Pyin Oo Lwin District, Mandalay Region, Myanmar. The objectives are to assess farmers' attitudes towards sustainable practices and evaluate the sustainability of the local coffee industry. The study employs a descriptive method, utilizing both primary and secondary data. Primary data is collected through structured questionnaires with 30 coffee farm owners and 40 coffee producers or sellers. Secondary data sources include research papers, government reports, and information from various coffee associations. The findings reveal that while there is a high level of awareness and positive perception towards sustainable agricultural practices among local coffee stakeholders, there are significant challenges related to economic viability and awareness of advanced applications such as the biomedical uses of coffee. The demographic analysis shows a predominance of older, male farmers, highlighting potential generational and gender gaps in the sector. The study suggests that enhancing awareness, providing targeted support for younger and female farmers, and addressing economic barriers could improve the sustainability of coffee farming in the region.

ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere gratitude to Professor Dr. Tin Tin Htwe, Rector of the Yangon University of Economics, for allowing me to study the Master of Public Administration. I would like to acknowledge my indebtedness to Professor Dr. Khin Thida Nyein, Pro-Rector and Professor Dr. Cho Cho Thein, Pro-Rector of the Yangon University of Economics.

Secondly, my sincere thanks to my supervisor Professor Dr. Su Su Myat, Head of Department of Applied Economics of the Yangon University of Economics and Programme Director of MPA Programme, her close supervision, expect advice, kind guidance, effective suggestion, and encouragement in supporting to complete this thesis successfully.

I would like to express my sincere gratitude to all the teachers, and visiting lectures who have made their grateful efforts in rendering knowledge sharing of EMPA Program during two years period. In addition, I would like to extend my appreciation to the faculty and all the staff in the Department of Applied Economics who have provided me with any administrative support and strength during my academic years.

Aye Aye Thant
Roll No. 2
EMPA (19th Batch)

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES

Table No. **Title** **Page**

LIST OF ABBREVIATIONS

BMPs	Best Management Practices
CSAs	Climate Smart Agricultural Practices
EFFFPs	Environmentally Friendly Farming Practices
EU	European Union
FDA	Food and Drug Administration
GAPs	Good Agriculture Practices
MCA	Myanmar Coffee Association
MFPEA	Myanmar Food Processors and Exporters Association
UMFCCI	Union of Myanmar Federation of Chambers of Commerce and Industry
US	United State

CHAPTER I
INTRODUCTION

Coffee is one of the most significant cash crops globally and a major source of export earnings. It is produced in over 70 countries worldwide (ICO, 2013), with leading producers located in South America, Africa, and Southeast Asia. Small-scale farmers involved in coffee production support approximately 25 million people globally (Watson and Achineli, 2008).

As the second largest traded commodity worldwide, coffee is consumed by a vast majority of the global population due to its rich, unique taste, aroma, and reported health benefits. However, coffee cultivation faces numerous challenges at various stages of production, including on-farm production, processing, curing, transportation, and shipment. Additional challenges at the farm level include pest and disease management, water and nutrient management, labor availability and cost, and infrastructure facilities. At the marketing level, international price fluctuations, consumer preferences, trade-related barriers, farm finance, and subsidies pose significant issues in the coffee production chain. Furthermore, maintaining biodiversity in the typically hot ecological regions where coffee is grown has become increasingly challenging in recent years.

Coffee has been an integral part of life in Myanmar for generations. Introduced in 1885, the coffee trade remained limited for fifty years. However, as Myanmar’s economy has opened in recent years, there has been increased focus on the coffee trade. Coffee plantations in Myanmar are primarily located in Shan, Kayin, and Chin States, as well as in the Mandalay, Thaninthayi, Magway, and Ayeyarwady Regions. Myanmar predominantly produces Arabica coffee, with most plantations in Shan State, Chin State, and Mandalay Region, while Robusta coffee is primarily grown in the Thaninthayi and Ayeyarwady Regions. Myanmar's specialty coffee beans are highly demanded due to their high quality and organic production.

Sustainable agriculture is a critical concept for informing coffee farmers and presents an alternative to conventional farming methods. Implementing sustainable coffee farming practices can mitigate the adverse impacts of agricultural activities. Various processing procedures can ensure the sustainability of the plants, contributing to agribusiness prosperity and improving the quality of life for coffee farmers. Sustainable practices are ecological, support habitats, and promote long-term livelihoods. By employing organic farming methods, avoiding harmful chemicals and pesticides, and promoting agroforestry practices, farmers can protect natural resources, enhance biodiversity, and improve crop quality.

Education and knowledge-sharing are essential for empowering coffee farmers to adopt sustainable practices. Training programs, workshops, and resources on sustainable agriculture equip farmers with the skills and information necessary to make informed decisions that benefit both their farms and the environment. Collaboration among farmers, researchers, and industry experts fosters a shared commitment to sustainability.

1.1 Rationale of the Study

Coffee, widespread throughout the tropics with over 70 species, originates from Africa. Economically important species today are Arabica and Robusta. Coffee is one of the top agricultural commodities globally, produced and exported by more than 60 nations, and ranks as a key cash crop in developing countries (Pohlan, Janssens, and Giesemann, 2008).

Traditionally, coffee trees are cultivated for their berries, processed using dry or wet techniques in the growing areas to produce green coffee, the basis for various coffee products. The highlands provide perfect growing conditions, and the skill of the roasters enhances the coffee quality. In Myanmar, introduced in the early 1800s by British colonists, coffee thrived in the highland climate and became a significant crop. Today, coffee is grown on both small farms and large estates, playing an important role in the local economy.

According to the Myanmar Coffee Association, highland Arabica coffee is mainly grown in Northern and Southern Shan State, Chin State, Kachin State, Kayah State, Sagaing Region, and Mandalay Region. Lowland Robusta coffee is grown in the Bago Region, Ayeyarwaddy Region, and Kayin State. The high elevation enhances the coffee

beans' flavor intensity and natural aroma. With the rising popularity of specialty coffee, Myanmar is poised for a shift towards sustainable agricultural practices and increased export market access.

Sustainability in Myanmar's rural areas is crucial for effective agricultural production, supporting the country's economy and contributing to its stability. Since gaining independence, Myanmar's agricultural sector has improved quality and production to meet the nation's expanding food needs. Agricultural development initiatives must prioritize expanding land for major commodities and garnering government support for agricultural development.

The coffee industry significantly contributes to Myanmar's economy, providing livelihoods for thousands of farmers and considerable export revenue. As consumer awareness of sustainability grows, it is essential to examine how the industry can align with global standards while supporting local communities' well-being. This study explores the rationale behind promoting sustainability practices within the coffee industry in Pyin Oo Lwin District, Mandalay Region, Myanmar. The industry faces various sustainability challenges, including environmental degradation, resource depletion, and social inequality.

Promoting sustainability in the coffee industry addresses environmental concerns such as deforestation, soil erosion, and water pollution. Sustainable farming practices like agroforestry, organic farming, and water conservation techniques can reduce the environmental footprint and preserve natural resources for future generations. Additionally, sustainability initiatives enhance social and economic outcomes, including improved market access, product quality, and competitiveness in the global market. This study aims to highlight the importance of sustainability in driving positive change within the coffee industry and inspiring stakeholders to embrace a more sustainable future.

1.2 Objective of the Study

The objectives of the study are to assess coffee farmers' perceptions of sustainable agriculture practices in Pyin Oo Lwin District, Mandalay Region, and to examine the sustainability of the coffee industry in the same region.

1.3 Method of Study

The study employs a descriptive method based on primary and secondary data. Primary data is collected from coffee farm owners, producers, and sellers in Pyin Oo Lwin District, Mandalay Region, using structured questionnaires. Secondary data is obtained from previous research papers, the Ministry of Commerce, the Ministry of Agriculture, Livestock and Irrigation, the Myanmar Coffee Association, the Mandalay Coffee Group, the International Coffee Organization, and various websites.

1.4 Scope and Limitations of the Study

The study focuses on the sustainability of the coffee industry in Pyin Oo Lwin District, Mandalay Region. It concentrates on 30 coffee farm owners and 40 coffee producers or sellers active in the local coffee industry.

1.5 Organization of the Study

The study comprises five chapters. Chapter one is the introduction, including the rationale of the study, problem statement, objectives, method, scope, limitations, and organization of the study. Chapter two provides a literature review on sustainable agriculture practices, factors influencing sustainable practices, constraints in sustainable coffee production, and sustainability challenges. Chapter three presents an overview of the coffee production sector in Myanmar. Chapter four describes the analysis of sustainable agriculture practices among coffee farmers in Pyin Oo Lwin District, Mandalay Region. Finally, chapter five concludes with findings and suggestions.

CHAPTER II
LITERATURE REVIEW

2.1 Concepts of Sustainable Agricultural Practices

The concept of sustainable agricultural practices is occasionally referred to as Good Agricultural Practices (GAPs), Best Management Practices (BMPs), Climate-Smart Agricultural Practices (CSAs), and Environment-Friendly Farming Practices (EFFPs) (Aryal, Jat, Sapkota, Kassie, Rahut & Maharjan, 2018). The significant principles utilized for sustainable agricultural practices in the present are outlined below.

Good Agricultural Practices are a voluntary certified system aimed at sustainability and equity for farmers through practical, efficient processes both on-farm and off-farm (Pongvinyoo, Yamao, & Hosono, 2014). One of the key concepts within sustainable agriculture is the practice of crop rotation. By alternating the types of crops planted in a particular area over successive seasons, farmers can effectively enhance soil health, reduce pests and diseases, and improve overall crop yields. Another vital aspect of sustainable agriculture is the promotion of Integrated Pest Management (IPM) strategies. Instead of relying on harmful pesticides that can disrupt the natural balance of ecosystems, IPM emphasizes a combination of techniques such as biological control, crop rotation, and the use of resistant plant varieties to manage pests effectively while safeguarding the environment and human health. It is based on the principles of risk prevention, risk analysis, and sustainable agriculture using IPM and integrated crop management for the long-term improvement of the farming system (Laosutsan, Shivakoti & Soni, 2019). These practices address the environmental, economic, and social sustainability of on-farm processes, resulting in safe and quality food and non-food agricultural products (Senanayake & Rathnayaka, 2015).

Conservation farming is a technique that revolves around the management of soil, water, and biological resources by minimizing soil disturbance, maintaining permanent soil cover, and practicing crop rotation (Kassie, Zikhali, Manjur & Edwards, 2020). This

method aims to replace unsustainable elements of conventional agriculture with conservation agricultural practices, ensuring the ecological sustainability of the production system (Mlenga, 2015). Organic farming is a sustainable agricultural system that focuses on producing food and fiber while considering environmental, social, and economic factors (Sriwichailamphan, 2014). This method relies on natural biodiversity and locally adapted ecological processes, rather than genetically modified resources and synthetic inputs (Kassie, Zikhali, Manjur & Edwards, 2020). Additionally, the zero-tillage approach offers an alternative to traditional agriculture by planting crops in minimally disturbed soil using narrow slots and trenches, along with practices such as managing plant residues, crop rotation, weed and pest control, and harvesting (Laxmi & Mishra, 2007).

Climate-smart agriculture focuses on promoting sustainable agricultural practices, addressing food insecurity, and implementing evidence-based climate change adaptation strategies. The main goals of this approach are to increase productivity, enhance resilience, and reduce emissions (Aryal, Jat, Sapkota, Kassie, Rahut & Maharjan, 2018). Integrated Pest Management, on the other hand, is a comprehensive strategy that integrates ecological and cultural practices to address pest issues sustainably. It combines various techniques to manage pests effectively while minimizing risks to human health and the environment (Blake, Sandler, Coli, Pober & Coggins, 2007). By embracing principles such as crop rotation, integrated pest management, and precision agriculture, farmers can cultivate a future where agriculture coexists harmoniously with nature, ensuring food security and environmental sustainability for generations to come.

2.2 Factors Influencing Sustainable Agriculture Practices

Kunzekweguta, Rich & Lyne (2017) categorized the factors influencing the adoption of sustainable agricultural practices into six different categories: socioeconomic factors, biophysical factors, institutional factors, financial factors, technological factors, and psychological factors.

2.2.1 Socioeconomic Factors

The age of farmers is a crucial variable in studying the factors of adoption. Due to their extensive experience and risk-aversion behavior, older farmers are less likely to shift to new farming technologies (Okon & Idiong, 2016). In contrast, younger farmers are more likely to adopt new technologies because of their risk-taking behavior and more years of schooling (Melisse, 2018). Education often increases farmers' knowledge and environmental concerns, influencing them to adopt environmentally sound agricultural practices. Global literature shows a positive correlation between education and the adoption of sustainable agricultural practices (Digal & Placencia, 2019). However, in some countries like Mozambique, Thailand, and Malaysia, the correlation is insignificant (Chichongue, Pelser, Tol, Du Preez & Ceronio, 2020). Additionally, higher farm income generally encourages the adoption of sustainable agricultural practices (Laosutsan, Shivakoti & Soni, 2019).

2.2.2 Biophysical Factors

Sustainable agriculture practices are often site-specific and depend on a region's geography and biophysical conditions. Therefore, biophysical factors play a significant role in adoption. Farmers with larger farm sizes are generally more willing to invest in improved technologies (Rajendran, Tey, Brindal, Shamsudin, & Radam, 2016).

However, mixed results have been found in many developing countries. Some studies show a positive correlation between farm size and adoption (Kunzekweguta, Rich & Lyne, 2017). Additionally, the distance between farms and markets can adversely affect adoption in developing countries; the larger the distance, the lower the adoption rate (Kunzekweguta, Rich & Lyne, 2017). Farmers' awareness of agricultural environmental degradation, such as water pollution and soil fertility loss, also stimulates the adoption of sustainable practices in both developed and developing countries (Okon & Idiong, 2016).

2.2.3 Institutional Factors

The adoption of sustainable agricultural practices also depends on institutional factors. Extension visits, participation in training programs, informational availability through information communication technology, farmer-to-farmer extension, and

organizational membership are vital determinants. Extension services are crucial institutional factors differentiating adoption status among farmers (Melisse, 2018).

Extension agents provide various services to motivate farmers and guide them with multiple technologies. Studies show that farmers who frequently participate in extension programs, whether from government, non-governmental organizations, or farmer-to-farmer interactions, are more likely to adopt sustainable practices (Chichongue, Pelser, Tol, Du Preez & Ceronio, 2020). Similarly, information and technical advice provided in training programs improve technical skills and play a significant role in adoption (Joshi, Kalauni, & Tiwari, 2019).

2.2.4 Financial Factors

The adoption of sustainable agricultural practices or any technology requires sufficient financial support. Lack of access to credit is a significant constraint (Laxmi & Mishra, 2007). Agriculture is a natural phenomenon subject to various climatic risks; thus, crop insurance ensures farmers take risks by shifting from one farming system to another. Therefore, credit and crop insurance availability through institutional or non-institutional sources play an important role in adoption (Aryal, Jat, Sapkota, Kassie, Rahut & Maharjan, 2018).

2.2.5 Technological Factors

The technological adoption of sustainable agricultural development is a challenging issue. To reduce costs and maximize profit or productivity, farmers continually seek new technologies. The adoption of new techniques for improving agricultural sustainability always depends on farmers' knowledge and skills. Farmers who have easy access to knowledge and improved technologies are highly motivated to adopt sustainable practices (Singh & Sharma, 2019).

2.2.6 Psychological Factors

Farmers' attitudes towards environmental concerns and uncertainty play an influential role in adoption. Farmers who perceive that conventional farming is harmful to human health and the environment are more likely to adopt sustainable practices

(Sriwichailamphan, 2014). Similarly, their intention to adopt or continue also affects their adoption behavior. Tey et al. (2014) demonstrate that sustainable behavior emerges from strong intentionality. Farmers are more likely to adopt sustainable agriculture practices when they perceive that sustainable farming would reduce cultivation costs (Srisopaporn, Jourdain, Perret, & Shivakoti, 2015). Perceived profitability, compatibility, complexity, and efficiency attributes also positively influence adoption (Joshi, Kalauni, & Tiwari, 2019).

2.3 Limitations of Sustainable Coffee Cultivation

Sustainable coffee cultivation has clear benefits for farms and farming communities. However, certain methods of sustainable production present disadvantages. The initial transition from conventional to organic or shade-grown farming can be labor-intensive, expensive, and take several years to establish. The introduction of shade trees and other shade crops incurs initial costs that may require farmers to take out loans or seek other means of financing. Furthermore, obtaining certifications such as organic or fair trade involves costs for assessment, detailed paperwork, and meeting specific requirements (Guthman, 2004).

Certifications such as organic require farms to produce for three years without any pesticides or herbicides before being officially certified (Riddle, 2003). This transition period can impact economic viability, as farms lack the price premiums of organic sales initially (Le, Wild & Jackels, 2017). Additionally, farmers will need to improve productivity to maintain or increase their income as the sustainable coffee market matures and price premiums decrease (Kilian, Jones, Pratt, & Villalobos, 2006). In some regions, certifications have become a norm, forcing farmers to obtain them to sell their beans to exporters (Le & Jovanovic, 2019).

The initial transition from conventional to organic farming can increase susceptibility to various pests and diseases (Bengtsson, Ahnstrom, & Weilbull, 2005). Shade trees can lead to increased fungal attacks, specifically by Mycena citricolor, due to higher humidity on the farm (Beer, 1987). Over-shading can significantly reduce coffee yields; shade cover above 50% can limit yields, while 30-45% shade cover promotes the highest yields (Soto-Pinto, Perfetto & Caballero-Nieto, 2000). Competition for water

between coffee plants and shade trees may reduce coffee health during the dry season (Vossen, 2005). Additionally, shade trees can damage coffee plants with falling branches, and regular pruning poses additional labor costs.

2.4 Requirements for the Sustainable Coffee Industry

Coffee is an economically important non-alcoholic stimulating beverage and the second-largest traded commodity in the world market, after petroleum. The majority of the world's population consumes coffee due to its rich and unique taste, aroma, and reported health benefits. Major coffee-producing countries include Brazil, Vietnam, Colombia, Indonesia, Mexico, Ethiopia, Guatemala, India, and Uganda.

Globally, 70% of coffee production is Arabica and 30% is Robusta. Coffee belongs to the family Rubiaceae, with the most popular cultivated species being Coffea arabica (Arabica coffee) and Coffea canephora (Robusta coffee). Another species, Coffea liberica (Liberian or tree coffee), accounts for 1% of the world's coffee production (Coffee Board, 2012).

Coffee cultivation faces various challenges at different stages of production (on-farm production, processing, curing, transportation, shipment), in addition to marketing issues. Pest and disease management, water and nutrient management, labor availability and cost, and infrastructure facilities pose major challenges to producing quality coffee at the farm level. At the marketing level, international price fluctuations, consumer preferences, trade-related barriers, farm finance, and subsidies are significant problems in the coffee production chain.

2.4.1 Production

Production in coffee cultivation involves several critical factors that ensure the quality and sustainability of the crop. These include soil and climate requirements, water management, pest and disease management, cropping systems, mechanization, nutrient management, and labor availability and cost.

Soil and Climate Requirements: Coffee, primarily a tropical plant, is also grown in semi-tropical climates. It requires varying levels of heat, humidity, and abundant rainfall at different stages of its crop cycle. In India, two primary coffee varieties are grown: Arabica

and Robusta. Generally, Arabica coffee is grown at elevations of 1000-1500 meters, while Robusta coffee is cultivated at 500-1000 meters (Coffee Board, 1996). Arabica coffee largely requires cooler temperatures (15-25°C), while Robusta coffee needs a hot humid climate (20-30°C). Coffee's vegetative growth is quicker during the hot rainy season, while berry ripening needs a cool dry season. Annually, coffee requires around 100-200 cm of rainfall for its growth. Arabica requires higher annual rainfall (160-250 cm) compared to Robusta (100-200 cm). Hill slopes (600-1800 meters) are generally chosen for cultivation to avoid waterlogging, which is detrimental to coffee growth.

Water Management: Coffee is extremely sensitive to water availability and requires water during critical growth stages such as pre-blossom, post-blossom, fruiting, and maturation to achieve expected yields (Ramaiah, Venkataramanan & Gopal, 1995). Yield and productivity largely depend on the timing and quantity of pre-blossom and post-blossom showers (Coffee Board, 1996). Delays in these showers significantly affect production, productivity, and quality. Arabica coffees are slightly more tolerant to moisture stress due to their deep-root nature, while Robusta coffees are highly susceptible to moisture stress because of their shallow-root system. The need for irrigation systems (sprinkler/drip) and sourcing water are major challenges for coffee farms. Sprinkler irrigation is effective for coffee cultivation, but requires more water compared to other methods. Drip irrigation saves water by minimizing loss due to seepage and evaporation, but requires significant initial investment, which is often unaffordable for small and marginal farmers. Pumping water through hoses or cutting channels is a common method adopted by many coffee farms.

Pest and Disease Management: Major pests causing economic loss in coffee farms include the coffee white stem borer (Xylotrechus quadripes), coffee berry borer (Hypothenemus hampei), and shot hole borer (Xylosandrus compactus). Other minor pests include nematodes (Pratylenchus coffeae), mealybugs (Planococcus citri and P. lilacinus), and green scale (Coccus viridis). Major diseases include coffee leaf rust (Hemileia vastatrix), black rot (Koleroga noxia), and dieback (Colletotrichum gloeosporioides Penz.). Different root diseases, such as brown root rot (Phellinus noxius Corner), red root rot (Poria hypolateritia Berk), black root rot (Rosellinia arcuata Petch), and Santavery root rot (Fusarium oxysporum f. sp. coffeae), also cause significant crop loss. Mixed canopies of

shade trees in coffee farms can favor various pest and disease problems by influencing the microclimate. Effective management of plant protection chemicals and resistance development in pests and pathogens is a significant challenge for coffee producers.

Cropping Systems: Coffee cultivators are reportedly switching from coffee to other crops, such as pepper and areca nut, due to coffee's unremunerative nature. The price of coffee has been falling more rapidly than other plantation crops. Mixed cropping systems provide additional income for growers and buffer crops during poor coffee years. Intercrops like black pepper, oranges, cardamom, vanilla, areca nut, and fruit crops are grown in coffee plantations. However, recent weather conditions and pest and disease problems have led many growers to abandon coffee and shift to other crops, reducing overall coffee production. Intercrops can also introduce multiple pest and disease problems that must be managed along with the main crop.

Scope for Mechanization: Coffee requires constant care throughout its crop cycle. In hilly regions, there is less opportunity for using sophisticated farm machinery. Coffee cultivation is labor-intensive, and labor shortages during critical farm operations (e.g., planting, bush management, weeding, fertilization, irrigation, harvest, and processing) affect profitability and sustainability. Developing suitable farm machinery is essential to improve efficiency and reduce production costs.

Nutrient Management: Though coffee-growing soils are rich in organic matter, maintaining soil pH is a major challenge (D'Souza & Jayarama, 2011). High rainfall washes away soil nutrients, making it acidic. Coffee demands high nutrients for growth, and steady nutrient supply is crucial for productivity (Krishnamurthy Rao, 1993). Maintaining optimum pH by liming is essential for nutrient management. The demand for organic manure, such as farmyard manure, is increasing due to cattle scarcity in high-altitude regions (Jessy, 2011). Coffee requires high nutrition, and fertilizers must be applied at three stages (post-blossom, pre-monsoon, post-monsoon), requiring significant labor (Jayarama, Shankar & Reddy, 1993). Leaching of applied nutrients due to high rainfall and slopes is a major challenge, leading to groundwater pollution and eutrophication in nearby water bodies.

Labor Availability and Cost: Coffee cultivation is labor-intensive, and labor costs have escalated in recent years. Shortages of skilled workers for critical operations like shade

lopping, weeding, tracing white stem borer-affected plants, and pruning significantly affect coffee plantations. Labor costs constitute 60-70% of total cultivation costs for Arabica and 55-65% for Robusta, depending on irrigation. Labor cost is a significant challenge in coffee cultivation, adding to production costs.

2.4.2 Processing

Processing coffee involves transforming harvested coffee cherries into green coffee beans through various methods. This section covers processing methods, challenges, drying, storage facilities, moisture management, and waste management.

Processing Methods and Challenges: There are two popular methods for processing coffee beans: wet and dry. Wet-processed coffee is designated as plantation or parchment coffee, while dry-processed coffee is referred to as natural or cherry coffee. Dry processing is common in regions with water scarcity and is characterized by marginal or small farmers. Dry coffee brew is considered rich in body and aroma, while wet-processed coffee gives brews with fine aroma and acidity (Velmourougane, Bhat, Gopinandhan & Panneerselvam, 2011). Coffee quality is assessed visually (traditional or on-farm knowledge) and based on overall organoleptic qualities. The intrinsic quality of coffee depends on genetic makeup and biotic and abiotic factors. Processing techniques adopted at the farm level play a pivotal role in influencing coffee beverage quality. Timely harvesting and processing are crucial to avoid quality deterioration. Selective picking during wet processing and sorting harvested cherries according to maturity stages improve quality.

Coffee should not be allowed to dry on the tree as it encourages mold growth. Harvest mats should be used to avoid direct contact with soil and reduce gleanings, which are potential sources of mold and mycotoxin contamination. Mixing gleanings with a good lot of coffee harvest is a potential source of toxigenic mold contamination. Grading coffee fruits or adjusting pulper discs according to berry size reduces pulper cuts. Timely processing or avoiding delays between harvest and processing improves coffee quality and reduces ochratoxigenic mold and ochratoxin A (OTA) contamination (Velmourougane, Bhat, Gopinandhan & Panneerselvam, 2011).

Drying and Storage Facilities: Drying is a crucial criterion determining coffee beans' shelf life. Appropriate drying methods ensure moisture and water activity that discourage

storage mold colonization. Different drying methods are used for early drying of processed coffee beans (Velmourougane, Bhat & Gopinandhan, 2010a). A good-quality drying yard is essential for producing high-quality coffee beans. The drying yard should be located in an elevated place with maximum sunshine, away from flooding or animal pollution. It needs a tiled, concrete, brick, or granite surface. Coffee beans should not be dried on bare soil or soil smeared with cow dung or slurry. Farmers without appropriate drying yards can use plastic or tarpaulin sheets, provided the coffee is turned frequently. The drying yard should be smooth with no crevices or cracks to avoid microbial propagation.

Moisture Management: Moisture meters (Kappa, Sinar, etc.) are used in large farms and curing factories, but small and marginal farmers use conventional methods. Moisture is estimated based on water loss from drying coffee mass using a metallic vessel called a 'forlit' (forty liters). When a forlit of raw coffee weighs 15.5 kg (parchment coffee) or 18 kg (cherry coffee), the moisture content is estimated at the appropriate drying level of 10 and 11%, respectively. However, this method is not reliable. Moisture estimation using the test weight method often produces erroneous results compared to moisture meters and the oven dry method. Coffee measured using the test weight method is either under-dried or over-dried, affecting cup quality and attracting higher mold and OTA contamination (Velmourougane, Panneerselvam, Gopinandhan & Jayarama, 2006).

Waste Management and Pollution Abatement: Coffee pulp and wastewater are primary waste products in coffee processing. Solid waste generated during processing is often used as compost in coffee plantations (Velmourougane & Kurian, 2012). Coffee waste, rich in polysaccharides and other nutrients, can become a source of harmful molds and OTA if not fully decomposed. Coffee processing wastewater (CPW) consists of sugar, pectin, tannin, caffeine, soluble salt, and suspended solids, which are highly acidic and can ferment, generating a foul smell (Dhananjaya, Srinivasamurthy & Bhaskar, 2009). CPW has unacceptable color, odor, high biological oxygen demand (BOD), and chemical oxygen demand (COD) (Velmourougane & Bhat, 2012). Reusing CPW for irrigation or composting can lead to land abuse or soil quality deterioration. Managing coffee waste, especially liquid wastes, is a major sustainability challenge along the coffee production chain.

2.4.3 Curing

Curing involves processing green coffee beans to improve their quality and prepare them for the market. This section covers plant capacity, drying facilities, moisture management, dust control, storage capacity, and methods.

Plant Capacity, Drying Facilities, and Moisture Management: The curing capacity of factories determines the quantity of coffee processed and its quality. Delays in curing pose problems like physical and cup quality changes, storage pest attack, off-taste, mold contamination, and low prices. Entry-level moisture checking is challenging as the receiving coffee lot is heterogeneous. Moisture meters, frequently calibrated, are recommended in curing factories instead of the test weight method. Drying yard facilities are crucial for curing factories, as under-dried coffee must be dried to factory moisture levels before curing. The Coffee Board provides finance for setting up curing works to speed up curing and preserve coffee quality.

Dust Control, Storage Capacity, and Methods: Dust accumulation in curing factories is a major problem. Operations like de-hulling, destruction, and polishing create dust, a potential source of mold pollution. Studies show that dust generated by curing machinery harbors high percentages of toxigenic molds (Velmourougane, Prafulla & Gopinandhan, 2008). Storage availability is another big challenge. Farmers store coffee in curing factories until market prices are favorable. If prices are not favorable, continued storage creates space constraints and quality issues.

2.4.4 Transport

Transporting cured coffee to ports for shipment involves challenges related to moisture management, packaging methods, and shipment delays. Proper handling during transport is essential to maintain coffee quality.

Moisture Management and Packaging Methods: Cured coffee is transported to ports for shipment, generally packed in sisal or jute bags (60 kg each) using conventional road transport. The time lag between loading and unloading is crucial as it affects quality. Coffee seeds contain moisture, and inappropriate packing, transport delays, or harsh conditions can make seeds 'sweat,' inviting molds and affecting quality. Proper packing methods like bulk packing in plastic-lined sheets maintain uniform moisture and temperature.

Shipment Delays: Coffee beans are highly hygroscopic and readily absorb atmospheric moisture, posing problems during long-distance shipment. Delays between loading and shipment should be minimized. Ensuring airtight containers and appropriate storage bags without leaks, wetting, or stains is crucial. Saddle stow is the best way to stow bags in a container, minimizing air circulation and moisture transportation.

2.4.5 Consumer Preference and Quality Issues

Quality is the most critical factor determining coffee prices in the international market. Coffee quality is assessed visually (moisture, size, color, roast quality, presence of defects, foreign matter) and organoleptically (body, acidity, aroma). Though quality largely depends on genetic makeup, intrinsic quality also depends on altitude, soil type, bean size and density, plant age, farm management, processing methods, and climatic factors. On-farm and off-farm practices significantly influence overall coffee quality. Careful handling at the farm and curing level can enhance inherent quality, while faulty processing practices may deteriorate quality.

2.4.6 Trade-Related Barriers

According to the World Trade Organization (WTO), member countries can implement sanitary and phytosanitary measures to protect human, plant, and animal life and health. The Codex Alimentarius Commission prescribes limits for residues and contaminants in food for human consumption, including maximum limits for different contaminants in green and roasted coffee beans (Gopinandhan, Velmourougane, Keshamma, Raghuramulu, 2008). The occurrence of mycotoxins (specifically OTA) in coffee has become a major trade barrier, affecting the economy of producing countries. OTA is classified as possibly carcinogenic to humans (Bhat, Rai & Karim, 2010).

2.5 Reviews on Previous Studies

Khin Le Mon (2009) studied the plantation and production of coffee in Myanmar, highlighting the crop's potential to fulfill domestic consumption and export needs. The Myanmar coffee industry is in its infancy, with opportunities for growth and benefits for

farmers. Private investors are driving the coffee industry by planting new coffee farms, but they need assistance with coffee marketing.

Shwe Yee Phoo Wai (2020) investigated factors influencing sustainable agricultural practices of farmers in Taikkyi Township, Yangon. The study showed that credit access significantly influences sustainable agricultural practices. Adoption of new technology and environmental awareness also significantly influence sustainable practices. Agriculture plays an important role in Taikkyi Township's economy, providing income to 18% of households.

Aung Naing Oo (2022) studied barriers to widespread adoption of Good Agricultural Practices (GAPs) and their impact on agricultural firms in Sagaing Region. The study found that while agricultural products conform to GAP standards, farmers are hesitant to adopt these practices.

Aderolu, Anagbogu, and Asogwa (2014) investigated major factors affecting coffee production and marketing in Kabba, Kogi State, Nigeria. The study revealed that Robusta coffee is mainly planted due to its adaptability to climate and soil and its ability to thrive despite high sunshine intensity. Many coffee producers have abandoned cultural practices that could improve yield, such as pest and disease control and soil improvement practices. The major marketing issue is reliance on external exporters, with international price trends affecting local producers.

Lee, Cho, Maskey, Nguyen, and Bae (2023) discussed the broad applications of coffee by-products collected throughout farming, processing, and consumption. Instead of being discarded as waste, coffee by-products can be used as raw materials for value-added products. Profitable and health-promoting products can be manufactured using coffee leaves, flowers, pulp, husks, silver skin, and used coffee grounds. Used coffee grounds, an abundant food waste worldwide, can be used to produce phenolic compounds, polysaccharides, biodiesel, antioxidants, bio-oil, bioethanol, and biopolymers like polyhydroxyalkanoates.

CHAPTER 3
COFFEE PLANTATION AND PRODUCTION IN MYANMAR

3.1 Historical Background of Coffee Cultivation

The history of coffee cultivation dates back several centuries, originating in Ethiopia. According to historical accounts and local legends, coffee beans were first discovered in the Ethiopian region of Kaffa. It is widely believed that a goat herder named Kaldi observed his goats exhibiting unusually energetic behavior after consuming the berries from a particular tree. This observation led to the discovery of the stimulating effects of coffee beans. The knowledge and use of coffee spread from Ethiopia to the Arabian Peninsula, where it quickly gained popularity, especially in Yemen. By the 15th century, coffee cultivation and trade had firmly established themselves in the Arabian Peninsula, with the beans being roasted and brewed in a manner similar to contemporary practices.

The journey of coffee extended beyond the Arabian Peninsula as it reached the Ottoman Empire and later Europe during the 17th century. The Dutch played a pivotal role in introducing coffee cultivation to Asia. Recognizing the economic potential of coffee, they established plantations in their colonies, particularly in Java, Indonesia. Java became the first region outside of Arabia to cultivate coffee on a substantial scale. The successful establishment of coffee plantations in Java spearheaded the expansion of coffee cultivation throughout Southeast Asia, setting the stage for its widespread adoption in the region.

Coffee production remains a significant agricultural activity worldwide. As of the 2022/2023 coffee year, global coffee production was approximately 171.3 million bags, rebounding from a slight decrease in the previous year due to adverse weather conditions and other challenges. South America remains the largest coffee-producing region, accounting for over 82 million bags, while Asia and Oceania produced approximately 49.7 million bags. Africa and Mexico & Central America contribute significantly as well, with

Africa showing a notable increase in production over the past decade. The top coffee-producing countries include Brazil, Vietnam, Colombia, Indonesia, and Ethiopia, each playing a crucial role in the global coffee market.

3.2 Historical Development of Coffee Cultivation in Myanmar

The cultivation of coffee in Myanmar dates to 1885, initiated by missionaries in Myeik and Dawei. Despite the establishment of two experimental coffee farms by the Department of Forestry, these efforts were short-lived. Concurrently, coffee farms were established in the Nancho area of Kayin State. Karen tribesmen developed and produced Robusta coffee, a practice that continues today. Roman Catholic missionaries introduced Arabica coffee in 1930 in Southern Shan State and Northern Shan State, particularly in Pyin Oo Lwin, areas that still produce Arabica coffee.

From 1930 to 1934, a significant 120-acre Arabica coffee plantation, Chaungwe, was established in Naung Cho Township, Northern Shan State, and remains productive. By 1935-1936, Myanmar's total coffee production was 268 tons, with imports of 175 tons and roasted ground coffee production at 108 tons. During 1932-1936, Myanmar exported 95 tons of coffee, with 60% going to the Madras Presidency in India, 31% to other parts of India, 7% to the UK, and the remainder to other countries. In 1952, the Chaungwe group established an additional 60 acres of Arabica coffee near Pyin Oo Lwin in Mandalay Region.

From 1968 to 1994, the Ministry of Industry managed state coffee farms, including Chaungwe, Pyin Oo Lwin, Pwe Daung, and Banbwe, which were previously private. In 1971, the total coffee area was 6,379 acres with a production of 859 tons. In December 1994, the state coffee industry was handed over to Myanmar Farm Enterprises (MFE). In the late 1980s, the Government of Myanmar initiated a nationwide coffee planting program, introducing new varieties from Costa Rica, such as Catimor and Catuai, with three tons of seed imported in 1986.

Expansion Phases and Production

The expansion campaign consisted of three phases: the first from 1975 to 1981, the second from 1981 to 1986, and the third from 1986 to 1991. By 1984-1985, the coffee

growing area was approximately 10,000 acres, with 86% consumed domestically and the remainder exported. From 1977 to 1985, average annual production was 1,146 tons. By 1986, production increased to 1,417 tons from 10,100 acres. By 2003-2004, the production area totaled 35,485 acres. In 2003-2004, production was 3,380 tons from 15,351 acres.

In 2004, the Government of Myanmar strategized to extend Arabica coffee cultivation to 100,000 acres, selecting suitable areas of 50,000 acres in Mandalay Region around Pyin Oo Lwin and Northern Shan State around Naungcho. Projections included planting 20,000 acres in 2004-2005, 40,000 acres in 2005-2006, and 40,000 acres in 2006-2007. Additionally, four large private companies planned to extend coffee planting over 30,000 acres in Southern Shan State (Yaksauk and Indaw/Kyakgu areas).

Recent Developments

In recent years, coffee acreage in Myanmar has increased, particularly in the Northern Myanmar region, known for its high-quality Arabica coffee due to high elevation plateaus with rich red soils and ample rainfall. A coffee expansion program in Myanmar has incorporated better production methods, coffee processing techniques, and farmer training, leading to higher returns and increased potential for high-quality Arabica coffee production.

Currently, Myanmar has over 50,000 acres of coffee plantations, primarily in Shan State and Mandalay Region, with new expansions in Chin State and Kachin State. In Mandalay, most farmers own large estates and produce washed coffee, while Shan State producers are mostly smallholders with less than a hectare of land. These plantations produce 12,000 tons of coffee per yield, with 85% Arabica, 14% Robusta, and 1% other varieties. Despite the presence of specialty coffee species, growers face challenges due to technological limitations and market weaknesses.

Myanmar plans to implement 200,000 acres of highland Arabica coffee by dividing into four zones and 100,000 acres of lowland Robusta coffee in three zones. The Arabica coffee expansion project includes Pyin Oo Lwin, Mogok, and Nawnghkio (Zone 1); Ywangan, Pindaya, and Naungtayar (Zone 2); Hopong, Heho, Pinlaung, and Mongnai (Zone 3); and Kengtung and Tachilek (Zone 4). Robusta coffee cultivation will expand in Taninthayi Region (Zone 1), Ayeyawady Region (Zone 2), and Kayin State (Zone 3).

Shan State is the main producer of Myanmar's coffee beans with 27,000 acres, followed by Kayin State (10,029 acres) and Mandalay (over 5,000 acres). At present, Myanmar's coffee plantations have covered 60 per cent of the land areas where coffee can be grown. The coffee farmers are entitled to seek land permits under the existing laws. As Myanmar's coffee bean is a lucrative crop, the coffee industry will boost production in the coming years, aiming to add 200,000 more acres. Myanmar's coffee is harvested between December and March and distributed to the markets in late April. The coffee bean is mostly grown in Mandalay Region and Shan State and can be found in other regions and states as well.

Table (3.1) Current Coffee Plantation Data (In Acres)

Year	Total Area (Acres)	Harvest Area (Acres)	Harvest (%)
2018-2019	115750	36000	31.1
2019-2020	135750	52000	38.3
2020-2021	155750	68000	43.7
2021-2022	175750	84000	47.8
2022-2023	205750	100000	48.8

Source: Department of Agriculture, 2024

The table indicates a consistent increase in the total coffee plantation area year by year, leading to a corresponding increase in the harvested area. This discrepancy is influenced by factors such as weed management, appropriate application of organic fertilizers and pesticides, and natural disasters.

3.2.1 Preparing the Field

Preparing the coffee planting area at least one year before planting is crucial. The procedures include: (1) land preparation, (2) planting windbreaks, (3) marking rows, (4) establishing shade trees, and (5) irrigation.

Land Preparation: The land must be cleared, with old trees and roots removed to avoid attracting pests. For land up to a 15% slope, rows should be run across the slope with a fall of 1-2% for drainage, and ground covers should be planted to prevent erosion. For slopes greater than 15%, contour planting is necessary. Coffee is planted in rows 8 feet (2.4 meters) apart, with plants 4 feet (1.2 meters) apart within the row.

Planting Windbreaks: Windbreaks are recommended only in sites exposed to strong winds. They should be well established before planting coffee trees, usually along the boundaries of the coffee area. Silver Oak (Grevillea robusta) is a preferred windbreak tree in Myanmar.

Marking Rows: Ideally, rows should be oriented north/south to maximize sunlight. The rows should be clearly marked.

Establishing Shade Trees: Shade trees should be planted one year before coffee trees to protect young plants from drought stress and overexposure to the sun, which can cause leaf yellowing and death. Shade also promotes balanced flowering and growth, resulting in better cherry production. Preferred shade trees include Erythrina subumbrans, Grevillea robusta, Gliricidia sepium, Cassia siamea, Melia azedarach, and Paulownia tomentosa.

Irrigation: If irrigation is to be used, it should be installed before planting coffee trees. Without irrigation, both shade trees and coffee will need hand watering for a few weeks until established.

3.2.2 Planting Coffee Trees

The procedures for planting coffee trees include: (1) seedling size and timing, (2) preparing the holes, (3) selecting the plants, and (4) planting procedure.

Seedling Size and Timing: Planting can begin when coffee plants in bags have at least six to eight leaf pairs. The plants should be strong and healthy, with no signs of pests or disease. Planting should be done on cloudy days, from June to August during the wet season. Avoid planting during windy, hot, or dry conditions.

Preparing the Holes: One month before planting, the planting holes are marked and dug to dimensions of 2 x 2 x 2 feet (60 x 60 x 60 cm). Topsoil and subsoil are piled separately, and farmyard manure and Triple Superphosphate (TSP) are mixed in and used to fill the

holes with topsoil. One month later, dolomite is spread over the soil in the planting hole and dug in. The soil should be moist at planting time.

Selecting the Plants: Healthy coffee plants with dark green, well-formed foliage and at least six to eight leaves should be selected. The plants should have no stem damage, a well-developed root system, and not be root-bound.

Planting Procedure: Before planting coffee trees, ensure they are thoroughly watered while still in their bags. When removing plants from plastic bags, either cut the bag away or gently slide the plant out, discarding any with J-roots or bent roots. For plants in bags for an extended period, gently untangle any roots that have grown in circles to prevent continued growth in this manner. Remove the plastic bag completely before planting. Position the seedling upright in the hole without tilting it, fill half the hole with soil and gently press it around the root ball. Water thoroughly to settle the soil, then finish filling the hole and press the soil down lightly with your feet. Avoid planting in depressions that retain water, which can be harmful to coffee plants. Water each plant well with 1.5 to 3.5 pints (1 to 2 liters) of water. Mulch newly planted coffee trees with rice straw or similar material, ensuring it's kept away from the plant base to reduce disease risk, especially reapplying after the wet season. Use crops like Pigeon pea or sorghum for temporary shade and Blady grass for frost protection. Ground covers such as Pinto peanut or Green leaf desmodium control weeds, add nitrogen, and provide mulch and cattle feed, with prunings from shade trees acting as a nutritious protein supplement for cattle.

3.2.3 Harvesting and Processing

Careful selection of red cherries during harvesting is crucial for good quality coffee. Only ripe, red cherries should be processed. Harvesting for Arabica takes place from November to February. Clean, washed bags should be used for collection. Cherries should be processed the same day as harvesting.

The processing of coffee involves transforming fresh cherries into clean, green beans ready for export or roasting. This includes harvesting, pulping, fermenting, washing, drying, hulling, cleaning, grading, sorting, storing, and transporting green beans. Processing methods include natural, semi-wash, and full-wash processes.

Natural Process: The coffee bean is dried inside the whole fruit to 12% moisture. The dry cherry is then hulled to produce a dry green bean. This low-cost method results in lower quality coffee and is not recommended for high-quality production.

Semi-wash Process: The skin of the fresh cherry is removed by a pulper machine with water, and the mucilage is immediately removed using a demucilager. The clean parchment is then dried until the bean reaches 12% moisture.

Full-wash Process: The skin of the fresh cherry is removed using a pulper machine with water, and the mucilage is allowed to ferment for one to two days before being washed thoroughly. The parchment is dried until the bean reaches 12% moisture. This method can produce high-quality coffee but requires large amounts of water and careful management.

3.3 Coffee Production

Coffee production in Myanmar is widespread across various States and Regions. Arabica is predominantly produced in upland northern areas, while Robusta is produced in lowland southern regions. Smallholders produce 80% of the coffee, with the remainder from larger estates. Arabica accounts for approximately 66% of total production, while Robusta makes up about 33%.

Myanmar plans to add 300,000 acres of coffee cultivation by 2023-2024 to boost exports and penetrate international markets. The annual coffee production is estimated at 7,000 tons, with about 800-1,000 tons exported to Asian countries, the US, and EU member countries, predominantly to Belgium.

Table (3.2) Current Coffee Production Data

Year	Tonnes
2018-2019	6154
2019-2020	6280
2020-2021	6550
2021-2022	6684
2022-2023	6820

Source: Myanmar Coffee Association, 2024

Table 3.2 shows the current coffee production data in Myanmar from the year 2018 to 2023. According to the data from Myanmar Coffee Association, 2024, the coffee production has shown a steady increase over the past five years. Starting from 6,154 tonnes in the 2018-2019 season, production has consistently risen, reaching 6,820 tonnes in the 2022-2023 season. This upward trend reflects the growing capacity and efficiency in coffee cultivation, supported by favorable climatic conditions and ongoing agricultural advancements.

3.4 Coffee Market

Historically, Myanmar has been dominated by a teashop culture where tea consumption significantly outweighed coffee consumption, especially before 1988. At that time, coffee was primarily consumed at home rather than in teashops, and there were no cafés offering a variety of coffee styles. Coffee's presence in the public sphere was minimal due to low demand and appreciation among local customers.

In the early 1990s, coffee began to appear on teashop menus, leading to a gradual increase in its consumption both in teashops and households. However, the offerings were limited, with styles such as cappuccinos, espressos, and café lattes largely absent. Since 1995, several coffee shops have endeavored to introduce Western-style coffee culture in Yangon, followed by Mandalay. This effort has paid off, with the coffee culture steadily growing, and four to five new cafés opening monthly in Mandalay. The consumption of instant coffee has declined in Yangon as the number of coffee shops selling freshly ground coffee has surged, creating numerous job opportunities.

One of the pioneering coffee houses, Fuji Coffee House in Yangon, initially faced challenges related to ingredient supplies, importing coffee machines, and adapting to the local consumer culture. Over time, however, Myanmar consumers embraced Western-style coffee culture. The growth of the tourism industry and increased international collaboration also boosted the number of coffee shops and restaurants offering Western-style coffee to both local and international customers.

The demand for locally grown coffee in Myanmar has risen significantly in both domestic and foreign markets, with Arabica coffee being the most popular. Since 2019, the supply and demand for coffee have increased, both locally and internationally. The market

for coffee cherries, which are peeled, has grown, with dried and peeled berries being stocked for year-round use.

In addition to Arabica, Myanmar also grows Robusta, Liberica, and Excelsa coffees. Approximately 80% of Myanmar's coffee is produced by small farms using traditional processing methods, such as dry processing where the coffee bean is dried in the cherry and then hulled by pounding. Most Arabica coffee is grown in the northern uplands, while Robusta is primarily grown in the southern lowlands. About two-thirds of Myanmar's annual coffee crop is Arabica, with the remainder being Robusta. The Specialty Coffee Association of America (SCAA) has recognized Myanmar's Arabica and Robusta coffees as meeting international standards, with scores of 89 for highland Arabica and 92 for lowland Robusta, indicating world-class quality.

Myanmar's high-quality coffee commands prices higher than global averages in Western countries, with both local consumption and small-scale production rates being high. The coffee is in demand due to its superior quality, and it regularly fetches premium prices.

Table (3.3) Coffee Export (In Tonnes)

Year	Tonnes	US$	Export Countries
2018-2019	107	877400	Australia, Belgium, Germany, Italy, Japan, USA, UK
2019-2020	86	705200	Australia, Belgium, Germany, Spain, Japan, South Korea, UK
2020-2021	113	954850	Australia, Belgium, Spain, Japan, UK
2021-2022	151	1275950	Australia, Belgium, Germany, Spain, Japan, South Korea,
2022-2023	35	297500	Germany, Japan, Spain, USA, UK

Source: Myanmar Coffee Association, 2024

As shown in data from Table 3.3, Myanmar's coffee is exported to fourteen countries, including the UK, USA, Netherlands, New Zealand, Australia, Germany, Japan,

China, Korea, Chinese Taipei, and Thailand. Coffee farmers in Myanmar are focused on producing high-quality coffee rather than merely trading, which enhances the value of their exports. The country's quality coffee fetches between $8,200 and $8,500 per tonne. Pyin Oo Lwin Township produces 500 metric tons of coffee annually, while Ywangan produces 700 metric tons, with Shan State being a leading producer.

Given the economic value of coffee, approximately half of Myanmar's production is exported. International trade partners are increasingly interested in Myanmar's coffee, seeing significant export potential. Efforts in the value chain, including value-added production and the selection of pedigree coffee seeds by farmers, have led to successful outcomes in cupping competitions.

Myanmar has been producing specialty coffee since 2014-2015. This specialty coffee is exported to Japan, South Korea, the US, and EU countries. The coffee industry is making concerted efforts to penetrate the German market and expand beyond the existing fourteen foreign markets. Buyers from Thailand have shown keen interest in Myanmar's specialty coffee, particularly from Ywangan, Pinlaung, Hopong, Mogok, and Pyin Oo Lwin.

3.5 The Importance of Local Communities

Local communities play a crucial role in the sustainable practices of coffee farming in Myanmar. Local farmers possess intimate knowledge of their land, enabling them to identify suitable areas for cultivation while respecting the environment's delicate balance. Traditional methods of nurturing coffee trees, such as pruning and nutrient management, have been passed down through generations and are integral to maintaining high-quality coffee production. Myanmar’s coffee farming combines traditional hand-picking and sorting techniques with modern roasting and brewing methods.

Coffee farmers meticulously pick the beans by hand to ensure that only ripe, high-quality beans are used. These beans are then carefully sorted to remove any foreign matter or defective beans before being processed and roasted. This attention to detail ensures the production of premium coffee beans.

Supporting local communities provides significant economic and social benefits. By collaborating, farmers can share resources such as labor, tools, and seeds more

efficiently, resulting in higher-quality harvests at lower costs. Furthermore, community-led initiatives, such as healthcare programs and educational initiatives, contribute to the overall well-being of these communities and help reduce poverty levels.

The sale of coffee also helps preserve traditional farming techniques, which are more environmentally friendly compared to industrialized processes. By maintaining these techniques, villagers ensure that their knowledge is preserved and passed down through generations. Additionally, rural communities often provide social spaces where people can come together to discuss new ideas or share experiences related to coffee production and consumption. These conversations foster community relationships and bring attention to social issues, such as deforestation and water pollution caused by unsustainable farming practices, ensuring that sustainable practices are adopted for the benefit of future generations.

According the information from Myanmar Coffee Association, annual permanent workers and Temporary workers (day-laborers) in coffee firms are shown in Table 3. 4.

Table (3.4) Annual Permanent and Temporary (Day-Labor) Workforce in Coffee Farms

Year	Permanent Workers	Temporary Workers
2018 – 2019	25	50
2019 – 2020	25	45
2020 – 2021	25	50
2021 – 2022	25	70
2022 – 2023	25	50

Source: Myanmar Coffee Association

The coffee firms employ about 25 permanent staff members. Additionally, there are always at least 50 day-laborers called in not only during the coffee season but also for daily tasks. Even during the 2019-20 Covid-19 period, the number of employees was reduced to only 5 people. In the late 2020s and early 2021, the ability to export more tons of coffee prompted a re-estimation of the need for 50 day-laborers. During the 2021-22 period, the

coffee firms were able to export 150 tons of coffee, necessitating the recruitment of 70 employees.

Currently, the staff strength is not determined by each farm but by the number of staff appointed by MCG. The day workers are residents from around Pyin Oo Lwin, as well as individuals from other areas who come to work.

CHAPTER IV
SURVEY ANALYSIS

This chapter presents the data analysis results derived from the study sample, followed by a thorough analysis and discussion of these findings. It encompasses the profile of the survey area, the survey design, and the survey results.

4.1 Profile of Survey Area

Pyin Oo Lwin Township, a renowned mountain resort and scenic hill town in the Mandalay Region, has long served as a hot-season getaway for local travelers. Originally known as May Myo, it was a summer retreat during British rule. Pyin Oo Lwin Township is located between latitudes 21°48' N and 22°12' N and longitudes 96°12' E and 96°45' E. The township spans 30 miles from east to west and 46 miles from north to south, situated 200 feet above sea level in the low-lying plains. It borders Naung Cho Township to the east and north, Pathein Gyi Township and Madaya Township to the west, and Kyaukse Township to the south.

Pyin Oo Lwin Township has an elevation ranging from a minimum of 205 feet to a maximum of 4,295 feet above sea level, with the township itself situated at 3,538 feet above sea level. The terrain is hilly and mountainous, featuring a cool climate year-round. The temperature ranges from a maximum of 35°C to a minimum of 1.5°C. According to the Pyin Oo Lwin Township General Administration Department report (2023), the population is 263,149, with 58% (152,807 people) residing in urban areas and the remaining 42% (110,342 people) in rural areas. The township comprises 116 villages, 37 village tracts, and 21 wards. Table 4.1 provides detailed information on the rural and urban areas in Pyin Oo Lwin Township.

According to the 2023 report from the Pyin Oo Lwin Township General Administration Department in Table 4.1, the population distribution and housing characteristics reflect notable differences between urban and rural areas.

Table 4.1 Details on Rural and Urban Areas in Pyin Oo Lwin Township

Description	Houses	Households	Wards	Village Tracts	Villages	Population
Urban	24105	26058	21	-	-	152807
Rural	18312	22450	-	37	116	110342
Total	**42417**	**48508**	**21**	**37**	**116**	**263149**

Source: Pyin Oo Lwin Township General Administration Department (2023)

The urban area of Pyin Oo Lwin Township is home to a larger population segment, with 58% of the total population residing in this part of the township. Urban areas include 24,105 houses and 26,058 households, spread across 21 wards. The concentration of population in urban areas can be attributed to better access to amenities, educational institutions, healthcare facilities, and employment opportunities, which draw people from rural areas.

In contrast, the rural areas, which comprise 42% of the township's population, encompass 18,312 houses and 22,450 households. These areas are organized into 37 village tracts, consisting of 116 villages. The lower population density in rural areas is often due to limited access to the same level of services and infrastructure available in urban settings. However, the rural population remains significant, with many residents engaged in agriculture and other primary sector activities that are essential to the township's economy.

4.2 Survey Design

The survey collected responses from 30 coffee farm owners and 40 coffee producers or sellers actively involved in the coffee industry within Pyin Oo Lwin District, Mandalay Region.

The survey questionnaire was structured into five sections. The questionnaire comprised multiple-choice questions and utilized a five-point Likert scale. The first section gathered demographic information about the respondents, such as gender, age, educational qualifications, and years of residence in Pyin Oo Lwin Township. The second section

focused on agricultural details, including the primary coffee plant type, plantation size, planting pattern, tree density per acre, age of existing coffee trees, pesticide usage, fertilizer type, coffee yield per acre, and strategies for increasing yield. The third section addressed the production and distribution processes of coffee. The fourth section examined the composition of coffee sold in the local market. The final section explored the development of value-added coffee products.

The survey was conducted through voluntary participation interviews in December 2023. The questionnaire was initially written in Myanmar and then translated into English for broader accessibility.

4.3 Survey Results

The survey results compiled insights from a diverse group of participants, including 30 coffee farm owners and 40 coffee producers or sellers in Pyin Oo Lwin Township. This study captures the perspectives and practices of key stakeholders actively engaged in coffee cultivation and production within the region.

4.3.1 Characteristics of Respondents

The data from Table 4.2 provides valuable insights into the demographics of coffee farm owners, coffee producers and sellers in Pyin Oo Lwin Township.

In terms of gender, males are more prevalent than females among coffee farm owners and coffee producers or sellers, with 65.7% being male and 34.3% female. This disparity can be attributed to traditional gender roles and socio-cultural factors that influence occupational choices and opportunities. In many agricultural communities, men often assume the roles of landowners and primary decision-makers in farming operations, while women may be more involved in supportive roles.

The age distribution of coffee farm owners and coffee producers or sellers in the survey shows a varied range, with the majority being older adults. Only 4.3% are between 21 and 30 years old, while the largest groups are aged 51 to 60 years (28.6%) and 61 years and above (27.1%). Those between 31- and 40-years account for 22.9%, and 17.1% are between 41 and 50 years old. This trend indicates that coffee farming and production in Pyin Oo Lwin District are primarily managed by more experienced individuals, possibly

due to the extensive knowledge and skills required in this coffee industry, which are often acquired over many years.

Table 4.2 Characteristics of Respondents

Particular	**No. of Respondents**	**%**
Gender		
Male	46	65.7
Female	24	34.3
Total	**70**	**100**
Age Level		
21 Year to 30 Years	3	4.3
31 Years to 40 Years	16	22.9
41 Years to 50 Years	12	17.1
51 Years to 60 Years	20	28.6
61 Years and above	19	27.1
Total	**70**	**100**
Educational Qualification		
Under Graduated Level	17	24.3
Graduated Level	45	64.3
Post Graduated Level	8	11.4
Total	**70**	**100**
Living Township		
Pyin Oo Lwin Township	52	74.3
Other Township	18	25.7
Total	**70**	**100**
Living Years in Pyin Oo Lwin Township		
Less than 10 Years	31	44.3
11 Years to 20 Years	20	28.6
21 Years to 30 Years	13	18.6
More than 30 Years	6	8.6
Total	**70**	**100**

Source: Survey Data, 2024

In terms of their education level, a majority, 64.3%, have graduated from college or university, indicating a strong foundation in higher education. Those with post-graduate degrees make up 11.4% of the respondents, while 24.3% are below graduation. This suggests that the coffee industry in this region attracts individuals with substantial educational backgrounds, possibly due to the technical and managerial skills required for effective farming and production practices.

The survey results show that 74.3% of coffee farm owners and producers or sellers reside in Pyin Oo Lwin Township, while 25.7% live in other townships. This indicates that a significant majority of those involved in the coffee industry are local residents, which may contribute to a deeper understanding of the local climate, soil conditions, and other factors critical for coffee cultivation. The presence of a smaller proportion of individuals from other townships suggests that the industry also attracts outside talent, possibly for their expertise or investment in the region's coffee production.

According to their responses, majority of them (44.3%) have resided there for less than 10 years. This indicates a relatively high turnover of new residents in the township, which could impact various aspects of the local coffee industry, such as land use patterns, agricultural practices, and community dynamics. The presence of individuals who have lived in the township for 11 to 20 years (28.6%) and 21 to 30 years (18.6%) also suggests a stable, yet evolving community with deepening roots. The smaller percentages for those residing more than 30 years (8.6%) may reflect long-term residents who likely have extensive knowledge and experience in the area’s coffee production landscape, potentially influencing decision-making and community cohesion within the industry.

Table 4.3 provides a detailed overview of the coffee plantation practices among the survey respondents engaged in coffee cultivation.

Table 4.3: Types of Coffee Cultivated in Pyin Oo Lwin Township

Sr No.	Particular	No. of Respondents	%
1	Arabic	30	100
2	Robusta	0	0
Total		**30**	**100**

Source: Survey Data, 2024

The table reveals that all respondents in the survey predominantly cultivate Arabic coffee plants, indicating a strong preference for this variety in the region. Additionally, the distribution of respondents across different farm sizes and plantation patterns offers insights into the scale and organization of coffee cultivation activities. The data on the number of coffee plants per acre further highlights the planting density practices adopted by coffee farmers in the surveyed area. This information is valuable for understanding the agricultural practices and productivity levels within the coffee plantation sector, contributing to a comprehensive understanding of coffee production dynamics in the region.

Table 4.4 describes the breakdown of the surveyed respondents based on the size of their coffee farms in Pyin Oo Lwin Township

Table 4.4 Coffee Farm Sizes in Pyin Oo Lwin Township

Sr No.	Particular	No. of Respondents	%
1	Less than 5 Acres	4	13.3
2	5 Acres to 10 Acres	3	10.0
3	10 Acres to 15 Acres	11	36.7
4	More than 15 Acres	12	40.0
Total		**30**	**100**

Source: Survey Data, 2024

Based on the survey result, the most significant category is farms with more than 15 acres, comprising 40.0% of respondents. This predominance suggests that larger coffee plantations are common, likely due to economies of scale and greater production capacity. Conversely, the least represented category is farms of 5 to 10 acres, accounting for only 10.0% of respondents, which may reflect challenges in maintaining medium-sized farms or a preference for either small-scale or large-scale operations.

Table 4.5 illustrates the overview of the various types of planting patterns employed in coffee plantations by the surveyed respondents in Pyin Oo Lwin Township.

Table 4.5 Varieties of Coffee Plantation Patterns in Pyin Oo Lwin Township

Sr No.	Particular	No. of Respondents	%
1	4’ X 4’	5	16.7
2	6’ X 3’	4	13.3
3	6’ X 4’	6	20.0
4	8’ X 4’	13	43.3
5	8’ X 8’	2	6.7
Total		**30**	**100**

Source: Survey Data, 2024

The data reveals the distribution of respondents across these different planting patterns, with a predominant preference for the 8' x 4' pattern among the surveyed individuals. This information sheds light on the layout strategies adopted by coffee farmers in the region, offering insights into the efficiency, productivity, and management practices within coffee plantations. Understanding the types of planting patterns utilized in coffee cultivation is essential for optimizing land use, crop yields, and resource allocation, contributing to sustainable agricultural practices and enhanced productivity in the coffee sector.

Table 4.6 shows the number of coffee plants per acre based on the response of individuals who cultivated coffee in this survey township.

Table 4.6: Number of Coffee Plants Per Acre

Sr No.	Particular	No. of Respondents	%
1	1000 to 2000	25	83.3
2	2000 to 3000	5	16.7
Total		**30**	**100**

Source: Survey Data, 2024

The survey results indicate that the majority of respondents, 83.3%, cultivate between 1,000 to 2,000 coffee plants, while only 16.7% grow 2,000 to 3,000 plants. This

significant data suggests that most coffee farm owners in Pyin Oo Lwin District operate small to medium-sized farms. The preference for cultivating 1,000 to 2,000 plants could be due to several factors, including available land, labor resources, and the management capacity of individual farmers. Smaller farms may also allow for more intensive care and maintenance of the coffee plants, leading to better quality yields.

In table 4.7, pesticide usage and types of fertilizers used in coffee farming are analyzed based on the response of the coffee farmers.

The survey results reveal important trends. A significant majority of respondents (70%) reported not using pesticides, while only 30% did. This preference for limited pesticide use could be driven by a growing awareness of environmental sustainability and the desire to produce organic coffee.

Table 4.7: Pesticide Usage and Types of Fertilizers used in Coffee Farming

Sr No.	**Pesticides**	**No. of Respondents**	**%**
1	Yes	9	30.0
2	No	21	70.0
Total		**30**	**100**
Sr No.	**Type of Fertilizer**	**No. of Respondents**	**%**
1	Organic	19	63.3
2	Inorganic	3	10.0
3	Organic and Inorganic	8	26.7
	Total	**30**	**100**

Source: Survey Data, 2024

Regarding fertilizers, 63.3% of respondents prefer using organic fertilizers, underscoring a commitment to environmentally friendly farming practices. In contrast, 10% use inorganic fertilizers, and 26.7% use a combination of both organic and inorganic fertilizers. The predominant use of organic fertilizers highlights the industry's move towards sustainable agriculture, likely influenced by market demand for organic products and the long-term benefits of maintaining soil health.

Table 4.8 describes the timing of coffee plant care based on responses collected from individuals representing coffee farms.

Table 4.8 Care Activities for Coffee Plants

Sr No.	Particular	No. of Respondents	%
1	Daily	21	70.0
2	Daily, One Time per Week and Two Times per Week	2	6.7
3	Daily and One Time per Week	2	6.7
4	One Time per Week and Two Times per Week	3	10.0
5	One Time per Month	2	6.7
	Total	**30**	**100**

Source: Survey Data, 2024

According to the survey findings on the timing for coffee plant care, 70.0% of coffer farmers indicated that they perform care activities on a daily basis. A smaller percentage, 6.7%, reported undertaking care activities daily, weekly, and biweekly. Similarly, 6.7% indicated a routine of daily care combined with weekly attention, while another 10.0% reported caring for their plants once per week and twice per week. A minority, 6.7%, manage care on a monthly basis. These diverse practices reflect varying approaches to managing coffee plant health and productivity, influenced by factors such as farm size, labor availability, and specific cultivation practices suited to local conditions in Pyin Oo Lwin District.

Table 4.9 indicates that the comparison of coffee yield reported by respondents with the previous year's figures. It provides insights into the fluctuations in coffee production among surveyed individuals in Pyin Oo Lwin District, Mandalay Region.

Table 4.9 Comparison of Coffee Yield with the Previous Year

Sr No.	Particular	No. of Respondents	%
1	Less than	20	66.6
2	Same	5	16.7
3	More than	5	16.7
Total		**30**	**100**

Source: Survey Data, 2024

According to the survey findings on coffee yield comparison with the previous year, the majority of respondents, accounting for 66.6%, reported lower yields compared to the previous year. A smaller proportion, 16.7% each, indicated that their yields remained the same or increased. These results highlight challenges within the coffee industry of Pyin Oo Lwin District, suggesting potential factors such as climate variations, pest outbreaks, or agricultural practices that may impact yield fluctuations from year to year.

In Table 10, their perspectives on factors contributing to increased coffee yield are analyzed accordingly.

The survey data on reasons for increasing coffee yield in Pyin Oo Lwin District highlight several key factors rated highly by respondents. Good quality seeds (mean 4.97) and technical requirements (mean 4.87) emerged as top priorities, reflecting the importance of starting with superior planting materials and employing advanced agricultural practices to enhance productivity. Financial motivations (mean 4.83) also play a significant role, underscoring the economic incentives driving yield improvement efforts. Expansion of new plantations (mean 4.30) suggests a strategy for scaling up production capacity, while the emphasis on increased fertilizer use (mean 4.53) aligns with agronomic practices aimed at boosting crop health and yield potential. In contrast, lower mean ratings were given to the need for increased pesticide use (mean 3.00) and additional labor (mean 4.00), potentially reflecting concerns over environmental sustainability and labor availability.

Table 4.10: Factors Contributing to Increased Coffee Yield

Sr No.	Particular	Mean	S.D
1	Good quality seeds are needed.	4.97	0.183
2	Technically necessary.	4.87	0.434
3	Need money.	4.83	0.592
4	New coffee plantations need to be expended.	4.30	0.837
5	Need to use more fertilizers.	4.53	0.860
6	Need to use more pesticides.	3.00	0.365
7	Need to use more labor.	4.00	0.983
8	Needs government support.	4.70	0.466
9	Good quality seeds are needed.	4.97	0.183
10	Technically necessary.	4.87	0.434
Overall Mean Value		**4.40**	**0.534**

Source: Survey Data, 2024

Government support (mean 4.70) was identified as crucial, indicating a desire for policy backing and infrastructure development to bolster the coffee industry's growth and efficiency in the region. Overall, these findings underscore a multifaceted approach where agricultural innovation, financial incentives, and supportive policies are integral to achieving higher coffee yields in Pyin Oo Lwin.

4.3.3 Coffee Production and Selling

This section comprises responses primarily from individuals engaged in the production and sale of coffee berries, with a total of 25 respondents. Table 4.11 illustrates the various types of coffee production and sales based on their response.

Table 4.11 Different Methods of Coffee Cultivation and Marketing

Sr No.	Particular	No. of Respondents	%
1	Berries	11	46.0
2	Berries, Green Beans, Natural Dry, Roasted Coffee Beans and Coffee Powder	4	15.0
3	Berries, Green Beans, Natural Dry and Parchment	2	8.0
4	Green Beans, Natural Dry, Roasted Coffee Beans and Coffee Powder	3	12.0
5	Green Beans, Natural Dry and Coffee Powder	1	4.0
6	Berries, Roasted Coffee Beans and Coffee Powder	2	7.5
7	Roasted Coffee Beans and Coffee Powder	2	7.5
Total		**25**	**100**

Source: Survey Data, 2024

The survey data on different methods of coffee cultivation and marketing reveal a variety of approaches among respondents. The most prevalent method, selected by 46.0% of respondents, involves processing berries. This method likely reflects traditional practices in the region, where coffee is harvested as berries and processed accordingly. On the other hand, the least preferred methods include options like processing green beans, natural dry methods, and producing roasted coffee beans and coffee powder (4.0% each). These methods may require more specialized equipment or knowledge, and their lower adoption rates could stem from factors such as higher production costs or less familiarity among local growers. Overall, the diversity in cultivation and processing methods underscores the adaptability of coffee production practices in Pyin Oo Lwin District, catering to both traditional techniques and evolving market demands.

Table 4.12 presents detailed insights into the annual production and selling trends of various coffee products among respondents in Pyin Oo Lwin District. It highlights the quantities of green beans, natural dried coffee, roasted coffee beans, and coffee powder produced per year, segmented by different production scales.

Table 4.12: Annual Coffee Production and Sales

Sr No.	**Green Beans**	**No. of Respondents**	**%**
1	Less than 1 Ton	4	16.0
2	1 Ton to 5 Ton	6	24.0
3	More than 5 Ton	15	60.0
	Total	**25**	**100**
Sr No.	**Natural Dries**	**No. of Respondents**	**%**
1	Less than 1 Ton	8	32.0
2	1 Ton to 5 Ton	13	52.0
3	More than 5 Ton	6	24.0
	Total	**25**	**100**
Sr No.	**Roasted Coffee Beans**	**No. of Respondents**	**%**
1	Less than 1 Ton	5	20.0
2	1 Ton to 5 Ton	18	72.0
3	More than 5 Ton	2	8.0
	Total	**25**	**100**
Sr No.	**Coffee Powder**	**No. of Respondents**	**%**
1	Less than 1 Ton	17	68.0
2	1 Ton to 5 Ton	6	24.0
3	More than 5 Ton	2	8.0
	Total	**25**	**100**

Source: Survey Data, 2024

The survey results provide insights into the production and selling trends of coffee products per year among respondents in Pyin Oo Lwin District. Regarding green beans, 60% of respondents produce more than 5 tons annually, reflecting a robust output likely

influenced by favorable growing conditions and agricultural practices. In contrast, natural dried coffee sees a varied distribution, with 52% producing between 1 to 5 tons, suggesting fluctuations in drying methods and possibly seasonal impacts on yield. Roasted coffee beans show a strong preference for moderate production levels, with 72% falling within the 1 to 5-ton range, indicative of controlled roasting capacities and market demands. Conversely, coffee powder production leans heavily towards smaller scales, with 68% producing less than 1 ton annually, possibly influenced by processing complexities and market niches for specialized products. These patterns underscore the diversified approaches and operational scales within Pyin Oo Lwin's coffee industry, shaped by production capabilities, processing techniques, and market dynamics.

Table 4.13 describes the distribution of coffee processing methods among respondents in Pyin Oo Lwin District, Mandalay Region.

Table 4.13: Coffee Processing Methods

Sr No.	Particular	No. of Respondents	%
1	Natural Dry	2	8.0
2	Natural Dry, Washed/Wet and Honey	4	16.0
3	Natural Dry and Washed/Wet	6	24.0
4	Washed/Wet	10	40.0
5	Honey	3	12.0
Total		**25**	**100**

Source: Survey Data, 2024

The survey on coffee processing methods among respondents in Pyin Oo Lwin District reveals a varied approach, with a predominant preference for washed/wet processing, accounting for 40.0% of respondents. This method is favored for its ability to produce consistently clean and vibrant flavors in coffee beans. Natural dry processing, chosen by 8.0% of respondents, is valued for its simplicity and its potential to enhance certain flavor profiles through natural fermentation. The combined methods of natural dry and washed/wet, selected by 24.0% of respondents, offer flexibility in processing to achieve desired flavor complexities. Honey processing, chosen by 12.0% of respondents,

is appreciated for its unique sweetness imparted during the drying process with some mucilage left on the bean. These preferences reflect a blend of traditional practices, flavor considerations, and economic factors influencing coffee processing choices in the region.

Table 4.14 presents data on the coffee production area sizes among respondents in Pyin Oo Lwin District, reflecting diverse scales of cultivation within the local coffee industry.

Table 4.14: Coffee Production Area Sizes

Sr No.	Particular	No. of Respondents	%
1	Less than 1 Acre	9	36.0
2	1 Acre to 5 Acre	11	44.0
3	More than 5 Acre	5	20.0
Total		**25**	**100**

Source: Survey Data, 2024

According to the survey data on coffee production process acres, a significant portion of respondents operate on smaller land holdings, with 36.0% cultivating less than one acre and 44.0% managing between one to five acres. This distribution reflects the common practice among coffee farmers in Pyin Oo Lwin District, where many starts with smaller plots due to initial capital constraints or limited experience. The 20.0% of respondents farming over five acres likely represents more established operations or those expanding their coffee cultivation. This variability in acreage highlights the diverse scales at which coffee production occurs in the region, influenced by factors such as investment capacity, land availability, and growth ambitions within the industry.

Table 4.15 provides insights into the adoption of different coffee production technologies among respondents in Pyin Oo Lwin District.

Table 4.15: Coffee Production Technology

Sr No.	Particular	No. of Respondents	%
1	Traditional	6	24.0
2	New	12	48.0
3	Traditional and New	7	28.0
Total		**25**	**100**

Source: Survey Data, 2024

The survey data on coffee production technology in Pyin Oo Lwin District highlights a diverse approach among coffee firm owners. A significant portion, 48.0%, adopts new technologies in coffee production, reflecting a trend towards modern agricultural practices that enhance efficiency and yield. Meanwhile, 24.0% adhere strictly to traditional methods, possibly organic farming principles. Additionally, 28.0% of them integrate both traditional and new technologies, indicating a balanced approach that combines the advantages of conventional wisdom with innovative advancements. This distribution underscores the nuanced strategies employed by coffee producers to optimize production while maintaining cultural and environmental considerations in the Mandalay Region's coffee industry.

Table 4.16 presents the percentages of the coffee firm owners who use the drying and storage facilities for coffee production.

Table 4.16: Drying and Storage Facilities for Coffee Production

Sr No.	Particular	No. of Respondents	%
1	Yes	18	72.0
2	No	7	28.0
Total		**25**	**100**

Source: Survey Data, 2024

The survey data on drying and storage facilities for coffee production reveal that 72.0% of coffee firms owners have access to these facilities, while 28.0% do not. The high percentage of respondents with drying and storage facilities highlights the importance of

proper post-harvest processing in maintaining coffee quality. Access to these facilities allows producers to control the drying process, reducing the risk of mold and other contaminants, which can significantly impact the flavor and market value of the coffee. In addition, these facilities help extend the shelf-life of the beans in the market. Conversely, the 28.0% without such facilities may face challenges in ensuring consistent quality and could be more vulnerable to losses due to inadequate storage conditions.

An overview of the number of laborers employed in the coffee production and harvesting process among surveyed coffee firm owners are shown in the Table 4.17.

Table 4.17: Number of Labors in Coffee Production and Harvesting Process

Sr No.	Particular	No. of Respondents	%
1	Less than 5	7	28.0
2	5 to 10	9	12.0
3	10 to 15	4	16.0
4	15 to 20	2	8.0
5	More than 20	3	12.0
Total		**25**	**100**

Source: Survey Data, 2024

The survey data on the number of laborers involved in the coffee production and harvesting process highlight significant differences. The most notable finding is that a majority of respondents, 28%, employ less than 5 laborers. This suggests that many coffee farms operate on a smaller scale, likely due to limited financial resources or the feasibility of managing smaller plots with fewer workers. On the other hand, the least common scenario is farms employing 15 to 20 laborers, accounting for only 8% of the respondents. This indicates that larger operations requiring more laborers are less prevalent, possibly due to the higher costs and logistical complexities associated with managing a larger workforce.

Table 4.18 shows the current status of Food and Drug Administration (FDA) approvals among coffee producers and sellers.

Table 4.18: Food and Drug Administration Approval Status

Sr No.	Particular	No. of Respondents	%
1	Approved	12	48.0
2	In Progress	13	52.0
Total		25	**100**

Source: Survey Data, 2024

The survey data indicates that 48% of respondents have received approval from the Food and Drug Administration (FDA) for their coffee products, while 52% are currently in the process of obtaining approval. The substantial number of approved respondents underscores the importance of regulatory compliance and quality assurance in the coffee industry. For those still in progress, this stage might involve meeting stringent standards and regulations set by the FDA, reflecting a commitment to ensuring product safety and quality.

Selling markets among coffee producers and sellers in Pyin Oo Lwin District, Mandalay Region, reflects their varied approaches to market engagement in Table 4.19

Table 4.19: Market Distribution Among Coffee Producers and Sellers

Sr No.	Particular	No. of Respondents	%
1	Retail	9	36.0
4	Retail and Wholesale	8	32.0
5	Retail, Wholesale and Export	4	16.0
6	Wholesale and Export	4	16
Total		**25**	**100**

Source: Survey Data, 2024

The majority of coffee producers and sellers, 36.0%, primarily sell their coffee through retail outlets, which may include local markets or specialty coffee shops catering to domestic consumers. A significant portion, 32.0%, participate in both retail and wholesale markets, reflecting a dual strategy to reach both individual buyers and larger-scale purchasers such as cafes or restaurants. Additionally, 16.0% of them sell through

retail, wholesale, and export channels, highlighting their involvement in international markets, potentially leveraging the region's reputation for quality coffee. Another 16.0% focus exclusively on wholesale and export markets, indicating their orientation towards larger commercial transactions and international trade.

Table 4.20 illustrates distinct preferences in the local market and export market for coffee products among coffee producers and sellers in Pyin Oo Lwin District.

Table 4.20: Local Market and Export Market for Coffee Products

Sr No.	**Local Market**	**No. of Respondents**	**%**
1	Green Bean	13	52.0
2	Green Bean, Natural Dry, Roasted Coffee Bean and Coffee Powder	4	16.0
3	Roasted Coffee Bean and Coffee Powder	3	12.0
4	Coffee Powder	3	12.0
5	Parchment	2	8.0
Total		**25**	**100**
Sr No.	**Export Market**	**No. of Respondents**	**%**
1	Green Bean	23	92.0
2	Green Bean and Natural Dry	2	8.0
	Total	**25**	**100**

Source: Survey Data, 2024

In the local market, the majority of respondents, comprising 52.0%, primarily deal with Green Bean coffee, highlighting a strong local demand for raw coffee beans. The second most prominent category in the local market involves a combination of Green Bean, Natural Dry, Roasted Coffee Bean, and Coffee Powder, accounting for 16.0%. This suggests a segment of consumers who prefer a variety of coffee forms, possibly catering to diverse tastes and preferences within the local community. Roasted Coffee Bean and Coffee Powder each constitute 12.0%, reflecting a significant interest in processed coffee products. In contrast, the export market is dominated by Green Bean coffee, with 92.0% of respondents focusing on this single product.

Table 4.21: Favorable Export Conditions

Sr No.	Particular	No. of Respondents	%
1	Yes	9	36.0
2	No	16	64.0
Total		**25**	**100**

Source: Survey Data, 2024

From the data presented in Table 4.21, it is evident that 36.0% of respondents find it easy to export coffee to other countries, while 64.0% do not. This disparity may stem from several factors influencing international trade, such as logistical challenges, regulatory requirements, and market access barriers. Those who find it easy to export likely benefit from established networks, favorable trade agreements, or efficient transportation infrastructure.

Table 4.22: Government Support

Sr No.	Particular	No. of Respondents	%
1	Loan	4	16.0
2	Technical	2	8.0
3	Loan + Technical	9	36.0
4	Land	10	40.0
Total		**25**	**100**

Source: Survey Data, 2024

According to Table 4.22, which details government support received by coffee farm owners and producers in Pyin Oo Lwin District, several key areas stand out. A significant 40.0% of respondents report receiving support related to land, indicating that land acquisition or tenure is a critical issue addressed by government initiatives. Additionally, 36.0% benefit from combined support in the form of both loans and technical assistance, highlighting the comprehensive approach taken to bolstering agricultural practices and economic sustainability in the region.

Table 4.23 presents essential factors identified as critical for achieving economically viable coffee production in Pyin Oo Lwin District, Mandalay Region.

Table 4.23: Essential Factors for Economically Viable Coffee Production

Sr No.	Particular	Mean	S.D
1	Adequate raw materials are needed.	4.70	0.564
2	Technologies are needed.	4.40	0.744
3	Skill labors are needed.	4.48	0.679
4	Financial is required.	4.83	0.501
5	Modern equipment is needed.	4.15	0.736
6	Government support is required.	4.48	0.679
7	It is necessary to expand domestic and foreign markets.	4.45	0.639
8	Need to be able to export more to foreign countries.	4.37	0.628
Overall Mean Value		**4.48**	**0.646**

Source: Survey Data, 2024

The survey indicates that adequate raw materials, financial resources, and government support are considered highly essential, with mean values of 4.70, 4.83, and 4.48 respectively. These findings underscore the importance of sufficient inputs and supportive policies in ensuring efficient coffee production. Additionally, technologies (mean = 4.40) and skilled labor (mean = 4.48) are also emphasized, highlighting the role of modern methods and knowledgeable workforce in enhancing productivity and quality standards. The high ratings for expanding domestic and foreign markets (mean = 4.45) and increasing exports (mean = 4.37) further illustrate a strong emphasis on market expansion strategies, crucial for sustaining growth and profitability in the coffee industry.

4.3.4 Local Market Coffee Sellers

The survey results from Table 4.24 to Table 4.30 provide an in-depth exploration of the local market dynamics within Pyin Oo Lwin Township's coffee industry. This section illustrates how coffee is sourced through various channels, the distribution of coffee sellers

across different selling places, regulatory insights into coffee product approval from the FDA, public perceptions on coffee products and the perceived benefits of value-added coffee products.

Table 4.24 describes the diverse sources from which individuals in the coffee industry of Pyin Oo Lwin District procure coffee for resale in the local market.

Table 4.24 Procurement of Coffee for Resale in the Local Market

Sr No.	Particular	No. of Respondents	%
1	Coffee Farm Owners	3	20.0
2	Coffee Farm Owners and Coffee Production Organizations	4	26.7
3	Coffee Farm Owners, Coffee Production Organizations and Brokers	1	6.7
4	Coffee Farm Owners and Brokers	1	6.7
5	Coffee Farm Owners and Wholesale Shop	2	13.3
6	Coffee Production Organization	4	26.7
Total		15	**100**

Source: Survey Data, 2024

The majority of respondents, constituting 26.7%, indicated they buy coffee from both coffee farm owners and coffee production organizations. This prominent data point reflects a strategic sourcing approach where respondents likely benefit from direct access to freshly harvested coffee beans and reliable quality control through established production organizations. Additionally, 26.7% of respondents exclusively purchase coffee from coffee production organizations, indicating a preference for standardized quality and perhaps logistical convenience. The diversity in sourcing methods, including involvement with brokers and wholesale shops, underscores a dynamic market ecosystem where different actors contribute to the supply chain, ensuring market competitiveness and product availability.

Table 4.25 presents a detailed analysis of the varieties and methods through which coffee is sold by coffee sellers in Pyin Oo Lwin District, Mandalay Region.

Table 4.25: Varieties and Selling Methods of Coffee

Sr No.	Type of Coffee Sold	No. of Respondents	%
1	Roasted Coffee Beans	3	20.0
2	Roasted Coffee Beans and Instant Coffee Powder	3	20.0
3	Roasted Coffee Beans, Instant Coffee Powder and Instant Coffee Mix	3	20.0
4	Roasted Coffee Beans and Instant Coffee Mix	1	6.7
5	Instant Coffee Powder	1	6.7
6	Instant Coffee Mix	3	20.0
7	Green Bean	1	6.6
	Total	**15**	**100**
Sr No.	**Particular**	**No. of Respondents**	**%**
1	Coffee beans are made powder and sold in the shop.	2	13.3
2	Coffee beans are made powder, made to be drunk and coffee powder sold separately.	5	33.3
3	Coffee beans are made powder, made to be drunk, coffee powder sold separately and sold instant coffee mix.	5	33.3
4	Coffee powder sold separately and sold instant coffee mix.	1	6.7
5	The coffee beans are made into powder and made to be drunk by the consumer.	1	6.7
6	Sold instant coffee mix.	1	6.7
	Total	**15**	**100**

Source: Survey Data, 2024

Table 4.25 provides insights into the types and methods of coffee sold by respondents in Pyin Oo Lwin District, Mandalay Region. The data reveals a diverse range of products offered to consumers, reflecting various preferences and market demands. Roasted coffee beans are the most prominently sold type, with options including both pure roasted beans and blends with instant coffee powder or mixes. This indicates a significant consumer preference for traditional roasted coffee, possibly due to its perceived quality and freshness compared to instant products. Additionally, the inclusion of instant coffee mixes highlights convenience as a driving factor in consumer choices, catering to those seeking quick and easy preparation methods. The variety of offerings in powdered forms and mixes suggests a dynamic market where producers adapt to consumer tastes and lifestyles, ensuring a broad appeal across different segments of coffee enthusiasts.

Table 4.26 Distribution Channels for Coffee Products

Sr No.	Particular	No. of Respondents	%
1	Own Shop	3	20.0
2	Own Shop and Convenient Stores	3	20.0
3	Own Shop, Convenient Stores, Departmental Stores and Supermarkets	3	20.0
4	Own Shop and Supermarkets	2	13.3
5	Convenient Stores	1	6.7
6	Supermarkets	3	20.0
Total		15	**100**

Source: Survey Data, 2024

Table 4.26 provides insights into the types and methods through which coffee is sold by local market sellers in Pyin Oo Lwin District. The data reveal a diverse distribution of sales channels, with significant percentages across multiple categories. Notably, 20.0% of respondents sell coffee exclusively through their own shops, reflecting a direct-to-consumer approach that allows for personalized customer interaction and potentially higher profit margins. Similarly, another 20.0% utilize a combination of their own shops and convenient stores, leveraging the convenience and foot traffic of these retail outlets. The

use of departmental stores and supermarkets alongside own shops, reported by 20.0% of respondents, underscores a strategy aimed at reaching a broader customer base through established retail chains. These findings highlight a strategic mix of direct sales and partnerships with retail outlets, enabling coffee producers to cater to varying consumer preferences and enhance market penetration in competitive coffee market.

Table 4.27 shows sales strategies in the domestic coffee market applied by the local market sellers.

Table 4.27: Sales Strategies in the Domestic Coffee Market

Sr No.	Particular	No. of Respondents	%
1	Roasted Coffee Beans	7	46.7
2	Roasted Coffee Beans, Instant Coffee Powder and Instant Coffee Mix	2	13.3
3	Roasted Coffee Beans and Instant Coffee Mix	1	6.7
4	Instant Coffee Mix	5	33.3
Total		15	**100**

Source: Survey Data, 2024

The majority of local market sellers, 46.7%, primarily sell roasted coffee beans, likely due to the higher demand for this form of coffee among consumers who prefer freshly ground coffee for its superior flavor and aroma. Instant coffee mix is the next most popular selling style, which can be attributed to its convenience and quick preparation, appealing to busy consumers. A smaller proportion (13.3%) sell a combination of roasted coffee beans, instant coffee powder, and instant coffee mix, indicating an attempt to cater to diverse consumer preferences. Only 6.7% of them focus on selling both roasted coffee beans and instant coffee mix, suggesting that while there is interest in offering variety, the market may still be dominated by specific product forms preferred by consumers.

Table 4.28 highlights the Food and Drug Administration (FDA) approval status among local market sellers in the Pyin Oo Lwin District.

Table 4.28: Food and Drug Administration Approval for Local Market Sellers

Sr No.	Particular	No. of Respondents	%
1	Approved	11	73.3
2	In Progress	4	26.7
Total		**15**	**100**

Source: Survey Data, 2024

According to the survey, 73.3% of local market coffee sellers have received FDA approval, while 26.7% are currently in the process of obtaining it. The high percentage of approved sellers suggests a strong compliance with regulatory standards, reflecting the sellers' commitment to ensuring the safety and quality of their products. This compliance likely enhances consumer trust and market credibility.

Table 4.29 presents the perspectives of local market sellers on coffee products, highlighting key factors that influence their opinions.

Table 4.29: Local Market Sellers' Perspectives on Coffee Products

Sr No.	Particular	Mean	S.D
1	Quality of coffee.	4.95	0.221
2	Coffee with a better taste.	4.85	0.427
3	Coffee with great smell.	4.85	0.362
4	Popular coffee brand.	3.45	0.846
5	Beautiful packing.	3.88	0.723
6	Cheap price.	3.50	1.086
7	Sales promotion.	3.75	1.032
8	Suggestion of family.	4.60	0.545
9	Easily purchase at many places.	4.90	0.304
Overall Mean Value		**4.30**	**0.616**

Source: Survey Data, 2024

The quality of coffee received the highest mean score of 4.95, indicating a strong consensus on its importance. Coffee taste and smell also scored highly, both with mean values of 4.85, reflecting their critical role in consumer satisfaction. The ability to easily purchase coffee at many places was rated highly as well, with a mean of 4.90, underscoring the significance of product availability. Family suggestions were influential, scoring 4.60, which shows the impact of personal recommendations. In contrast, popular coffee brands and attractive packaging scored lower, with means of 3.45 and 3.88, respectively, suggesting that while branding and packaging are considered, they are less critical compared to quality and sensory attributes. The emphasis on price, with a mean of 3.50 and a higher standard deviation of 1.086, indicates mixed views on its importance. Sales promotion also showed variability, with a mean of 3.75 and a standard deviation of 1.032. In general, the survey data reveals that quality, taste, smell, and availability are the most valued attributes of coffee products among local market sellers, while branding, packaging, and pricing play relatively lesser roles.

Table 30: Perceived Benefits of Value-Added Coffee Products

Sr No.	Particular	Mean	S.D
1	Hulled coffee parchment shells can be reused as fertilizer.	4.83	0.379
2	Hulled coffee parchment shells will have a natural effect on plants and save money.	4.67	0.802
3	The environment can be protected from damage by obtaining organic fertilizer.	4.83	0.461
4	As a biofuel, coffee beans can be used.	4.17	0.747
5	Coffee beans are useful in the production of cosmetic industry.	4.00	0.947
6	Coffee beans are useful in the production of biomedical industry.	3.80	0.664
7	Other Income is got from not up to quality are made into coffee scrub, candles, soap and fragrance stick.	4.23	0.679
8	Good quality grade coffee beans can be sold not only for drinking coffee, but also as other products such as coffee whiskey, coffee wine and coffee enhancers.	4.17	0.747
Overall Mean Value		**4.34**	**0.678**

Source: Survey Data, 2024

The survey results from Table 4.30 highlight the perceived benefits of value-added coffee products among local market sellers. The data reveal strong positive perceptions across various categories. These high scores (mean = 4 and above) likely reflect the practical benefits and cost-saving potential associated with sustainable agricultural practices and organic inputs, appealing to coffee producers' economic and environmental concerns. However, concerning the use of coffee beans in the biomedical industry, received the lowest mean score of 3.80. The lower rating could stem from factors such as limited awareness of biomedical applications, logistical challenges in product development, or lower perceived economic viability in this specific sector compared to others like agriculture or cosmetics.

CHAPTER V
CONCLUSION

This study has highlighted key factors influencing coffee production and market dynamics through an in-depth analysis of coffee farmers' perceptions of sustainable agriculture practices and the overall sustainability of the industry. In addressing the study's objectives, the findings show farmers' attitudes and the overall sustainability of the coffee sector. By drawing conclusions from the study data, this chapter emphasizes the critical factors influencing sustainable practices on coffee industry in Myanmar, especially in Pyin Oo Lwin township, Mandalay Region.

5.1 Findings

The survey results provide insight into the perceptions of coffee farmers in Pyin Oo Lwin Township regarding sustainable agriculture practices.

In terms of coffee firm owners' awareness and implementation of sustainable practices, a significant number of them demonstrate awareness and implementation of sustainable agriculture practices. The adoption of organic fertilizers and minimal pesticide use reflects an understanding of sustainable methods. Specifically, 70% of farmers reported not using pesticides, suggesting a strong inclination towards environmentally friendly farming practices. 72% of them have access to drying and storage facilities and this is important for maintaining coffee quality by controlling the drying process and extending the shelf-life of the beans. In terms of labor, the survey shows that a majority of coffee firms operate on a smaller scale, with 28% employing less than 5 laborers. This suggests limited financial resources and the feasibility of managing smaller plots with fewer workers.

Farm owners perceive economic benefits associated with sustainable practices, such as reduced costs and improved coffee quality. This is evidenced by the high scores in

survey responses related to the benefits of value-added coffee products. The practical benefits and cost-saving potential of organic inputs are particularly appealing to the farmers, indicating a positive perception of sustainability's economic viability.

Despite the positive perceptions, some challenges remain, particularly in areas like biomedical applications of coffee beans, which received lower scores. This indicates limited awareness or perceived viability in this sector.

The sustainability of the coffee industry in Pyin Oo Lwin Township was assessed through various aspects, including plantation practices, production scale, and market engagement. The majority of coffee farms are small to medium-sized, with most farmers cultivating 1,000 to 2,000 plants per acre. This scale of operation allows for more intensive care and better-quality yields, which contributes to the sustainability of the industry. Larger farms (more than 15 acres) constitute a significant portion of the respondents (40%), indicating a robust capacity for large-scale production, which supports the industry's sustainability through economies of scale.

Among coffee producers, a balanced approach to integrating traditional methods and new technologies is observed, with 28% combining both to optimize production while considering cultural and environmental factors. The high importance of sufficient inputs and supportive policies is noted, along with a strong emphasis on skilled labor and modern methods to enhance productivity and quality standards. Furthermore, the survey reveals that a significant portion of coffee producers sell their products through multiple channels, including retail, wholesale, and export markets, indicating their involvement in both domestic and international trade.

Local market sellers in Pyin Oo Lwin District primarily sell roasted coffee beans (46.7%), followed by instant coffee mix (33.3%), reflecting consumer preferences for freshly ground coffee and convenience products. A high percentage (73.3%) of these sellers have received FDA approval, which enhances consumer trust and market credibility. The diverse sources of coffee procurement, including coffee farm owners and production organizations, highlight a dynamic market ecosystem that ensures product availability and market competitiveness. Additionally, sellers' perspectives on coffee products emphasize the importance of quality and better taste, which are critical factors influencing their opinions and strategies in the market.

To sum up, according to the survey results, individuals involved in coffee industry in Pyin Oo Lwin Township have a positive perception of sustainable agriculture practices and are increasingly adopting methods that support the sustainability of the coffee industry. This is reflected in their farming practices, production scale, and market engagement strategies. However, there are areas for improvement, particularly in raising awareness about broader applications of coffee and addressing challenges in adopting certain sustainable practices.

5.2 Suggestions

Based on the survey results, the following suggestions are made for coffee firm owners, producers, and sellers in Pyin Oo Lwin Township, Mandalay Region.

For coffee firm owners, it is crucial to adopt modern agricultural practices to enhance soil health and productivity. Implementing sustainable agricultural practices such as crop rotation, integrated pest management, and organic farming will not only improve yields but also contribute to long-term environmental sustainability. Investing in modern technology and equipment is equally important to increase production efficiency. Securing funding and support for advanced machinery and processing equipment can significantly boost productivity. Additionally, engaging with government programs that provide financial assistance and technical support can help firm owners secure necessary resources for better crop management. Expanding market access through partnerships, attending trade fairs, and leveraging online marketing strategies will also be essential in reaching a broader customer base both domestically and internationally.

Coffee producers should focus on improving raw material management to ensure a steady supply of high-quality coffee beans. Collaborating with local suppliers and farmers is vital to maintain consistent quality and availability of raw materials. Investing in training programs for workers to enhance their skills in modern coffee production techniques will lead to better handling and processing of beans. Stringent quality control measures should be implemented to ensure that only the best beans are processed and sold, thereby enhancing the reputation and competitiveness of Pyin Oo Lwin coffee. Exploring opportunities to diversify product offerings, such as developing specialty coffees and

value-added products like coffee scrubs, candles, and soaps, can create additional revenue streams and attract a wider range of customers.

For coffee sellers, enhancing marketing strategies is key to promoting coffee products effectively. Utilizing social media, local markets, and coffee festivals can significantly boost sales and brand recognition. Building strong relationships with customers through exceptional service and community engagement is also crucial. Gathering feedback from customers can provide valuable insights for product and service improvements. Exploring various sales channels, including e-commerce platforms, local retail stores, and international exports, will help reach a broader customer base and increase sales. Emphasizing sustainability practices in marketing efforts can appeal to environmentally conscious consumers. Highlighting sustainable farming methods, fair trade practices, and eco-friendly packaging will attract customers who prioritize ethical and sustainable products. These suggestions aim to enhance productivity, ensure economic viability, and promote environmental sustainability in the coffee industry in Pyin Oo Lwin Township, Mandalay Region.

REFERENCES

Aderolu, I., Anagbogu, C.F., & Asogwa, E., (2014), Production and marketing of Coffee (Robusta) in Kogi State, Nigeria: Challenges and recommendation for intervention, Journal of Social Science Research, 3(2)

Anastopoulos, I.; Karamesouti, M.; Mitropoulos, A.C.; Kyzas, G.Z. (2017) A review for coffee adsorbents. J. Mol. Liq., 229,

Aryal, J. P., Jat, M. L., Sapkota, T. B., Kassie, M., Rahut, D. B., & Maharjan, S. (2018). Adoption of multiple climate-smart agricultural practices in the Gangetic plains of Bihar, India. International Journal of Climate Change Strategies and Management, 10(3),

Aung Naing Oo (2022), A Study on Farmers' Perception of the Adoption of Good Agricultural Practices (GAP) of Rice Production in Sagaing Region, EMPA Thesis, Department of Applied Economics, Yangon University of Economics

Baek, B.-S.; Park, J.-W.; Lee, B.-H.; & Kim, H.-J. (2013) Development and application of green composites: Using coffee ground and bamboo flour. J. Polym. Environ., 21,

Banerjee, A.; Singh, V.; Solanki, K.; Mukherjee, J.; & Gupta, M.N. (2013) Combi-protein coated microcrystals of lipases for production of biodiesel from oil from spent coffee grounds. Sustain. Chem. Process., 14

Beer, J. (1987). Advantages, disadvantages and desirable characteristics of shade trees for coffee, cacao and tea. Agroforestry, 5,

Bengtsson, J., Ahnstrom, J., and Weilbull, A. (2005). The effects of organic agriculture on biodiversity and abundance: a meta-analysis. J. Appl. Ecol. 42,

Bhat, R., Rai, V. R. and Karim, A. A. (2010). Mycotoxins: Present status and future concerns. Comprehensive Reviews in Food Science and Safety, 9(1):

Blake, G., Sandler, H. A., Coli, W., Pober, D. M., & Coggins, C. (2007). An assessment of grower perceptions and factors influencing adoption of IPM in commercial cranberry production. Renewable Agriculture and Food Systems, 22(2)

Chanakya, H. N., Reddy, B. V. V. and Modak, J. (2009). Biomethanation of herbaceous biomass residues using 3-zone plug flow like digesters: A case study from India, Renewable Energy, 34

Chichongue, O., Pelser, A., Tol, J. V., Du Preez, C., & Ceronio, G. (2020). Factors influencing the adoption of conservation agriculture practices among smallholder farmers in Mozambique. *International Journal of Agricultural Extension*, 7(3),

Cho, E.J.; Lee, Y.G.; Song, Y.; Nguyen, D.T.; & Bae, H.J. (2022) An integrated process for conversion of spent coffee grounds into value-added materials. *Bioresour. Technol*., 346

Coffee Board (1996). Coffee Guide. Bangalore: Coffee Board Research Department, Coffee Research Station.

Dhananjaya, B. N., Srinivasamurthy, C. A., and Bhaskar, S. (2009). Utilization of coffee pulp effluent in agriculture and its impact on soil and water environment. *Environment and Ecology*, 27

Digal, L. N., & Placencia, S. G. P. (2019). Factors affecting the adoption of organic rice farming: The case of farmers in M'lang, North Cotabato, Philippines. *Organic Agriculture*, 9(2),

D'Souza, M. V. and Jayarama (2011). Soil acidity and its management (liming). *Indian Coffee*, 75

General Administration Department (2023), Report of Pyin Oo Lwin Township General Administration Department, Ministry of Home Affairs, Myanmar

Giannakis, E. (2014). Modelling farmers' participation in agri-environmental schemes in Greece. *International Journal of Agricultural Resources, Governance and Ecology*, 10(3),

Gopinandhan, T. N., Velmourougane, K., Keshamma, E. and Raghuramulu, Y. (2008). Evaluation of moisture testing instrument of coffee. *Indian Food Industry Journal*, 60

Guthman, J., (2004). Back to the land: the paradox of organic food standards. *Environ. Plan. A Econ. Space,* 36,

Jayarama, Naik, C. S. K., Shankar, B. N. and Reddy, H. T. (1993). Correlation between soil fertility parameters and coffee yield in small coffee holdings of Chikmagalur zone. *Journal of Coffee Research*, 23(1)

Jenkins, R.W.; Stageman, N.E.; Fortune, C.M.; & Chuck, C.J. (2014) Effect of the type of bean, processing, and geographical location on the biodiesel produced from waste coffee grounds. *Energy Fuels*, 28,

Jessy, M. D. (2011). Potassium management in plantation crops with special reference to tea coffee and rubber. *Karnataka Agricultural Science*, 24(1)

Joshi, A., Kalauni, D., & Tiwari, U. (2019). Determinants of awareness of good agricultural practices (GAP) among banana growers in Chitwan, Nepal. *Journal of Agriculture and Food Research*, 1,

Kafle, B. (2011). Factors affecting adoption of organic vegetable farming in Chitwan district. Nepal. *World Journal of Agriculture Sciences*, 7(5),

Karmee, S.K. (2018) A spent coffee grounds based biorefinery for the production of biofuels, biopolymers, antioxidants and biocomposites. *Waste Manag*., 72,

Kassie, M., Zikhali, P., Manjur, K., & Edwards, S. (2020). *Adoption of organic farming technique: Evidence from a semi-arid region of Ethiopia*. Environment for Development Initiative.

Kilian, B., Jones, C., Pratt, L., and Villalobos, A. (2006). Is sustainable agriculture a viable strategy to improve farm income in Central America? a case study of coffee. *J. Bus. Res*. 59

Kondamudi, N.; Mohapatra, S.K.; and Misra, M. (2008) Spent coffee grounds as a versatile source of green energy. *J. Agric. Food Chem*., 56,

Kookos, I. (2018) Technoeconomic and environmental assessment of a process for biodiesel production from spent coffee grounds (SCGs). *Resour. Conserv. Recycl*., 134,

Krishnamurthy Rao, W. (1993). Fertilizer management in coffee. In: H. L. S. Tondon (ed.), *Fertilizer Management in Commercial Crops*. Fertilizer Development and Consultation Organization, New Delhi.

Kunzekweguta, M., Rich, K. M., & Lyne, M. C. (2017). Factors affecting adoption and intensity of conservation agriculture techniques applied by smallholders in Masvingo district, Zimbabwe. *Agrekon*, 56(4)

Kwon, E.E.; Yi, H.; and Jeon, Y.J. (2013) Sequential co-production of biodiesel and bioethanol with spent coffee grounds. Bioresour. Technol., 136,

Lamine, S.M.; Ridha, C.; Mahfoud, H.-M.; Mouad, C.; & Lotfi, B.; (2014) Chemical activation of an activated carbon prepared from coffee residue. *Energy Procedia*, 50,

Laosutsan, P., Shivakoti, G. P., & Soni, P. (2019). Agricultural and natural resources adaptations to climate change: Factors influencing the adoption of good agricultural practices and export decision of Thailand's vegetable farmers. *International Journal of the Commons*, 13(2),

Laxmi, V., & Mishra, V. (2007). Factors affecting the adoption of resource conservation technology: Case of zero tillage in rice-wheat farming systems. *Indian Journal of Agricultural Economics*, 62(1)

Le, Q. V., Wild, B., and Jackels (2017). The case of Café Ambiental, SPC: a new business model for a Nicaraguan fair-trade cooperative. *World Dev. Perspect*. 6,

Le, Q. V., and Jovanovic, G. (2019). From crisis to specialty coffee: the case of Nicaraguan smallholder cooperatives and Jesuit business education for sustainability and justice. *J. Manag. Glob. Sustain.* 7

Lemeilleur, S. (2013). Smallholder compliance with private standard certification: The case of global GAP adoption by mango producers in Peru. *International Food and Agribusiness Management Review*, 16(4)

Martins, S.; Mussatto, S.I.; & Aguilar, C.N.; Teixeira, J.A. (2011) Bioactive phenolic compounds: Production and extraction by solid-state fermentation. A review. *Biotechnol. Adv*., 29,

Melisse, B. (2018). A review on factors affecting adoption of agricultural new technologies in Ethiopia. *Journal of Agricultural Science and Food Research*, 9(3)

Mlenga, D. H. (2015). Factors influencing adoption of conservation agriculture: A case for increasing resilience to climate change and variability in Swaziland. *Journal of Environment and Earth Science,* 5(22),

Mussatto, S.I.; Machado, E.M.S.; Carneiro, L.M.; & Teixeira, J.A. (2012) Sugars metabolism and ethanol production by different yeast strains from coffee industry wastes hydrolysates. *Appl. Energy*, 92

Myanmar Coffee Association (2024), Annual Report of Myanmar Coffee Association, Myanmar

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of No-Till Conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal Province. Sustainability, 10(2), 5

Obruca, S.; Petrik, S.; Benesova, P.; Svoboda, Z.; Eremka, L.; (2014) Utilization of oil extracted from spent coffee grounds for sustainable production of polyhydroxyalkanoates. *Appl. Microbiol. Biotechnol*., 98

Obruca, S.; Benesova, P.; Kucera, D.; Petrik, S.; & Marova, I. (2015) Biotechnological conversion of spent coffee grounds into polyhydroxyalkanoates and carotenoids. New Biotechnol. 32

Okon, U. E., & Idiong, I. C. (2016). Factors influencing adoption of organic vegetable farming among farm households in south-south region of Nigeria. *American-Eurasian Journal of Agricultural and Environmental Sciences*, 16(5),

Panneerselvam, P., Velmourougane, K., Shanmukhappa, D. R. and Naidu, R. (2000). Study on association of mould in gleanings of arabica. Journal of Coffee Research, 28(1)

Pimentel, J.L., (2010), A note on the usage of Likert Scaling, *USM R & D Journal*, 18(2)

Pohlan, J., Janssens, M.J.J. and Giesemann Eversbusch, B. (2008). Impact of Canavalia Cover Crop Management in Coffea arabica L. on Plant-Invertebrate Associations. *The Open Agriculture Journal*, 2.

Pongvinyoo, P., Yamao, M., & Hosono, K. (2014). factors affecting the implementation of Good Agricultural Practices (GAP) among coffee farmers in Chumphon Province, Thailand. *American Journal of Rural Development*, 2(2),

Ramaiah, P. K., Venkataramanan, D. and Gopal, N. H. (1995). Physiological aspects of coffee yield. In: D. N. Tyagi (ed.), *Physiological Approaches for Crop Improvement.* Rajeshwari Publishers, Varanasi, India

Rajendran, N., Tey, Y. S., Brindal, M., Shamsudin, M. N., & Radam, A., (2016). Factors influencing the adoption of bundled sustainable agricultural practices: A systematic literature review. *International Food Research Journal*, 23(5),

Saud, S.; and Salamatullah, A.M. (2021) Relationship between the chemical composition and the biological functions of coffee. *Molecules*, 26,

Senanayake, S. S., & Rathnayaka, R. M. S. D. (2015). Analysis of factors affecting for adoption of good agricultural practices in potato cultivation in Badulla district. *Sri Lanka S.S.Senanayake. Agrieast*, 10

Singh, B., & Sharma, A. K. (2019). Factors affecting adoption of organic farming technology in arid zone. *Annals of Arid Zone*, 58(4)

Shwe Yee Phoo Wai (2020), Factors Influencing Sustainable Agricultural Practices of Farmers in Taikkyi Township, Yangon, M.Act Thesis, Department of Commerce, Yangon University of Economics

Soto-Pinto, L., Perfetto, I., and Caballero-Nieto, J. (2000). Shade effect on coffee production at the Northern Tzeltal Zone of the State of Chipas, Mexico. *Agric. Ecosyst. Environ.* 80,

Srisopaporn, S., Jourdain, D., Perret, S. R., & Shivakoti, G. (2015). Adoption and continued participation in a public Good Agricultural Practices program: The case of rice farmers in the Central Plains of Thailand. Technological Forecasting and Social Change, 96

Sriwichailamphan, T. (2014). Factors affecting adoption of vegetable growing using organic system:a case study of Royal Project Foundation, Thailand. *International Journal of Economics & Management Sciences*, 3(2),

Utomo, H.D.; and Hunter, K. (2006) Adsorption of divalent copper, zinc, cadmium and lead ions from aqueous solution by waste tea and coffee adsorbents. *Environ. Technol*. 27,

Tey, Y. S., Li, E., Bruwer, J., Abdullah, A. M., Brindal, M., Radam, A., Ismail, M. M., & Darham, S. (2014). The relative importance of factors influencing the adoption of

sustainable agricultural practices: A factor approach for Malaysian vegetable farmers. *Sustainability Science*, 9(1)

Tuntiwiwattanapun, N.; Monono, E.; Wiesenborn, D.; & Tongcumpou, C. (2017) In-situ transesterification process for biodiesel production using spent coffee grounds from the instant coffee industry. *Ind. Crops Prod*., 102,

Velmourougane, K., Panneerselvam, P., Gopinandhan, T. N. and Jayarama (2006). Determination of optimal drying floors for quality improvement, mould prevention and Ochratoxin contamination in coffee. *Journal of Coffee Research*, 34(2)

Velmourougane, K., Prafulla K.D., and Gopinandhan, T. N., (2008). Evaluation of dust contamination potential in coffee curing works in relation to mould incidence. Indian Coffee, 72

Velmourougane, K. and Bhat, R. (2009). Improvement of coffee quality through prevention of molds. In: K. R. Sridhar (ed.), *Frontiers in Fungal Ecology, Diversity and Metabolites*. I. K. International Publishing House, New Delhi

Velmourougane, K., Bhat, R. and Gopinandhan, T. N. (2010). Impact of drying surface and raking frequencies on mold incidence, ochratoxin A contamination, and cup quality during preparation of arabica and robusta cherries at the farm level. *Foodborne Pathogens and Disease*, 7

Velmourougane, K., Bhat, R., Gopinandhan, T. N. and Panneerselvam, P. (2011). Impact of delay in processing on mold development, Ochratoxin-A and cup quality in arabica and robusta coffee. *World Journal of Microbiology and Biotechnology*, 27

Velmourougane, K. and Kurian, R. (2012). Vermicomposting of coffee processing wastes. Dynamic soil, *Dynamic Plant*, 6(1):

Vossen, H. A. M. (2005). A critical analysis of the agronomic and economic sustainability of organic coffee production. *Exp. Agric.* 41,

Zuorro, A.; and Lavecchia, R. (2012) Spent coffee grounds as a valuable source of phenolic compounds and bioenergy. *J. Clean. Prod.,* 34,

SURVEY QUESTIONNAIRE

I am studying Master of Public Administration at Yangon University of Economics. I have designed the following questionnaire for **"SUSTAINABILITY OF COFFEE INDUSTRY IN MYANMAR (Case Study: Pyin Oo Lwin District, Mandalay Region)"** which requires for my thesis paper as an integral part towards the requirement for the degree of Master of Public Administration.

All information has treated as confidential. You will require approximately 20 minutes completing these questionnaires. Read the questions and mark your response off with a cross (**X**) in the box provided. Thank you for your participation.

Section (A) Characteristics of Respondent

1. Gender

(a) Male ☐ (b) Female ☐

2. Age ( ) Years

3. Educational Qualification

(a) Under Graduated Level ☐ (b) Graduated Level ☐ (c) Post Graduated Level ☐

4. Where do you live?

(a) Pyin Oo Lwin Township ☐ (b) Another Township ☐

5. How many years do you live in Pyin Oo Lwin Township?

(a) Less than 10 ☐ (b) 11 – 20 ☐ (c) 21 – 30 ☐ (d) More than 30 ☐

Section (B) Coffee Plantation

1. What type of coffee plant in your coffee farm?

(a) Arabica ☐ (b) Robusta ☐

2. How many acres of coffee farm?

(a) Less than 5 Acres ☐ (b) 5 Acres to 10 Acres ☐ (c) 10 Acres to 15 Acres ☐

(d) 15 Acres to 20 Acres ☐ (e) 20 Acres to 25 Acres ☐ (f) ( ) Acres

3. What kind of pattern do you plant a coffee plantation?

(a) 4’ X 4’ ☐ (b) 6’ X 3’☐ (c) 6’ X 4’ ☐ (d) 6’ X 6’ ☐ (e) 8’ X 4’ ☐ (f) 8’ X 8’ ☐

4. How many coffee plants per acre?

(a) 1 to 1000 ☐ (b) 1000 to 2000 ☐ (c) 2000 to 3000 ☐

5. How many years are the current coffee plants?

(a) Less than 5 Years ☐ (b) 5 Years to 15 Years ☐ (c) More than 15 Years ☐

6. Are pesticides used in coffee farming?

(a) Yes ☐ (b) No ☐

7. What kind of fertilizer is used in coffee plantation?

(a) Organic Fertilizer ☐ (b) Inorganic Fertilizer ☐

8. When do you take care of the coffee plants?

(a) Daily ☐ (b) One Time per Week ☐ (c) Two Times per Week ☐

(d) One Time per Month ☐ (e) Two Time Per Month ☐ (f) None ☐

9. How many labors are working in your coffee farm?

(a) Family Labor ( ) No. (b) Hired Labor ( ) No.

10. What is the estimated cost of coffee plantation?

(a) Seed ( ) Kyat

(b) Labor ( ) Kyat

(c) Transportation ( ) Kyat

(d) Other ( ) Kyat

11. How many yields per acre?

( ) Viss

12. How is the coffee yield compared to previous year?

(a) Less than ☐ (b) Same ☐ (c) More than ☐

13. What you should do to increase coffee yield?

Please choose your opinion on each of the following questions.

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

Statements	**1**	**2**	**3**	**4**	**5**
Good quality seeds are needed.					
Technically necessary.					
Need money.					
New coffee plantations need to be expended.					
Need to use more fertilizers.					
Need to use more pesticides.					
Need to use more labor.					
Needs government support.					

Section (C) Coffee Producer and Seller

1. Describe the types of coffee produced and sold.

(a) Berries ☐ (b) Green Beans ☐ (c) Natural Dry ☐ (d) Roasted Coffee Beans ☐

(e) Coffee Powder ☐(f) Parchment ☐

2. How many green beans are produced and sold per year?

(a) Less than 1 Ton ☐ (b) 1 Ton to 5 Ton ☐ (c) More than 5 Ton ☐

3. How many natural dries produced and sold per year?

(a) Less than 1 Ton ☐ (b) 1 Ton to 5 Ton ☐ (c) More than 5 Ton ☐

4. How many roasted coffee beans are produced and sold per year?

(a) Less than 1 Ton ☐ (b) 1 Ton to 5 Ton ☐ (c) More than 5 Ton ☐

5. How many coffee powders are produced and sold per year?

(a) Less than 1 Ton ☐ (b) 1 Ton to 5 Ton ☐ (c) More than 5 Ton ☐

6. Which method do you use in coffee processing?

(a) Natural Dry Process ☐ (b) Washed/Wet Process ☐ (c) Honey Process ☐

7. How many areas do you use in the coffee production process?

(a) Less than 1 Acre ☐ (b) 1 Acre to 5 Acre ☐ (c) 5 Acre to 10 Acre ☐

(d) 10 Acre to 15 Acre ☐ (e) More than 15 Acre

8. What technology do you use to produce coffee?

(a) Traditional Technology ☐ (b) New Technology ☐

9. Are there drying and storage facilities for coffee production?

(a) Yes ☐ (b) No ☐

10. How many labors are working in the coffee production or harvesting process?

(a) Less than 5 ☐ (b) 5 to 10 ☐ (c) 10 to 15 ☐ (d) 15 to 20 ☐ (e) More than 20 ☐

11. How many numbers of coffee processing machinery?

Name of Machine	Number

12. Your products have approved by the Food and Drug Administration?

(a) Approved ☐ (b) Not Approved ☐ (c) In progress ☐

13. How do you sell the produced coffee to the market?

(a) Retail Sale ☐ (b) Whole Sale ☐ (c) Export ☐

14. Which type of coffee sells glowing in the local market?

(a) Green Bean ☐ (b) Natural Dry ☐ (c) Roasted Coffee Bean ☐

(d) Coffee Powder ☐ (e) Parchment☐

15. Which type of coffee sells glowing to export market?

(a) Green Bean ☐ (b) Natural Dry ☐ (c) Roasted Coffee Bean ☐ (d) Coffee Powder ☐

16. Is it easy to export coffee to other countries?

(a) Yes ☐ (b) No ☐

17. How does the government support coffee production?

(a) Loan ☐ (b) Technical ☐ (c) Loan + Technical ☐ (d) None ☐ (e) Land ☐

18. Describe the requirements for economically practical coffee production.

Please choose your opinion on each of the following questions.

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

Statements	**1**	**2**	**3**	**4**	**5**
Adequate raw materials are needed.					
Technologies are needed.					
Skill labors are needed.					
Financial is required.					
Modern equipment is needed.					
Government support is required.					
It is necessary to expand domestic and foreign markets.					
Need to be able to export more to foreign countries.					

Section (D) Local Market Coffee Seller

1. Where do you buy coffee from for resale in the local market?

(a) Coffee Farm Owners ☐ (b) Coffee Production Organizations ☐ (c) Brokers ☐

(d) Wholesale Shop ☐ (e) Retail Shop ☐ (f) Own Farm ☐

2. Describe the types of coffee sold in the local market.

(a) Roasted Coffee Beans ☐ (b) Instant Coffee Powder ☐ (c) Instant Coffee Mix ☐

(d) Green Bean ☐

3. How do you sell coffee?

(a) The coffee beans are made into powder and sold in the shop. ☐

(b) The coffee beans are made into powder and made to be drunk by the consumer. ☐

(c) Coffee powder sold separately. ☐

(d) Sold instant coffee mix. ☐

4. Where do you sell coffee products?

(a) Own Shop☐ (b) Convenient Store☐ (c) Departmental Stores☐ (d) Supermarkets☐

5. Which style is selling glowing in the current domestic coffee market?

(a) Roasted Coffee Beans ☐ (b) Instant Coffee Powder ☐ (c) Instant Coffee Mix ☐

6. How many roasted coffee beans are sold per day? ( ) kg

7. How many instant or roasted coffee powders are sold per day? ( ) kg

8. How many instant coffees mix (3+1 or 2+1) are sold per day? ( ) kg

9. Are coffee products approved for sale by the Food and Drug Administration?

(a) Approved ☐ (b) Not Approved ☐ (c) In progress ☐

10. Consumers attitudes toward the coffee products.

Please choose your opinion on each of the following questions.

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

Statements	**1**	**2**	**3**	**4**	**5**
Quality of coffee.					
Coffee with a better taste.					
Coffee with great smell.					
Popular coffee brand.					
Beautiful packing.					
Cheap price.					
Sales promotion.					
Suggestion of family.					
Easily purchase at many places.					

Section (E) Value Added

Please choose your opinion on each of the following questions.

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

Statements	**1**	**2**	**3**	**4**	**5**
Hulled coffee parchment shells can be reused as fertilizer.					
Hulled coffee parchment shells will have a natural effect on plants and save money.					
The environment can be protected from damage by obtaining organic fertilizer.					
As a biofuel, coffee beans can be used.					
Coffee beans are useful in the production of cosmetic industry.					
Coffee beans are useful in the production of biomedical industry.					
Other Income is got from not up to quality are made into coffee scrub, candles, soap and fragrance stick.					
Good quality grade coffee beans can be sold not only for drinking coffee, but also as other products such as coffee whiskey, coffee wine and coffee enhancers.					

Thank you.