

**YANGON UNIVERSITY OF ECONOMICS
MASTER OF DEVELOPMENT STUDIES PROGRAMME**

**CHALLENGES FOR THE DEVELOPMENT OF
COMMERCIAL HORTICULTURE FARMING IN
HLEGU TOWNSHIP: MANGO FRUIT**

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MDevS – 14 (14th BATCH)**

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This thesis is submitted as a partial fulfillment to the requirements for the
degree of Master of Development Studies (MDevS)

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ABSTRACT

The study focuses the challenges for the development of commercial horticulture farming of mango fruit in Hlegu Township. The objective of this research is to identify the constraints and challenges of the mango grower in Hlegu Township. In this study, four villages were selected and ten growers were chosen for interview. To meet the research objective, descriptive method is used based on primary and secondary data. This study finds that major constraints and challenges are lack of capital to purchase inputs and invest in farm for long term, bad weather condition problems, the widespread use of traditional technologies, lack of knowledge in using fertilizers and pesticides. Moreover, growers face lack of storage facilities, no power in the market, labor shortage problem, higher transportation cost and access to low interest credit.

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LIST OF ABBREVIATIONS

ABD	- Agricultural Business Development
AFTA	- ASEAN Free Trade Agreement
ASEAN	- Association of Southeast Asian Nations
CDZ	- Central Dry Zone
DOA	- Department of Agriculture
FAO	- Food and Agriculture Organization
FDA	- Food and Drug Administration
GAP	- Good Agricultural Practices
GATT	- General Agreement on Tariff and Trade
HACCP	- Hazard analysis and critical control points
HCDA	- Horticulture Crops Development Authority
HWT	- Hot Water Treatment
ISO	- International Standard Organization
MFVP	- Myanmar Fruit, Flower and Vegetable Producers and Exporters Association
MRL	- Maximum pesticide Residual Levels
NGOs	- Non Government Organizations
NTBs	- Non-tariff barriers
RECs	- Regional Economic Communities
SPS	- Sanitary and Phytosanitary
TBT	- Agreement on Technical Barriers to Trade
UNCTAD	- United Nations Conference on Trade and Development
USAD	- United States Department Of Agriculture
VHT	- Vapor Heat Treatment
WTO	- World Trade Organization

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Questionnaires

1. **Socioeconomic Conditions of the Growers**
 - a. Gender
 - b. Age
 - c. Education Level
 - d. Family Size
 - e. Number Of Working Persons(Age 16-59 Years) In Family
2. **Business Operation Of The Growers**
 - a. The Year Of Operation Of The Plantation
 - b. Number Of Acre Operated By Growers

3 Source Of Labor

4 **Utilization Of Farm Implements And Machineries**

Quantity	Ploughs	Harrows	Other Equipments	Water Pumps	Tractors

5 **Utilization Of Farm Inputs**

Local Seeds	Imported Seeds	Local Plants	Imported Plants	Chemical Fertilizers	Natural Fertilizers	Pesticides, Insecticide Fungicide

6 **Source Of Credit For Growers**

Bank	Friends/ Relatives	Government	Microfinance	NGOs

7. **Constraints Faced By Growers**

Thank You So Much For Your Cooperation

CHAPTER I

INTRODUCTION

1.1 Rationale of the Study

Mango is native to Indo-Myanmar region and has been cultivated for more than 4000 years. Mango is a very delicious and widely liked fruit around the globe; it is called the “King of Fruits” which makes it the most popular fruit than others. It is a historical fruit because in ancient days of its cultivation, thousands of years it was cultivated in South Asia. It is available in sweet as well as sour taste, which is used in different ways of consumption.

Mango is cultivated throughout the tropical and subtropical world for commercial fruit production. In 2016, India, China (mainland), Thailand, Indonesia, Mexico and Pakistan produced the largest amount of fresh mango for export among the mango growing countries. In fact, Asia was the main exporter with 42% of global mango production in 2016.

Myanmar is a developing, agro and resource based Southeast Asian, country which is currently transforming to achieve greater openness. Generally, it has three seasons. There are monsoon or rainy season, the cool dry season and the hot season. The country enjoys a tropical monsoon climate and most of tropical fruit are well cultivated in different areas.

Traditionally, rice is regarded as main staple and export item yet rice trading has been controlled by the State. Since the 1990s, pulses and beans started contributing as major export and cash crops for farmers. After 2011, together with the open door policies of Myanmar and increasing foreign demand for horticulture crops, production of these fruits is needed to promote.

Nowadays, the improvement of country’s political view and the connection within the ASEAN regions, Myanmar has vast potentials in growing, trading, and exporting for horticulture crops which can enhance income of growers and support rural development.

In general, except from rice, horticultural crops provide essential nutrition for inhabitants in the country. Among the horticultural fruits, mango plays a central role as fruit crop in Myanmar. In 2016-2017, total mango production area was 254 thousands acres and it has the opportunity to increase the export mango quantity in the future because production is increasing every year.

Myanmar mangoes are mainly exported to China through Muse border trade. Myanmar exporters have few other places to sell their produce when the mango supply exceeds the quantity for local consumption. Growers received buying prices by marketers depending on the fruit quality. Nowadays, most of the mango fruits are still intended for domestic market alone because growers are facing the constraints and challenges in production to get the quality fruit. Result in, they will stay in the poverty cycle. In this research, we will find out the challenges of growers that will help to improve and then the profitability of growers is expected to increase and help upgrading rural development which finally contributes to the economic development of the country.

1.2 Objective of the Study

The objectives of the study is to identify the constraints and challenges of the mango grower.

1.3 Method of Study

To meet the research objective, descriptive method is used based on primary and secondary data. Moreover, gross marketing margin of mango grower is calculated. Primary data obtained from interviewing the mango growers concerning costs, profit margins, their constraints and benefit. Secondary data is made based on published source from domestic and international sources. Survey and interviews were conducted in four selected villages in 2019.

1.4 Scope and Limitation of the Study

In this study, the challenge for the development of commercial horticulture farming for mango fruit is studied in the Hlegu township. Among the villages within the Helgu township, Ngarsutaung, Gyokone, Hineku and Oyinwa villages are chosen to identify the constraints and challenges of the mango grower in which ten growers were recruited for interview.

1.5 Organization of the Study

This study is organized into five chapters. Briefs outlines of the chapters are as follows: Chapter I is an introductory chapter, it includes rationale of the study, objective of the study, scope of the study, method of the Study and organization of the study. The literature review will be portrayed in Chapter II. In this chapter, Horticulture and Horticultural crops, World mango production, Standards and Certifications, Marketing of Mango Fruits will be studied. Moreover, barriers to export mango fruit from developing countries will also be included in this chapter. Chapter III explains Overview of the Agriculture Sector in Myanmar, Horticulture crops Production, Cultural practices of mango production in Myanmar and Myanmar mango production, marketing and trade. Chapter IV presents constraint and challenges of mango grower for horticulture development of mango fruit in Hlegu township. Finally, Chapter V discusses findings and suggestions for the development of the horticulture firming for mango fruit in the Helgu township in Yangon Region.

CHAPTER II

LITERATURE REVIEW

2.1 Horticulture and Horticultural Crops

Generally, horticulture defines the raising and tending of garden crops such as vegetables, fruits, and ornamental plants. The origin of the word comes from the Latin *hurts* (garden) and *colere* (to cultivate) (Encyclopædia Britannica 2014b). Although the term covers all forms of garden management, it most commonly refers to intensive commercial production in which horticultural crops are produced for sale and profit (USAD 2014).

According to the Schuler (2004, 15–16), Horticulture is a branch of agriculture which is concerned with the production and the marketing of vegetables, flowers, and fruits for nutritional, medicinal or esthetic purposes. Horticultural crops are vegetables, flowers, and fruits which require high inputs in terms of labor and other production factors, which are perennial or biennial crops and have a short shelf life and, in the case of vegetables, are harvested immature.

2.2 World Mango Production

Mango, mangosteen and guava comprise by far the world's most prolifically produced group of tropical fruits, it included in large volumes of mango production. In 2017, according to the global prospects of major tropical fruits for production and trade, it estimated that mango accounts for approximately 75 percent of total production volume, guava for 15 percent and mangosteen for the remaining 10 percent. Worldwide mango production occurs in over 100 countries. Although only a relatively small proportion of total mango production enters international trade. In terms of regional distribution, approximately 74 percent of mango, mangosteen and guava production originate in Asia, 15 percent in Africa and 11 percent in Latin America and the Caribbean respectively in 2017.

The world's mango production countries which account for about 75% of the world's production. India currently accounts for approximately 50 percents of total

global production, almost exclusively mango and guava., China is the second largest with 13% percents and then followed by Thailand with 10 percents, Indonesia with 6 percents and Mexico, Pakistan and Egypt each with 4 percents respectively. Other leading mango producing countries in 2017 include Pakistan and Egypt each with 4 percents, Bangladesh, Kenya and Brazil each with 3 percents of total global production.

In terms of export volumes, mango is estimated to account for 90 percents of global shipments. Mexico is leading exporter, with an estimated volume share of 23 percent in 2017 followed by Brazil 13 percents, Thailand 12 percents and Peru 12 percents. Mexico primarily exports mangoes to the United States (approximately 80 percent of the country's entire shipments) and is forecast to benefit strongly from higher import demand for the fruit in 2017.

In 2016 imports were valued at US\$12,110,338,000 a significant increase over 2015 (US\$10,321,363,000). United States of America was the largest importer of mangoes in 2016, in terms of dollar value (US\$3,388,527,000) followed by the Netherlands (US\$948,747,000).

In ASEAN countries, Thailand produced mango with highest production 3,432.1 (Thousand Metric Ton), followed by Indonesia 2,184.4 (Thousand Metric Ton) , Philippines 827.1 (Thousand Metric Ton) and Viet Nam 725.3 (Thousand Metric Ton) in 2016 . Mango production in Myanmar was 1.4 (Thousand Metric Ton) and the production was less than Thailand, Philippines, Indonesia Cambodia, Malaysia, Laos and Viet Nam.

In 2017, Philippines exported 295 (Thousand Metric Ton) of the country's production and followed by Thailand exported 170 (Thousand Metric Ton) of total production and Vietnam had 125 (Thousand Metric Ton) of the country's total production, respectively. Philippines, Vietnam and Thailand are likely to increase export quantity in future because they currently export amount of total production is higher than other ASEAN countries.

Vietnam was the main importer as it imported 236 (in Million US\$) of total ASEAN imports, followed by Malaysia 84 (in Million US\$) and Singapore 65(in Million US\$) respectively.

2.3 Standards and Certifications

Mango producers and processors face a complex system of multiple standards at national, regional and international levels. Most public standards focus primarily on preventing SPS problems. Private standards have emerged alongside a host of health and safety standards for fruits sector that have proliferated in developed nations over the past 15 years.

Public standards have become increasingly strict as countries strive to protect their own agricultural production from disease and their citizen's health in the face of increased global movement of products. In general, public standards are much stricter in developed countries such as the US, Europe and Japan than developing and emerging economy markets such as Russia and China.

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product (FDA, 2016).

Private standards are not only concerned with phytosanitary aspects, but also with product quality and size, and establish requirements that differentiate their products according to environmental, social, and environmental factors of production (FAO, 2006; TESCO, 2005).

The private standard that has the most impact, by far, is Global GAP, which emerged in the late 1990s as the European public grew concerned that government regulations were not strict enough to ensure food safety (Steven Jaffee et al., 2011; Singh, 2013).

Mango farmers thus have begun certifying their production in order to enter these high value markets. Peru, Mexico, Brazil, India and Egypt shows a high number of producers certified in Global GAP; however, other countries are lagging behind including Ecuador, Thailand, Pakistan, and Guatemala. Philippines has no mango producer certified (Global GAP, 2017).

2.4 Marketing of Mango Fruits

As is the case for all food stuff, the mango fruit sector needs to be organized in a more coordinated and integrated way for it to be beneficial to farmers (European Union, 2000). Unfortunately, many challenges hinder proper organization of mango fruit sector. Studies by GoK, (2003) and Serem, (2010), pointed that poor road

infrastructure, especially the rural and trunk roads constitute significant challenge to agriculture in Africa. Nearly 50% of African farmers still spend five hours or more to the market. Not only are there few roads, but transport costs in Africa are among the highest in the world, reaching as much as 77% of the value of exports (GoK, 2003 and Serem, 2010).

According to Griesbach, (2003), mango fruits provide a significant portion of households' income in Kenya. However, Kenya can benefit more from mango fruit sector if farmers can be educated or trained on maximizing prices especially through focusing on mango fruits products (Steve, 2010). According to Kehlenbeck et al., (2010) the market for fresh fruit currently constitutes the biggest market for mangoes accounting for almost 90% (165,000MT) in 2010. Within this market, the urban market is the biggest and most lucrative accounting for 75% of the total marketed production (14,200MT) valued at ks.5.3 billion annually. Apart from fresh fruit market, there is also processing of fresh fruits for extraction of juice. International market for mango fruits from Kenya account for 10% total value of marketed mangoes estimated at ks. 800 million in 2011 (HCDA, 2011). According to Serem, (2010) major mango marketing challenges in Kenya include, poor roads, inadequate post harvest handling facilities, price fluctuation in internal and external markets and limited knowledge on value addition opportunities. ABD (2011), pointed out that the mango fruits distribution and marketing channels are generally dominated by middlemen who play an important role in getting farmers produce to the market. The farmers selling through middlemen at farm gates get less income from their produce compared to the value released by the processors and exporters. Mututo (2011) found out that income from mango farming is shaping livelihoods in most families in Makueni County as farmers in the County adopt modern mango farming in agribusiness venture. He recommended that farmers need to form organized groups to assist in transporting fruits to the markets rather than using middlemen to get fruits from their farms to the markets.

A study by Musinga et al., (2012) found out that mango fruit prices vary per mango variety. On the overall Kent, Apple, Tommy and Ngowe fetch high prices in that order. Main challenge in Kibwezi is however on the distribution and marketing channels which are generally dominated by middlemen who dictate the prices to farmers (Mututo, 2011). According to ABD, (2011) baseline survey of trees, there are 2,288 mango farmers in Kibwezi constituency with a total of 107,041 number of

mango trees. This gives an average of 47 trees holding per farmer. The main varieties are Van dyke, Kent, Tommy, Ngowe, and Apple. ABD, (2011) pointed out that mango fruits for export market are sold at an average price of Ks 25 per fruit while the ones for local market are sold at a farm gate price of as low as Ks 5 per fruit. These challenges on poor roads, price fluctuation, limited farmer's knowledge on marketing and many middlemen in Masongaleni ward requires to be investigated to determine how they impact on the marketing of mango fruits.

2.5 Barriers to Export Mango Fruit from Developing Countries

International trade has expanded tremendously over the last decades due to the changing consumer behaviors and tastes, developing in high-value food products, transportation and other supply chain technologies (The World Bank, 2005). Even though a wide range of developing countries have successfully expanded their exports of agricultural and food products, there is growing concern that a serious lack of food safety and agricultural health standards could undermine this progress. The World Bank (2005) stated that "It mainly reflected that the emerging product and process standards amount to a barrier to the trade of developing countries and, in particular, to small producers and agro-enterprises."

Mango is an important fruit crop exported mainly from Asia, Africa, and Latin America. About 90 percent mango producing countries are from the developing world (Ghafoor, 2010). Good performance of many leading mango exporting countries in international trade is a benefit of adoption of Good Agricultural Practices (GAP), post-harvest management and enhancing market arrivals of mangoes. They adopt the market oriented approach with effective advertisement and promotion to enhance export mangoes in international markets. However, importing countries are demanding of international standards such as the Hazard Analysis Critical Control Points (HACCP), GLOBALGAP and ISO 9001 (UNCTAD, 2004; Ghafoor, 2010). These standards are mainly imposed by developed countries and increasingly established by large food processing and distribution companies. These standards act as new barriers for exportation of developing country, however, some argue that these can be a catalyst for the upgrading and modernization of developing country's food supply systems and for export growth (FAO, 2008).

Agricultural trade has become liberated to a great extent under the General Agreement on Tariff and Trade (GATT) and then under the auspices of World Trade

Organization (WTO). Non-tariff barriers (NTBs) became the focal point of trade negotiations among trading partners. WTO member countries have adopted two multilateral agreements to deal with NTBs, namely Agreement on Sanitary and Phytosanitary (SPS) measures and Agreement on Technical Barriers to Trade (TBT) (Rastogi, 2011).

The World Bank (2005) mentioned that “The SPS Agreement permits measures that are “necessary to protect human, animal or plant life and health,” yet requires regulators to: (1) base measures on a scientific risk assessment; (2) recognize that different measures can achieve equivalent safety outcomes; and (3) allow imports from distinct regions in an exporting country when presented with evidence of the absence or low incidence of pests and diseases.” A country can follow SPS measures to protect human, animal, and plant health and life from imported foods and/or agricultural products (Rastogi, 2011).

WTO Members have been reducing tariffs as part of their commitments in the multilateral trading system as establishing Free Trade Areas. However, NTBs are increasingly emerging as trade barriers of developing country exports. Kumar (2005) described that South Asian and South East Asian countries may find their export markets restricted because of inadequate infrastructure to deal with these standards and technical regulations. The US banned import of Indian mango in 1989 on account of excessive usage of pesticides and fear of invasion of fruit flies and stone weevils. India tried to reduce pesticide levels and offered Hot Water Treatment (HWT) as a viable measure of pest control. In 2006, after prolonged negotiations, the US permitted import of Indian mangoes with nuclear irradiation and routine inspection only (Rastogi, 2011).

Lemeilleur (2011) stated that exports need to respect the Codex Alimentarius and maximum pesticide residual levels (MRL) for both the US and EU markets. However, some the major constraint from the US market is a public norm: a hydrothermal treatment is required to kill fruit flies. For the case of Peru, it still faces a problem in complying with the need for hydrothermal treatment of mango to export to the US relates to a public norm. Opposed to the US, Europe does not require hydrothermal treatments and more relative to private standards: at the plant level, HACCP is essential; at the production level, GLOBALGAP has been becoming a *de facto* standard since 2007, organic certification and ISO 22000 has spread (Bignebat et al., 2011; Lemeilleur, 2011). For Pakistan mango exports, ISO 9001 certificate

(UNCTAD, 2004) was only the parameter to evaluate impact of standardization. Ghafoor (2010) said that lack of infrastructural facilities and weak diplomatic efforts and appropriate regulatory systems are affected for less market share of Pakistan in the world exporting market.

India's mango had been banned by Australia, China and Japan on fear of invasion of fruit flies and stone weevils. Japan demands only the vapour heat treatment (VHT) procedure for export of mangoes and other fruits. Pakistan's mangoes continue to face a prohibition by the US. Lately, Australia, Germany and Japan have also banned imports of Pakistan mangoes due to the case of fruit flies (Kumar, 2005).

In African countries, non-tariff barriers are a bigger obstacle to free trade than tariffs within the Regional Economic Communities (RECs). African countries themselves also have high barriers to trade in agricultural products due to the reasons of limiting trade opportunities, increasing costs of food, and causing waste of scarce food resources. By lifting these barriers, it will enable to trade in agricultural products of African countries (Krist and Sewell, 2011).

The World Bank (2005) pointed out that "Agri-food processors and traders in developing countries clearly need to incorporate current and expected SPS and other standards requirements (for multiple markets) into their commercial strategy decisions, including those related to markets and products, the design and adjustment of product procurement systems, and possible investments in processing and marketing facilities."

Firms should foresee changes in official and private requirements in their major export markets and attempt proactive and preemptive measures to maintain or improve market positioning. Jaffee and Henson (2004) claimed that "there is also concern that many developing countries lack the administrative, technical, and scientific capacities to comply with emerging requirements, presenting potentially insurmountable barriers in the short and medium term." Therefore, the firms should work together with industry and trade organizations to build awareness, encourage adoption of good practices and codes of practice, and otherwise strengthen food quality and SPS management throughout the private sector (The World Bank, 2005).

Under the implementing of ASEAN Free Trade Agreement 1992 (AFTA), the aims were to achieve zero tariff for all products by 2010 for the ASEAN-6 (Brunei, Indonesia, Philippines, Thailand, Singapore and Malaysia) countries and 2015 for the

CLMV (Cambodia, Laos, Myanmar and Viet Nam) countries. ASEAN economic integration process started with liberalization of trade in goods through the reduction and elimination of tariffs within ASEAN free trade area.

CHAPTER III

BACKGROUND OF AGRICULTURE SECTOR IN MYANMAR

3.1 Overview of the Agriculture Sector in Myanmar

The Republic of the Union of Myanmar is an agricultural country, and agriculture sector is the backbone of its economy. Myanmar has total population of about 51.7 million and more than 70% of the total population residing in the rural areas is principally engaged in agriculture. It has total land area of 676,552.697380 square kilometers and the total land for agriculture is 161,303,131 acres with three main agro ecological zones: Delta, Central Dry Zone (CDZ) and the Hilly zone.

In the Delta zone, population of about 22 million, farmers are primarily engaged in rice production, particularly during the monsoon. The CDZ, with a population of about 19 million, lies in a monsoonal shadow receiving 600 mm rainfall annually. Farmers are primarily located along the main river valleys, dependent on both rained and irrigated agriculture producing rice, oilseeds, beans and pulses, the latter fed by both surface storage and artisanal water supply.

In the Hilly zone, with a population of about 6.5 million and dominated by Shan state, farmers cultivate a wide range of rain-fed tree crops and horticulture products along with rice, maize and pulses. Livestock production is found across all three zones, while aquaculture primarily occurs in the delta and coastal areas.

Agriculture is the main source of livelihood for people as well as the basis for all round sectorial development of the economy in Myanmar. It contributes 22.1 % to GDP, account for 20% of export earnings and employ 61.2% of total labor force in 2017. Main crop production accounts have three main groups include paddy, beans and pulses, and oilseed crops.

The production of paddy rice is 26,210.300 tons in 2015/16 and continues to dominate Myanmar's agricultural production, being 45.7% of harvested area and 53.4% of production volume of major crops produced in Myanmar.

Beans and pulses are currently the largest agriculture export, returning \$1,152 million in 2015/16, with rice, livestock and fisheries, the other main agricultural export items, each generating between \$400-500 million.

Other key crops include beans and pulses, oilseeds and rubber. Given its diverse agro-climatic zones, the country also produces, sugar, maize, a wide range of fruit and vegetables (some of which are exported particularly to China), palm oil, coffee and tea.

After the economic transition from planned economic system to market oriented economic system in 1988, agricultural policies of Myanmar pay attention on boosting production and promotion of agricultural exports. The Government considers agriculture as the base for all-round development of other economic. Agriculture is as a source of employment and income for many small farmers, and of foodstuffs and raw materials. Nowadays, it is essential to upgrade the agriculture sector for the country.

3.2 Production of Horticultural Crops

Horticulture is one of the sub-sectors of agriculture and its crops in general play an important role in economic development and nutritional status of population. Many developing and developed countries have been benefiting a lot, not only for food self-sufficiency but also for sustainability of their economies. The horticulture crops which includes a wide variety of crops such as fruits, vegetables, spices, plantation crops, floriculture, medicinal and aromatic plants, cashew etc.

Most of these horticultural crops are produced in areas remote from Yangon (Shan State in the North-East and Sagaing State in the North-West). In particular in the Shan State, various vegetables and fruits are produced under its cool climate. The major fruit consumed in Myanmar are banana, mango, watermelon, papaya, jujube, avocado, pomelo, and guava.

A wide range of crops are produced, including papaya, bananas, coconuts, guavas, limes, lemons, grapes, watermelons, musk melons, jack fruit and pineapple. Summer season fruit are durian, mangosteen, rambutan, marian and mango. Apples, oranges, pears are the seasonal fruit of winter.

In addition, some of intercrops are produced, including leaf vegetables, cabbage, cauliflower, leaf mustard, chayote, watermelon, citrus, pineapple, dragon fruit, pear, Chinese quince, plum, chestnut, strawberry, walnut. These crops are

cultivated mainly as intercrops after the cultivation of rice (paddy-rice and upland-rice), maize and sugarcane.

Horticulture crop production in all States and Regions of Myanmar (from 2012 – 2013 to 2016-2017) are shown in Table 3.1. It crops include mango, lemon, orange, pomelo and sweet lime, durian, pineapple, custard apple, lichee, grapes, apple, Pear, damson, walnut, cashewnut, tamarind, strawberry, cabbage, cauliflower, lettuce, Mustard (leaf), tomato, carrot, radish, watermelon, gourd and asparagus. Among them, Mango was the largest production and tomato is the second largest production of horticulture crop in Myanmar.

Table (3.1) Horticulture Crops Production

Crops	Unit (thousand)	2012-13	2013-14	2014-15	2015-16	2016-17
Mango	Number	2098617	2123251	2228279	1981290	2309027
Lemon	Number	783268	826960	761890	841756	913235
Orange	Number	193587	208972	216206	215442	216881
Pomelo and Sweet Lime	Number	82300	87383	77113	89930	91355
Durian	Number	63847	62377	63230	52613	64545
Pineapple	Number	252477	244897	250182	254092	245452
Custard apple	Number	108698	101338	101885	101527	104075
Lichee	Number	359467	389381	336668	365029	366967
Grapes	Number	5725	7597	7449	12596	19163
Apple	Number	1241	1258	2891	2391	2881
Pear	Number	10244	9626	9827	8655	10141
Damson	Number	8930	21441	8023	10759	9910
Walnut	Number	5173	6203	7686	7744	7955
Cashewnut	Number	34426	34549	31380	42392	48958
Plums	Number	187970	190531	187807	200625	202563
Chestnut	Number	251	273	270	319	320
Tamarind	Number	88868	88242	94551	90675	112170
Strawberry	Number	974	874	974	972	982
Cabbage	Number	290767	288752	292098	299664	303807
Cauliflower	Number	231063	226324	237402	241612	254003
Lettuce	Number	47056	48085	45322	55343	60499
Mustard (Leaf)	Number	171910	183711	146711	167903	189706
Tomato	Number	845419	845028	822552	808335	812768
Carrot	Number	14425	13257	10165	9413	9278
Radish	Number	158539	154740	167095	167184	164894
Watermelon	Number	113779	141337	144664	165737	177190
Gourd	Number	161378	172886	163568	165841	162840
Asparagus	Number	1520	2269	2041	1968	3425

Source: Department of Agricultural Land Management and Statistics

3.3 Cultural Practices of Mango Production in Myanmar

Myanmar has the favorable weather conditions and the soil types are highly suitable for mango cultivation. Most of the mangoes are grown at home and at farms. Mango trees can survive for several hundred years and can reach a height of 40 m or more.

In Myanmar, about 200 species of mangoes can be grown. Mango season in Myanmar is in summer and rainy seasons, from April to July. Among the major type of mango, Sein Ta Lone is the origin of Kyauk Se, Mandalay Region, upper Myanmar yet grown all over the country. It was famous among local and foreign consumers after 1990s.

Harvesting period depends on Region. In Lower Myanmar, Sein Ta Lone can be harvested in last week of April while May first week in upper Myanmar and June second week in Hilly Regions of Shan State.

The main advantage of the Sein Ta Lone is its long lasting. It is mainly exported to China via border trade route. Mya Kyauk is originated from Bago Region. Its large size and good taste attract consumers yet perishable nature impedes popularity in both local and export markets. Shwe Hin Thar is the Mandalay origin and grown mostly in central Myanmar and Shan State.

Although it is grown in Yangon Region, Shwe Hin Thar is less popular among local consumers. However, it has huge export market, China. Yin Gwe mango can be grown in every parts of Myanmar, yet prefer more in lower Myanmar and Rakhine State. It is also used for Mango Leather and puree. Ma Chit Su is the most favorite among Myanmar consumers. It can be consumed at both stages, green and ripe. However, it has no export market at all.

Myanmar mango cultivars flower between mid-December to mid-January in the tropical climate of southern part of Myanmar, whereas flowering is delayed in subtropical area such as upper Myanmar beyond Yangon Division by 15-20 days.

However, flowering time of commercial mango cultivars is the entire month of January. Late flowering occurs during February in southern Shan State, where cool climate prevails due to hilly situation. Therefore, duration of flowering period occurs from mid-December to mid-February from south to north Myanmar.

According to the flowering time, variation of mango production season occurs from March-April in the southern part of Myanmar, April-June in the central part of

Myanmar and ends in July-early September in Shan State at high altitude. The latest harvesting cultivar in Myanmar is ‘Yin Kwe’ in hilly region of Southern Shan State.

Harvesting is one of the most expensive operations in mango production because fruit do not mature synchronously, and trees require multiple pickings. Harvesting is generally done by hand, and ladder or picking pole, hook with basket and/or container held open by a ring are used when the plant is high.

Practice of pre cooling is very rare at the farm level. After picking, the fruits are piling under the shading tree because lack of packing house facilities. The harvested and selected mangoes are packed with paper and placed in the wooden or paper crate for Yangon wholesale market and in the hard paper crate and plastic baskets for export through border trade.

During packing there is hardly any grading; while little sorting is usually done and is designed to place the best few fruits at the top of the package. After then the fruits are sent to Yangon wholesale market, Mandalay market and Muse border trade by trucks.

Mango grading is doing mainly on the fruit size and regardless for other qualities such as sweetness, color, shape and smell, etc. Currently, grading is categorized into two sizes as special and large and separated with two groups as bagged and unbagged fruits.

3.4 Myanmar Mango Production, Marketing and Trading

In Myanmar, main mango producing areas are observed in the southern regions; Ayeyarwaddy, Bago and Yangon Division and in the central region; Mandalay and Sagaing Division.

The production and harvest of mango in all States and Regions of Myanmar (from 2013 – 2014 to 2017-2018) are shown in Table 3.2. Mango production in Myanmar was 530813 metric tons, 557070 metric tons, 495323 metric tons, 577275 metric tons and 622644 metric tons in the years 2013-2014, 2014-2015, 2015-2016, 2016-2017 and 2017-2018, respectively.

Mango harvested in Myanmar was 77694 hectares, 79585 hectares, 80813 hectares, 83866 hectares and 91159 hectares in the years 2013-2014, 2014-2015, 2015-2016, 2016-2017 and 2017-2018, respectively.

Table (3.2) Mango Production and Harvesting Area in Myanmar

Year	Production	Harvesting
	Metric Ton	Hectare
2013-2014	530813	77694
2014-2015	557070	79585
2015-2016	495323	80813
2016-2017	577275	83866
2017-2018	622644	91159

Source: Department of Agricultural Land Management and Statistics

The marketing channels for the harvested mango are varying according to harvesting period. There are many different types of marketing agents such as contract buyers, primary collectors, brokers, township wholesalers and retailers or supermarket buyers operating in the mango supply chain. The marketing flow of mango for the local consumption and export market are shown in figure (3.1).

Figure (3.1) Marketing Flow of Mango for the Local Consumption and Export Markets



Source: Export Conditions of Myanmar Mango: Hindrances and Opportunities in the Supply Chain

In Myanmar, marketing channels for mango are

1. From Mawlamyain, Mon State to Thiri Mingalar wholesale market in Yangon Division;
2. From Ayeyarwaddy Division to Thiri Mingalar wholesale market in Yangon Division;
3. From Yangon and Bago (West) to Sagaing market and Mandalay market;

4. From Mandalay (chief production area of ‘Sein Ta Lone’ mango) to Monywa and Shwebo markets in Sagaing Division and Thiri Mingalar wholesale market in Yangon Division; and
5. From Mandalay to Kachin State, Northern Shan State and China through Muse border trade.

For export market, exportable quality cultivars are mainly produced in the central and east region, and the remaining planting areas produce mango for local consumption. Currently, the exportable mango quality is mainly produced from Mandalay Division and it was sent to China by truck via Muse border trade and to Singapore via Yangon International Airport. China is currently the main importing country for Myanmar mango.

The exported volumes and value of mango from Myanmar (2013-2014 to 2017-2018) are shown in Table 3.3. Mango export volume in Myanmar was 32676 tons, 39749 tons, 27843 tons, 29352 tons and 30588 tons in the years 2013-2014, 2014-2015, 2015-2016, 2016-2017 and 2017-2018, respectively.

Mango export value in Myanmar was 10.824 billions of dollars, 13.500 billions of dollars, 9.466 billions of dollars, 9.984 billions of dollars and 9.456 billions of dollars in the years 2013-2014, 2014-2015, 2015-2016, 2016-2017 and 2017-2018, respectively.

Table (3.3) Mango Export Volume and Value in Myanmar

Year	Volume (Ton)	Value (billions of dollars)
2013-2014	32676	10.824
2014-2015	39749	13.500
2015-2016	27843	9.466
2016-2017	29352	9.984
2017-2018	30588	9.456

Source: MFVP

Mango growing area and harvesting area in all States and Regions of Myanmar are shown in Table (3.4). In 2010-2011, the total gross area planted for mango was 79,908 hectares and the total gross area harvested was 70,084 hectares. Among them, Ayeyarwaddy division was the largest mango growing area and

Bago(East) was the second largest land utilization for gross area planted with 18,041 and 10,448 hectares.

Table (3.4) Mango Growing Area and Harvesting Area in Myanmar (2010-2011)

No	State / Division	Gross Area Planted (hectare)	Gross Area Harvested (hectare)
1	Ayeyarwaddy	18,041	15,999
2	Bago (East)	10,448	10,445
3	Mandalay	7,552	5,320
4	Yangon	7,458	7,365
5	Sagaing	6,030	6,029
6	Shan (South)	5,742	3,275
7	Bago (West)	5,230	5,069
8	Rakhaine	4,032	3,333
9	Kachin	3,560	2,946
10	Mon	3,212	2,658
11	Magway	2,422	2,393
12	Tanintharyi	2,332	2,051
13	Shan (East)	1,297	989
14	Kayin	1,163	1,030
15	Chin	697	623
16	Shan (North)	573	440
17	Kayah	121	121
Total		79,908	70,084

Source: Department of Agriculture (DOA)

Gross area planted for mango, in all States and Regions of Myanmar was 18,041 hectares in Ayeyarwaddy, 10,448 hectares in Bago (East), 7,552 hectares in Mandalay, 7,458 hectares in Yangon, 6,030 hectares in Sagaing, 5,742 hectares in Shan (South), 5,230 hectares in Bago (West), 4,032 hectares in Rakhaine, 3,560 hectares in Kachin, 3,212 hectares in Mon, 2,422 hectares in Magway, 2,332 hectares in Tanintharyi, 1,297 hectares in Shan (East), 1,163 hectares in Kayin, 697 hectares in Chin, 573 hectares in Shan (North) and 121 hectares in Kayah, respectively.

Gross area harvested for mango, in all States and Regions of Myanmar was 15,999 hectares in Ayeyarwaddy, 10,445 hectares in Bago (East), 5,320 hectares in Mandalay, 7,365 hectares in Yangon, 6,029 hectares in Sagaing, 3,275 hectares in Shan (South), 5,069 hectares in Bago (West), 3,333 hectares in Rakhaine, 2,946 hectares in Kachin, 2,658 hectares in Mon, 2,393 hectares in Magway, 2,051 hectares in Tanintharyi, 989 hectares in Shan (East), 1,030 hectares in Kayin, 623 hectares in Chin, 440 hectares in Shan (North) and 121 hectares in Kayah, respectively.

CHAPTER IV

SURVEY ANALYSIS

4.1 Profile of the Survey Area

Yangon is the main center for trading and business in Myanmar. The city is previously the capital city of Myanmar and now regarded as main trading hub for all kinds of merchandise in Lower Myanmar. The international banking system is available in Yangon which is one of the best cities for commerce. Both Air-way and sea-freight for trading are available in Yangon. Thus, Yangon is recognized as highly potential in agricultural production with main products including mango with other fruits, vegetables and ornamental plants. Within the Yangon Region as a whole, there are 48 townships. Although Yangon Region is the major commercial area of Myanmar, mango is grown within the region. Among the townships within Yangon Region, Hlegu Township is selected to study the constraints of Mango growers for the development of commercial horticulture farming.

Hlegu Township in Myanmar sits 45 km northeast of Yangon. It is a rural township within Yangon Region. It is comprised with 5 wards, 57 village tracts and 22,060 villages. According to the 2014 census, Hlegu township has a population of 270,741 people and 15 percents of the population are urban, the remaining 85 percents being rural. It has a total of 58,023 households and population density of Hlegu Township is 181 persons per square kilometer. There are 4.3 persons living in each household in Hlegu Township. The township has a poverty rate of 16.2 percent, and an unemployment rate of 4.2 percents. Hlegu currently has a primarily agricultural economy. The proportion of productive working population between 15 to 64 years of age in Hlegu Township is 66.3 percents, proportion of children aged 14 below together with the proportion of the elderly aged 65 and over are less than the proportion of the working age group population. Labor force participation rate for the population aged 15-64 in Hlegu Township is 59.8 percents. Among them, labor force participation rate of females is 40.4 percents and is much lower than that of their male counterparts which is 79.6 percents. Moreover, the unemployment rate for aged 15-64

in Hlegu Township is 3.4 percents. There is not much difference between the unemployment rate for males 3.4 percents and for females 3.6 percents. In Hlegu Township, 22.8 percents of the employed persons aged 15-64 are skilled agricultural, forestry and fishery workers and is the highest proportion, followed by 19.8 per cent in elementary occupations.

According to the 2014 census, the birth rate has been declining in Hlegu Township since the last 10 years and the population has markedly declined from age group 15-19 onwards. The township currently has three government hospitals with a combined total of 82 beds, five public rural health department clinics, and 24 private rural health clinics. In education, the township has three colleges, seven high schools, 118 basic schools, and four preschools. The literacy rate of aged 15 and over in Hlegu Township is 93.9 percents. Among them, female literacy rate is 92.0 percents and 96.1 percents for males.

In Hlegu Township, the Nga Moe Yeik reservoir, which is located 50 kilometers north of Yangon. The reservoir is designed to supply Yangon with 90 million gallons of drinking water per day and is also used to irrigate approximately 35,000 acres of farmland. Due to land use changes and deforestation in the watershed above the Nga Moe Yeik dam, the reservoir is experiencing sedimentation that is reducing its storage capacity, and thus its ability to provide water for Yangon and farmers.

In this study aim to identify the challenges faced by mango growers are studied in Hlegu township. In the survey area, Ngar Su Taung Village, HineKuVillage, Gyokone and Oyinwa village are selected for asking information about the challenges faced by mango growers and survey was conducted in 10 growers in Hlegu township.

4.2 Survey Design

In Hlegu township, a total sample of 10 respondents was interviewed in Ngar Su Taung Village, HineKuVillage, Gyokone and Oyinwa village are selected for asking information about the challenges faced by mango growers. Data were collected using a semi-structured interviewer-administered questionnaire by face to face interview. Data processing of the survey only with the field work for primary data. These growers were asked question on the following topics.

1. Socio demographic characteristics

2. Business information
3. Source of finance
4. Source of Labor
5. Utilization of farm implements and machineries
6. Utilization of farm inputs
7. Gross Marketing Margin
8. Constraints and challenges of growers

4.3 Analysis on Survey Data

This study based on the socio-economic and characteristics of the growers such as age, education, family size and number of working persons in family, operated with number of acre, experience in mango cultivation. And then, preferred source of finance by growers, includes bank, friends/relatives, government, microfinance, NGOs and source of labor by growers, includes local villages, out of the township and out of the region. Moreover, utilization of farm implements and machineries, include ploughs, harrows, water pumps and large machine) and utilization of farm inputs includes local seeds, imported seeds, local plants, imported plants, chemical fertilizers, natural fertilizers, chemical fertilizers and pesticides, insecticide, fungicide. Finally, constraints and challenges of growers include availability of farm inputs, modern technology, climate risk, market information, labor shortage, storage facilities and transport costs. In addition, cost and net profit margins of mango grower is calculated. Through this analysis, needs and challenges of growers can be assessed and able to find out ways to solve the challenges.

1. Socioeconomic Conditions of the Growers

Socioeconomic condition of the respondents includes demographic aspects, and experience in mango cultivation. Demographic factors are age, education, marital status and number and ages of family members. All the ten growers are male and socioeconomic conditions of the growers are shown in table (4.1).

Table (4.1) Socioeconomic Condition of the Growers

Factors	Respondents	Percentage
Age Distribution (Years)		
Less than 40 years	0	0
Between 40-45 years	4	40
Between 45-50 years	4	40
Above 50 years	2	20
Total	10	100
Education		
Primary School	0	0
Middle School	1	10
High School	1	10
Bachelor	8	80
Total	10	100
Family size		
Less than 2 Numbers	0	0
Between 2 and 4 Numbers	4	40
Between 4 and 6 Numbers	6	60
Above 6 Numbers	0	0
Total	10	100
Number of working persons (age 16-59 Years) in family		
Less than 2 Numbers	4	40
Between 2 and 4 Numbers	6	60
Between 4 and 6 Numbers	0	0
Above 6	0	0
Total	10	100

Source: Survey Data by Author

According to the survey data, 80% of growers are between the age of 40-50 years while the 20% of growers are above 50 years.

In terms of the educational qualification of the respondents, majority of them, 10% of growers are the middle school level and another 10% of growers are high school level and then followed by 80% of growers are Bachelor degree holders.

Conditions of family size, 40% of respondents have between two and four numbers and 60% of respondents have above four numbers.

Among the families of growers, 40% of growers have less than 2 numbers of working age people within family and 60% of growers have above 2 numbers of working age people within their family.

2. Business Information (Operation) of the Growers

In this section, studying the business information (operation) are studied. In terms of the land holding, majority 20% of growers are operating on between 2 and 4 acres while other 40% of growers run between 4 and 6 acres. And then 40% of the growers have above 6 acres of land.

Majority of the respondents, 10% of growers have less than two years of experience in mango cultivation. Another 30% of growers also have experience between two and four years and 50% of growers have between four and six in mango cultivation. Only 10% of growers have experience in above six years. These are shown in table (4.2).

Table (4.2) Business Operation and Experience of the Growers

Land acre	Respondents	Percentage
Number of Acre Operated by Growers		
Less than 2 acres	0	0
Between 2 and 4 acres	2	20
Between 4 and 6 acres	4	40
Above 6 acres	4	40
Total	10	100
Experience in mango cultivation		
Less than 2 years	1	10
Between 2 and 4 years	3	30
Between 4 and 6 years	5	50
Above 6 years	1	10
Total	10	100

Source: Survey Data by Author

3. Preferred Source of Finance by Growers

Financing of growers is indispensable as availability of inputs is based on financial accessibility of these growers. The growers rarely use loans and credits for buying land, chemical fertilizer, seeds, labor charge and other transportation cost. Especially, 100% of mango grower, access to credit by growers in Hlegu township is mainly from informal sources.

Among the financing, preferred type or source of finance by growers includes Banks, friends and relatives, government assisted funds, microfinance and NGOs.

From the table, Small holder farmers with poor knowledge of financing, therefore, 100% of grower also prefer friends and relatives. Banks (public and private banks), micro financing programs, government support and NGOs rarely offer credits for mango growers. Therefore, growers face high interest rate and being exploited by money lenders. Growers preferred sources of finance are shown in table (4.3) below.

Table (4.3) Preferred Source of Finance by Growers

Preferred Source of Finance	Respondents	Percentage
Bank	0	0
Friends/Relatives	10	100
Government	0	0
Microfinance	0	0
NGOs	0	0
Total	10	100

Source: Survey Data by Author

4. Source of Labor

In this survey, Source of Labor are shown in table 4.4. 100% of the workers are local village and not all workers are permanent and majority of the labor force is still relying on family workforce. In busy period, they hire worker for their orchad. But, access to labors is more difficult especially for mango growers year by year due to its seasonal nature. Because mango usually harvests in May to August, during the rainy season, workers are being idle in summer and winter.

Table (4.4) Source of Labor

Factors	Respondents	Percentage
Local Villages	10	100
Out of the township	0	0
Out of the Region (migrant)	0	0
Total	10	100

Source: Survey Data by Author

5. Utilization of Farm Implements and Machineries

Another important aspect of operation in horticulture is the use of other inputs. These include equipment for cultivation and spraying and large machineries. Following table (4.5) shows the use of farm implements and machineries by growers.

Table (4.5) Utilization of Farm Implements and Machineries

Farm Implements and Machineries	Respondents	Percentage
Ploughs	10	100
Harrows	10	100
Water Pumps	10	100
Other Equipments (large Machine)	0	0
Tractors	0	0

Source: Survey Data by Author

From the table, it can be seen that 100% of growers can not use all farm equipments. Utilization of ploughs, harrows, and tractors by respondents are lower comparing to the use of water pump. As most growers are small holder farmers, their affordability is low on spending large and expensive machineries and vehicles. However, the respondents use small farm implements and the water is indispensable for their plantations, the growers use water pump.

6. Utilization of Farm Inputs

Another important farm inputs for growers include seeds, plants, fertilizers, pesticides, insecticide and fungicide. Mango can be grown in any place especially in lower Myanmar. However, availability of quality plants and seeds are also important for high yield and export quality.

Availability of inputs is depends on financial condition of the growers. As most of the growers are small holders, their input costs rely on profit and availability of financial capital. The use of farm inputs by growers is illustrated in table (4.6).

Table (4.6) Utilization of Farm Inputs

Inputs	Respondents	Percentage
Local Seeds	2	20
Imported Seeds	0	0
Local Plants	8	80
Imported Plants	0	0
Chemical Fertilizers	0	0
Natural Fertilizers	10	100
Pesticides, Insecticide, Fungicide	10	100

Source: Survey Data by Author

In the study, mango growers use only local seeds, plants, natural fertilizer and pesticides, insecticide, fungicide. Among them, 80% of growers use domestic plants and 20% of growers use local seeds. 100% of growers use natural fertilizers and pesticides, insecticide and fungicide.

7. Gross Marketing Margin

In calculating the gross margin of mango growers, difference between their gross income and expenses is used. The gross margin provides growers in deciding the choice of growing current fruits and vegetables or new one. Following table (4.7) shows the Techno-economic parameters for mango cultivation.

Table (4.7) Techno-economic Parameters (per acre)

Spacing	20 m x 20 m
Plant Population (per acre)	100 plants
Plant price	1500 Ks
Fertilizer	31000 Ks
Manure	30000 Ks
Plant protection material(one bottle)	1000 Ks
Labor (per day)	5000 Ks
Sale price	500Ks

Source: Survey Data by Author

From the table (4.8), average cost per acre can be calculated for mango grower. Average cost by items pertaining to the establishment year and for other sections is given in Table (4.8). The average annual total cost for the establishment year of mango plantation came to be Ks 435600 per acre and it included in interest per year. Total cost was divided into twelve items and calculated in labor cost included. Labor included family labor and hired labor used for various activities like digging, application of fertilizer and irrigation, etc. Twelve items were land preparation , cost of plants, digging, manures & fertilizers , application, planting and staking, irrigation, pesticide, insecticide and spraying, clear danel, harvesting, prunching, plant protection material and transportation.

Table (4.8) Average Cost of Mango (per acre)

(Value in Kyat)

Items	Year											Total
	Section A	Section B				Section C			Section D			
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	11 th	
Cost of Plants	150000	-	-	-	-	-	-	-	-	-	-	150000
Land preparation	40000	-	-	-	-	-	-	-	-	-	-	40000
Digging	50000	-	-	-	-	-	-	-	-	-	-	50000
Manures & fertilizers , application	81000	51000	51000	51000	51000	51000	51000	51000	51000	51000	51000	591000
Planting and staking	20000	-	-	-	-	-	-	-	-	-	-	20000
Irrigation	-	50000	50000	50000	50000	30000	30000	30000	30000	30000	30000	380000
Pesticide , Insecticide and spraying	-	-	20000	20000	30000	30000	40000	40000	50000	50000	60000	340000
Clear danel	20000	40000	40000	40000	40000	40000	40000	20000	20000	20000	20000	340000
Harvesting	-	-	-	-	-	10000	10000	20000	20000	20000	20000	100000
Prunching	-	-	20000	-	20000	-	30000	-	30000	-	30000	130000
Plant protection material	-	-	-	-	25000	-	19000	-	-	-	-	44000
Transportation	35000	-	-	-	-	-	-	-	-	-	-	35000
Capital Cost	396000	141000	181000	161000	216000	161000	220000	161000	201000	171000	211000	2220000
Interest (10%)	39600	14100	18100	16100	21600	16100	22000	16100	20100	17100	21100	222000
Total Capital Cost by year	435600	155100	199100	177100	237600	177100	242000	177100	221100	188100	232100	2442000
Total by Section	435600	768900				596200			641300			

Source: Survey Data by Author

Cost incurred on Plants was Ks. 150000. Land preparation was estimated to be Ks. 40000, those of digging, manures & fertilizers, application, planting and staking, clear danel and transportation were Ks. 50000, Ks. 81000, Ks. 20000, Ks. 20000 and Ks. 35000 respectively.

Similarly, for the 2nd-5th years, capital cost (comprising all above mentioned categories) was determined and it came to be Ks. 768900 and the main component of total cost was manures & fertilizers, application, irrigation, clear danel, pesticide , insecticide and spraying , punching and plant protection material whereas the second most important one was labor.

For the 6th-8th years, total cost or capital cost was Ks. 596200 and manures & fertilizers, application, irrigation, clear danel, pesticide, insecticide and spraying, harvesting, punching and plant protection material were the major constituents of total cost in descending order during this period.

A total of Ks. 641300 was estimated as capital cost for the period from 9th-11th years. During this period, the crucial constituents of capital cost manures & fertilizers, application, irrigation, clear danel, pesticide, insecticide and spraying, harvesting, punching and plant protection material respectively.

(a) Output and Returns of Mango Cultivation

In this study, mango trees do not start bearing in the early years, therefore, output and returns were assumed zero from first to five year. Output and returns were considered from the start of 6th year and onward because during that period, output was produced in such amount that could be marketed. Following table (4.9) shows the output and revenue per acre for mango production.

Table (4.9) Output and Revenue per Acre

Items	Year					
	First period			Second period		
	6 th (Output)	7 th (Output)	8 th (Output)	9 th (Output)	10 th (Output)	11 th (Output)
No. per Plant	15	25	35	45	55	65
No. per Acre	1500	2000	3000	4000	5000	6000
Sale price	Ks 500					
Gross revenue	Ks.750000	Ks.1000000	Ks.1500000	Ks.2000000	Ks.2500000	Ks.3000000
Gross revenue by period	Ks.3250000			Ks.7500000		
Total Gross revenue	Ks.10750000					

Source: Survey Data by Author

Output depends on number of trees planted per acre and in the case of present study; average number of trees per acre were estimated to be 100. From these 100 mango trees in first period, output produced was 6500 fruits per acre and total amount was Ks. 3250000 per acre during years 6th to 8th.

During second period that started from 9th to 11th year, output increased substantially and it was 15000 fruits per acre and amount was Ks. 7500000. Therefore, total amount was Ks. 10750000 per acre during years 6th to 11th in Table (4.9). This amount shows that mango cultivation gives huge returns by investing less amount of capital i.e. Ks. 2442000 as shown in Table (4.8).

(b) Total Profit/ Net Margin of Mango

Total profit is also termed net margin which can be obtained from subtracting total costs from total revenue. Table 4.10 shows the total profit/ net margin of mango per acre for the period from 1st -11th years.

Table (4.10) Total Profit/ Net Margin of Mango per Acre

Items	Value (kyat)
Total Revenue	10750000
Total Costs	2442000
Total Profits/ Net Margin	8308000

Source: Survey Data by Author

For mango growers, total revenue per acre is Kyats 10750000 and total cost per acre is Kyats 2442000 for the period from 1-11 years. Therefore, total profit per acre is Kyats 8308000 for mango grower.

These results point out that mango cultivation gives higher returns. Therefore, the mango growers could earn a large amount of profit on one hand and can contribute towards earning foreign exchange reserves for Myanmar if mango orchards are planned on commercial basis.

8. Constraints and Challenges

Most of the mango cultivation is faced with many challenges and constraints in production. Mango production is still characterized by low levels of farm output, low productivity, fluctuations in production and poor product quality. In this survey area, the low production, productivity levels and poor quality of mango attributes to the following constraints faced by growers.

(a) Availability of Farm Inputs

From the interview, it was found that most of the growers face many difficulties in farm inputs. Most growers discussed about impact of weather condition and high input cost. Sometime, they face the humidity is high and fungal diseases hit the fruit on the trees in this area. So, they are using pesticides to protect the orchards from diseases. Currently, the price of fertilizers and labor charges are fluctuation in the market. So, they can use a few pesticides to protect the diseases because of the lack of capital to purchase the inputs and increase price of various inputs, such as fertilizers, insecticides. If they can't control pest and disease problems, they will face losses always.

Some growers discussed that fruit quality reflects on price and if they can produce quality fruits, they will get higher price. There was a

strong relation between quality and price. Therefore, quality plants and seeds are also important for to get high yield. They explained to get higher price depends on farm input.

(b) Modern technology

From the interview, it was found that most of the growers usually rely on traditional approaches. They do not follow the pre-harvest and post-harvest handling practices.

Some growers discussed about impact of pruning. They explained systematic pruning can give quality fruits. If they couldn't do systematic pruning, they will have no possibility to produce the quality fruits. But, some of the mango trees are little high in their orchard and it can reduce fruits quality. Therefore, they want to know to do systematic pruning.

Some growers discussed about harvesting. Harvesting period of mango is first week of June to second week of July. In this period, they harvest the fruit used with bamboo pole to pick ripen fruits. So, harvest included both mature and immature fruits and a lot of fruit is lost after harvest. When they harvested, the fruits are putting and cleaning with wet clothes and grading is done. And then, the fruits are putting to the fiber box. Grading is done with experience and didn't use weighting scale.

Most grower discussed about pest and diseases problem. They explained flowering period is December and January. In this period, they face several weather condition. Therefore, they want to understand well about pests and diseases management to protect their fruits and flowers.

(c) Climate risk

From the interview, it was found that most of the growers discussed that they can't avoid wind storm and unusual summer rains that normally happened about March and April. Sometimes, they face groundwater shortage in summer season to supply for orchards and unseasonal rains in February that to fungal diseases in the orchard.

Therefore, they face several weather patterns resulted in a delayed crop and variations in temperature led to growth of new leaves and flowering.

Some growers discussed that about the impact of strong wind. They explained that some fruits were also destroyed by strong wind. After the strong wind, mangoes are falling from the trees and leaves are drying up due to pest attack. Therefore, they spraying pesticides was essential to save the fruits.

Some growers discussed that humidity is high in December and January. In this situation, fungal diseases hit the fruit and flowers on the trees. Without pesticides application, they can't get good quality and higher price. Therefore, they have no option but to use excessive pesticides, which can increase input costs.

(d) Market Information

From the interview, it was found that most of the growers said that marketing information is important for mango production and can affect their income because they can adjust the harvested quantity to avoid losing their income.

Another grower discussed that they have not market information from other source such as TV, radio channel. Therefore, they have always talked with marketers and friends about the quality requirement of market and important facts for quality improvement.

Some growers discussed that Mango is a perishable fruit and they can't store. It should be the same size, free from damage, free from spot on the skin, if quality is low, price will be differing more. Therefore, they want to compare market price by collecting information from the different sources.

(e) Labor Shortage

From the interview, it was found that most of the growers face access to laborers is more difficult year by year due to its seasonal nature. They are mainly used labors for trimming trees, fertilizing, spraying, watering plants and harvesting fruits. As mango usually harvests in

May to August, during the rainy season, workers are being idle in summer and winter. Therefore, they need to find jobs in other areas. Finally, they left the study areas and migrate to other places.

Some growers discussed that farm worker are mostly irregular depending on the weather conditions. Therefore, labor mostly consists of family members and sometime temporary labors are only hired during busy seasons.

Some growers discussed that the nature of mango plantation is labor intensive but in these region the younger generation gets no incentive to join the mango cultivation. Some of the growers are now switching to other non-seasonal fruits because of labor shortage problem.

Other growers explained that they face labor shortage problem in the busy time of trimming trees, fertilizing, spraying, watering plants and harvesting fruits, during which time it demands more labor forces to help.

(f) Storage facilities

From the interview, it was found that most of the growers did not apply cool storage and hot water treatment to control diseases after harvesting because of the lack of consistent electricity supply system and high cost.

Most growers discussed that mango harvesting period is very short and mango is a perishable fruit. Some fruit quality is very good on the tree before harvest. After harvested, due to the lack of inadequate facilities, mango fruit quality is very low when arrives to market. Especially, they can't store mangoes for long time because don't have cold room facilities.

Some growers explained that the marketers and retailers expect to get quality fruits which are free from disease, fruit fly, and physical damages. So, to get the quality fruits, it depends on the harvest to right maturity fruits are very important. After harvesting, they can not apply to control diseases because of frequent electricity supply shortages and didn't cover the cost. If they didn't take care about post-harvest practices well, they should be worry for the market demand.

(g) Transport Costs

From the interview, it was found that most of the growers are facing the poorly maintained infrastructure such as farm access roads and the poor road infrastructure network from the district to main market.

Some growers discussed that they always distributed to nearby towns and transports through roadways. But they have the poor condition of rural road from orchard. They carry mango from their orchard by cycle and then transport to market by car. Therefore, transportation cost is high.

Some growers explained that sometimes they face transportation cost for urban markets are the highest because of fluctuation of fuel price, labor charge and other transaction costs.

Other constraints faced by growers are the poorly maintained infrastructure such as farm access roads and the poor road infrastructure network from the district to main market centres. Rural roads are important for delivering goods and services required for production and transporting outputs to markets. Rural roads in four village are mostly in not bad condition from orchard but fuel costs and hire car for transportation to urban markets are the highest. In addition, the primary form of transport for growers is by cycle and light truck.

From the interview, major constraints and challenges are lack of capital to purchase inputs and invest in farm for long term, bad weather condition problems, the use of traditional technologies is widespread and lack of knowledge in using fertilizers and pesticides. Moreover, growers face lack of storage facilities, no power in the market, labor shortage problem, higher transportation cost and access to low interest credit is still difficult.

CHAPTER V

CONCLUSION

5.1 Findings

In the study area still possesses benefits of potential for commercial cultivation can gives higher returns but most of the growers face many challenges and constraints in cultivation.

Most growers are operating on a small acres and experience in horticulture production has a little. As most growers are small holder, their affordability is low on spending. The main reason for the poor productivity in mango cultivation is the low levels of input use in the farm and small farm implements. There is little input use by growers apart from seeds, plants and labor and apply fertilizers and pesticides. This in turn is due to the low levels of income and low purchasing power of their households. In this study, access to credit by growers in Hlegu township is mainly from informal sources.

Moreover, most growers use traditional technologies is widespread and continues to constrain in the mango cultivation. In this study, growers do not practice systemically pre and post-harvest practices.

Another constraint is bad weather conditions in flowering time especially winter season. Growers in these four villages also face widespread occurrence of pest and diseases which attack the mango fruits and trees. However, a few can the ability to purchase pesticides, they are unable to deal with pests and diseases, hence resulting to low yields.

Mango is a perishable fruit and growers can't store for long time because they don't have cold room facilities. Therefore, market information is important for mango production. Growers must always have phone contact with marketers and friends during harvesting season. They have not get other channel for market information.

Mango growers need large numbers of workers especially during planting, growing, and harvesting. Majority of the labor force is still relying on family workforce. But most of the growers face access to laborers is more difficult year by

year due to its seasonal nature. Some labor are migrated to neighboring countries and others to large cities and border areas of Myanmar and some do other work for better income. Therefore, only few laborers are available in these areas.

Rural roads are important for delivering goods and services required for mango production and transporting outputs to markets. Rural roads in four village are mostly in not bad condition from orchards but fuel costs for transportation to urban markets are the highest.

In conclusion, government supports for horticulture farms still low especially for mango cultivation. Myanmar has the opportunity to increase export mango quantity in the future because production and supply are increasing every year. The improvement of country's political view and the connection within the ASEAN regions and EU will improve the export. If they have more opportunities to choose export countries, it will be most advantages for the grower. Therefore, grower is the not only main actor but also knowledge and ideas improvement in the grower level is the basic thing to horticulture development especially in mango fruit.

5.2 Suggestions

In this study, mango cultivation gives huge returns by investing less amount of capital within 1st-11th years. If mango orchards are planned on commercial basis , mango growers could earn a large amount of profit on one hand and can contribute towards earning foreign exchange reserves for Myanmar.

Knowledge and ideas improvement in the grower level is the basic thing to improve the mango cultivation. Therefore, government should training to growers for controlling pests and disease problems, pre and post harvest practice to change from their traditional practices to the international production practices for export quality.

Marketing information is important for mango production and it can affect grower and avoid losing their income. So, Media such as radio, TV, Newspaper, Journals should be supported for market price of mango.

Moreover, government's support is needed to build up good infrastructure especially for rural road. Government should support loan scheme to the fruit tree growers. Normally, Myanmar Agricultural Development Bank supports to the rice growers and not put emphasis for the fruit tree growers. Myanmar GAP standard (based on ASEANGAP) should be implemented.