COMPARATIVE STUDY OF PROFITABILITY OF BLACK GRAM PRODUCTION BEFORE AND AFTER INDIA'S IMPORT SUSPENSION IN KYAUKTAGA TOWNSHIP, BAGO REGION

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COMPARATIVE STUDY OF PROFITABILITY OF BLACK GRAM PRODUCTION BEFORE AND AFTER INDIA'S IMPORT SUSPENSION IN KYAUKTAGA TOWNSHIP, BAGO REGION

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The thesis attached here to, entitled "**Comparative Study of Profitability of Black Gram Production before and after India's Import Suspension in Kyauktaga Township, Bago Region**" was prepared under the direction of the chairperson of the candidate supervisory committee and has been approved by all members of that committee as a requirement for the degree of **Master of Agricultural Science (Agricultural Economics).**

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This thesis represents the original works of the author, except where otherwise stated. It has not been submitted previously for a degree at any other university.

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DEDICATED TO MY BELOVED PARENTS,

U KYI WIN AND DAW KYIN SEIN

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ABSTRACT

Black gram is one of the major exportable pulses in Myanmar. It was mainly exported to India and the domestic prices depend on India's demand. India published a notification restricting the import of pulses through a strict quota for black gram, green gram, and pigeon pea in August, 2017. This study attempted to compare the profitability of black gram production before and after India's import suspension. Total 120 sample farm households were chosen by using a simple random sampling method from six villages in Kyauktaga Township. The study principally aimed to examine changes in cultivated areas, profitability of black gram production and to analyze the determinants on profitability of black gram production before and after India's import suspension. Descriptive, cost and return, and regression analyses were employed. The findings indicated that after import suspension, cultivated areas decreased in black gram and increased in green gram significantly in the study area. Accordingly, incomes from black gram as well as crop income were also decreased. Sample farmers mainly relied on crop income, and non-farm and remittance income sources became more important after import suspension. Therefore, it needs to create non-farm employment opportunities to sustain livelihoods of farmers. The effective price of black gram was significantly decreased and benefit-cost ratio before import suspension was about double than after import suspension. Hence, research and development are required for alternative crop substitution. The regression analysis showed that, effective yield of black gram, total material cost, hired labour cost and number of credit sources were significantly influenced on profit of black gram production before and after import suspension. To improve production and reduce cost of production, government should promote farmers to achieve systematic usage of inputs and extension services are required to provide improved agricultural practices. Because credit sources are important for profitability of black gram farmers, access to more credits from different sources should be facilitated. Import suspension in the study area had negative effect on the profit of black gram. Thus, government and related institutions need to find out alternative international markets. To penetrate other international markets, quality and standard of black gram are becoming critical factors for farmers. Finally, trade agreement would be needed to compensate the risk of domestic farmers and traders.

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LIST OF ABBREVIATIONS

Amd	=	Animal-day
ASEAN	=	Association of Southeast Asian Nations
BCR	=	Benefit-Cost Ratio
ºC	=	Degree Celsius
DOA	=	Department of Agriculture
FYM	=	Farm Yard Manure
GAD	=	General Administrative Department
GDP	=	Gross Domestic Product
ha	=	Hectare
HH	=	Household
kg	=	Kilogram
MADB	=	Myanmar Agricultural Development Bank
Md	=	man-day
MMK	=	Myanmar Kyat
MOALI	=	Ministry of Agriculture, Livestock and Irrigation
MOC	=	Ministry of Commerce
MPBSA	=	Myanmar Pulses, Beans and Sesame Seeds Merchant Association
MSP	=	Minimum Support Price
MT	=	Metric ton
No.	=	Number
TL	=	Total Labour
TLC	=	Total Labour Cost
UAE	=	United Arab Emirates
U.S.	=	United States

LIST OF CONVERSION FACTORS

1 basket of black gram	=	32.7 kilograms
1 hectare	=	2.471 acres
1 metric ton	=	1,000 kilograms

CHAPTER I
INTRODUCTION

1.1 Overview of Agriculture Sector in Myanmar

Agriculture sector is one of the most important sectors of Myanmar economy. It includes crop, livestock and fishery sub-sectors which contributes 25.6% of GDP, 24.4% of total exports earning in 2017-2018 and employs 61.2% of labour force (Ministry of Agriculture, Livestock and Irrigation [MOALI], 2018). About 70% of the total populations living in rural areas of Myanmar engage in agriculture for their livelihood. Therefore, agriculture is a critical sector of Myanmar giving livelihood and employment opportunities for vast majority of population.

Agriculture sector in Myanmar has vast areas of fertile land and abundant success of water, which are the principal ingredients of an agro-based economy. Land resources constitute the fundamental base for all human activities. Land utilization in Myanmar was illustrated in Figure (1.1). Reserved forest covered the largest share (27.90%), followed by other land (23.95%) and other forest (21.45%) among total land area of Myanmar. Land is important not only for producing foodstuffs, cereals, pulses and other crops but also for generating surplus to meet increasing demands created by rising population and developing industrial sector, for laying down the transport network, communication, construction of dwellings and public institution, etc. About 12.05 million hectares (17.82% of country area) are utilized as net sown area in Myanmar. The remaining fallow land (0.46 million hectares) and cultivable waste land (5.54 million hectares) which were 0.69% and 8.19% of total land area can be utilized for the expansion of new agricultural land (MOALI, 2018).

Under the different topography, climate and soil types, more than 61 kinds of crops are usually cultivated in Myanmar. They can be grouped into six categories: cereals, oil seeds, pulses, industrial crops, culinary crops, and fruits and other crops. Rice is the staple food and it is largely cultivated in Myanmar. In early 1960s, Myanmar was the world's largest producer and exporter of rice, a position it is trying to regain through planned initiatives. Oilseed and pulses crops successively occupy the next largest area planted while pulses are the major commercial crop, used mainly for export (MOALI, 2018).

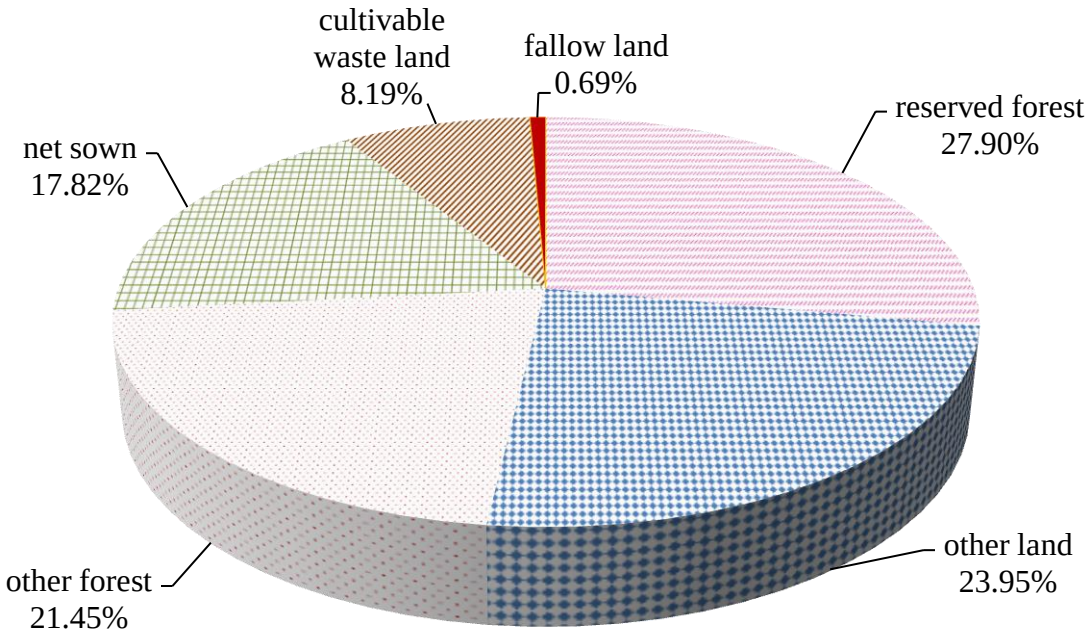

Figure 1.1 Land utilization in Myanmar during 2017-2018

Source: MOALI (2018)

1.2 Overview of Pulses Sector in Myanmar

The production of beans and pulses can be traced back to the British Rule, when the first seeds were brought from India, along with growers, to be cultivated on the rich Burmese soil. A ready Indian market ensured a significant proportion of the produce being exported to India. The big push for the beans and pulses cultivation was driven by the private sector and their emergence as a cash crop with huge export potential came only after 1988 with incentives given by the government to farmers (Myanmar Insider, 2015).

Pulses play an important role in food, feed and farming systems. A vast majority of people are dependent on pulses for their nutritional requirement and food security. Pulses are highly nutritious with high levels of dietary fiber, vitamins, minerals, phytochemicals and complex carbohydrates. Apart from their nutritional benefits, pulses also help to prevent and combat chronic health issues such as diabetes, heart diseases, and obesity. They are quite popular in developing countries, where they serve as a significant part of a healthy diet. However, the consumption of pulses may differ from country to country depending on the availability, dietary patterns, and the local prevailing conditions (PR Newswire, 2017). Despite high levels of pulses consumption in neighboring countries such as India and Bangladesh, Myanmar households consume only limited quantities. Apart from chickpeas, pulse consumption remains very limited. Value added products such as noodles, bean sprouts, high-protein flours, and various fried snacks offer prospects for possible market growth.

Pulses become important in the rural economy of Myanmar, not only for their dietary contribution but also for their income-earning potential and their agronomic contribution within a crop rotation system where little inorganic fertilizer is available. The residues of pulses are valuable for animal feed and these pulses grown rotation with cereals provide sustainable cropping systems.

Pulses are the second important crops in Myanmar after rice and other cereals, and occupying 21.71% of total sown area and over 20 kinds of pulses are sown in Myanmar. The major pulses grown in Myanmar are green gram, black gram, pigeon pea, chickpea, soybean, butter bean, kidney bean, cowpea, lab lab bean, sultani and sultapya. More popular among these are green gram, black gram, pigeon pea, chick pea, soybean and cowpea (MOALI, 2018).

Myanmar is the largest pulses exporter in the ASEAN region as well as one of the top five pulses exporters in the world (Agri Exchange, 2018). Major exportable pulses are black gram, green gram, pigeon pea, chickpea, soybean, butter bean, cowpea and kidney bean.

Total sown area, production and export of pulses in Myanmar were shown in Table (1.1). Pulses sown areas were increased from 4.41 million hectares to 4.66 million hectares during 2011-2012 and 2016-2017 and yield and production were also increased. But, sown areas, yield and production were decreased in 2017-2018. Export volumes of pulses were fluctuated during 2011-2012 and 2017-2018. Share of sown area of pulses in Myanmar were presented in Figure (1.2). Among the total pulses sown area in Myanmar, green gram dominated 27.94% of total pulses sown area followed by black gram (22.01%), other pulses (19.37%), pigeon pea (14.82%), chickpea (8.09%), soybean (3.15%), sultapya (2.26%), butter bean (1.26%) and garden pea (1.10%) respectively in 2017-2018 (MOALI, 2018).

Pulses are normally grown immediately after the harvest of the main rice crop in lower parts of Myanmar and are also grown as a monsoon crop in the central plain areas and Shan State (East part of country). About 70% of all pulses are grown during the winter season. Pulses sown area and production in State and Region of Myanmar were represented in Figure (1.3). Pulses are grown throughout Myanmar and Sagaing Region is the largest cultivated area followed by Bago, Magway, Ayeyawady and Mandalay Regions. Sagaing Region had the largest production of pulses followed by Bago, Ayeyawady, Magway and Mandalay Regions (Department of Agriculture [DOA], 2018). These regions represented 87.44 % of total pulses growing areas in Myanmar during 2017-2018.

Table 1.1 Sown area, harvested area, yield, production and export of pulses in Myanmar during 2011-2012 to 2017-2018

Year	Sown area ('000 ha)	Harvested area ('000 ha)	Yield (MT/ha)	Production ('000 MT)	Export ('000 MT)
2011-12	4,417	4,416	1.23	5,410	1,296
2012-13	4,449	4,447	1.28	5,701	1,484
2013-14	4,534	4,533	1.30	5,902	1,301
2014-15	4,554	4,550	1.32	5,999	1,459
2015-16	4,656	4,654	1.33	6,211	1,192
2016-17	4,661	4,653	1.33	6,189	1,308
2017-18	4,439	4,434	1.27	5,639	1,248

Source: MOALI (2018)

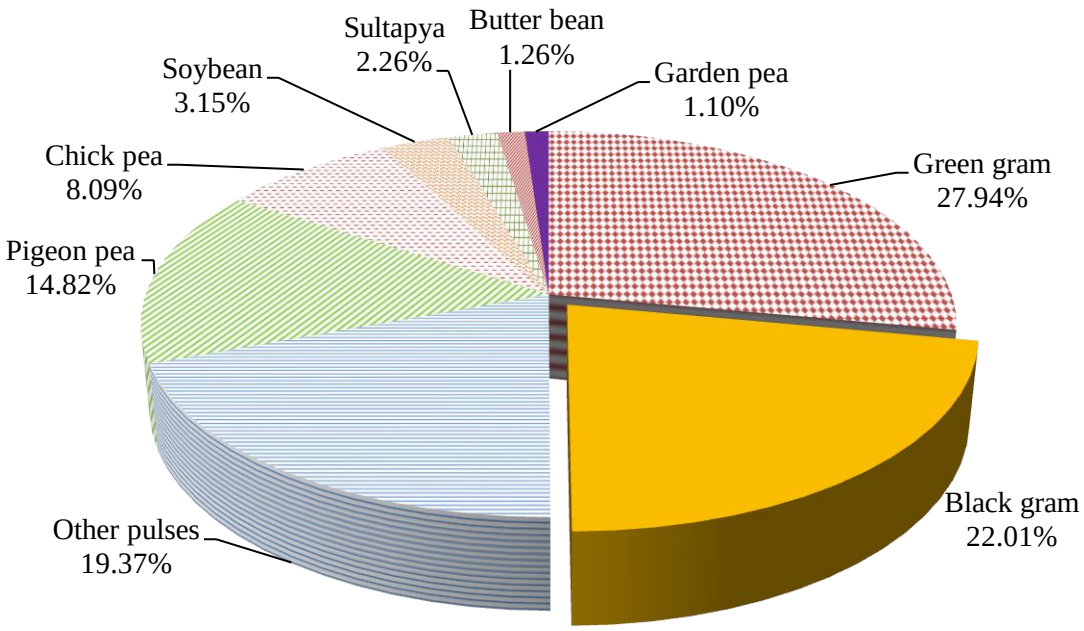

Figure 1.2 Share of sown area for pulses in Myanmar during 2017-2018

Source: MOALI (2018)

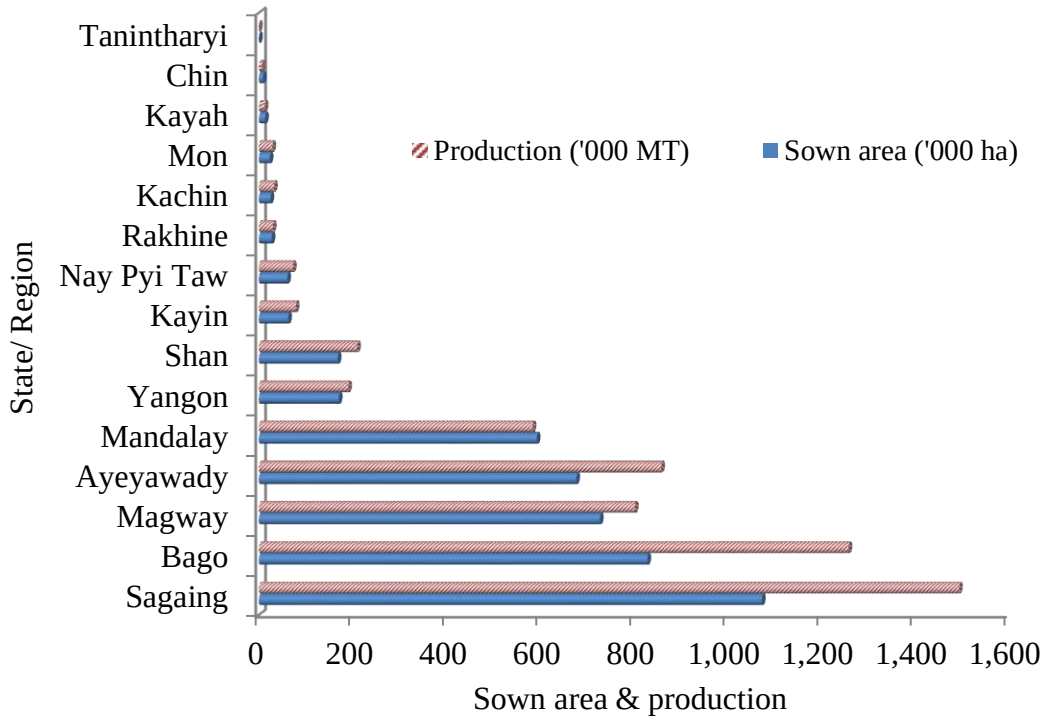

Figure 1.3 Sown area and production of pulses in State and Region during 2017-2018

Source: DOA (2018)

1.3 Effects of India's Pulses Import Suspension on Myanmar

Myanmar has been exporting pulses to India for nearly 30 years, while India exported medicines, sugar and agricultural machinery. Out of Myanmar's total exports of various kinds of pulses to India in 2016 amounting to 1 million metric tons, exports of three kinds of pulses (black gram, green gram and pigeon pea) from Myanmar reached 900,000 metric tons worth 1.4 billion MMK in export earnings. Canada is first in the global pea export market, followed by Australia and Myanmar. Myanmar exports pulses to India, China, Japan, European countries and ASEAN countries.

In August 2017, India announced a 200,000 tons import quota on pigeon peas and 150,000 tons quota each for black gram and green gram. That time was two months before harvesting of the pigeon peas, and before planting time of black gram and green gram in Myanmar. India's severe restrictions which limited the amount of pea products from Myanmar have quickly and adversely affected the local pulses market in Myanmar. Farmers from Ayeyawady, Bago and Yangon Regions were especially concerned about how to handle the produce after pigeon pea harvest in October. According to the Myanmar Pulses, Beans and Sesame Seeds Merchant Association (MPBSA), there were 100,000 tons of pigeon peas and 300,000 tons of black gram left in the hands of local merchants due to the Indian government's decision to restrict pulses import.

The restriction helped support prices of the lentils in India, the world's biggest importer of the pulses, but it put pressure on producers in Myanmar, which relies heavily on exports to India. Myanmar still accepted India's exports (medicines, sugar and agricultural machinery) after pulses import restriction but they did not accept Myanmar's pulses exports; it become imbalanced in trade between the two countries. It is tantamount to a violation of the trade ethic between the partner countries to have stopped without advance notification. Due to the unexpected restriction of India's pulses import, unnecessary price changes had occurred in Myanmar. Pulse merchants said lessons should be learned from the latest unexpected trade policy changes and suggested a broadening of the market (Thit, 2017).

The import restrictions imposed by India in August 2017 resulted in a complete cessation of black gram and pigeon pea purchases by Myanmar traders, followed by an inevitable collapse of domestic prices in Myanmar. The Myanmar government formed a task force with the Ministry of Commerce (MOC) and other key

government Ministries such as Agriculture, Livestock and Irrigation, and Planning and Finance, and representatives of MPBSA. Discussions of this task force focused on three main areas: domestic price support measures, farm diversification options for the coming post-monsoon (winter) season, and how to respond to a Government of India long-term trade deal. The MPBSA requested government to provide a soft loan of approximately $40 million to purchase and stock pigeon pea and black gram. The government was only able to accede to a much smaller loan, approximately $11 million and a group of major traders publicly announced plans to purchase a limited quantity at close to prevailing market prices. The committee also considered encouraging the substitution of pigeon pea for chick pea for public tenders for use by public institutions such as the military.

In late 2017, the Government of India offered the Government of Myanmar a five-year agreement for up to one million tons of exports per annum at a sales price linked to the India minimum price plus a marketing margin. However, in 2015 and 2016, wholesale prices in India, as well as export and wholesale prices in Myanmar were far above the minimum support price (MSP) of India. If such a fixed price agreement had been in place in that period, Myanmar farmers and traders would have lost substantial income. More generally, any arrangement where the sales price is set equal to the MSP (adjusted for a marketing margin) would provide stability, but could result in a wide disparity between the negotiated sales price and market prices.

Ultimately, the Myanmar task force established to respond to the crisis was over-awed by the scale of the quantity commitment in the Government of India offer, and worried by the consequences of not being able to fulfill it. Moreover, there was no assurance of what the India MSP would be in the future, nor whether the marketing margin would defray the costs of delivery. Consequently, the Government of Myanmar never formally responded to the Government of India offer. Kishore (as cited in Boughton, Haggblade & Dorosh, 2018) reported that in the meantime, farmers in India, supported by the Indian Council on Agricultural Research, have expressed strong opposition to the Government of India offer as they see it as supporting foreign producers even when the government is unable to defend the MSP at home.

Myanmar traders appeared resignation to “business as usual” with India, a business they had much experience in navigating. Instead, the Ministry of Commerce turned its attention to expanding alternative pulse export market, organizing a trade

fair in China in January 2018 where ninety Chinese companies participated. With access to irrigation, post-monsoon rice is an attractive option due to robust paddy prices in response to increased export demand for Myanmar rice. But without sufficient irrigation, chick pea and green gram were alternative options because their prices had remained relatively stable. MOALI recommended sunflower cultivation to sufficient domestic oil consumption and has taken steps to improve seed availability for farmers seeking to diversify, although most would rely on neighbors and traders to acquire seed (Boughton et al., 2018).

1.4 Black Gram Production in Myanmar

Black gram (*Vigna mungo*) is the second largest cultivated pulse crop in Myanmar. It is the nutritious pulse which is commonly known as urad bean, black lentil and matpe. It contains 60% carbohydrates, 24% protein, 1.3% fat and is the richest among the various pulses in phosphoric acid (P_2O_5), being 5-10 times richer than others and used to cook soups, curries, stews and side dishes. Black gram is originated in India and mainly grown in tropical and sub-tropical climate and has become very popular pulse crop in India, Pakistan, Bangladesh, Myanmar, Sri Lanka and West Indies (Gangaiah, 2008).

Black gram is one of the major exportable crops in Myanmar. Black gram, pigeon pea and green gram are primarily exported to India. Although Myanmar pulses and beans have penetrated the markets of Bangladesh, Pakistan, Nepal, Malaysia and Indonesia, the volume of exports to those countries is extremely low. Black gram production and export in Myanmar is shown in Table (1.2). Black gram sown areas were increased from 2011-2012 to 2016-2017. Yield was also increased from 2011-2012 to 2015-2016 and slightly decreased from 2016-2017 to 2017-2018. But, production was found as increasing trend until 2016-2017. Sown area and production were declined in 2017-2018. Export volumes of black gram varied from year to year. Monthly price of black gram from 2014 to 2018 was illustrated in Figure (1.4). In 2017, black gram price is the highest in January (before harvesting) and declined in February and March (harvesting time) but slightly increased in April. Then, the price gradually decreased until the end of year. In January 2018, the price was slightly increased but this price was half of price in January 2017. From 2014 to 2018, the highest price was 2,287,500 MMK/ton in October, 2015 and the lowest price was 382,000 MMK/ton in May, 2018 (MOALI, 2018; MOC, 2019).

Table 1.2 Sown area, harvested area, yield, production and export of black gram in Myanmar during 2011-2012 to 2017-2018

Year	Sown area ('000 ha)	Harvested area ('000 ha)	Yield (MT/ha)	Production ('000 MT)	Export ('000 MT)
2011-12	1,090	1,090	1.26	1,375	598
2012-13	1,108	1,108	1.40	1,548	658
2013-14	1,102	1,102	1.43	1,574	644
2014-15	1,098	1,098	1.44	1,580	626
2015-16	1,133	1,133	1.47	1,671	483
2016-17	1,179	1,179	1.45	1,703	559
2017-18	977	976	1.41	1,377	528

Source: MOALI (2018)

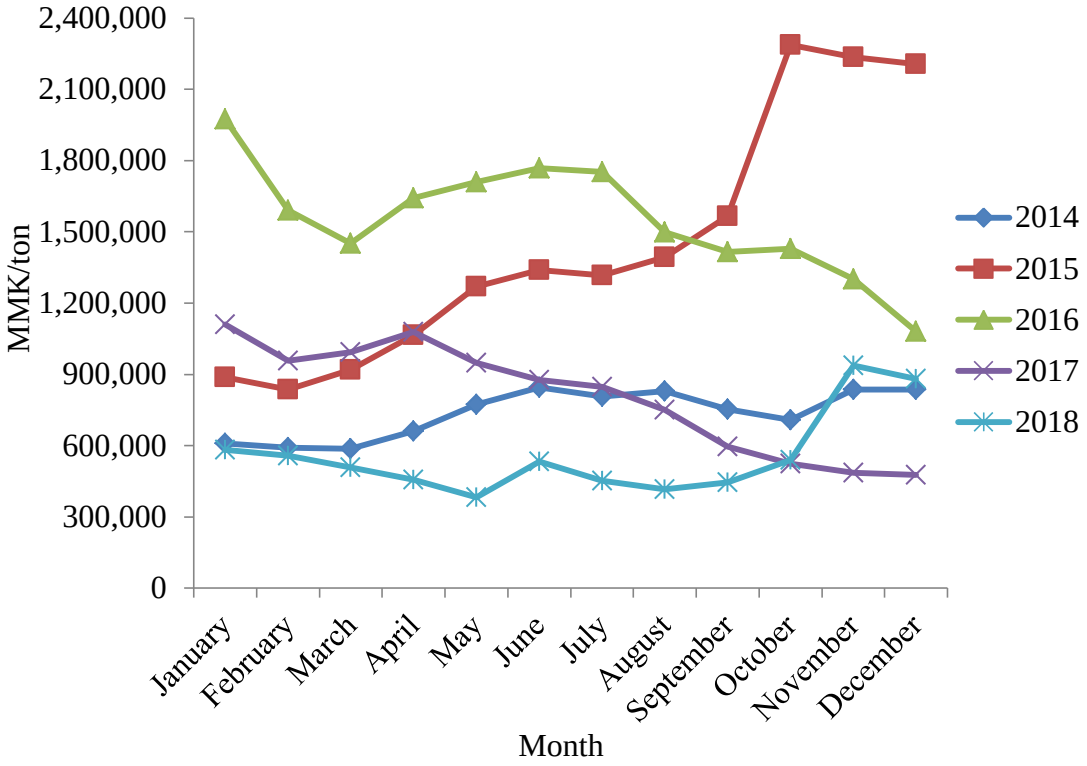

Figure 1.4 Monthly price of black gram for one ton in Myanmar from 2014 to 2018

Source: MOALI (2018), MOC (2019)

In Myanmar, black gram is cultivated in both monsoon and winter seasons and mainly planted after monsoon paddy on residual moisture. Sown area and production of black gram from 2014 to 2018 were presented in Figure (1.5) and Figure (1.6). Bago Region is the largest cultivated area and production followed by Ayeyawady and Sagaing Regions. Due to changing supply and demand conditions and frequent policy changes (export and import pulses), production varies from season to season and from year to year. Thus, it is necessary to understand the changes of agricultural planning and polices on trade of importing countries to maintain the stabilization of export of pulses.

1.5 Rationale of the Study

Pulses are attractive to farmers because they have lower production costs and better returns in comparison with other crops in Myanmar. Pulses contribute the major export portion among Myanmar's agricultural export products. Major exportable pulses are black gram, green gram, pigeon pea, chickpea, soybean, butter bean, cowpea and kidney bean. Black gram, green gram and pigeon pea accounted for 70% of total pulses production, and are the main kinds of exported pulses. About 91% of total pigeon pea production and 77% of total black gram are exported to India and the domestic wholesale prices depend almost entirely on India's demand (DOA, 2017). Another exported pulse, green gram is exported to many countries including India, China, Indonesia, Malaysia and UAE.

An unexpected announcement from India was to change policy on pea and bean imports from Myanmar at the beginning of August, 2017. Under this policy, India had limited the amount of pea and bean products from Myanmar. The import quotas were 200,000 tons for pigeon pea and 150,000 tons each for black gram and green gram. This restriction affected both domestic and export prices for Myanmar beans and pulses. Especially black gram prices prominently decreased in September 2017 and it gradually decreased until the end of year. The value or market price of a crop is one of the important factors that influence the farmer's decision on whether to grow it or not. In response to India's import restriction on beans and pulses, farmers reduced the black gram and pigeon pea growing areas and to shift to other crops such as seed corn, soybeans, green gram, summer rice, and sesame, starting from the 2017 winter season. This reduction was due to Indian import restrictions, which hit the Myanmar market and affected Myanmar farmers' incomes and profits in some degrees.

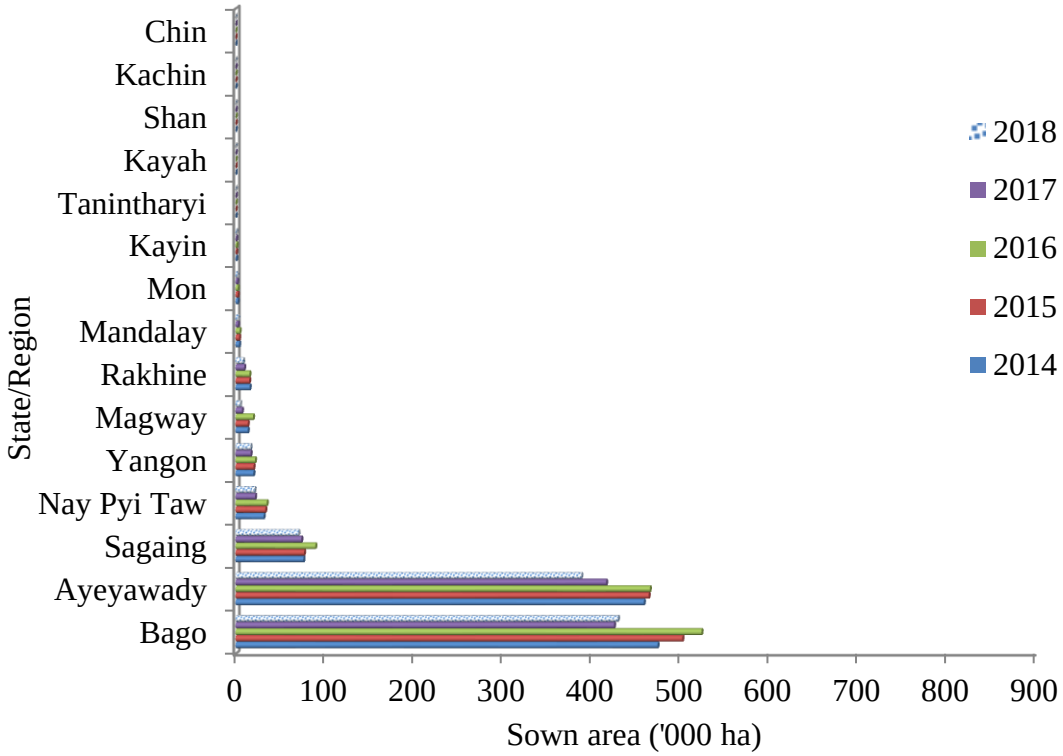

Figure 1.5 Sown area of black gram in State and Region from 2014 to 2018

Source: DOA (2018)

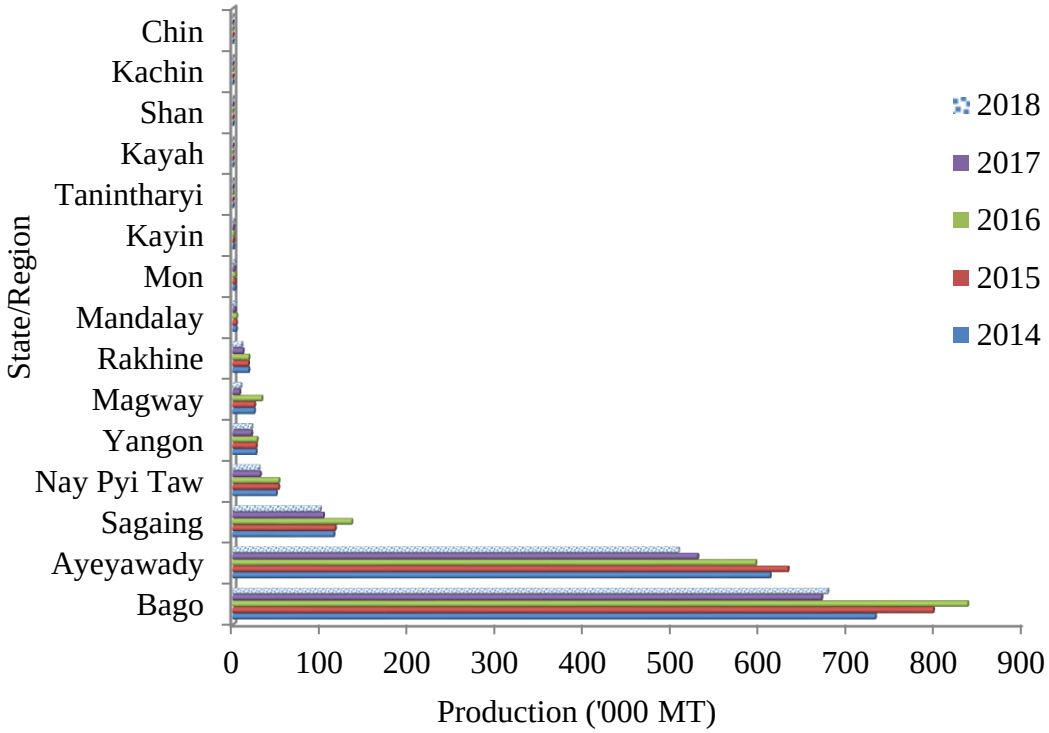

Figure 1.6 Production of black gram in State and Region from 2014 to 2018

Source: DOA (2018)

Because of this restriction, not only the farmers and factory workers but also more than thousands of people who make a living by providing services along the pulses and bean supply chain were affected. Additionally, climate changes, input price changes and labour scarcity also affect the profitability of farmers.

In this condition, a statistical study is needed as it is important to know cultivated area changes and profitability of black gram in Myanmar. It is vital for farmers how much change their profitability before and after India' import restriction. Therefore, in order to know the consequences of India's import suspension, farmers' agricultural conditions, incomes in 2016 (before India's import suspension) and 2017 (after India's import suspension) were examined in this study. The present study was conducted to evaluate the profitability of black gram because black gram is mainly exported to India and the domestic prices depend on India's demand.

1.6 Objectives of the Study

The overall objective of this study is to know how much the profit has been changed and the determining factors on the profitability of black gram production. The specific objectives of the study are as follows:

1. To study the socio-economic characteristics of black gram farmers before and after India's import suspension in the study area
2. To examine changes in cultivated areas and profitability of black gram production before and after India's import suspension in the study area
3. To analyze the determinants on profitability of black gram production before and after import suspension in the study area

CHAPTER II
LITERATURE REVIEW

2.1 Import Restrictions

Methods employed in controlling the volume or values of goods coming into a country maintain the exchange rate of the country's currency. Also called import controls, the primary import restrictions are:

(1) Tariffs (import duties) or taxes levied on the imported goods to make them expensive,
(2) Import licenses or import quotas that limit the total quantity of goods imported, or imported from a certain country,
(3) Currency restrictions that limit the amount of foreign exchange available for payment of imports, and
(4) Prohibition that prevents entry of illegal or harmful items. The last three are collectively known as non-tariff barriers (Business dictionary online, 2019).

Governments' three primary means to restrict trade: quota systems, tariffs and subsidies.

(1) A quota system imposes restrictions on the specific number of goods imported into a country. Quota systems allow governments to control the quantity of imports to help protect domestic industries.
(2) Tariffs are fees paid on imported goods. Tariffs increase the price that consumers pay for the good, thus reducing the quantity of the good demanded and making the price more in line with the price charged by domestic producers. Tariff profits may go to the government or to developing industries.
(3) Subsidies are grants given to domestic industries to help them develop and compete with foreign producers. Through subsidies, domestic producers can charge less for their goods without losing money due to outside grants.

Through judicious use of quotas, tariffs, and subsidies, governments are able to improve the domestic economy. This may increase the price that domestic consumers pay for goods, though this small annoyance is usually outweighed by significantly bolstered overall economic levels and long-term economic growth (Pet therapy, n.d.).

2.1.1 Concept of import restrictions

Since the time of the ancient Greek philosophers, there has been a dual view of trade: a recognition of the benefits of international exchange combined with a concern that certain domestic industries (or labourers, or culture) would be harmed by foreign competition. Depending upon the weights put on the overall gains from trade or on the losses of those harmed by imports (Irwin, 2001).

Smith (as cited in Irwin, 2001) said that the great object of mercantilism was to diminish as much as possible the importation of foreign goods for home consumption, and to increase as much as possible the exportation of the produce of domestic industry. These goals were to be achieved through import restrictions (to reduce imports), on the one hand, and export subsidies (to increase exports). Turning to import restrictions, Smith argued that they would benefit certain domestic industries, but would also diminish competition and give those producers a monopoly in the home market, enabling them to charge higher prices. Monopolies also were prone to mismanagement and were likely to become inefficient.

Davis & Engerman (2003) reported that in trade theory measures restricting import and export flows can be divided into price targeting and quantity targeting measures or a mixture such as tariff quotas. An import ban is a quantitative restriction which aims at a partial or a total prohibition of imports from a given country or set of countries in the country imposing the ban. Bans or embargos are economic sanctions aiming at lowering the demand for particular good and hereby creating welfare losses for the target country. One of the mechanisms for achieving this is by impacting on the foreign currency earnings and the capacity of the target country to purchase goods and services.

An analysis of redistributional effects is crucial in determining the economic impact on the target and sanctioning country as price and quantity effect will differ. For the sanctioning country, the imposition of an import ban lead to a rise in domestic prices and a decline in the demanded quantity. For the target country on the other side, the imposition of the import embargo lowers the price of the export good as total demand for the banned product deceases causing a decline in the terms of trade and export revenue (Eyler, 2007). As a consequence the import embargo lowers welfare in both countries. The ultimate impact on prices and quantities will depend on the import demand and supply elasticities, the quantity affected by the ban as well as the substitutability of imported versus domestic production and of imports from different sources.

2.1.2 Reasons for restrictions to import goods

Globalization101 (2019) reported that governments restrict imports for four basic reasons:

(1) For some governments, particularly in the developing world, tariffs provide a significant source of government revenues.

(2) Every country in the world, including the United States, maintains high tariffs on at least a handful of products for which domestic producers are thought to be vulnerable to foreign competition. This so-called tariff protection is typically imposed early in an industry's life or at moments of weakness or decline, when the threat from more efficient foreign producers is thought to be particularly severe. Once imposed, tariff protection is very difficult to remove, because the enterprises and workers who benefit from it work hard to keep it in place.

(3) Governments use import restrictions to protect domestic health or safety. A government sometimes bans all imports of a particular good when it has reason to believe it could harm public safety or health. For example, in March 2001, the United States prohibited all European imports of livestock to protect U.S. livestock herds from foot and mouth disease, which had afflicted large numbers of animals in Europe.

(4) Governments also restrict imports and exports for political reasons. This kind of governmental restriction on trade is called a sanction. Countries wishing to punish or influence the behavior of another country for human rights violations or for an act of aggression, for example, will sometimes restrict imports from "misbehaving" country. In times of war, adversaries will often prohibit all imports from each other, a measure known as an embargo.

Investopedia (2019) stated that governments may opt to impose tariffs for a multitude of reasons, including the following goals:

(1) To protect nascent industries

(2) To fortify national defense programs

(3) To support domestic employment opportunities

(4) To combat aggressive trade policies

(5) To protect the environment

(1) Infant industries

Tariffs are commonly used to protect early-stage domestic companies and industries from international competition. The tariff acts as an incubator that theoretically affords the domestic companies in question the ample runway time it may need to properly nurture, develop, and grow its business into a competitive entity, on the international landscape.

(2) National defense

If a particular segment of the economy provides products that are critical to national defense, a government may impose tariffs on international competition to support and secure domestic production. This can happen both during times of peace and during times of conflict.

(3) Domestic employment

It is common for government economic policies to focus on fostering environments that provide its constituents with robust employment opportunities. If a domestic segment or industry is struggling to compete against international competitors, the government may use tariffs to discourage consumption of imports and encourage consumption of domestic goods, in hopes of supporting associated job growth, especially in the manufacturing sector.

(4) Aggressive trade practices

International competitors may employ aggressive trade tactics such as flooding the market, in an attempt to gain market share and put domestic producers out of business. Governments may use tariffs to mitigate the effects of foreign entities employing unfair tactics.

(5) Environmental concerns

Governments may use tariffs to diminish consumption of international goods that do not adhere to certain environmental standards.

2.2 Trade Policy Changes on Myanmar's Pulses Sector

Before 1988, government had monopolized all agricultural products by Myanmar Export and Import Service under Ministry of Trade and Commerce. After that, domestic markets as well as export markets were liberalized for private traders except rice and rice products. Export of pulses was fully liberalized except chickpeas.

Chickpea exporters had to sell some portion of export volume to the government at fixed price. Destination countries of Myanmar pulse exports are South and South East Asia countries. India is the largest consumer of Myanmar pulses. Domestic market prices of pulses in Myanmar are determined based on market exchange rate and international prices like New delhi and Mumbi. If there are the distortion of international prices of pulses, consequently, exporter in Myanmar was discouraged to expand the exports and foreign earnings become lower and lower. The balance of trade was unstable in condition. Unification of exchange rate is an essential way to reduce the inflation rate and price fluctuations, to promote increasing of exports and to integrate domestic markets with global economy. Pulses trade is still weak integrated and poor linkages among exporting and importing countries. Although international trade becomes well developed since 1990 because of trade liberalization policy, there are many trade barriers and restrictions in both countries, India and Myanmar. Minimum support price program in India causes distortions of price signals in domestic and international prices. Banning export and high levy of import taxes in India are impediments of marketing efficiency. In Myanmar, parallel exchange rate system and high levy of export taxes are major determinants of spatial efficiency of international markets (Moe, Yutaka, Fukuda & Kai, 2008).

Pulse crop exports from Myanmar grew from nothing to 1 billion dollars per annum over the past 30 years. The sector offered uniquely attractive returns to both smallholder farmers and traders during three decades of international isolation and underinvestment in agriculture. In 2017, India, the major client for Myanmar's pulse exports, effectively banned imports of Myanmar's pulses, resulting in a collapse of domestic prices for black gram and pigeon pea. The loss of farmers' confidence in these two crops threatens potential future gains from trade for both countries. Green gram enjoys more diversified market outlets. Over the past five to ten years, overland exports of green gram to China have become significant. A growing number of high-value markets such as Thailand, Taiwan, Indonesia, and Malaysia attract green gram exports from Myanmar. European buyers have also entered the market recently, although it remains to be seen whether Myanmar will be able to meet strict traceability requirements and pesticide residue limits. China and the high value markets in East Asia and Europe prefer the top quality (large diameter) green gram used for making bean sprouts. The prospect of a long-term bilateral trade deal with India is fraught with technical difficulties. Myanmar traders have little incentive, nor

the financial resources, to maintain significant stockholdings from one year to another. Myanmar's government does not have the financial or administrative resources to manage a price stabilization scheme for exporters. Diversification into high value new export markets requires encouragement of foreign direct investment into the processing sector, which in turn requires allowing foreign countries to purchase raw material domestically in local currency. This will increase liquidity at peak marketing times and provide stronger incentives for quality. To ensure that local traders and processors can compete on a level playing field they should also have access to bank credit and export guarantee services. While exploration and access to new international markets may well require diplomatic involvement, this will be especially important in the case of the Indian market, to support private sector overtures and efforts at expanding quantities and value added in pulse exports to that country from Myanmar (Boughton et al., 2018).

2.3 Concept of Profitability

Profitability means ability to make profit from all the business activities of an organization, companies, firm, or an enterprise. It shows how efficiently the management can make profit by using all the resources available in the market. Profitability is the ability of a given investment to earn a return from its use. For any firm, the profit motive leads to decisions that ensure maximum utility is gained from a venture. Similarly, the price of a crop is one important factor that influences the farmer's decision on whether to grow it or not. It is assumed that farmers are rational and thus are likely to make production decisions based on crops that will yield the most utility or profit to them (Samboko, 2011).

Engel (as cited in Samboko, 2011) outlined farmers differ in their farm and physical characteristics. These characteristics are expected to impact on the profits through their impact on the volume of production, price received per unit of a commodity and the cost structure as depicted in Figure (2.1). There are a number of reasons to explain why profitability varies amongst producers in a particular enterprise. These include aversion to risk and uncertainty; social networks and organization; age, gender, tillage practices, mechanization, household size and education; such variables may influence the costs of production, volume of production, bargaining ability, and one's ability to comprehend technologies.

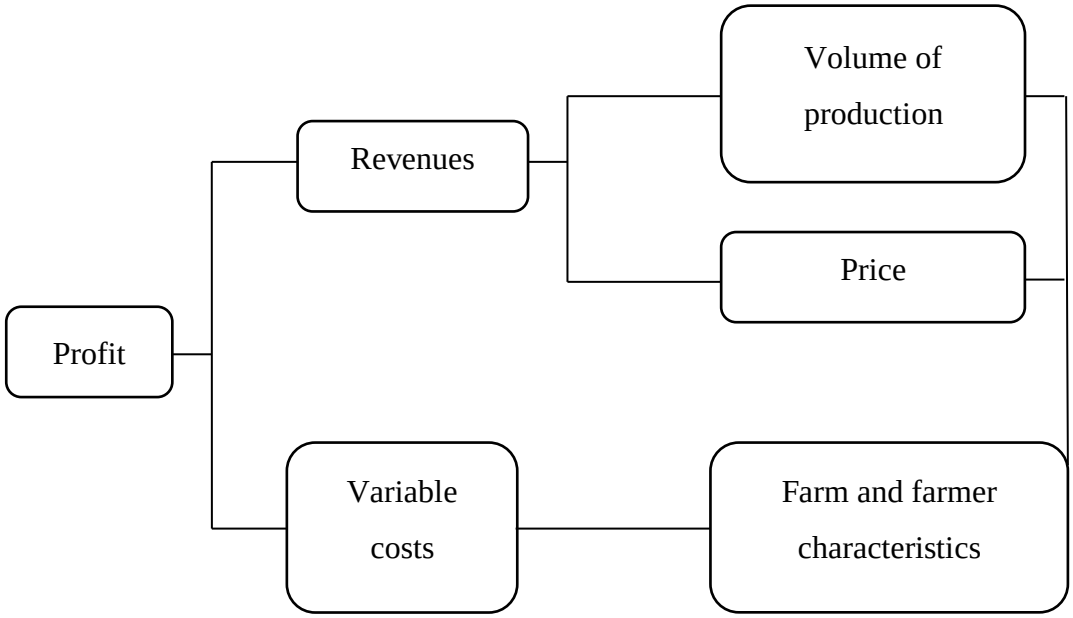

Figure 2.1 Profitability conceptual analyses

Source: Adapted from Engel (as cited in Samboko, 2011)

2.4 Gross Margin or Enterprise Budget Analysis

Gross margin is the simplest and most practical method of assessing enterprise profitability and it is widely used in farm management economics was described by Chisoni (2012). Gross margin has been defined as total income less total variable costs. It serves as the unit of analysis in evaluating the economic performance of an enterprise and gives an indicator of the feasibility of an enterprise and its potential contributing to household income (Masvongo, Mutambara & Zvinavashe, 2013).

Gross margin analysis involves determining all variable costs and revenue associated with an enterprise. The difference between revenue and total variable costs is the gross margin for the enterprise. Gross margins allow comparison to be made of the relative profitability of alternative cropping options that have similar land, machinery and equipment requirements. They indicate the costs of production of alternative enterprises, which helps with farm management decisions. They can be used to analyze the performance of individual enterprises and may indicate areas where possible improvements can be made (Leslie, 2013).

Islam, Rahman, Hossain & Hossain (2011) revealed that costs are the expenses in organizing and carrying out the production process. The cost of production included different variable cost items like land preparation, human labour, seed, manure, fertilizer, insecticides, etc. Both cash expenditure and imputed value of family supplied inputs were included in the analysis. It revealed that highest cost was incurred for human labour (54%) followed by land preparation (28%) and seed cost (7%) when family supplied inputs were valued at market rate.

Enterprise budgets project costs and returns for an activity such as raising livestock, producing grain, or growing vegetables for a production period was described by Doye & Sahs (2016). Each budget specifies a system of production, inputs required, and the annual sequence of operations, as well as summarizes the costs and returns associated with the process. Most budgets are based on one year. For enterprises where production spans more than one year (for example, pecans or cow-calf), a budget generally includes income and expenses for a representative one-year period.

Philip (as cited in Musimu, 2018) said that gross margins do not take into account any changes that may occur in fixed cost structure of the business. A gross margin analysis may show a good result for one particular crop. However, gross

margin of an enterprise is not necessarily an indication of its profitability. Increasing the intensity of enterprises on a farm may increase the total farm gross margin but will not necessarily increase the farm profit since the fixed cost may also rise in greater proportion. Profit is not proportional to gross margin. Philip, Heaslip, Shannon & Casement (as cited in Musimu, 2018) reported that a higher gross margin may be achieved on a farm but this could lead to a lower profit if the resultant increase in fixed costs were greater than the increase in gross margin.

2.5 Regression Analysis

Regression analysis is a statistical technique that attempts to explain movements in one variable, the dependent variable, as a function of movements in set of other variables, called the independent (or explanatory) variables, through the quantification of a single equation. The double-log form is the most common functional form that is nonlinear in the variables while still being linear in the coefficients. In a double-log functional form, the natural log of Y is the dependent variable and the natural log of X is the independent variable (Studenmund, 2005).

The multiple linear regression model otherwise known as the multiple regression model is still the most widely used vehicle for empirical analysis and the social sciences. Multiple regression analysis is more amenable to ceteris paribus analysis because it allows us to explicitly control for many other factors which simultaneously affect the dependent variable. Multiple regression models can accommodate many regressors which may be correlated thus helping us infer causality where simple regression analysis would be misleading. Multiple regression analysis can also incorporate fairly general functional form relationships (Wooldridge, 2003).

Regression analysis is a collection of statistical techniques that serve as a basis for drawing inferences about relationships among interrelated variables. Since these techniques are applicable in almost every field of study, including the social, physical and biological sciences, business and engineering, regression analysis is now perhaps the most used of all data analysis methods. Hence, the goal of this text is to develop the basic theory of this important statistical method and to illustrate the theory with a variety of examples chosen from economics, demography, engineering and biology. To make the text relatively self-contained we have included basic material from statistics, linear algebra and numerical analysis (Golberg & Cho, 2004).

2.6 Determinants on Profitability Analyses

Several factors have been identified to influence agricultural profitability at farm level in Africa. These include the farm gate price, government price policies, farm location, production costs, variety of seed used, yield, farm size, tillage practices, land tenure, experience in production of crop which impacts on yield, education level of the household head, age of household head, gender of household head, household size, off-farm income received, extension services, and distance to market (Reardon et al., 1996).

Yield was very influential in explaining profitability. The enterprise gross margin sensitivity analysis showed that for traditional farmers, gross margins were more sensitive to yield and price changes than for modern farmers in Nicaragua. None of the farmers in the sample completely followed the recommended practices for bean production and that the major share of the total production cost consisted of labour cost. However, this study focused more on cost and input pattern amongst bean farmers. Nonetheless, there is a still need to study the farmer characteristics that influence the yields and variability in profitability of beans (Ishikawa, 1999).

A profitability analysis of bean production in Honduras was conducted by Tschering (2002). An assessment of the cost pattern of input and labour and consequently a profitability analysis of bean production for farmers growing traditional and improved bean varieties was conducted. It was found that farmers growing modern varieties had higher average yields and earned higher profits or suffered less loss than the farmers growing traditional varieties.

Farm size, production costs, farm location, interaction between production costs and farm gate price as well as the interaction between the varieties used and fertilizer applied were significant in explaining the observed sorghum gross margins in Tanzania. However, contrary to literature farm size was found to negatively influence the gross margins (Erbaugh, 2008).

Sulumbe, Iheanacho & Mohammed (as cited in Samboko, 2011) looked at the profitability of cotton production under sole-cropping in Nigeria and found that, family size, income and extension were positively related to cotton output. Farming experience was negatively related to the cotton output. Gross margin was positively relationship with farm size. The interaction between production cost and farm gate price was found to be positive and significant while the farm gate price alone was insignificant. The findings also showed that the variety used, tillage method, and the

application of fertilizer were not significant but the interaction between variety used and fertilizer application was significant and positive.

Educated farmers can easily allocate inputs more efficiently accurately to assess the profitability of new technology, compared to farmers with no education. Farmer's education is an important factor in determining the readiness to accept and apply new technologies which leads to the increase sunflower and maize productivity and income of the smallholder farmers in Tanzania and Benin (Liberio, 2012; Adegbola & Gardebroek, 2007).

A research on profitability of smallholder sugarcane farming in Swaziland using linear regression was conducted by Masuku & Dlamini (2013). The results indicated that variables such as farm size, farming experience, sucrose price, labour cost per hectare and fertilizer cost per hectare significantly influence the profitability of smallholder sugarcane farmers' associations in the study area.

A study to analyze the factors affecting groundnut profit at farm level in Magway Township was focused by Htun (2013). To determine the factors affecting the groundnut profit, log linear regression function was employed. The specific profit functions of groundnut farmers were estimated by using 7 independent variables; farm experience, sown area, yield, total labour cost on the farm, total material cost on the farm, price of groundnut and access to credit. According to the groundnut profit regression estimates, groundnut profit was positively and significantly influenced by yield at 1% level and negatively influenced by total material cost at 5% level.

A study on factors affecting the productivity and profitability of vegetables production in Swaziland using multiple linear regression, the results showed that the factors that significantly affected productivity of vegetable farmers were access to credit, selling price, fertilizer quantity, distance to market and gender of the farmer and had a positive relationship with the productivity of vegetable farmers. The same study revealed that the determinants of profitability of vegetable production were level of education, land under vegetable production and type of marketing agency and had a direct influence on profitability of vegetables (Xaba & Masuku, 2013).

Provision of credit to smallholder farmers in Nzega District, Tabora Region alleviates the capital constraint on smallholders enabling them to acquire inputs for investing into their maize production which consequently improves their gross profit. Also those who had access to credit had better gross margin because they were able to by improved varieties for planting. Improved varieties increase gross margin because they are drought resistant and high yielding (Raphael, 2014).

A study on socio-economic factors influencing profitability of rice seed production in Bangladesh using multiple linear regression, the results showed that farm size, contact with information sources, knowledge on quality rice production and age of the respondents were identified as significant contributors in profitability of rice seed production (Hoque & Haque, 2014).

Profitability of rice production in Nigeria found that the positive gross margin (GM) and net farm income (NFI) values obtained by the farmers indicated that rice cultivation in the area was profitable. The coefficient of per unit price of labour (PPL) was statistically significant at 5% level and negative. This finding is in line with *apriori* expectations and implied that the farmers who were more economical in labour use might have realized higher profit. The costs and return analysis of the study also indicated that labour cost accounted for 75.80% of total cost of production; hence any rice farmer who minimized the cost of production would earn better profit. Farm size on the other hand had positive relationship with maximum variable profit and was significant at 5% level. This implied that as the rice farmers' farm size increased, output and net farm income also increased (Nwike & Ugwumba, 2015).

CHAPTER III
RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was carried out in Kyauktaga Township, the largest cultivated area of black gram in Myanmar during 2016-2017 (DOA, 2017). This township was chosen due to its mainly decreased cultivated area of black gram after India's import restriction.

3.1.1 Location, topography and climate of the study area

Kyauktaga Township is a township in Bago District in the Bago Region. The principal town is Kyauktaga and Penwegon is the other major town. Both are located on the Bago- Toungoo highway and rail line.

Geographically, Kyauktaga Township is located between North Latitude from 17˚55' to 18˚55' and East Longitudes from 96˚15' to 96˚45' and it is located at 24.07 meter above sea level. Total area is 1,093 square miles and it is widest 34 miles and narrowest 21 miles long from east to west and widest 40 miles and narrowest 28 miles long from south to north. It is bordered by Sittaung river and Toungoo District- Kyaukkyi Township on the East, Nyaunglebin and Daik U Townships on the South, Bago Yoma on the West and Toungoo District- Pyu Township on the North.

The most areas of township are plains, valleys and streams except situating of Bago Yoma in the West. The monthly temperature ranges from minimum of 12.5˚C to maximum 40˚C throughout a year. Average monthly rainfall precipitation from 2011 to 2018 was presented in Figure (3.1). Rainfall was the highest in rainy season from July to August while the lowest was found in January to April and December. From 2011 to 2018, the highest total rainfall was 3,491.99 mm in 2017 and the total lowest rainfall was 2,772.41 mm in 2016 (Figure 3.2).

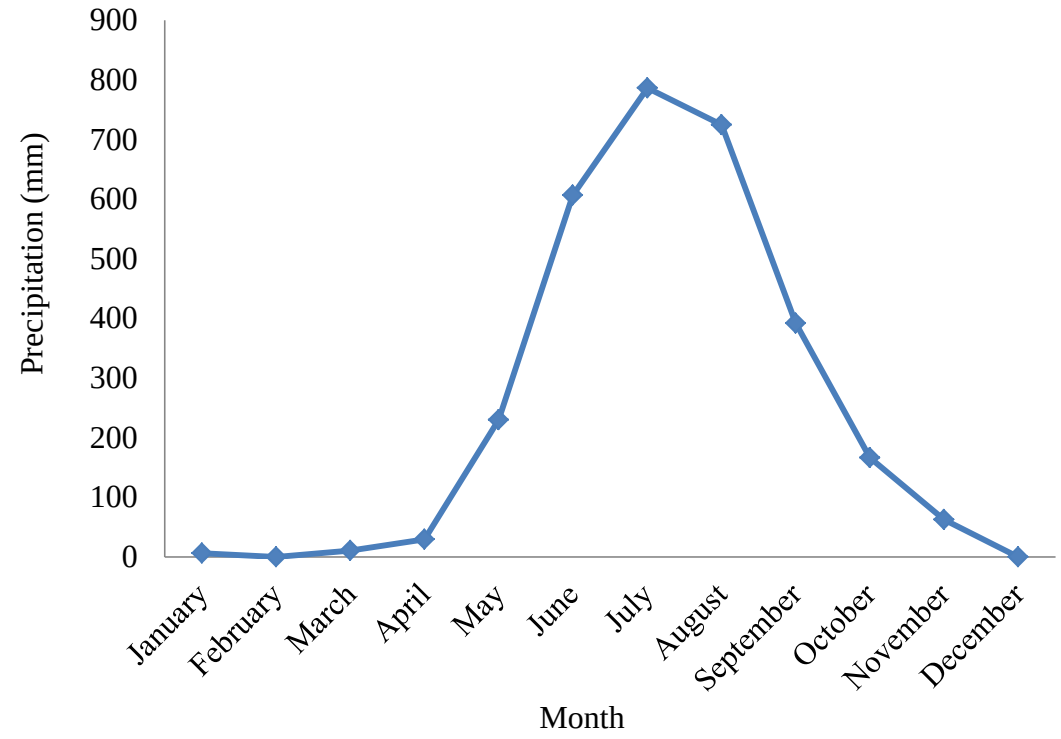

Figure 3.1 Monthly average rainfall precipitation of Kyauktaga Township from 2011 to 2018

Source: DOA (2019)

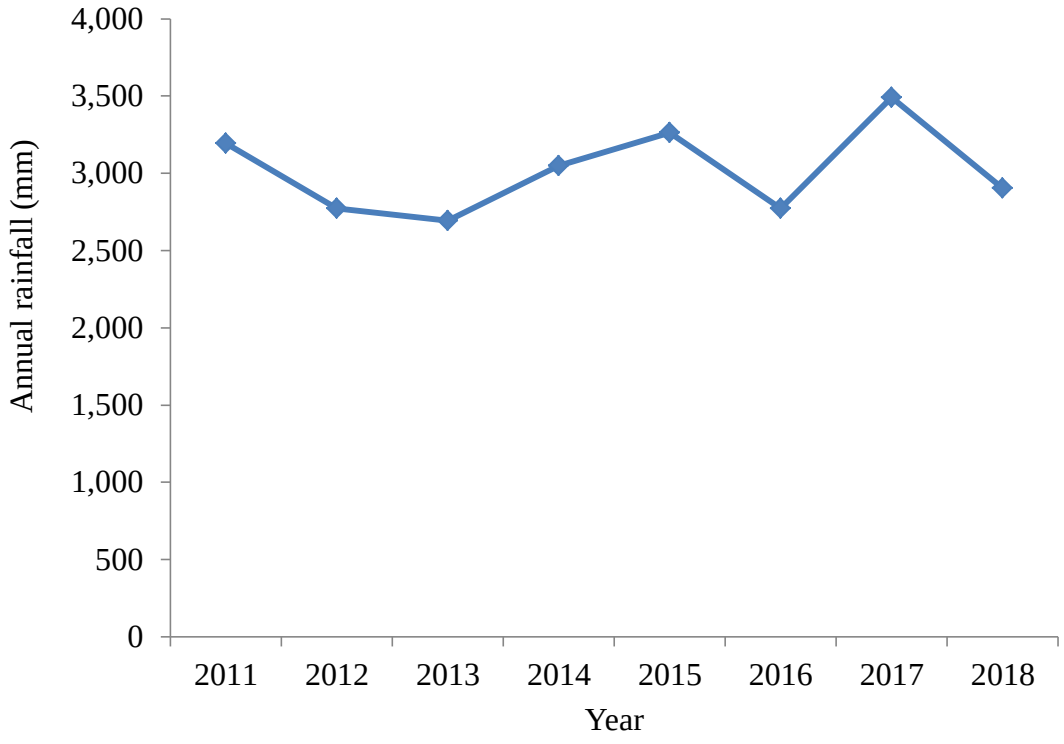

Figure 3.2 Annual rainfall precipitation of Kyauktaga Township from 2011 to 2018

Source: DOA (2019)

3.1.2 Area and population of the study area

The area of Kyauktaga Township was 283,107.24 hectares and there were 18 wards and 46 village tracts including 312 villages in Kyauktaga Township. Its total population was about 251,212 with 120,024 (47.78%) male population and 131,188 (52.22%) of female population according to Myanmar census report 2014.

The selected villages from Kyauktaga Township were Doe Tan, Kyauk Sayit and Let Khan villages from Let Khan village tract and Shwe War, Taw Kywe Inn (North) and Kanbawza villages from Taw Kywe Inn village tract. The total population of Doe Tan village was 944 with 445 of male and 499 of female. In Kyauk Sayit village, the total population was 360 with 170 of male and 190 of female and in Let Khan village, 636 of total population with 308 of male and 328 of female. The total population of Shwe War village was 2,100 with 985 of male and 1,115 of female. In Taw Kywe Inn (North) village, the total population was 550 with 300 of male and 250 of female and in Kanbawza village, 900 of total population with 350 of male and 550 of female (DOA, 2019). A map of the Kyauktaga Township with selected sample villages was shown in Appendix (1).

3.1.3 Land use pattern

Land utilization in Kyauktaga Township during 2016-2017 was illustrated in Figure (3.3). Among total land area of Kyauktaga Township, agricultural land occupies 59,250.09 hectares, 20.93% of the total area, forest area occupies 198,098.75 hectares, 69.97% of the total area and remaining 25,758.40 hectares were other lands (around 9.10%). Agricultural land utilization in Kyauktaga Township was presented in Figure (3.4). Among the agricultural land, lowland occupied 56,159.85 hectares (94.78%) and upland occupies 2,070.82 hectares (3.50%). Therefore, in the study area, paddy land (lowland) cropping was the major cropping system. The kaing and garden land comprised 431.40 hectares (0.73%) and 588.02 hectares (0.99%) respectively.

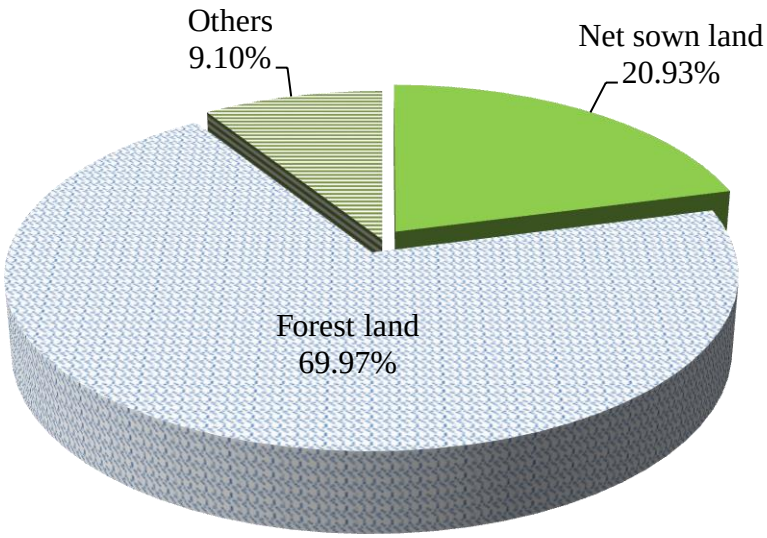

Figure 3.3 Land utilization in Kyauktaga Township during 2016-2017

Source: General Administrative Department [GAD] (2017)

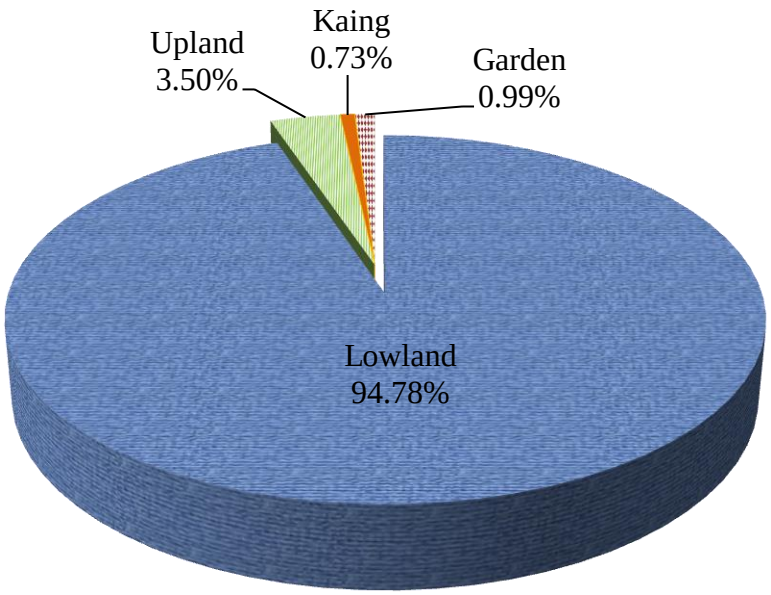

Figure 3.4 Agricultural land utilization in Kyauktaga Township during 2016-2017

Source: GAD (2017)

3.1.4 Sown area and production of major crops in Kyauktaga Township

In Kyauktaga Township, monsoon rice is the main cultivated crop and other crops are cultivated after monsoon rice. Sown areas and production of major crops such as monsoon rice, summer rice, black gram, green gram, groundnut and sesame in Kyauktaga Township during 2016-2017 and 2017-2018 were shown in Figure (3.5) and Figure (3.6). Sown areas of monsoon rice, summer rice and green gram were increased in 2017-2018. But, sown areas of black gram and groundnut were decreased, and sesame sown areas were not changed in 2017-2018. The production of monsoon rice, black gram and groundnut were decreased and that of green gram and sesame were increased in 2017-2018.

After harvesting of monsoon rice, black gram is a mainly cultivated crop during winter season in the study area. Table (3.1) shows the sown area, harvested area, yield and production of black gram from 2011-2012 to 2017-2018. The sown areas were fluctuated and yield was much not different from 2011-2012 to 2016-2017. In 2016-2017, the cultivated area of black gram was 47,174 hectares and then decreased to 25,630 hectares in 2017-2018. The sown area and production of black gram were decreased 45.67% and 51.79% respectively compared to 2016-2017 and 2017-2018 due to India's import suspension.

3.2 Data Source and Data Collection

Both primary and secondary data were used in this study. The primary information was collected by personal interview with a structured questionnaire using simple random sampling method. The survey was conducted in January, 2019. Total of 120 sample farmers, in which 40, 20 and 12 respondents from Doe Tan, Kyauk Sayit and Let Khan villages and 24, 12 and 12 respondents from Shwe War, Taw Kywe Inn (North) and Kanbawza villages, were interviewed in each village. Primary data collected were farm and household characteristics such as demographic characteristics, crop production, assets ownership, income from different sources and credit, etc. before and after India's import suspension.

The relevant secondary data was taken from published official records of Ministry of Agriculture, Livestock and Irrigation (MOALI), Ministry of Commerce (MOC), General Administrative Department (GAD), related journal articles, books, thesis and other relevant data sources.

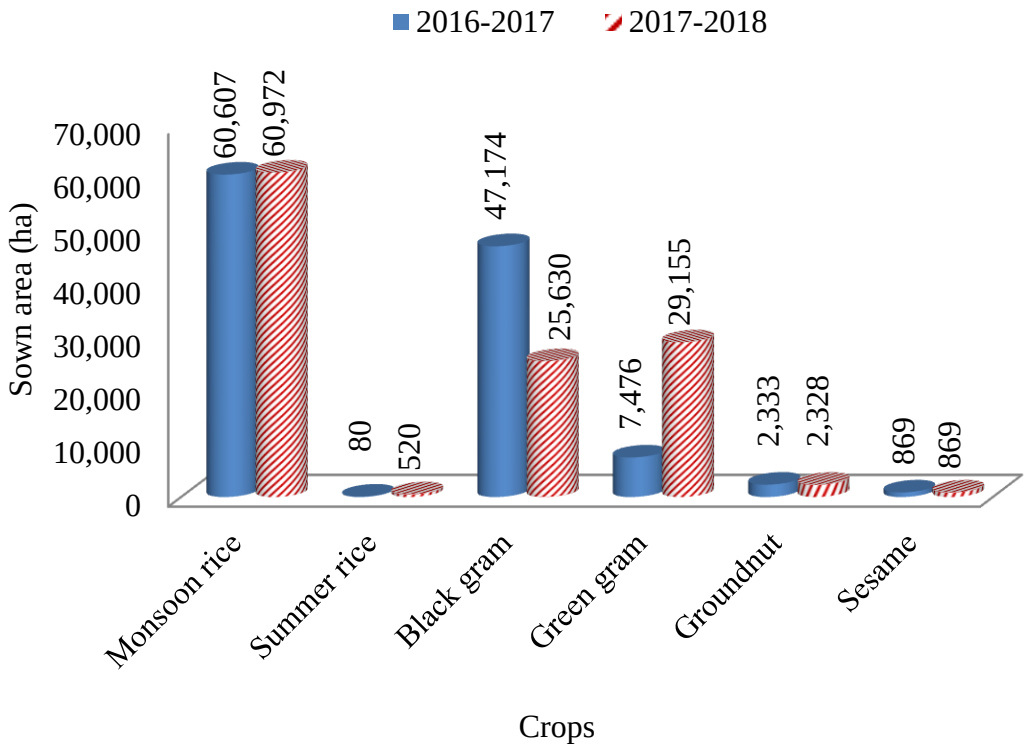

Figure 3.5 Sown areas of major crops in Kyauktaga Township during 2016-2017 and 2017-2018

Source: DOA (2018)

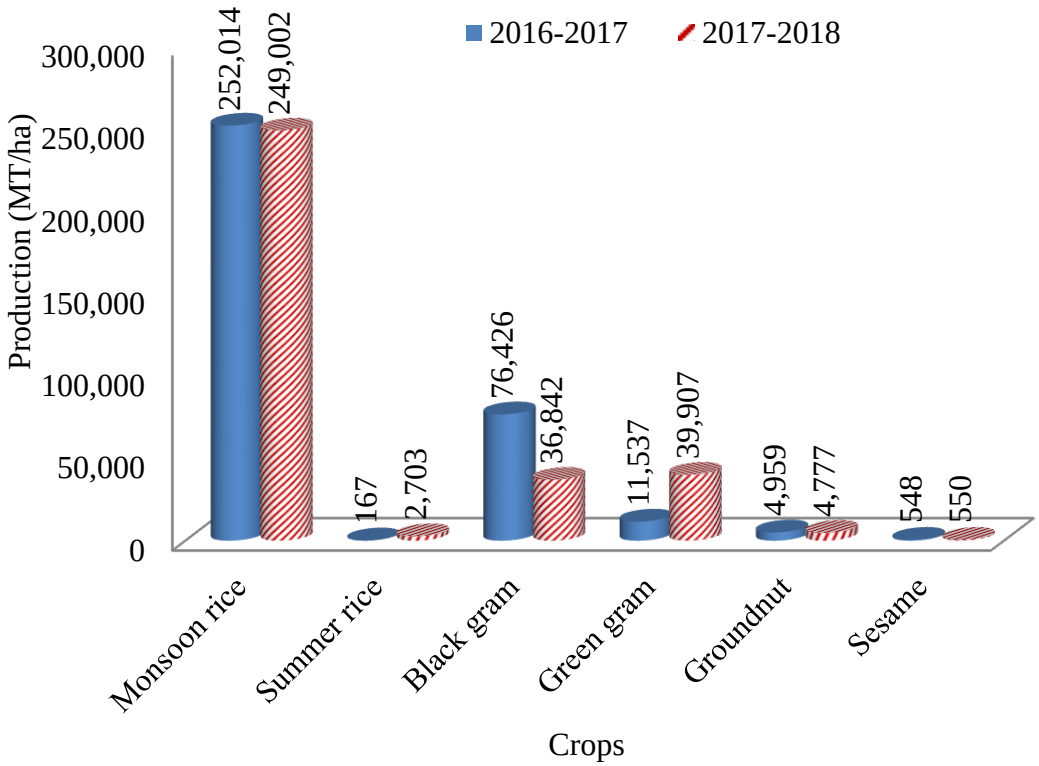

Figure 3.6 Production of major crops in Kyauktaga Township during 2016-2017 and 2017-2018

Source: DOA (2018)

Table 3.1 Sown area, harvested area, yield and production of black gram in Kyauktaga Township during 2011-2012 to 2017-2018

Year	Sown area (ha)	Harvested area (ha)	Yield (MT/ha)	Production (MT)
2011-12	46,104	46,104	1.61	74,244
2012-13	47,567	47,567	1.61	76,678
2013-14	46,353	46,353	1.61	74,795
2014-15	45,920	45,920	1.61	74,134
2015-16	47,091	47,091	1.61	75,911
2016-17	47,174	47,174	1.62	76,426
2017-18	25,630	25,630	1.44	36,842

Source: DOA (2018)

3.3 Method of Analysis

Data were firstly entered into the Microsoft Excel program. These data were analyzed by STATA 12 statistical software. Descriptive statistics such as the mean, frequency counts, and percentage distributions were used to describe socio-economic and agricultural conditions of sample farm households. In order to compare crop production activities before and after import suspension, independent t-test was used. Enterprise budget and multiple regression analyses were used to fulfill the research objectives.

3.3.1 Descriptive analysis

Descriptive statistics such as frequency, percentage, mean, minimum and maximum were used to explore the socio-economic characteristics of sample farm households such as age, education level, farming experience, family size, crop production activities, annual household income (i.e. crop income, off-farm income, non-farm income, livestock income and remittance), household assets and farm implements before and after import restriction.

To characterize black gram production systems before and after import suspension, the farm record data were evaluated. To assess their profitability, average quantity and costs of various inputs (seed, fertilizer, herbicide, insecticide and fungicide) used per hectare of black gram production was computed for comparison and to be used for profitability analysis. Further, labour use (man-days/ha) and its associated costs per hectare by type of operations were analyzed and compared before and after import suspension. Labour use and costs per hectare by operations were separated into family and hired labour to gain a better understanding of the composition of labour and distribution of cost.

3.3.2 Cost and return analysis

The evaluation and focus on the economic and technical performance of an individual farm enterprise is called an enterprise budget which is used to examine the profitability of specific farm enterprise and to compare the profitability of existing and proposed enterprises. Enterprise budget enables to evaluate the cost and return of production process. The purpose of enterprise budgeting was to show the differences in net benefits under several resources situations in such a way as to help one make management decision (Olson, 2003).

Enterprise budget analysis was used to assess the cost and profitability of black gram production in the study area. In this analysis, variable costs were taken into account;

(1) Material input cost,

(2) Hired labour cost,

(3) Family labour cost, and

(4) Interest on cash cost.

The interest was normally charged on cash expense in the early growing season. The counted interest rate was 8% for cropping period of four months. Both cash and non-cash items were included in the estimation of material cost and labour cost. Non-cash items for material cost included seeds, family labour and farm yard manure. Cash payment for labour included hired labour payment for production.

The first measurement was the difference between the total gross benefits or total returns and total variable cash costs, excluding opportunity costs. This value was referred to as "return above variable cash costs". The second measurement was the deduction of the opportunity costs and total variable cash costs from gross benefit. This return was referred to as "return above variable costs" or "gross margin". The "return per unit of cash cost" could be calculated by gross benefits per total cash costs. The "return per unit of capital invested" could be calculated by gross benefits per total variable costs. The current variable inputs included seeds, FYM, fertilizers, pesticides and labour cost. Expressions for estimating returns to various factors were given in Table (3.2).

3.3.3 Profit function of black gram production

The following model was used to examine the determining factors on black gram profit of the selected farm households in Kyauktaga Township. To determine the factors affecting profit of black gram production at farm level in the study area, linear regression function was used. The regression function was as follows;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + b_1 D_1 + b_2 D_2 + \mu_i$$

Where;

Y_i = Black gram profit ('000 MMK/ha)

X_1 = Age of household heads (year)

X_2 = Education level of household heads (year)

X_3	=	Black gram sown area (ha)
X_4	=	Effective yield of black gram (kg/ha)
X_5	=	Agricultural family labour (No.)
X_6	=	Total material cost (‘000 MMK/ha)
X_7	=	Hired labour cost (‘000 MMK/ha)
X_8	=	Number of credit sources (No.)
D_1	=	Access to extension services (Dummy variable, 1= yes, 0= no)
D_2	=	Before and after import suspension (Dummy variable, Before suspension=0, After suspension=1)
β_0	=	Constant
β_1 to β_8, b_1 to b_2	=	Estimated coefficients
μ_i	=	Disturbance term

In this study, the selected variables included were effective yield of black gram, sown area, education level of household heads, age of household heads, agricultural family labour, total material cost, hired labour cost and number of credit sources. The dummy variables were access to extension services and before and after import suspension. A complete decision of the variables specified and types of measures that have been employed are shown in Table (3.3).

Table 3.2 Estimating return to factors of production

Factor	Unit	Formula
Return above variable cash cost	MMK/ha	TR - TVCC
Return above variable cost (Gross margin)	MMK/ha	TR - TVC
Return per unit of cash cost	MMK	TR/TVCC
Return per unit of capital (BCR)	MMK	TR/TVC
Break-even yield	kg/ha	TVC/Average price per kg
Break-even price	MMK/kg	TVC/Average yield per ha

Where,

TR = Total revenue

TVCC = Total variable cash cost

TVC = Total variable cost

BCR = Benefit-cost ratio

Table 3.3 Expected signs of the independent variables in black gram profit

Independent variables	Unit	Expected sign
Effective yield of black gram	kg/ha	(+)
Sown area	ha	(+/-)
Age of household heads	Year	(+/-)
Education level of household heads	Year	(+)
Agricultural family labour	No.	(+)
Total material cost	MMK/ha	(+/-)
Hired labour cost	MMK/ha	(+/-)
Number of credit sources	No.	(+)
Access to extension services	Dummy variable (1= Yes, 0= No)	(+)
Before and after import suspension	Dummy variable (0 = Before suspension, 1 = After suspension)	(-)

CHAPTER IV
RESULTS AND DISCUSSION

In this chapter, the results of the study were presented and discussed in detail to address three objectives of the research. These included description of households' socio-economic characteristics, farm size, black gram sown area, households' incomes, profitability of black gram production, labour use and factors influencing on profitability in the study area.

4.1 Description of Households' Socio-economic Characteristics

Age, education level and farming experiences of household heads, family size, agricultural family labour, farm assets, non-farm assets, livestock assets, access to credit and access to extension services were principally considered as vital socio-economic characteristics of selected farm households in this study.

4.1.1 Age distribution and education level of sample farm household heads

Age distribution and education level of sample farm household heads were described in Table (4.1). The oldest age of sample household heads was 74 years old and the youngest age was 26 years. The average age of household heads was 49.31 years. The active working aged group of 26-64 years old constituted the majority (91.67%) while household heads who were over 64 years old were only 8.33%.

The household heads' education level were divided into monastery education, primary level, middle level, high school level and graduate level. In these categories, monastery education referred to informal schooling although they could read and write, primary level referred to formal education up to 5 years, middle level referred to formal schooling up to 9 years, high school level referred to formal schooling up to 11 years and graduate level referred to those who was attending the university and received a bachelor from university.

Education of the farmers is also an important aspect of learning about modern agriculture, farm management and adoption of new technology. Majority of sample household heads had primary school level (40.84%) followed by middle school level (35.83%). The average schooling year of farmers was middle school level (6.03 years). The maximum schooling year was 15 but the minimum was 1 year.

4.1.2 Farming experience of sample farm household heads

Farming experiences of farmers play an important role in agricultural production to make correct decision and/or to take the risk. It is expected that the higher the farmers' experience in farming, the better the production capacity of the farmers. About 35% of sample household heads had 21-30 years of farming experiences while 20.83% each of sample household heads had 11-20 years and 31-40 years of farming experiences, about 15.84% and 7.50% of sample farm household heads had 1-10 years and over 40 years of farming experiences respectively (Table 4.2). Farmers had 25.32 years of farming experience on average ranging from minimum 3 years to maximum 55 years.

4.1.3 Family size and agricultural family labour of sample farm households

The average family size of the sample farm households was 4.17 (Table 4.3). The maximum number of family members was 9 and minimum was one person. About 50% of sample households had family member of 4 to 6 persons while about 40% of sample households had 1 to 3 persons and 10% of sample households had 7 to 9 persons. The average agricultural family labour of sample households was 1.05 within the range of no agricultural family labour to maximum 5 agricultural family labours. About 73.34% of sample farm households had only 1 agricultural family labour whereas about 23.33% and 3.33% of farm households had 2 to 3 persons and 4 to 5 persons respectively.

4.1.4 Ownership of farm assets of sample farm households

The possession of farming tools, equipment and machineries of sample farm households was presented in Table (4.4). Most of sample farm households possessed hoe, sprayer, sickle, spade and power tiller, and the average numbers of these assets were 1.60, 1.35, 1.79, 1.03 and 0.72 respectively. Less than 50% of farm households owned harrow, plough, water pump and bullock cart as well as their average numbers were 0.53, 0.52, 0.43 and 0.22 respectively. A few sample farm households possessed the average amount of farm assets such as thresher (0.06), ware house (0.03), truck (0.03), tractor (0.02) and combine harvester (0.01).

Table 4.1 Age distribution and education level of sample farm household heads (n=120)

Items	Frequency	Percent	SD
Age group (year)			
26 - 35	16	13.33	
36 - 50	50	41.67	
51 - 64	44	36.67	
Over 64	10	8.33	
Mean	49.31		11.08
Range	26 - 74		
Education level (year)			
Monastery	12	10.00	
Primary (1-5)	49	40.84	
Middle (6-9)	43	35.83	
High (10-11)	13	10.83	
Graduate (12-15)	3	2.50	
Mean	6.03		3.13
Range	1 - 15		

Table 4.2 Farming experience of sample farm household heads (n=120)

Farming experience (year)	Frequency	Percent	SD
1 - 10	19	15.84	
11 - 20	25	20.83	
21 - 30	42	35.00	
31 - 40	25	20.83	
Over 40	9	7.50	
Mean	25.32		11.75
Range	3 - 55		

Table 4.3 Family size and agricultural family labour of sample farm households (n=120)

Items	Frequency	Percent	SD
Family size (No.)			
1 - 3	48	40.00	
4 - 6	60	50.00	
7 - 9	12	10.00	
Mean	4.17		1.67
Range	1 - 9		
Agricultural family labour (No.)			
0 - 1	88	73.34	
2 - 3	28	23.33	
4 - 5	4	3.33	
Mean	1.05		1.08
Range	0 - 5		

Table 4.4 Farm assets of sample farm households (n=120)

Assets	Units	Frequency	Percent	Average
Hoe	No.	114	95.00	1.60
Sprayer	No.	108	90.00	1.35
Sickle	No.	107	89.17	1.79
Spade	No.	93	77.50	1.03
Power tiller	No.	73	60.83	0.72
Harrow	No.	53	44.17	0.53
Plough	No.	53	44.17	0.52
Water pump	No.	48	40.00	0.43
Bullock cart	No.	26	21.67	0.22
Thresher	No.	7	5.83	0.06
Ware house	No.	4	3.33	0.03
Truck	No.	3	2.50	0.03
Tractor	No.	2	1.67	0.02
Combine harvester	No.	1	0.83	0.01

4.1.5 Ownership of non-farm assets of sample farm households

Lists of non-farm assets possessed by sample farm households were shown in Table (4.5). In this table, most of sample farm households possessed hand phone (95.00%), TV (84.17%), motor cycle (83.33%), bicycle (70.83%), satellite dish (62.50%) and solar panel (60.83%). Less than 50% of sample farm households possessed DVD (48.33%), radio (24.17%), htaw lar gyi (15.83%), refrigerator (13.33%), sewing machine (4.17%), generator (1.67%), car (0.83%) and tricycle (0.83%) respectively.

The average amounts of non-farm assets possessed by sample farm households were hand phone (2.20), TV (0.84), motor cycle (1.18) and bicycle (1.07) respectively. The average amounts of other assets were less than one.

4.1.6 Types of land ownership of sample farm households

Sample farm households held about 3.55 ha of own lowland while about 0.39 ha were under rent in condition. As shown in Table (4.6), the average farm size of sample farm households was 4.18 ha within the range of 0.40 ha to 16.19 ha which was composed of lowland, 3.94 ha, upland, 0.08 ha and kaing, 0.17 ha respectively. Most of sample farm households possessed lowland and about 14.17% of sample farm households rented lowland. About 3.33% and 5.83% of sample farm households owned upland and kaing.

4.1.7 Ownership of livestock assets of sample farm households before and after import suspension

Livestock assets possession of sample farm households before and after suspension was presented in Table (4.7). The farm households used poultry for home consumption, draft cattle for crop production activities while pig was raised for their extra family income. About 65% of sample farm households possessed poultry before and after import suspension. Draft cattle and pig possessions were slightly decreased from 35.83% to 34.17% and 30% to 25% of sample farm households respectively after import suspension. Average number of poultry (11.33) was the same before and after import suspension. After import suspension, the average number of draft cattle and pig were slightly reduced from 0.91 to 0.88 and 0.83 to 0.66 respectively.

Table 4.5 Non-farm assets of sample farm households (n=120)

Assets	Units	Frequency	Percent	Average
Hand phone	No.	114	95.00	2.20
TV	No.	101	84.17	0.84
Motor cycle	No.	100	83.33	1.18
Bicycle	No.	85	70.83	1.07
Satellite dish	No.	75	62.50	0.63
Solar panel	No.	73	60.83	0.80
DVD	No.	58	48.33	0.48
Radio	No.	29	24.17	0.25
Htaw lar gyi	No.	19	15.83	0.16
Refrigerator	No.	16	13.33	0.13
Sewing machine	No.	5	4.17	0.07
Generator	No.	2	1.67	0.02
Car	No.	1	0.83	0.01
Tricycle	No.	1	0.83	0.01

Table 4.6 Types of land ownership by sample farm households (n=120)

Land ownership	Frequency	Percent	Area (ha)		
			Average	Minimum	Maximum
Lowland (Le)			**3.94**	**0.40**	**16.19**
own	115	95.83	3.55	0.40	16.19
rent in	17	14.17	0.39	0	8.09
Upland (Yar)	**4**	**3.33**	**0.08**	**0**	**3.24**
Kaing	**7**	**5.83**	**0.17**	**0**	**6.07**
Total	**120**	**100.00**	**4.18**	**0.40**	**16.19**

Table 4.7 Livestock assets of sample farm households before and after import suspension (n=120)

Assets	Units	Before		After	
		Frequency	Average	Frequency	Average
Poultry	No.	78 (65.00)	11.33	78 (65.00)	11.33
Draft cattle	No.	43 (35.83)	0.91	41 (34.17)	0.88
Pig	No.	36 (30.00)	0.83	30 (25.00)	0.66

Note: The values in the parentheses represent percentage of sample farm households.

4.1.8 Farm size and black gram sown area of sample farm households in the selected villages of Kyauktaga Township before and after import suspension

Changes in farm size and black gram sown area of sample farm households in Kyauktaga Township before and after import suspension were shown in Table (4.8). Apart from average farm size of sample farm households in Kanbawza village, average farm sizes of sample farm households from Doe Tan, Kyauk Sayit, Let Khan, Shwe War, Taw Kywe Inn (North) villages slightly increased after import suspension in comparison with those of sample farm households before suspension. The largest farm size was 16.19 ha in Doe Tan village followed by Let Khan (12.14 ha) and Kanbawza (12.14 ha) villages.

However, average black gram sown area of sample farm households was decreased from 3.17 ha to 2.67 ha after import suspension. In Let Khan village tract, black gram sown areas of sample farm households in Doe Tan, Kyauk Sayit and Let Khan villages were decreased from 3.02 ha to 2.41 ha, 2.49 ha to 2.43 ha and 4.04 ha to 3.28 ha respectively in comparison with before and after import suspension. Similarly, in Taw Kywe Inn village tract, black gram sown areas of sample farm households in Shwe War, Taw Kywe Inn (North) and Kanbawza villages were decreased from 3.44 ha to 2.57 ha, 3.07 ha to 2.87 ha and 3.51 ha to 3.32 ha respectively after import suspension. Sample farm households in Doe Tan village possessed the largest cultivated area of black gram followed by sample farm households in Kanbawza village.

Table 4.8 Farm size and black gram sown area of sample farm households before and after import suspension (n=120)

Village tract	Village	Before		After	
		Farm size (ha)	Black gram sown area (ha)	Farm size (ha)	Black gram sown area (ha)
Let Khan		**3.92**	**3.04**	**4.05**	**2.56**
		(0.40-16.19)	**(0.40-16.19)**	**(0.40-16.19)**	**(0.00-12.14)**
	Doe Tan	3.62	3.02	3.68	2.41
		(0.40-16.19)	(0.40-16.19)	(0.40-16.19)	(0.00-12.14)
	Kyauk Sayit	3.38	2.49	3.44	2.43
		(1.21-8.50)	(0.61-7.28)	(1.21-8.50)	(0.40-7.28)
	Let Khan	5.79	4.04	6.30	3.28
		(2.02-12.14)	(1.21-8.09)	(2.02-12.14)	(0.00-8.09)
Taw Kywe Inn		**4.22**	**3.36**	**4.38**	**2.83**
		(0.81-12.14)	**(0.61-12.14)**	**(0.81-12.14)**	**(0.00-12.14)**
	Shwe War	4.21	3.44	4.65	2.57
		(1.62-11.33)	(0.61-8.09)	(1.62-11.33)	(0.00-8.09)
	Taw Kywe	3.71	3.07	3.81	2.87
	Inn (North)	(1.01-8.50)	(1.01-6.88)	(1.01-9.31)	(0.61-6.88)
	Kanbawza	4.77	3.51	4.43	3.32
		(0.81-12.14)	(0.81-12.14)	(0.81-12.14)	(0.00-12.14)
Total		**4.04**	**3.17**	**4.18**	**2.67**
		(0.40-16.19)	**(0.40-16.19)**	**(0.40-16.19)**	**(0.00-12.14)**

Note: The values in the parentheses represent range.

4.1.9 Access to agricultural extension services before and after import suspension

Agricultural extension service plays a crucial role in disseminating cultural practices and boosting agricultural productivity. Table (4.9) presented that the sample households' meeting attendance offered by private agro-input companies and DOA. In this study, most of farmers attended trainings offered by private companies than that of DOA because private companies provided services in accordance with their specialized incentives such as input supply and farmers responded in terms of what they saw as most beneficial to them. DOA can support improved methods of farming, demonstrate innovations; organize farmer meetings and field days on a wide range of topics. Moreover, farmers desired to work in the field and were not very interested in attending meetings because they faced the work load in the field.

Before the restriction, about 20.83% and 50% of farmers had no contact with private and government extension agents. The attendance of extension training or meeting of farm households offered by private companies and DOA was 8.33% and 25 % for one time, 46.67% and 22.50% for two to three times and 20% and 2.50% for four to five times respectively. About 4.17% of farmers attended the meeting above five times offered by private companies per season.

After the restriction, about 20.83% and 47.50 % of farm households had no contact with private and DOA extension agents. About 7.50% and 25.83% of farmers participated only one time in the agricultural extension meeting offered by private and government organizations. The attendance of extension meeting accessible by private companies and DOA was 45.84% and 23.33% for two to three times and 20.83% and 3.34% for four to five times respectively. Only 5% of sample farm households had above five times contact with extension agents from private companies.

4.1.10 Sources of credit taken by sample farm households before and after import suspension

Credit has a vital role for elimination of farmer's financial constraints to invest in farm activities, increasing productivity and improving technologies. Generally, credit accessibility is important for improvement of quality and quantity of farm products. In addition, it can increase farmer's income and avoid from rural migration. Although Myanmar Agricultural Development Bank (MADB) was paying loans to

farmers, the amount did not cover the requirements of crop production. Therefore, farm households had to take credit from other sources such as private lenders, cooperatives and Mya Sein Yaung (Evergreen project). According to survey data, MADB was the main credit source and about 36.68% of sample farm households received credit only from MADB as well as about 2.49% of sample farm households received from cooperative, Mya Sein Yaung and money lenders before the restriction (Table 4.10). About 20.83% of sample farm households received credit from two sources (MADB and money lenders), about 18.34% of sample farm households received from MADB and cooperative and about 5.83% of sample farm households received from MADB and Mya Sein Yaung before the restriction. About 10.00% of farmers received credit from three sources and about 1.67% of farmers received from four sources while about 2.50% of sample farm households did not take the credit before the restriction.

After the restriction, about 35% of sample farm households received credit from MADB and about 2.49% of sample farm households received credit from cooperative, Mya Sein Yaung and money lenders. About 20.83% of sample farm households received from MADB and money lenders, about 14.18% of sample farm households from MADB and cooperative and about 9.17% of sample farm households from MADB and Mya Sein Yaung. The percentage of sample farm households received credit from cooperative and money lenders, and Mya Sein Yaung and money lenders was not different after the restriction. About 13.33% of farmers received credit from three sources and the percentage of farmers received from four sources was not changed while only 1.67% of sample farm households did not take the credit after the restriction.

Table 4.9 Access to production practices by sample farm households before and after import suspension (n=120)

Frequency of meeting/ season	Before		After	
	Input dealer	DOA	Input dealer	DOA
One time	10 (8.33)	30 (25.00)	9 (7.50)	31 (25.83)
2 - 3 times	56 (46.67)	27 (22.50)	55 (45.84)	28 (23.33)
4 - 5 times	24 (20.00)	3 (2.50)	25 (20.83)	4 (3.34)
> 5 times	5 (4.17)	0 (0.00)	6 (5.00)	0 (0.00)
Nil	25 (20.83)	60 (50.00)	25 (20.83)	57 (47.50)

Note: The values in the parentheses represent percentage of sample farm households.

Table 4.10 Sources of credit taken by sample farm households before and after import suspension (n=120)

Sources of credit	Before	After
MADB	44 (36.68)	42 (35.00)
Cooperative	1 (0.83)	1 (0.83)
Mya Sein Yaung	1 (0.83)	1 (0.83)
Money lenders	1 (0.83)	1 (0.83)
MADB and Cooperative	22 (18.34)	17 (14.18)
MADB and Mya Sein Yaung	7 (5.83)	11 (9.17)
MADB and Money lenders	25 (20.83)	25 (20.83)
Cooperative and Money lenders	1 (0.83)	1 (0.83)
Mya Sein Yaung and Money lenders	1 (0.83)	1 (0.83)
MADB, Cooperative and Mya Sein Yaung	3 (2.50)	7 (5.83)
MADB, Cooperative and Money lenders	4 (3.33)	4 (3.33)
MADB, Mya Sein Yaung and Money lenders	5 (4.17)	5 (4.17)
MADB, Cooperative, Mya Sein Yaung and Money lenders	2 (1.67)	2 (1.67)
Nil	3 (2.50)	2 (1.67)

Note: The values in the parentheses represent percentage of sample farm households.

4.2 Comparison of Changes in Cultivated Areas, Gross Annual Crop Incomes and Cropping Patterns Practiced by Sample Farm Households before and after Import Suspension

4.2.1 Changes in cultivated area and gross annual crop incomes by sample farm households before and after import suspension

Changes in cultivated areas by sample farm households before and after import suspension were shown in Table (4.11). According to results, all sample farmers cultivated monsoon rice and their cultivated areas were not significantly different before and after suspension. The number of black gram farmers decreased from 120 to 111 farmers and cultivated areas of black gram were significantly decreased from 3.17 ha to 2.67 ha at 10% level before and after suspension. The number of farmers cultivated green gram, cowpea and sesame crops increased but the number of farmers grown groundnut and other pulses (pae ni lay) were the same. The cultivated areas of green gram were significantly increased from 0.59 ha to 1.12 ha at 1% level after import suspension and that of groundnut, cowpeas, sesame and other pulses were not significantly different as compared to before and after import suspension. Thus, green gram was cultivated increasingly instead of black gram after import restriction.

Gross annual incomes of cultivated crops by sample farm households before and after import suspension were presented in Table (4.12). Monsoon rice was the main income source and the average amount of monsoon rice income was increased from 3.22 million MMK to 3.52 million MMK per year after import suspension. Average black gram income was significantly decreased from 2.66 million MMK to 1.00 million MMK per year at 5% level before and after import suspension. Other crop incomes received from green gram, groundnut, cowpea, sesame and other pulses were increased but not significantly different before and after import suspension.

Table 4.11 Changes in cultivated areas of sample farm households before and after import suspension (n=120)

Crops	Number of households		Average sown area (ha)			
	Before	After	Before	After	Area changes (%)	t test
Monsoon rice	120	120	3.80	3.89	(+) 2	0.25^{ns}
Black gram	120	111	3.17	2.67	(-) 16	1.63*
Green gram	45	70	0.59	1.12	(+) 90	3.27***
Groundnut	6	6	0.03	0.03	0	0.12^{ns}
Cowpea	2	3	0.01	0.01	0	0.16^{ns}
Sesame	1	2	0.02	0.02	0	0.27^{ns}
Other pulses	1	1	0.01	0.01	0	0.00^{ns}

Note: * and *** are significant at 10% and 1% level respectively and ns is not significant.

Table 4.12 Gross annual crop incomes of sample farm households before and after import suspension (n=120)

(Unit = '000 MMK/year)

Crops	Before	After	t test
Monsoon rice	3,220	3,527	0.84^{ns}
Black gram	2,666	1,004	6.19**
Green gram	594	818	1.50^{ns}
Groundnut	24	39	0.55^{ns}
Cowpea	4	5	0.13^{ns}
Sesame	5	6	0.09^{ns}
Other pulses	0.5	0.6	0.13^{ns}
Average crop income	**6,514**	**5,399**	**1.91***

Note: * and ** are significant at 10% and 5% level respectively and ns is not significant.

4.2.2 Different cropping patterns practiced by sample farm households before and after import suspension

In the study area, sample farmers practiced monsoon paddy based cropping pattern, following crops such as black gram, green gram, cowpea, other pulses, groundnut and sesame. These data were presented in Table (4.13). The percentage of sample farmers who practiced monsoon rice- black gram cropping pattern decreased from 57.51% to 37.50% after the restriction. In monsoon rice- black gram and green gram pattern, percentage of sample farmers increased about 35% to 46.67% after the restriction. In monsoon rice- black gram and groundnut pattern, sample farmers decreased 3.33% to 2.51% after the restriction. The same percentage of farmers practiced 0.83% of monsoon rice- black gram and sesame, 0.83% of monsoon rice- black gram, green gram and cowpea, 1.67% of monsoon rice- black gram, green gram and groundnut and 0.83% of monsoon rice- black gram, cowpea and other pulses patterns before and after import suspension. After the restriction, about 0.83% of sample farmers cultivated monsoon rice- black gram and cowpea pattern. About 7.50% of sample farmers did not cultivate black gram after the restriction and it was seen that only 6.67% of sample farmers cultivated monsoon rice and only green gram pattern. More, 0.83% of sample farmers practiced monsoon rice- green gram and groundnut pattern. It was found out that farmers cultivating only black gram were diversified to other crops and reduced black gram sown area after the restriction.

4.3 Household Income of Sample Farm Households before and after Import Suspension

The households' income means all incomes such as crop income, non-farm income, off-farm income, livestock income and remittance received by all members of family during the reference period. Non-farm income involved income from working as broker, tailor, driver, government staff, companies' staff, handicraft, brick production, shopkeeper, threshing and road construction. Off-farm income was the casual labour income in agriculture. Livestock income was income from selling draft cattle and pig. Remittance is a transfer of money by family members, currently staying both in abroad and in capital town within the country.

Table 4.13 Cropping patterns practiced by sample farm households (HH) before and after import suspension (n=120)

Cropping patterns	Before		After	
	Frequency	% of HH	Frequency	% of HH
Monsoon rice- black gram	69	57.51	45	37.50
Monsoon rice- black gram and green gram	42	35.00	56	46.67
Monsoon rice- black gram and groundnut	4	3.33	3	2.51
Monsoon rice- black gram and sesame	1	0.83	1	0.83
Monsoon rice- black gram and cowpea	-	-	1	0.83
Monsoon rice- black gram, green gram and cowpea	1	0.83	1	0.83
Monsoon rice- black gram, green gram and groundnut	2	1.67	2	1.67
Monsoon rice- black gram, cowpea and other pulses	1	0.83	1	0.83
Monsoon rice- black gram, green gram and sesame	-	-	1	0.83
Monsoon rice- green gram	-	-	8	6.67
Monsoon rice- green gram and groundnut	-	-	1	0.83
Total	**120**	**100.00**	**120**	**100.00**

4.3.1 Average annual household income of sample farm households before and after import suspension

Different income sources and average annual incomes before and after import suspension were described in Table (4.14). The main income source was crop income for sample farm households and it did not change due to import suspension. However, the number of sample farm households who received income from non-farm sources increased from 39 households to 43 households after import suspension. The number of sample farm households who received income from remittance also increased from 19 households to 25 households. On the other hands, the number of sample farm households who received income from selling livestock decreased and off-farm income source did not change.

According to the results, the average annual crop income of farm households decreased from 6.51 to 5.39 million MMK per year after import suspension and it was significantly different at 10% level before and after import suspension. The average amount of non-farm, livestock and off-farm incomes increased from 2.39 to 2.53 million MMK, 0.21 to 0.22 million MMK and 0.41 to 0.53 million MMK per year after import suspension, respectively. The average amount of remittance decreased from 4.48 to 4.31 million MMK after import suspension. There were no significant differences for non-farm, remittance, livestock and off-farm incomes in comparison with before and after import suspension.

4.3.2 Income composition of sample farm households before and after import suspension

The importance of different income sources in households' livelihood before and after import suspension was presented in Figure (4.1). All sample farm households in the study areas mainly relied on agriculture and it was followed by remittance and non-farm incomes. Crop production provided about 46.43% and 41.52% of total household incomes before and after import suspension, respectively. Remittance income sharing to total household incomes were about 31.97% and 33.17% before and after import suspension, respectively. Non-farm income contributed about 17.10% and 19.49% of household incomes before and after the restriction, respectively. About 1.51% and 1.68% of total household incomes respectively were earned by selling livestock and about 2.99% and 4.14% of off-farm incomes respectively were received by working as wage labour in agriculture before and after import suspension.

4.4 Black Gram Production of Sample Farm Households before and after Import Suspension

According to survey results, sample farm households cultivated about an average of 3.17 ha of black gram before import suspension and decreased to 2.88 ha after import suspension (Table 4.15). Mean yield was decreased from 923.16 kg/ha to 885.49 kg/ha after import suspension. There were no significant differences in cultivated areas and yield between two years. Average total production of black gram was significantly decreased from 2,825.23 kg to 2,397.31 kg at 10% level after import suspension. Reserved seed and marketed surplus of black gram was significantly decreased from 217.59 kg to 185.30 kg and 2,607.63 kg to 2,212.01 kg respectively after import suspension. Market price of black gram was decreased from 919 MMK/kg to 467 MMK/kg and it was significantly different at 5% level before and after import suspension.

According to the secondary data collection, India's move to restrict the importation of pulses in August 2017 has severely affected on the growers in Myanmar. Before the restrictions were put in place, the prices stood at 800 MMK/kg in average, but after the restriction, the price was declined into 600 MMK/kg in September 2017 and it gradually decreased until the end of year. In 8th May 2018, black gram prices had plummeted sharply to 382 MMK/kg. However, India announced an import quota of 150,000 tons each on black gram and green gram as well as 200,000 tons on pigeon peas between mid-June and August. Black gram was priced below 600 MMK/kg on 22nd October 2018 and the rate bounced back to 988 MMK/kg on 6th November 2018 on the back of increasing demand from India (Aung & Htet, 2019). Comparing the survey data and situation in 2018, black gram price was increased in November 2018.

4.4.1 Black gram varieties cultivated by sample farm households before and after import suspension

Varieties of black gram cultivated by sample farm households before and after import suspension were described in Figure (4.2). In the study areas, 39.17% and 41.44% of sample farm households grew Yezin-5 before and after import suspension. About 27.50% and 28.83% of sample farm households grew Pae Lae Tun while Yezin-3 was grown by 21.67% and 19.82% of sample farm households before and after import suspension. About 11.67% and 9.91% of farm households cultivated Yezin-2 before and after import suspension.

Table 4.14 Gross annual household incomes of sample farm households before and after import suspension

(Unit = '000MMK/year)

Items	Before			After			t test
	No. of households	Avg.	Range	No. of households	Avg.	Range	
Crop income	120	6,514	872-34,780	120	5,399	675-26,180	1.91*
Non-farm income	39	2,398	75-13,000	43	2,534	75-13,200	0.26^{ns}
Livestock income	36	212	30-3,000	30	219	30-3,000	0.06^{ns}
Remittance	19	4,484	1,200-12,000	25	4,313	1,000-13,400	0.20^{ns}
Off-farm income	8	419	160-1,032	8	539	160-1,200	0.72^{ns}
Average household income		**14,027**	**1,164-36,700**		**13,004**	**1,080-30,030**	**1.17^{ns}**

Note: * is significant at 10% level and ns is not significant.

Table 4.15 Black gram production of sample farm households before and after import suspension

Items	Units	Before (n=120)	After (n=111)	t test
Cultivated area	ha	3.17	2.88	0.92^{ns}
		(0.40 - 16.19)	(0.40 - 12.14)	
Yield	kg/ha	923.16	885.49	0.77^{ns}
		(242.41 - 2,020.04)	(161.60 - 2,181.65)	
Total production	kg	2,825.23	2,397.31	1.46*
		(392.40 - 18,312.00)	(163.50 - 9,810.00)	
Reserved seed	kg	217.59	185.30	1.38*
		(0 - 981.00)	(0 - 719.40)	
Marketed surplus	kg	2,607.63	2,212.01	1.41*
		(261.60 - 17,331.00)	(163.50 - 9,711.90)	
Market price	MMK/kg	919	467	15.65**
		(366 - 1,788)	(366 - 1,070)	

Note: The values in the parentheses represent range.
* and ** were significant at 10% and 5% level respectively and ns is not significant.

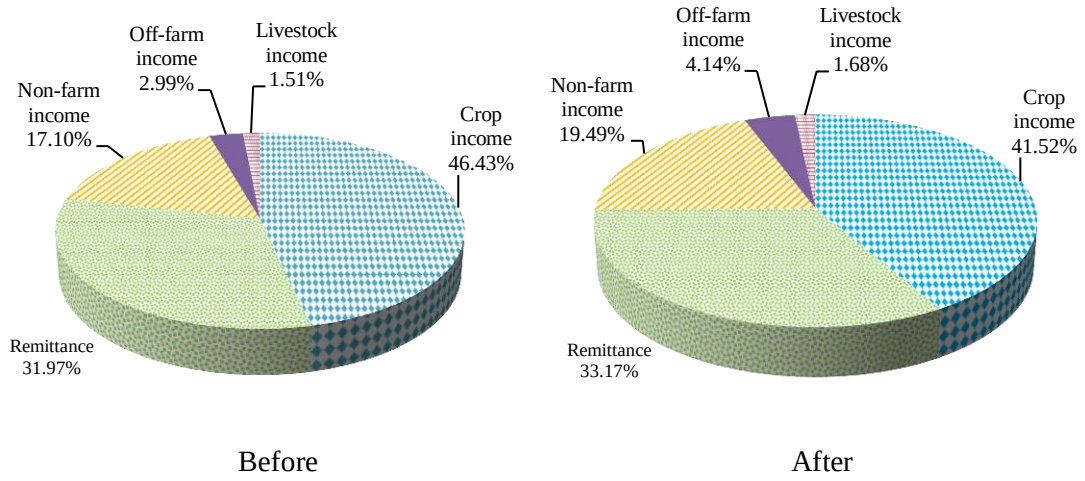

Figure 4.1 Income compositions of sample farm households before and after import suspension

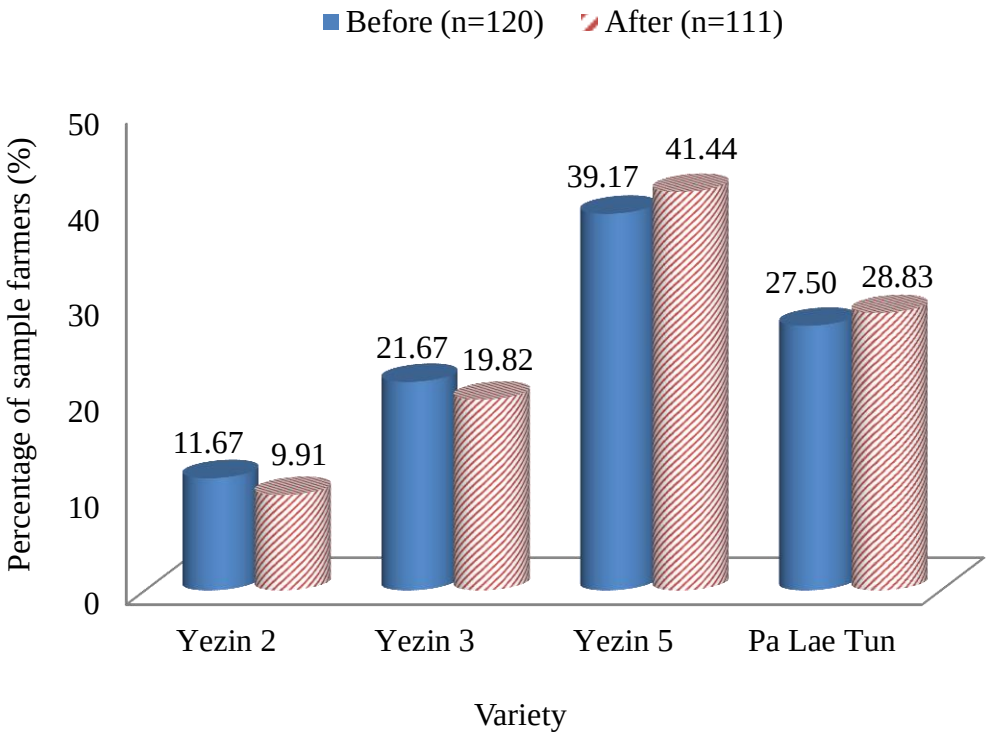

Figure 4.2 Varieties of black gram grown by sample farmers before and after import suspension

4.5 Quantity and Costs of Inputs Use, Labour Use in Black Gram Production before and after Import Suspension

4.5.1 Quantity and costs of different inputs use for black gram production

The percentage of sample farm households who used seed, pesticide and fertilizer in black gram production was presented in Table (4.16). It was found that all sample farmers applied insecticides in their black gram production. A few sample farmers put manure and chemical fertilizers in their land during land preparation period. For crop protection, farmers applied insecticides and fungicide in crop season by using sprayer for black gram production in the study area. About 99.17% and 99.10% of sample farmers applied foliar for black gram production before and after import suspension. Sample farmers used herbicide in the cultivation of black gram which was about 68.33% before and 69.37% after import suspension. Average quantity and cost of inputs used by sample farm households before and after import suspension were presented in Table (4.17) and Table (4.18).

(1) Seed

Farmers in the sample mostly planted seed saved from previous harvest or obtained from other farmers. Although sample farmers used an average seed rate of 73.02 kg/ha before the restriction was slightly lower than an average seed rate of 73.75 kg/ha after the restriction, average cost for seed was 75,878 MMK/ha before the restriction was significantly reduced 69,268 MMK/ha after the restriction.

(2) Insecticide

Farmers used an average quantity of 3.04 liters/ha at an average cost of 50,515 MMK/ha before the restriction while farmers used an average quantity of 3.02 liters/ha at an average cost of 50,702 MMK/ha after the restriction. There was no significant difference for amount and cost of insecticide before and after import suspension.

(3) Fungicide

Sample farm households used fungicide an average quantity of 1.45 kg/ha and 1.40 kg/ha at the average cost of 19,099 MMK/ha and 19,121 MMK/ha before and after the restriction. There was no significant difference for fungicide application and cost before and after import suspension.

(4) Herbicide

Farmers did not change average quantity of herbicide (0.79 liters/ha) and an average cost was 14,507 MMK/ha before suspension. However, it become 14,756 MMK/ha after suspension. There were no significant differences average amount and cost of herbicide before and after import suspension.

(5) Fertilizer (Foliar, Urea, Compound, FYM)

Farmers used foliar fertilizer at average rate of 3.46 liters/ha and average cost was 40,408 MMK/ha before the restriction. After the restriction, at average rate of 3.40 liters/ha and average cost was 40,423 MMK/ha. There was no significant difference for foliar application before and after import suspension. Farmers used 2.23 kg/ha of urea before the restriction and 1.94 kg/ha of urea after the restriction. Average costs for urea were 1,082 MMK/ha and 824 MMK/ha respectively before and after the restriction. Average rates for compound were 2.11 kg/ha and 2.32 kg/ha and average cost were 822 MMK/ha and 902 MMK/ha respectively before and after the restriction. Farmers did not change 0.02 ton/ha of FYM and average cost were 165 MMK/ha and 200 MMK/ha respectively before and after the restriction. There were no significant differences for urea, compound and FYM before and after import suspension.

Table 4.16 Percentage of sample farm households using different inputs for black gram production before and after import suspension

Items	Before (n=120)		After (n=111)	
	Frequency	Percent	Frequency	Percent
Seed	120	100.00	111	100.00
Insecticide	120	100.00	111	100.00
Foliar	119	99.17	110	99.10
Fungicide	83	69.17	78	70.27
Herbicide	82	68.33	77	69.37
Urea	6	5.00	5	4.50
Compound	4	3.33	4	3.60
FYM	2	1.67	2	1.80

Table 4.17 Amount of input used by sample farm households in black gram production before and after import suspension

Items	Units	Before (n=120)	After (n=111)	t test
Seed	kg/ha	73.02	73.75	0.39^{ns}
		(30.30 - 121.20)	(30.30 - 121.20)	
Insecticide	liter/ha	3.04	3.02	0.09^{ns}
		(0.25 - 12.36)	(0.25 - 9.88)	
Foliar	liter/ha	3.46	3.40	0.36^{ns}
		(0 - 7.41)	(0 - 7.41)	
Fungicide	kg/ha	1.45	1.40	0.35^{ns}
		(0 - 7.41)	(0 - 4.94)	
Herbicide	liter/ha	0.79	0.79	0.01^{ns}
		(0 - 2.47)	(0 - 2.47)	
Urea	kg/ha	2.23	1.94	0.23^{ns}
		(0 - 61.78)	(0 - 61.78)	
Compound	kg/ha	2.11	2.32	0.11^{ns}
		(0 - 123.55)	(0 - 123.55)	
FYM	ton/ha	0.02	0.02	0.08^{ns}
		(0 - 1.24)	(0 - 1.24)	

Note: The values in the parentheses represent range. ns is not significant.

Table 4.18 Input costs for black gram production before and after import suspension

Items	Units	Before (n=120)	After (n=111)	t test
Seed	MMK/ha	75,878	69,268	2.39**
Insecticide	MMK/ha	50,515	50,702	0.05^{ns}
Foliar	MMK/ha	40,408	40,423	0.01^{ns}
Fungicide	MMK/ha	19,099	19,121	0.01^{ns}
Herbicide	MMK/ha	14,507	14,756	0.13^{ns}
Urea	MMK/ha	1,082	824	0.41^{ns}
Compound	MMK/ha	822	902	0.12^{ns}
FYM	MMK/ha	165	200	0.19^{ns}

Note: ** is significant at 5% level and ns is not significant.

4.5.2 Quantity and costs of labour use for black gram production before and after import suspension

4.5.2.1 Labour use by type of operations before and after import suspension

Labour use of sample farm households by type of operations was illustrated in Table (4.19). On average, sample farmers used a total of 66.15 man-days/ha before the restriction compared to 65.50 man-days/ha after the restriction. With respect to their source of labour, total labour consisted of 34.45% family labour and 65.55% hired labour before the restriction, while total labour consisted of 35.13% family labour and 64.87% hired labour after the restriction.

Before import restriction, the largest share of total labour was used for harvesting (46.30%), followed by threshing (17.75%), land preparation (8.58%), transportation from field (7.35%), insecticide application (5.91%), foliar application (5.75%), transportation to market (3.26%), herbicide application (2.65%), planting (2.30%), fertilizer application (0.12%) and manure application (0.03%).

After import restriction, the largest share of total labour was used for harvesting (45.59%), followed by threshing (17.74%), land preparation (8.79%), transportation from field (7.34%), insecticide application (6.16%), foliar application (5.91%), transportation to market (3.30%), herbicide application (2.67%), planting (2.35%), fertilizer application (0.12%) and manure application (0.03%).

4.5.2.2 Labour costs by type of operations before and after import suspension

Total labour costs of sample farm households were 365,459 MMK/ha and 363,255 MMK/ha before and after import suspension (Table 4.20). Family labour cost accounted for 136,747 MMK/ha and 228,712 MMK/ha for hired labour cost per hectare before the restriction, compared to 139,443 MMK/ha and 223,812 MMK/ha for family and hired labour costs per hectare after import restriction.

Before import restriction, the largest amount of total labour cost was used for harvesting (140,383 MMK/ha), followed by land preparation (86,979 MMK/ha), threshing (53,049 MMK/ha), transportation from field (22,641 MMK/ha), insecticide application (18,374 MMK/ha), foliar application (17,955 MMK/ha), transportation to market (9,809 MMK/ha), herbicide application (8,319 MMK/ha), planting (7,515 MMK/ha), fertilizer application (358 MMK/ha) and manure application (77 MMK/ha).

After import restriction, the largest amount of total labour cost was used for harvesting (136,984 MMK/ha), followed by land preparation (88,733 MMK/ha), threshing (51,585 MMK/ha), transportation from field (22,401 MMK/ha), insecticide application (18,913 MMK/ha), foliar application (18,358 MMK/ha), transportation to market (9,851 MMK/ha), herbicide application (8,387 MMK/ha), planting (7,601 MMK/ha), fertilizer application (359 MMK/ha) and manure application (83 MMK/ha). There were no significant differences for all labour costs by type of operations.

4.6 Constraints of Sample Farm Households Faced in Black Gram Production in the Study Area

In black gram production, sample farmers in the study area faced different constraints of production and marketing. Major constraints mentioned by the sample farmers were difficulties in low crop price, labour scarcity, high input costs, inadequate credit, incidence of pests and diseases, weakness of extension services, difficulty to access quality seed, lack of capital and low yield. The farmers' perception of constraints in black gram production and marketing was illustrated in Figure (4.3).

(1) Low crop price

The most serious problem faced by sample farmers was low crop price. About 60.83% of farmers in the study area answered the low price was a major problem. This was because black gram price was mainly depending on the export market to India.

(2) Labour scarcity

Labour scarcity was one of the constraints of production for sample farmers. Many of the people in these areas migrated to other townships or aboard for many job opportunities with regular incomes. As a result, some farmers could not hire labour when they needed.

(3) High input costs

High input price was a common problem for black gram production. About 31.67% of sample farm households in the study area faced an increase in the price of various inputs such as fertilizer, pesticide, herbicide and fungicide. Therefore, most of farmers used the low quality of inputs especially fertilizer imported by China.

Table 4.19 Family, hired and total labour use of sample farm households by operations before and after import suspension

Type of operation	Unit	Before (n=120)						After (n=111)					
		Family labour	% of TL	Hired labour	% of TL	Total	% of TL	Family labour	% of TL	Hired labour	% of TL	Total	% of TL
Land preparation		3.12	4.72	2.56	3.86	5.68	8.58	3.29	5.02	2.47	3.77	5.76	8.79
- Ploughing (cattle)	Amd/ha	0.41	0.62	0.02	0.03	0.43	0.65	0.40	0.61	0.02	0.03	0.42	0.64
- Ploughing (machine)	Machine day/ha	1.19	1.80	1.25	1.89	2.44	3.69	1.27	1.94	1.21	1.85	2.48	3.79
- Harrowing (cattle)	Amd/ha	0.16	0.24	-	-	0.16	0.24	0.13	0.20	-	-	0.13	0.20
- Harrowing (machine)	Machine day/ha	1.36	2.06	1.29	1.94	2.65	4.00	1.49	2.27	1.24	1.89	2.73	4.17
Manure application	Md/ha	0.02	0.03	-	-	0.02	0.03	0.02	0.03	-	-	0.02	0.03
Fertilizer application	Md/ha	0.06	0.09	0.02	0.03	0.08	0.12	0.07	0.11	0.01	0.02	0.08	0.12
Planting	Md/ha	1.27	1.92	0.25	0.38	1.52	2.30	1.28	1.95	0.26	0.40	1.54	2.35
Insecticide application	Md/ha	2.65	4.01	1.26	1.90	3.91	5.91	2.72	4.15	1.31	2.01	4.03	6.16
Foliar application	Md/ha	2.65	4.01	1.15	1.74	3.80	5.75	2.67	4.08	1.20	1.83	3.87	5.91
Herbicide application	Md/ha	1.08	1.63	0.67	1.01	1.75	2.65	1.07	1.63	0.68	1.04	1.75	2.67
Harvesting	Md/ha	3.59	5.43	27.04	40.88	30.63	46.30	3.61	5.51	26.25	40.08	29.86	45.59
Transportation from field	Md/ha	2.04	3.08	2.82	4.26	4.86	7.35	1.99	3.04	2.82	4.31	4.81	7.34
Threshing	Md/ha	4.15	6.27	7.59	11.47	11.74	17.75	4.13	6.31	7.49	11.44	11.62	17.74
Transportation to market	Md/ha	2.16	3.26	-	-	2.16	3.26	2.16	3.30	-	-	2.16	3.30
Total labour (TL)		**22.79**	**34.45**	**43.36**	**65.55**	**66.15**	**100.00**	**23.01**	**35.13**	**42.49**	**64.87**	**65.50**	**100.00**

Table 4.20 Family, hired and total labour cost of sample farm households by operations before and after import suspension

Type of operation	Unit	Before (n=120)						After (n=111)						t test
		Family labour cost	% of TLC	Hired labour cost	% of TLC	Total	% of TLC	Family labour cost	% of TLC	Hired labour cost	% of TLC	Total	% of TLC	
Land preparation	MMK/ha	45,672	12.50	41,307	11.30	86,979	23.80	48,040	13.22	40,693	11.20	88,733	24.43	0.46^{ns}
-Ploughing (cattle)	MMK/ha	5,425	1.48	206	0.06	5,631	1.54	5,254	1.45	222	0.06	5,476	1.51	0.07^{ns}
-Ploughing (machine)	MMK/ha	17,616	4.82	19,953	5.46	37,569	10.28	18,722	5.15	19,879	5.47	38,601	10.63	0.46^{ns}
-Harrowing (cattle)	MMK/ha	2,214	0.61	-	-	2,214	0.61	1,781	0.49	-	-	1,781	0.49	0.35^{ns}
-Harrowing (machine)	MMK/ha	20,417	5.59	21,148	5.79	41,565	11.37	22,283	6.13	20,592	5.67	42,875	11.80	0.44^{ns}
Manure application	MMK/ha	77	0.02	-	-	77	0.02	83	0.02	-	-	83	0.02	0.07^{ns}
Fertilizer application	MMK/ha	296	0.08	62	0.02	358	0.10	314	0.09	45	0.01	359	0.10	0.01^{ns}
Planting	MMK/ha	6,117	1.67	1,398	0.38	7,515	2.06	6,179	1.70	1,422	0.39	7,601	2.09	0.12^{ns}
Insecticide application	MMK/ha	12,305	3.37	6,069	1.66	18,374	5.03	12,669	3.49	6,244	1.72	18,913	5.21	0.35^{ns}
Foliar application	MMK/ha	12,392	3.39	5,563	1.52	17,955	4.91	12,578	3.46	5,781	1.59	18,358	5.05	0.29^{ns}
Herbicide application	MMK/ha	5,050	1.38	3,269	0.89	8,319	2.28	5,070	1.40	3,317	0.91	8,387	2.31	0.07^{ns}
Harvesting	MMK/ha	16,339	4.47	124,044	33.94	140,383	38.41	16,395	4.51	120,589	33.20	136,984	37.71	0.72^{ns}
Transportation from field	MMK/ha	9,560	2.62	13,081	3.58	22,641	6.20	9,311	2.56	13,090	3.60	22,401	6.17	0.12^{ns}
Threshing	MMK/ha	19,130	5.23	33,919	9.28	53,049	14.52	18,954	5.22	32,631	8.98	51,585	14.20	0.64^{ns}
Transportation to market	MMK/ha	9,809	2.68	-	-	9,809	2.68	9,850	2.71	-	-	9,851	2.71	0.05^{ns}
Total labour cost (TLC)		**136,747**	**37.42**	**228,712**	**62.58**	**365,459**	**100.00**	**139,443**	**38.39**	**223,812**	**61.61**	**363,255**	**100.00**	

Note: ns is not significant.

(4) Inadequate credit

Another constraint for sample farm households was inadequate credit. About 30.83% of sample farmers complained this problem in the study area. Provision of credit from MADB was not covered total cost of black gram production. Therefore, many farmers relied on informal credit at a high interest rate.

(5) Incidence of pests and diseases

In the study area, incidence of diseases and pests were one of the constraints and about 27.50% sample farm households faced this problem. Thus, this had an effect on yield and quality of black gram production.

(6) Weakness of extension services

The extension service provides technical advice to farmers, helps farmers to acquire inputs and link to supply chain and market, provides training agricultural technologies. But, about 8.33% of farmers were facing the weakness of extension services. Most of farmers who were not facing this constraint were the key farmers of the villages.

(7) Difficulty to access quality seed

About 5.83% of sample farmers in the study area said that it was difficult to obtain quality black gram seed. This was because the supply of quality black gram seeds by government and private sectors did not meet with the demand.

(8) Lack of capital

In the study area, about 5.83% of sample farmers complained that the lack of capital was one of the constraints for black gram production. Therefore, farmers borrowed money from private lenders with high interest rate and paid immediately after harvest.

(9) Low yield

Another constraint for sample farm households was low yield of black gram. About 3.33% of sample farmers mentioned this problem in the study area. Yield is one of major components for farmers' income and if farmers get low yield, profit will decline.

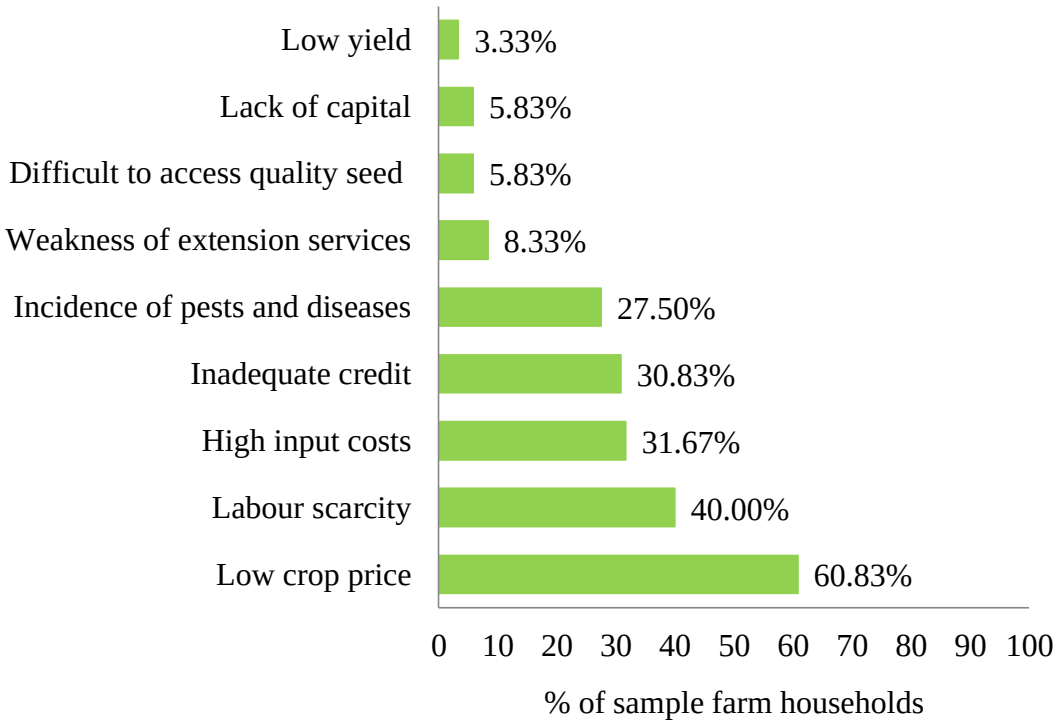

Figure 4.3 Constraints faced by sample farmers in black gram production in the study area (n=120)

4.7 Cost and Return Analysis of Black Gram Production before and after Import Suspension

The enterprise budget was used to compare cost and return of black gram production before and after import suspension. Various measures of costs and returns were reported in Table (4.21). Effective black gram yield of sample farmers (851.69 kg/ha) before the restriction was slightly higher than that of sample farmers (811.23 kg/ha) after the restriction. Effective price of black gram (911.48 MMK/kg) before the restriction was also significantly higher than (461.35 MMK/kg) after the restriction. Therefore, average gross benefit before the restriction (776,296 MMK/ha) was significantly greater than after the restriction (374,260 MMK/ha). There were significantly different in price and gross benefit of black gram at 5% level before and after import suspension.

Total material cost included farmers' owned materials such as seed and FYM and bought materials such as seed, urea, compound, foliar fertilizer, herbicide, fungicide and insecticide. Costs for farmers' owned materials were 68,536 MMK/ha and 64,769 MMK/ha respectively before and after import suspension. Material costs expended by farmers were 133,940 MMK/ha before import suspension and 131,427 MMK/ha after import suspension. Average total family labour cost were 136,747 MMK/ha and 139,443 MMK/ha before and after import suspension. It was expensed for hired labour cost of 228,712 MMK/ha and 223,812 MMK/ha respectively before and after the restriction. In the total interest cost on cash cost, farm households expended 29,012 MMK/ha and 28,419 MMK/ha respectively before and after import suspension. The total variable costs were 596,947 MMK/ha and 587,870 MMK/ha while the total variable cash costs were 391,664 MMK/ha and 383,658 MMK/ha respectively before and after import suspension. There were not significantly different in all variable costs while comparing before and after import suspension.

Return above variable cost (RAVC) before the restriction was 179,349 MMK/ha and (-) 213,610 MMK/ha after the restriction. Return above variable cash costs (RAVCC) were 384,632 MMK/ha and (-) 9,398 MMK/ha respectively before and after import suspension. Hence, the benefit-cost ratios (BCRs) were 1.30 and 0.64 while return per unit cash costs were 1.98 and 0.98 respectively before and after import suspension. They were significantly different in benefit-cost ratios and return per unit cash costs at 5% level before and after import suspension.

Therefore, it can be concluded that sample farm households received more profit before import restriction. The important reason for farmers receiving a larger profit before the restriction was that they got higher prices though total variable costs before the restriction was slightly higher than that of after restriction period.

Break-even yield for black gram production were 654.92 kg/ha and 1,274.24 kg/ha whereas break-even price were 700.90 MMK/kg and 724.67 MMK/kg respectively before and after import suspension. It was significantly different in break-even yield for black gram production at 1% level before and after import suspension. Detail information of gross margin analysis for black gram production was described in Appendix (2).

It was found that sample farm households expended total variable cost (596,947 MMK/ha) which consisted of hired labour cost (38.31%), material cost as cash payments (22.44%), opportunity cost of family labour (22.91%) and owned material cost (11.48%), interest on cash cost (4.86%) before import suspension (Figure 4.4). After import suspension, farmers expended total variable cost (587,870 MMK/ha) which consisted of hired labour cost (38.07%), family labour cost (23.72%), material cost as cash payments (22.36%), and owned material cost (11.02%), interest on cash cost (4.83%) respectively.

4.8 Factors Affecting the Profitability of Black Gram Production before and after Import Suspension

This section indicated the estimate results of factors affecting on the black gram profit of sample farm households before and after import suspension in the study area. To determine the factors affecting the black gram profit, linear regression function was employed. The specific profit function of black gram farmers before and after import suspension were estimated by using 10 independent variables; effective yield of black gram, sown area of black gram, age of household heads, education level of household heads, agricultural family labour, total material cost, hired labour cost, number of credit sources, dummy variable of access to extension services (1= yes, 0= no) and before and after import suspension (Before suspension= 0, After suspension= 1). The mean value of dependent and independent variables of black gram profit function before and after import suspension were shown in Table (4.22).

Table 4.21 Enterprise budget for black gram production before and after import suspension

Items	Unit	Before (n=120)	After (n=111)	t test
Effective yield	kg/ha	851.69	811.23	0.79^{ns}
Effective price	MMK/kg	911.48	461.35	15.60**
Gross benefit	**MMK/ha**	**776,296**	**374,260**	**8.56****
Variable cost				
(a) Total material cost (own)	MMK/ha	68,536	64,769	0.99^{ns}
(b) Total material cost (cash)	MMK/ha	133,940	131,427	0.26^{ns}
(c) Total family labour cost	MMK/ha	136,747	139,443	0.29^{ns}
(d) Total hired labour cost	MMK/ha	228,712	223,812	0.45^{ns}
(e) Total interest on cash cost	MMK/ha	29,012	28,419	0.56^{ns}
Total variable cost (TVC) (a+ b+ c+ d+ e)	**MMK/ha**	**596,947**	**587,870**	**0.66^{ns}**
Total variable cash cost (TVCC) (b+ d+ e)	**MMK/ha**	**391,664**	**383,658**	**0.56^{ns}**
Return above variable cost (GB – TVC)	**MMK/ha**	**179,349**	**(-)213,610**	**8.45****
Return above variable cash cost (GB – TVCC)	**MMK/ha**	**384,632**	**(-)9,398**	**8.43****
Benefit–cost ratio (GB/ TVC)		**1.30**	**0.64**	**8.50****
Return per unit cash cost (GB/ TVCC)		**1.98**	**0.98**	**7.40****
Break – even yield (TVC / average price per kg)	**kg/ha**	**654.92**	**1,274.24**	**13.73*****
Break – even price (TVC / average yield per ha)	**MMK/kg**	**700.90**	**724.67**	**0.90^{ns}**

Note: ** and *** are significant at 5% and 1% respectively and ns is not significant.

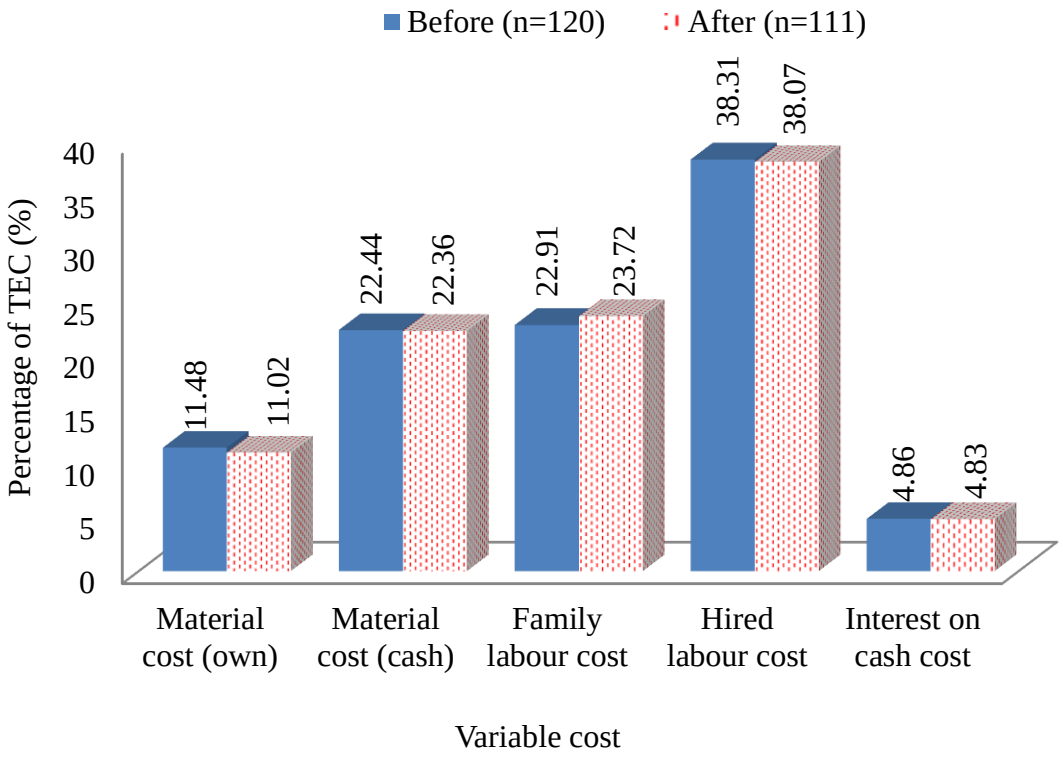

Figure 4.4 Percentage of total enterprise cost (TEC) by different production costs of sample farm households before and after import suspension

According to the descriptive statistics, average profit of black gram, 10,418 MMK/ha, effective yield of black gram, 832.25 kg/ha, sown area of black gram, 3.03 hectares, average age of household heads, about 49 years, average schooling year of household heads, 6 years, agricultural family labour of sample farm households, 1 person, total material cost, 199,459 MMK/ha, hired labour cost, 226,357 MMK/ha and number of credit sources received by sample farm households, 1.71 were resulted. Access to extension services in the study area was used as dummy variables, whereas 82.25% of sample farm households had access to extension services and the remaining 17.75% had no contacts with the extension services. In order to know the effect of India's import suspension on profit of black gram, time difference was also considered as dummy variable, it meant that 0 is equal to 2016 (before suspension) and 1 meant 2017 (after suspension). About 51.95% of total sample households cultivated black gram before suspension while about 48.05% of total sample households cultivated black gram after suspension.

Black gram profit regression estimates before and after import suspension was described in Table (4.23). According to results, black gram profit was positively correlated with effective yield of black gram at 1% level. If yield of black gram 1 kg increased, black gram profit would be increased by 741 MMK per hectare. The result showed that the farmers who had got the higher yield can receive more profit because yield greatly affected on profit. Black gram profit was negatively correlated with total material cost and hired labour cost at 1% level. The result showed that if 1,000 MMK increased in total material cost and hired labour cost on the farm, the black gram profit would be decreased by 855 MMK and 978 MMK per hectare respectively. It means that the farmers who had suffered high cost of material inputs and hired labour cost in black gram production can receive low profit. Black gram profit was positively correlated with the number of credit sources at 10% level. If sample farmers received more credit from an additional source in black gram production, black gram profit would be increased by 47,340 MMK per hectare. The result showed that if farmers received higher credit, they would pay more attention in black gram production, therefore, the government would provide more credit programs to the farmers in black gram production. In addition, the result indicated that profit of black gram after import suspension significantly decreased 419,808 MMK per hectare than before import suspension. The adjusted R squared pointed out that the model was significant and it can explain the variation in black gram profit by 64 percent. The influencing factors on black gram profit of sample farm households before and after import suspension were separately illustrated in Appendix (3) and Appendix (4).

Table 4.22 Mean values of dependent and independent variables of black gram profit function before and after import suspension

Description of variables	Units	Mean	Standard deviations
Profit of black gram	MMK/ha	10,418	456,365
Effective yield of black gram	kg/ha	832.25	383.99
Sown area of black gram	ha	3.03	2.38
Age of household heads	Year	49	11.05
Education level of household heads	Year	6	3.13
Agricultural family labour	No.	1	1.06
Total material cost	MMK/ha	199,459	64,929
Hired labour cost	MMK/ha	226,357	81,283
Number of credit sources	No.	1.71	0.76
Access to extension services	Percent	Yes=1 (82.25%)	
(Dummy variable)		No=0 (17.75%)	
Before and after import suspension	Percent	Before suspension = 51.95%	
(Dummy variable)		After suspension = 48.05%	

Table 4.23 Determinants of the profitability of black gram production before and after import suspension

Independent variables	Unstandardized Coefficients		t-value	Sig.
	B	Std. Error		
(Constant)	10.540^{ns}	138.297	0.081	0.939
Effective yield of black gram	0.741***	0.055	13.461	0.000
Sown area of black gram	-9.819^{ns}	8.306	-1.182	0.238
Age of household heads	-2.243^{ns}	1.768	-1.269	0.206
Education level of household heads	6.137^{ns}	6.025	1.019	0.310
Agricultural family labour	-2.869^{ns}	20.333	-0.141	0.888
Total material cost	-0.855***	0.326	-2.624	0.009
Hired labour cost	-0.978***	0.232	-4.210	0.000
Number of credit sources	47.340*	25.740	1.839	0.067
Access to extension services (Dummy)	2.296^{ns}	52.422	0.044	0.965
Before and after import suspension (Dummy)	-419.808***	36.131	-11.619	0.000
R^2		0.659		
Adjusted R^2		0.644		

Note: Dependent variable = Profit of black gram farmers

***** and *** are significances at 10% and 1% level respectively and ns is not significant.

CHAPTER V
SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of Findings

According to the results of the descriptive analysis, most sample farmers were elder and the majority of sample farmers were active age persons whereas farming experiences were half of their life. Sample farmers had middle education level while primary education level was the highest percentage and graduate level was the lowest. Most of household heads were male and family members of sample households had 4.17 persons. Family members working on the farm was 1.05 persons and some households did not have agricultural family labour. Almost sample farmers possessed lowland (Le) and few farmers possessed upland (Yar) and kaing. The cultivated areas of black gram in the study area were decreased after import suspension.

Most of sample farmers possessed hoe, sprayer, sickle, spade and power tiller and in non-farm assets, most farmers owned hand phone, TV, motor cycle, bicycle, satellite dish and solar panel. Sample farm households possessed draft cattle, pig and poultry. Draft cattle and pig possessions were slightly decreased after import suspension. Farmers received production practices by private companies and DOA. Most of farmers attended the meetings offered by private companies than DOA. In case of credit, most farmers mainly received credit from MADB but the amount was not covered the requirements of crop production. Therefore, they had to take credit from other sources such as private lenders, cooperatives and Mya Sein Yaung.

According to results of changes in cultivated areas, all sample farmers cultivated monsoon rice whereas number of black gram farmers and cultivated areas were significantly decreased after import suspension. Hence, black gram income was significantly decreased after import suspension. Green gram was more cultivated instead of black gram after import suspension. Therefore, cropping pattern with only black gram after monsoon rice was decreased and with both black gram and green gram after monsoon rice was increased after import suspension. In case of household income, all sample farm households in the study area were mainly relied on crop income followed by remittance and non-farm incomes. Crop incomes were significantly reduced after import suspension and non-farm, livestock and off-farm incomes were better after import suspension.

In black gram production, cultivated area and yield were slightly decreased after import suspension. Market price of black gram was significantly reduced at 5% level after import suspension. Most of sample farmers grew Yezin-5 variety followed by Pae Lae Tun and Yezin-3. All sample farmers applied insecticides whereas few farmers put manure and chemical fertilizer during land preparation. For crop protection, farmers used insecticide and fungicide while foliar and herbicide application were found in the study area. Labour contribution was mainly in harvesting, threshing and land preparation before and after import suspension.

According to the results of cost and return analysis, effective price of black gram was significantly decreased at 5% level and therefore, gross benefit was significantly decreased after import suspension. Total variable cost and total variable cash cost were not different before and after import suspension. The benefit-cost ratio before import suspension was about double higher than after import suspension while return per unit cash cost were 1.98 and 0.98 respectively before and after import suspension. Break-even yield for black gram production after import suspension was about two times higher than before import suspension and break-even price was not significantly different before and after import suspension.

According to the black gram profit regression estimates before and after import suspension, the significant influencing factors of black gram profit were effective yield of black gram, total material cost, hired labour cost, number of credit sources as well as time difference (before and after) import suspension.

The major constraints of black gram production of sample farm households were difficulties in low crop price, labour scarcity, high input costs, inadequate credit, incidence of pests and diseases, weakness of extension services, difficulty to access quality seed, lack of capital and low yield.

5.2 Conclusion and Recommendations

According to result findings, farmers had more productive experiences and better potential for decision making in black gram production because they spent half of their lives in farming. Although they had many experiences in farming, India's import suspension had negative effects on black gram farmers. Low demand from India by import suspension was a pulled factor for lower price in black gram domestic market. The cultivated areas decreased about 16% in black gram and increased 90% in green gram. Some farmers tried to solve by substituting green gram instead of

black gram because green gram was exported to many other countries. Although MOALI recommended sunflower cultivation to sufficient domestic oil consumption, sample farmers did not cultivate sunflower in the study area. In the study area, there were very few economically alternative substitute crops and therefore, research and development are required for alternative crop substitution.

In case of annual households' income, the study showed that non-farm and remittance incomes became more important after import suspension because some of households' members were working in non-farm sector and as migrate workers outside countries. Therefore, better employment opportunities should be created by public and private institutions in the rural area to sustain their livelihoods for black gram farmers.

According to BCRs result, sample farmers received more profit before import restriction than after the restriction and they could not be able to cover their cost of black gram production after the restriction. The important reason for farmers receiving a larger profit before the restriction was that they got higher prices though total variable costs before the restriction was slightly higher than that of after restriction period. Thus, price is the significant factor for black gram production.

In profit regression estimates, effective yield of black gram, total material cost, hired labour cost and number of credit sources significantly influenced on profit of black gram production. To improve production and reduce cost of production, government should promote farmers to achieve systematic usage of inputs and extension services are required to provide improved agricultural practices. Moreover, credit sources are important for profitability of black gram farmers, access to more credit from different sources should be facilitated. Import suspension showed negative effect, thus it reduced the profit of black gram in the study area.

India is the large country importer of black gram and has more bargaining power to control black gram market. Therefore, government and related institutions need to find out alternative international markets. To penetrate other international markets, quality and standard of black gram are becoming critical factors for farmers. Moreover, trade agreement would be needed to compensate the risk of domestic farmers and traders.

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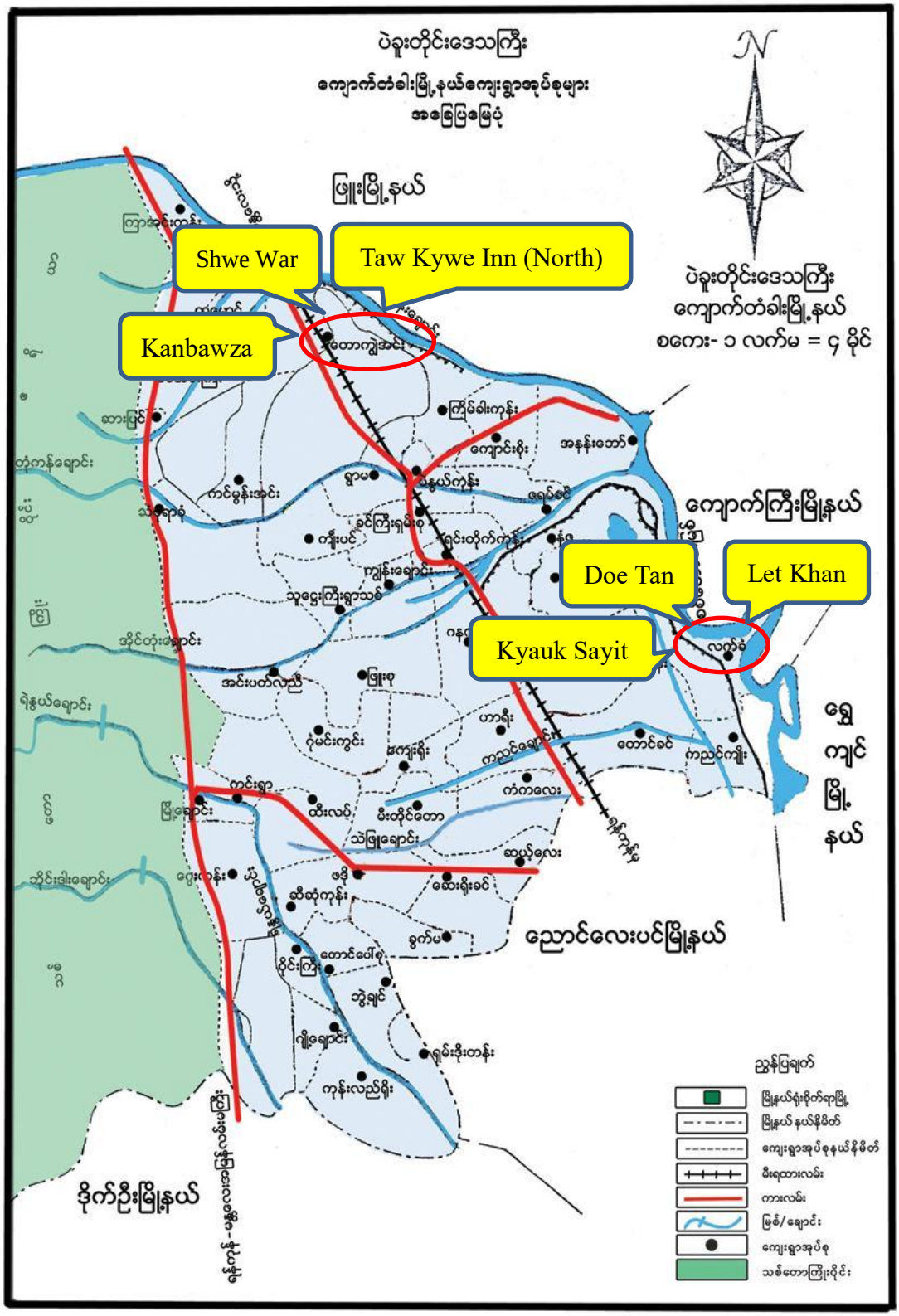
APPENDICES

Appendix 1 Map of Kyauktaga Township by village tracts



Appendix 2 Gross margin analysis of black gram production of sample farm households before and after import suspension

Items	Unit	Before (n=120)			After (n=111)		
		Level	Effective price	Total value (MMK/ha)	Level	Effective price	Total value (MMK/ha)
1. Gross Benefit							
- Yield of black gram	kg/ha	851.69	911.48	776,296	811.23	461.35	374,260
Total gross benefit	**MMK/ha**			**776,296**			**374,260**
2. Variable cost							
(a) Material cost (own)							
- Seed	kg/ha	65.78	1,034.12	68,371	68.11	948.98	64,569
- FYM	ton/ha	0.02	8,000.00	165	0.02	9,000.00	200
Total material cost (own) (a)	**MMK/ha**			**68,536**			**64,769**
(b) Material cost (cash)							
- Seed	kg/ha	7.24	1,029.56	7,507	5.64	821.10	4,699
- Urea	kg/ha	2.23	470.00	1,082	1.94	422.00	824
- Compound	kg/ha	2.11	410.00	822	2.28	420.00	902
- Foliar	liter/ha	3.46	11,798.32	40,408	3.40	12,018.18	40,423
- Herbicide	liter/ha	0.79	18,804.88	14,507	0.79	19,006.49	14,756
- Insecticide	liter/ha	3.04	16,404.17	50,515	3.02	16,576.58	50,702
- Fungicide	kg/ha	1.45	13,506.02	19,099	1.40	13,987.18	19,121
Total material cost (cash) (b)	**MMK/ha**			**133,940**			**131,427**

Appendix 2 (Continued) Gross margin analysis of black gram production of sample farm households before and after import suspension

Items	Unit	Before (n=120)			After (n=111)		
		Level	Effective price	Total value (MMK/ha)	Level	Effective price	Total value (MMK/ha)
(c) Family labour cost							
- Ploughing (cattle)	Amd/ha	0.41	13,300.00	5,425	0.40	13,230.77	5,254
- Ploughing (machine)	Machine day/ha	1.19	14,794.12	17,616	1.27	14,785.71	18,722
- Harrowing (cattle)	Amd/ha	0.16	13,214.29	2,214	0.13	13,000.00	1,781
- Harrowing (machine)	Machine day/ha	1.36	14,990.74	20,417	1.49	14,990.38	22,283
- Manure application	Md/ha	0.02	5,000.00	77	0.02	5,000.00	83
- Fertilizer application	Md/ha	0.06	4,666.67	296	0.07	4,625.00	314
- Planting	Md/ha	1.27	4,726.89	6,117	1.28	4,754.55	6,179
- Pesticide application	Md/ha	2.65	4,730.09	12,305	2.72	4,740.38	12,669
- Foliar application	Md/ha	2.65	4,730.09	12,392	2.67	4,750.00	12,578
- Herbicide application	Md/ha	1.08	4,697.53	5,050	1.07	4,720.00	5,070
- Harvesting	Md/ha	3.59	4,516.68	16,339	3.61	4,518.36	16,395
- Transportation from field	Md/ha	2.04	4,642.86	9,560	1.99	4,651.96	9,311
- Threshing	Md/ha	4.15	4,675.00	19,130	4.13	4,674.31	18,954
- Transportation to market	Md/ha	2.16	4,573.91	9,809	2.16	4,586.54	9,850
Total family labour cost (c)	**MMK/ha**			**136,747**			**139,443**

Appendix 2 (Continued) Gross margin analysis of black gram production of sample farm households before and after import suspension

Items	Unit	Before (n=120)			After (n=111)		
		Level	Effective price	Total value (MMK/ha)	Level	Effective price	Total value (MMK/ha)
(d) Hired labour cost							
- Ploughing (cattle)	Amd/ha	0.02	10,000.00	206	0.02	10,000.00	222
- Ploughing (machine)	Machine day/ha	1.25	16,101.69	19,953	1.21	16,547.17	19,879
- Harrowing (cattle)	Amd/ha	-	-	-	-	-	-
- Harrowing (machine)	Machine day/ha	1.29	16,537.04	21,148	1.24	16,791.67	20,592
- Manure application	Md/ha	-	-	-	-	-	-
- Fertilizer application	Md/ha	0.02	4,000.00	62	0.01	4,000.00	45
- Planting	Md/ha	0.25	5,450.00	1,398	0.26	5,350.00	1,422
- Pesticide application	Md/ha	1.26	4,877.19	6,069	1.31	4,833.33	6,244
- Foliar application	Md/ha	1.15	4,859.65	5,563	1.20	4,833.33	5,781
- Herbicide application	Md/ha	0.67	4,886.36	3,269	0.68	4,857.14	3,317
- Harvesting	Md/ha	27.04	4,566.38	124,044	26.25	4,573.33	120,589
- Transportation from field	Md/ha	2.82	4,650.96	13,081	2.82	4,665.26	13,090
- Threshing	Md/ha	7.59	4,664.22	33,919	7.49	4,672.28	32,631
- Transportation to market	Md/ha	-	-	-	-	-	-
Total hired labour cost (d)	**MMK/ha**			**228,712**			**223,812**

Appendix 2 (Continued) Gross margin analysis of black gram production of sample farm households before and after import suspension

Items	Unit	Before (n=120)			After (n=111)		
		Level	Effective price	Total value (MMK/ha)	Level	Effective price	Total value (MMK/ha)
(e) Interest on cash cost							
- Material cost (cash)	MMK/ha			10,715			10,514
- Hired labour cost	MMK/ha			18,297			17,905
Total interest on cash cost (e)	**MMK/ha**			**29,012**			**28,419**
Total variable cost (TVC)	**MMK/ha**			**596,947**			**587,870**
Total variable cash cost (TVCC)	**MMK/ha**			**391,664**			**383,658**
Return above variable cost (GB – TVC)	**MMK/ha**			**179,349**			**(-)213,610**
Return above variable cash cost (GB – TVCC)	**MMK/ha**			**384,632**			**(-)9,398**
Benefit-cost ratio (GB/ TVC)				**1.30**			**0.64**
Return per unit cash cost (GB/ TVCC)				**1.98**			**0.98**

Appendix 3 Mean values of dependent and independent variables of black gram profit function before and after import suspension

Description of variables	Units	Before (n=120)		After (n=111)	
		Mean	Standard deviations	Mean	Standard deviations
Profit of black gram	MMK/ha	179,349	529,531	(-)213,610	182,746
Effective price of black gram	MMK/kg	911.48	295.75	461.35	25.95
Sown area of black gram	ha	3.17	2.51	2.88	2.23
Age of household heads	Year	49	11.08	48	11.07
Education level of household heads	Year	6	3.13	6	3.96
Agricultural family labour	No.	1	1.08	1	1.04
Total material cost	MMK/ha	202,476	64,416	196,196	65,615
Hired labour cost	MMK/ha	228,712	78,844	223,812	84,126
Number of credit sources	No.	1.69	0.75	1.74	0.77
Access to extension services (Dummy variable)	Percent	Yes=1 (82.50%) No=0 (17.50%)		Yes=1 (81.98%) No=0 (18.02%)	

Appendix 4 Determinants of the profitability of black gram production before and after import suspension

Independent variables	Before (n=120)		After (n=111)	
	Coefficient	Std. Error	Coefficient	Std. Error
(Constant)	-747.07***	245.15	-257.79**	128.56
Effective price of black gram	1.23***	0.11	0.49***	0.15
Sown area of black gram	-25.22**	12.74	-18.96***	7.25
Age of household heads	-5.23*	2.92	-1.13^{ns}	1.41
Education level of household heads	0.30^{ns}	9.99	-0.59^{ns}	4.79
Agricultural family labour	46.88^{ns}	32.78	3.73^{ns}	16.68
Total material cost	0.25^{ns}	0.52	-0.20^{ns}	0.26
Hired labour cost	-0.79*	0.41	-0.94***	0.19
Number of credit sources	122.18***	42.56	61.44***	20.50
Access to extension services (Dummy)	66.67^{ns}	86.28	91.09**	41.48
R^2		0.66		0.39
Adjusted R^2		0.63		0.33

Note: Dependent variable = Profit of black gram farmers

***,** ** and *** are significances at 10%, 5% and 1% level respectively and ns is not significant.