

**UNDERSTANDING OF MAIZE VALUE CHAIN IN
TATKON TOWNSHIP**

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TATKON TOWNSHIP**

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**A Thesis Submitted to the Post-Graduate Committee of the Yezin
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for the Degree of Master of Agricultural Science
(Agricultural Economics)**

**Department of Agricultural Economics
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This thesis represents the original work 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 THAN SOE KYAW AND DAW KHIN MAR MYINT**

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ABSTRACT

This study was carried out to understand the maize value chain in Tatkon Township. Therefore, this study conducted with the analyses of the production and marketing along the maize value chain including the socio-economic conditions of the farmers, cost and return in maize growing, maize marketing chains and margins and the determinants factors on maize yield in the study area. The farm level survey and the market intermediaries level survey were conducted during October-November 2014. The primary data was collected 120 sample farmers from Nweyit and Kyathaii villages in Tatkon and 15 village brokers, 14 local wholesalers in Tatkon, 1 poultry farm in Tatkon and 2 maize exporters in Mandalay.

The results cost and return analysis, benefit cost ratio indicated that maize farmers earned good profit from maize production in the study area. The benefit cost ratio was 2.05 indicating maize production was economically attractive and profitable for farmers. There were three marketing chains in Tatkon Township. According to the comparison of these three chains, the highest profit percentage obtained by farmers followed by Mandalay wholesalers, local wholesalers and profit percentage of village brokers as commission fees. Maize growers obtained about 70% of export price share along the maize value chain which is the reasonable profit share.

According to the regression analysis, maize yield was positively and significantly influenced by maize sown area, total postharvest costs and seed rate. It can be concluded that large farmers who used more seed rate and proper postharvest handling activities obtained higher maize yield. Farmers education level, family size, amount of farm yard manure used, total family labor cost and total hired labor cost were also positively related to maize yield, although there were not so strong effect in the analysis. Therefore, higher value of these factors supposed to increase in maize yield. Moreover, younger farmers can produce high yield and fertilizer utilization also seems to be negative to the yield. It can be concluded that proper fertilizer utilization technologies would be disseminated by education program especially to the farmers in the study area.

CONTENTS

	Page
ACKNOWLEDGEMENTS	v
ABSTRACT	vi
CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDICES	xi
LIST OF ABBREVIATIONS	xii
LIST OF CONVERSION FACTORS	xii
CHAPTER I. INTRODUCTION	1
1.1 Background of the Study	1
1.2 Importance of Maize in Worldwide	1
1.3 Importance of Maize in Myanmar	2
1.4 Maize Marketing and Trade in Myanmar	3
1.5 Problem Statement of the Study	4
1.6 Objectives	5
CHAPTER II. LITERATURE REVIEW	6
2.1 Concept of Marketing	6
2.2 Value Chain and Marketing Cost and Margin	7
2.2.1 Value chain	7
2.2.2 Marketing cost and margin	7
2.3 Review of Empirical Marketing Studies on Maize in Developing Countries	9
2.4 Review of Empirical Marketing Study on Maize in Myanmar	10
2.5 Review of Empirical Study of Determinants Factor on Profitability of Crop Production	12
CHAPTER III. RESEARCH METHODOLOGY	13
3.1 General Description of the Study Area	13
3.2 Data Collection and Sampling Methods	13
3.3 Method of Analysis	14
3.3.1 Cost and return analysis	14
3.3.2 Marketing chain, marketing cost and margin analysis	16
3.3.3 The determinants factors on maize yield	16

CHAPTER IV. RESULTS AND DISCUSSION	18
4.1 Socio-Economic Characteristics of Sample Farmers	18
4.1.1 Demographic characteristics of sample farmers	18
4.1.2 Productive and household assets of sample farmers	20
4.1.3 Cropping pattern in the study area	20
4.2 Socio-Economic Characteristics of Market Participants	20
4.2.1 Demographic characteristics of village brokers (commission men)	20
4.2.3 Demographic characteristics and marketing activities of local wholesalers	21
4.2.4 Demographic characteristics and marketing activities of poultry farm in Tatkon Township	23
4.2.5 Demographic characteristics and marketing activities of Mandalay wholesalers (exporters)	23
4.3 Resources Use, Maize Yield, and Cost and Return Analysis	26
4.3.1 Resources use and yield of maize production	26
4.3.2 Cost and return analysis of maize production	26
4.4 Maize Value Chain, Margin, Cost and Profit	27
4.4.1 Maize value chain in Tatkon Township	27
4.4.2 Marketing margin, cost and profit of local wholesalers	28
4.4.3 Marketing margin, cost and profit of Mandalay wholesalers (exporters)	29
4.4.4 Comparison of percent composition among the market participants	34
4.5 General Constraints of Maize Production Raised by Sample Farmers in the Study Area	35
4.6 Measurement of the Factors Determining on Maize Yield	35
4.6.1 Descriptive statistics of output and input characteristics of sample farmers	39
CHAPTER V. CONCLUSION AND POLICY IMPLICATION	41
5.1 Description of the Market Participants and their Functions	41
5.2 Policy Implication	42
REFERENCES	44
APPENDICES	47

LIST OF TABLES

Table	Page
4.1 Demographic characteristics of sample farmers	19
4.2 Productive and household assets of sample farmers	19
4.3 Demographic characteristics of village brokers (commission men)	22
4.4 Demographic characteristics of local wholesalers	22
4.5 Marketing activities of local wholesalers	24
4.6 Demographic characteristics of poultry farm in Tatkon	24
4.7 Marketing activities of poultry farm in Tatkon	24
4.8 Demographic characteristics of Mandalay wholesalers (exporters)	25
4.9 Marketing activities of Mandalay wholesalers (exporters)	25
4.10 Resources use and average yield of maize production	30
4.11 Cost and return analysis of maize production	30
4.12 Marketing margin, cost and profit of local wholesalers for chain 1	32
4.13 Marketing margin, cost and profit of local wholesalers for chain 2	32
4.14 Marketing margin, cost and profit of local wholesalers for chain 3	33
4.15 Marketing margin, cost and profit of Mandalay wholesalers (exporters)	33
4.16 Percent composition on export price for chain 1	36
4.17 Percent composition on export price for chain 2	36
4.18 Percent composition on export price for chain 3	37
4.19 Comparison on percent profit share of market participants	37
4.20 Mean values of dependent and independent variables	40
4.21 Result of the parameters determinants on maize yield	40

LIST OF FIGURES

Figure		Page
4.1	Crop-calendar of maize-based cropping pattern	22
4.2	Percentage of market participants along the maize value chain	31
4.2	Cost and profit composition of market participants along the maize value chain	38
4.3	General constraints raised by sample farmers	38

LIST OF APPENDICES

Appendix		Page
Appendix	1 Percent share of crops sown areas in Myanmar (MoAI 2013-2014)	47
Appendix	2 Maize sown area, harvested area, yield and production of Myanmar and neighboring countries in 2013	47
Appendix	3 Sown area, harvested area, yield, production and export of maize in Myanmar (2004-2014)	48
Appendix	4 Sown area, yield and production of maize in Myanmar (2004-2014)	48
Appendix	5 Sown areas, harvested areas, yield and production in Tatkon Township (2004-2014)	49
Appendix	6 Value chain of maize in Myanmar	49
Appendix	7 Map of Tatkon Township and sample villages	50

LIST OF ABBREVIATIONS

ac	Acre
BCR	Benefit cost ratio
DP	Department of Planning
DoA	Department of Agriculture
FAO	Food and Agriculture Organization
FYM	Farm yard manure
GDP	Gross Domestic Product
ha	Hectare
Kg	Kilogram
MMK	Myanmar Kyat
MoAI	Ministry of Agriculture and Irrigation
MT	Metric ton
TV	Television

LIST OF CONVERSION FACTORS

1 basket of maize	=	25 Kg
1 metric ton of maize	=	40 baskets
1 hectare	=	2.47 acres
1 MT	=	1000 Kg
1 MT	=	2 cartloads of farm yard manure

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Myanmar, one of the agricultural countries, grows more than 60 different crops with its diverse agro-ecological conditions, which is suitable for growing many different kinds of crop. These different crops can be grouped into eight categories such as cereal crops, oilseed crops, pulses, industrial crops, culinary crops, vegetables, fruits and other crops, respectively. Among them, cereal crops constitute about 48 % of the total crop sown area followed by pulses 25 % and oilseeds 19 % in 2013 (Appendix 1). Among the cereal crops group, maize stands the second most important crop after rice in Myanmar. Myanmar's economy has been dominated by the agriculture sector with around 23 % of GDP and its share of export earnings is about 20 %. At the same time, agriculture sector provides employment to more than 61.2 % of work force (MoAI 2014).

Maize numerous diversified uses as human food, animal feed and industrial raw material make it a valuable agricultural commodity. In Myanmar, maize production are moving forward gradually due to the important livestock and food processing industries, also important as substitute staple food for people in some rural areas and mountainous regions, and the exportable commodity for neighboring countries. Maize is cultivated in both the rainy and the winter season. Maize planting time for rain-fed areas usually starts in May-June and harvesting begins in September-October. Winter maize can be grown from November-December with adequate moisture content in the soil and harvest begins from February.

1.2 Importance of Maize in Worldwide

Maize (*Zea mays L.*) also known as corn, is one of the most extensively cultivated cereal crops and the third largest cereal crop after wheat and rice in the world. The world maize production reached a level of 1,018 million MT and sown area was 185 million hectare in 2013 (FAOSTAT 2013). It is mostly used and traded as a leading feed crop for animals but is also an important staple food. About 73 % of the world's maize growing areas are located in developing countries, most abundantly in low and lower-middle income nations. Maize is predominantly grown under rain-fed

conditions by small-holders and resource-limited farmers which display it as important role in the livelihoods of millions of poor people in Latin America, sub-Saharan Africa, and Asia (Prasanna 2011).

In Asia, maize is the second most important cereal crop after rice. It is also the primary source of feed for the poultry and livestock industry as well as a source of raw material for the manufacturing sector, and is therefore maize stands an important source of income for many Asian farmers. China was leading maize producer among the Asia maize producing countries with 219 million metric ton in 2013. The countries with the largest maize growing areas were China, India, Indonesia, Philippines, Viet Nam and Thailand while Malaysia got the highest maize yield followed by China and Lao. It can be seen that Myanmar maize sown area and also yield were still lack behind in comparing with the neighboring countries. The maize sown area, harvested area, yield and production of Myanmar and neighboring countries in 2013 were shown in Appendix 2.

1.3 Importance of Maize in Myanmar

Myanmar is a maize producing and exporting country among 163 maize producing countries in the World. After 2009, the demand of maize has been increased annually. A total of 83 % maize sown areas are contributed among Shan, Chin States and Sagaing, Mandalay, Ayeyarwaddy, and Magway Regions, respectively. The sown area, harvested area, average yield, production and export of maize in Myanmar from 2004-2005 to 2013-2014 were presented in Appendix 3 and 4. The maize sown area was increased from 0.293 million hectares in 2004-2005 to 0.441 million hectares in 2013-2014. The average maize yield was gradually increased. The total maize production reached a level of 1.626 million metric ton. Maize export was increased during the period of 2005-2006 to 2012-2013.

Tatkon Township, one of the major maize growing areas, is now located in Nay Pyi Taw. Before 2008, Tatkon Township constituted under Mandalay Region. It is contributed maize sown area about 20 % in total maize sown area of Nay Pyi Taw. The cultivated area was only 840 hectares in 2004-2005 and started increase to about 1,011 hectares in 2006-2007. In 2007-2008, not only maize sown area but also the yield per hectare increased gradually. It was decreased again up to 2011-2012 and a little increased in the later years. The average yield of maize was increased

significantly up to 4.28 metric ton per hectare in 2010-2011, however, it was decreased again in 2013-2014 growing season. It can be seen that the average yield level of Tatkon Township is higher than the national level. The sown area, harvested area, yield and production of maize Tatkon Township from 2005-2006 to 2013-2014 were presented in Appendix 5.

1.4 Maize Marketing and Trade in Myanmar

Since Myanmar has changed its economic course from a centrally planned economy into market oriented system, a series of structural reforms had been introduced and new legal policy instruments were enacted as paving way for market oriented economy. The Myanmar government has recognized, in the context of the market-oriented economic system, the private sector as a prime-mover of the market mechanism and pays great attention for its development. All-out efforts are being made to encourage the active participation of private sectors in foreign trade and giving full support in every angle as to cope with the international trading practices. Currently, Myanmar is a member country to World Trade Organization (WTO), Association of South East Asian Nation (ASEAN) and Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Co-operation (BIMSTEC) and is having total of over (70) countries of trading partners and a series of effective measures are being taken for the increase in numbers. The basic principle of export policy is to penetrate into the global market by using the existing natural and human resources and to produce value added products more than normal export items (Country Report on Myanmar 2014).

Based on the above criteria, Myanmar need to diversify and improve its trading products by using the abundant natural and human resources, especially in agricultural sector. Consequently, it is required to develop the maize industry which is one of the trade and potential crops of Myanmar. Maize production in Myanmar is gradually increased due to its improve average yields and strong demand from domestic and Chinese feed mills.

Increased number of farmers were profiting from growing hybrid maize rather than growing competing crops. Yields are apparently increasing because the higher use of hybrid seeds, which have been introduced to Myanmar by private companies such as the Charoen Pokphand Group (CP) from Thailand since 1999. Trade sources

claimed that CP has an 80 % market share of Myanmar's hybrid seed market. Myanmar's livestock and aquaculture industries are increasingly substituting traditional livestock feed with compound corn feeds. Most of the maize supplies go to commercial mills in Yangon, Mandalay, and Shan State and is primarily used for livestock feed in contract farming systems. Most of the maize trade to China flows through informal channels and is not officially recorded (Swe Mon Aung 2014).

1.5 Problem Statement of the Study

Agricultural marketing is the main driving force for economic development and has a guiding and stimulating impact on production and distribution of agricultural produce. In Myanmar, the increasing proportion of the population living in urban centers and rising level of income require more organized channels for distributing agricultural products. Nowadays, maize production become important not only earning income for farmers but also its diversifying usages. In Myanmar, most of the maize production is aimed to produce livestock feed for both domestic and export. Therefore, after rice, maize production becomes prominent role to earn farm income together with its gradually increasing yield year after year.

Tatkon Township, which is one of the major maize producing area in Myanmar, most of the maize crop was traded to China through Mandalay and Muse Township and only a few portion of maize was used as domestic livestock feed. Therefore, maize became the main income source not only for the farmers but also for the traders in the study area. Consequently, marketing activities are important to investigate for maize growers in this region. In the absence of well developed markets, marketing facilities, and marketing efficiency, farmers are at disadvantage by selling their increased marketable surplus to traders in the market as they get low prices.

After 1990, market-oriented economic policy was adopted and all the system started to change. At the same time the introducing of hybrid variety of maize by CP Company from Thailand, maize production increased year after year. In the domestic maize marketing, price uncertainty can decrease market efficiency, responses and productivity, inadequate road infrastructure and network, in-transparency of market and price information and, lack of the consistency of weighting measurement lead to inefficient Market system. At the harvest time, farmers don't have enough storage

facilities to handle and have a credit problem. So, most farmers have to sell their produce just after harvest. The main research outcome will be the elaboration of understanding the maize production, profitability, current marketing chain and determinants on maize yield of the study area.

1.6 Objectives

The general objective of the study was to find out the maize marketing and production conditions in the study area with the following specific objectives:

- To analyze the profitability of maize production in the study area
- To investigate the marketing cost and margin of various stakeholders along the maize value chain
- To identify the determinants on yield of maize production of the sample farmers in the study area.

CHAPTER II

LITERATURE REVIEW

2.1 Concept of Marketing

Marketing is the most important aspect in the development process. This is obviously due to the fact that development basically means larger size productive activities in the economy. But we cannot have more of production unless the goods produced are actually sold out and selling depends on the proper marketing conditions (Prasad and Prasad 1995). Marketing is the process of bringing sellers and buyers together for the purpose of exchanging title to goods and services (Kilingo and Kariuki 2001). Marketing has basic productive value, in that it adds time, form, place and possession utilities to products and commodities. Through the technical functions of storage, processing and transportation, and through exchange, marketing increases consumer satisfaction from any given quantity of output. Marketing is defined as a system because marketing usually comprises several interrelated structures along the production, distribution and consumption units under the economic process (Mendoza 1995).

Marketing is a social process by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services of value with others (Kotler 2003). Marketing encompasses all of the business activities performed in directing the flow of goods and services from the producer to the consumer or final user. These activities are usually classified into six stages. These are: production, assembly, processing, wholesaling, retailing and consumption (Casavant et al. 1999).

Consumers spend a large amount of income on basic foods hence with the growth of urbanization the agricultural marketing system is expected to play a great role in linking the rural and the urban population. Agricultural marketing covers all the activities associated with the agricultural production and food, feed, and fiber assembly, processing, and distribution to final consumers, including analysis of consumers' needs, motivations, and purchasing and consumption behavior (Branson and Norvell 1983).

2.2 Value Chain and Marketing Cost and Margin

2.2.1 Value chain

Value chains are similar to supply chains but different in important ways, as well. Value chains like supply chains are forms of industrial organization. The biggest difference is that value chains concern themselves with creating and maintaining maximum consumer value, whereas supply chains concern themselves primarily with minimizing the delivered cost of the products moving through them. Value chains develop in order to support the supply of relatively high value products—products, which are differentiated in value frequently based on the service or product attributes which are added within the chain itself. Supply chains, on the other hand, primarily move undifferentiated products or commodities from where they are produced to where they are consumed (Agricultural Council of Tanzania 2010).

Value chain is a sequence of related business activities (functions) from provision of specific inputs for a particular product to primary production, transformation and marketing, up to the final sale of a particular product to the consumer. It also includes the set of operators performing different functions, such as producers, processors, traders and distributors of a particular product linked by a series of business transactions through which the product passes from primary producers to end-consumers. Thus, value chain actors, responsible for transmission of materials, information and/or services, share an interest in the end-product because changes in the end-market affect them both collectively and simultaneously (GTZ Value Links 2008).

2.2.2 Marketing cost and margin

One way of defining costs is that they are all of the expenses incurred in organizing and carrying out marketing process. Another definition is the charge which should be made for any marketing activities. Assembling transport, storage, grading, processing, wholesaling and retailing, which can all be stages in the marketing chain, involves expenses (Smith 1992).

According to William and Robinson (1990) a marketing margin is defined alternatively as (1) the difference between the price paid by consumers and that obtained by producers (2) the price of a collection of marketing services that is the outcome of the demand for and the supply of such services. Marketing margin is

defined as a difference between price paid by consumers and that obtained by producers or the price of collection of marketing services (Tomek and Robinson 1990). Mendoza (1995) also explained that marketing margin measures the share of the final selling price that is capturing by particular agent in the marketing chain. It includes costs and typically, though not necessarily, some additional income.

Marketing margin or price spread is a commonly used measure of the performance of a marketing system (Abbott and Makeham 1990). It can be a useful descriptive statistics if used to show how the consumers' expenditure is divided among market participants at different levels of the marketing systems. It is defined as the difference between the price the consumer pays and the price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services. A large number of studies have analyzed the marketing margins for different types of commodities to examine the performance of agricultural products marketing (Wohlengenant and Mullen 1987; Schroeter and Azzam 1991; Holt 1993). In analyzing factors explaining variations in the margin, some authors used the observed margin as a dependent variable while others used the expected margin as a dependent variable criticizing the former for not taking expectations with respect to both the mean and variance of the output price. The explanatory variables used to explain the variations in the margin may include marketing costs, total volume traded, time trend, seasonality, lagged margin, etc (Brorsen et al. 1985; Wohlengenant and Mullen 1987; Schroeter and Azzam 1991). Sexton, Zhang and Chalfant (2005) argued that even though variations in the margin over time might be attributable to marginal marketing costs under perfect competition, additional factors such as seasonality, technological changes, and sales volume may also explain the variations in the margin.

As Mendoza (1995) argued, when there are several participants in the marketing chain, the margin is calculated by finding the price variations at different segments and then comparing them with the final price to the consumer. The consumer price is then the base or the common denominator for all marketing margins. Computing the total gross marketing margin (TGMM) is always related to the final price or the price paid by the end consumer and expressed as a percentage. Net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary as net income once the marketing costs are deducted.

A marketing margin is the percentage of the final weighted average selling

price taken by each stage of the marketing chain. The total marketing margin is the difference between what the consumer pays and what the producer/farmer receives for his product. In other words it is the difference between retail price and farm price (Cramers and Jensen 1982). A wide margin means usually high prices to consumers and low prices to producers. The total marketing margin may be subdivided into different components: all the costs of marketing services and the profit margins or net returns. The cost and price information obtained from the survey were used to evaluate the gross marketing margin.

2.3 Review of Empirical Marketing Studies on Maize in Developing Countries

Franzel and Legesse et al. (1992) reported that before the Ethiopian revolution in 1974, the marketing of maize was dominated by the private sector (70%) while retailers and consumers handled 30%. However, in 1976 the Ethiopian Government established the Agricultural Marketing Corporation with the mandate to buy and distribute maize at fixed prices. In 1987 the Corporation purchased 570,000 tons of grain, 30-40% of the nation's marketable surplus. Concurrently, the role of private sector was sharply curtailed. By the late 1980s it was evident that the marketing system was inefficient, inequitable and resulted in chronic food shortages. As a result, in 1990 Ethiopia liberalized grain marketing, although the state still retains a significant role in grain production and marketing.

Maize marketing was well organized in Pakistan, especially amongst the contract growers of Rafhan Maize Products. This company procures 35% of its total requirements from spring crop contract growers, while the remaining portion is procured from the open market. The main marketing channel of maize consisted of direct purchase by Rafhan Company from the farms of its contract growers. Contract growers of maize were satisfied with the present procurement procedures and prices received from Rafhan, their extension services and production campaign. However, as the spring maize was mainly grown by large farmers, only they benefited from contract-farmer approach to maize production. Other companies buy maize through the village dealers. Non-contract growers usually sell their maize surplus to commission agents directly or through village beoparies. In addition, these farmers also sell their surplus maize to Rafhan's authorized agents located in the grain market if market prices are lower than Rafhan's prices, otherwise they sell to other

commission agents in the market (CIMMYT 1989; Akhtar and Byerlee 1986; Tetlay et al. 1987).

Maize is the main staple food in Malawi, and its availability defines the household and national food security. As a result, increasing the production and availability of maize has been a preoccupation of agricultural policy in Malawi. During the fifteen post-independence years, agricultural policy concentrated on the development of the maize sector. Some of the policies towards promotion of maize production included intensive research in maize leading to development of high yielding maize varieties (Smale 1995); extension services throughout the country which facilitated the adoption of technology (hybrid maize and application of fertilizers); subsidized credit and inputs to the smallholder sector delivered through farmers' clubs linked to the Agricultural Development and Marketing Corporation (ADMARC); and pan-territorial and pan-seasonal guaranteed prices of maize and other smallholder agricultural produce. ADMARC, a state marketing agency, was entrusted to market smallholder food and cash crops and was used as an agent for the implementation of government agricultural pricing policies. ADMARC was mandated to market, process and dispose of agricultural produce; to provide adequate price stability and to provide storage facilities for food reserves (Scarborough 1990). The government invested substantially in market infrastructure in the rural areas through ADMARC. By 1991, ADMARC had 3 regional offices, 12 divisional offices, 80 area offices, 217 unit (primary) markets and 1,300 seasonal markets across the country (ADMARC 1990).

2.4 Review of Empirical Marketing Study on Maize in Myanmar

Aung Kyi (2005) reported that production and maize marketing in central dry zone. Central Agricultural Research Institute (CARI) distributes its hybrid seeds to maize farmers for the production of grain and also collaborates with contract farmers to produce hybrid seeds. For this study production costs and profit margin returns of hybrid seed producing farmers and hybrid grain producing farmers were selected as samples in Pyinnmana Township located in the southern part of Mandalay division known as the central dry zone region. Hybrid seed producing farmers make more profit than the hybrid maize grain producing farmers. The reason is that the price of hybrid seed is higher than that of hybrid grain. Hybrid seed is purchased by CARI at a

price of 160 MMK/kg and the marketing price of maize grain was 65 MMK/kg at the time of survey. Farmers in Pyinmana Township sold their maize at the nearest market town of Pyinmana. For this, horse cart drivers deliver the maize to wholesalers and received 100 MMK/basket (18 viss = 29 kg) for commission fees, which are paid by maize farmers. The marketing channel of maize in the country involves different actors; such as farmers, collectors, wholesalers, exporters, the feed industry and commercial poultry farms, all dependent on the main surplus-producing area, local markets, urban markets and transit markets. Based on market reconnaissance, the maize marketing channel from farmer to feed industry or local exporter is mentioned in Appendix 6.

Thi Mar Win et al. (2012) reported that average farm gate price of maize in the villages in Kanpetlet Township is 4200 MMK/ basket (210 MMK/viss). At that time, price of maize in Mandalay wholesale market is 389 MMK/viss which is nearly doubled to the farm gate price in Chin State. Quality specification of maize in Mandalay is based on the color, moisture content, cleanliness, and free from inert materials. Quality of maize in Chin State after storage has gradually decreased. If there is not much export demand from other countries such as India through normal trade, price at Muse border trade govern maize price. From Muse (105 miles) price information is disseminated to Taungyi, Lasiho and Mandalay wholesale markets through the exporters and large traders. After then, traders from various townships, especially from the major producing areas received Taunggyi, Lashio and Mandalay Crop Exchange Centers' prices in various ways. Farmers in Chin State know market price of maize in Kanpetlet from the collectors and traders. Traders and collectors use to know market price of Mandalay and Chauk and they determined buying or selling price based on these wholesale market prices. Although farmers in the studied areas consumed maize they produced without selling for cash, they do not buy for their consumption from other wholesale markets even though they reduced yield due to rodent and pests infestations. Quality losses and quantity losses due to pest and diseases problems are found in Kanpetlet Township as a result of poor farming practices and post harvest techniques.

2.5 Review of Empirical Study of Determinants Factor on Profitability of Crop Production

Erbaugh (2008) stated that the profitability of sorghum in Tanzania found that the 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. Surprisingly, farm size was negatively influencing the gross margin contrary to the literature. However, the interaction between production cost and farm gate price was positive and significant while farm gate price alone was not significant. In addition, the variety used, 7 application of fertilizer and tillage method were not significant but the interaction between variety used and fertilizer application was positive and significant.

Bagamba (1998) studied that the profitability of bananas found that the total farm size, total farm income, off-farm income, age of the farmer, weevil damage, interaction with government extension agents, gender of the farmer, distance from the farm to the tarmac, years spent in school and number of cattle owned had a significant effect on the profitability of banana production. Increasing the area planted was expected to increase yield which should lead to increased gross margin. However this negative relationship between area and gross margin may be attributed to the fact that the area was not used efficiently thus increasing area of cowpeas planted would not actually lead to increased production. Quantity harvested also has a positive influence on gross margin at 95% confidence. An increase in yield had a positive relationship to gross margin because increasing the quantity harvested increases the number of kg that can be valued (Warr 1999).

Rearden (1997) revealed that several factors have been identified to influence agricultural profitability at farm level. These include; the farm gate price, government price policies, farm location, production costs, variety of seed used, yield, farm size, tillage practices, land tenure which also influences yield, 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.

CHAPTER III

RESEARCH METHODOLOGY

3.1 General Description of the Study Area

Tatkon Township is located in Nay Pyi Taw Council Area with a total population of 220,600. Before 2008, Tatkon is one of the major maize growing areas in Central Myanmar. This area is suitable for maize production due to its tropical agro-climatic and soil conditions. Tatkon Township is situated between latitude 20° 20' North and East longitude 96° 30'. The total land area is 180,237 hectares and 39,639 hectares are under cultivated. The minimum temperature is 54°F, the maximum temperature is 106°F and average annual rainfall is about 34 inches. The criteria for selecting the study area based on major maize growing area. The Kythaa village was selected from Kythaa village tract and Nweyit village was selected from Nweyit village tract. The total farm population was 625 farmers in Kythaa and 400 farmers in Nweyit villages. These study areas occupied about 42% in total maize sown areas of Tatkon Township. The sample villages are distributed within a distance with 4.8 kilometer away from Tatkon Township. Map of Tatkon Township and sample villages were shown in Appendix 7.

3.2 Data Collection and Sampling Methods

Both primary and secondary data were collected based on the maize growing season of 2013-2014. The primary data was collected by personal interview with structured questionnaire. The household survey was conducted from October to November 2014, covering 120 maize growing farmers in which each of 60 farmers from Kythaa village in Kythaa village tract and Nweyit village in Nweyit village tract in Tatkon Township.

The questionnaire was mainly structured in details on the socio-economic conditions and maize production and marketing activities. Socio-economic characteristics of maize farmers such as age, education level, family size, household's experience in maize farming, family labor, maize sown area etc were collected. And then detail about maize production and cost data such as yield obtained, price received, and the use of inputs, such as labors, fertilizers, seeds, FYM, post harvest activities cost, source and marketing behavior of for maize production, and problems

facing the farmer etc were collected.

Then, market performance of market intermediaries of maize market were collected from village brokers/commission men, local wholesalers, Tatkon poultry farm, Mandalay wholesalers (exporters) for their respective marketing activities, cost and margin of purchasing channels, sold system, transport facilities and other socio-economic data etc. The total number of market participants collected in the study area are as followed;

1. Village brokers (commission men)	15
2. Local wholesalers	14
3. Tatkon poultry farm	1
4. Mandalay wholesalers (exporters)	2

The relevant secondary information were taken from published and official records of Ministry of Agriculture and Irrigation (MOAI), the Department of Planning (DP), Department of Agriculture (DOA), Food and Agricultural Organization (FAO), Central Statistical Organization (CSO) and the other relevant data sources.

3.3 Method of Analysis

The collected data from farmers and traders were analyzed by using Excel Software and Statistical Packages for Social Science (SPSS) version 16.0. The analytical techniques included descriptive analysis, cost and return analysis, marketing cost and margin analysis and regression analysis on maize yield determinants.

3.3.1 Cost and return analysis

Enterprise budgets are important decision making tools. They can help individual producers determine the most profitable crops to grow, develop marketing strategies, obtain financing necessary to implement production plans, and make other farm business decisions. An enterprise budget is a physical and financial plan for raising and selling a particular crop or livestock commodity. It is a physical plan because it indicates the type and quantity of production inputs and the output, or yield, per unit based. It is also a financial plan, because it assigns costs to all the inputs used in producing the commodity. Budgets are calculated in units of one acre to facilitate budgeting for different enterprise sizes and to simplify calculations (Carkner 2000).

An enterprise budget is a detailed accounting of revenues and expenses related to a profit center within a business. Enterprise budgets are important tools in determining profitability of individual ventures (Peabody 2007).

Enterprise budget enables to evaluate the cost and return of production process. Hired labor costs were valued by market wage rates and man days used in all farming practices. In order to estimate gross return for respective crops, average yield and average price were used. Benefit cost ratio was used as profitability measures for each crop enterprise computing total gross margin or return above variable cost and return above cash costs. Input quantities and values used in production process (costs) and output quantities and values (benefits) are the basic data required for budgets (Olson 2009). The cost and return analysis was used to determine the profitability of the crop in the study area. Both cash and non-cash items were included in the estimation of material cost and labor cost. Cash items were seeds, fertilizer and non-cash items for material costs were family labor, cattle, farm yard manure and cost of inputs (fertilizer and seed). Hired labor costs were valued by market wage rates and man days used in all farming practices. In order to estimate gross return, average yield and average price were used.

Profitability measures were estimated by using the following formulae:

1. Return Above Variable Cost = Total Gross Return - Total Variable Cost

$$\text{RAVC} = \text{TGR} - \text{TVC}$$
2. Return Above Variable Cash Cost = Total Gross Return - Total Variable Cash Cost

$$\text{RAVCC} = \text{TGR} - \text{TVCC}$$
3. Benefit Cost Ratio = Total Gross Return / Total Variable Cost

$$\text{BCR} = \text{TGR} / \text{TVC}$$

Other measurements were used in economic analysis are as follows;

Total variable cash cost (TVCC) = Total material costs + Total hired labor cost

Total variable cost (TVC) = Total variable cash costs + Total family labor cost

3.3.2 Marketing cost and margin analysis

Marketing margins reflect both the cost of marketing and the profits of marketing agents. Thus, marketing margins are differences between prices at different events in the marketing channel. The price paid by the consumer is thus made up of the amount of money paid to the farmer for his product plus all of the costs involved in getting it to the consumer (Tomek and Robinson 1990). The percentage share of the final price that is taken up by the marketing function is known as the marketing margin (Mendoza, 1995). The cost and price information obtained from the survey were used to evaluate the gross marketing margin.

The method of analysis of marketing margin was as follows:

- (i) Marketing Margin = Average Selling Price – Average Buying Price
- (ii) Profit = Marketing Margin – Total Marketing cost
- (iii) Total Gross Marketing Margin (TGMM)
 - TGMM = (Export Price – Farm Gate Price) / Export Price × 100
 - Margin of Wholesalers = (Export Price – Wholesale Price) / Export Price × 100
- (iv) Farmer's Portion of Producer's Gross Marketing Margin (PGMM)

The TGMM is useful to calculate 'producer's gross margin' (PGMM) which is the portion of the price received by the export that goes to the producer. The producer's margin is calculated as:

$$PGMM = (\text{Export Price} - \text{Total Gross Marketing Margin}) / \text{Export Price} \times 100$$

3.3.3 The determinants factors on maize yield

According to the objective, to examine the determinants factors on maize yield of the sample farmers, the following regression model of Cobb-Douglas function was used.

$$\text{Ln}Y = \beta_0 + \beta_1 \text{Ln} X_{1i} + \beta_2 \text{Ln} X_{2i} + \beta_3 \text{Ln} X_{3i} + \dots + \beta_8 \text{Ln} X_{8i} + \beta_9 \text{Ln} X_{9i} + \beta_{10} \text{Ln} X_{10i} + u_i$$

Where,

LnY = natural log of maize yield (MT/ha)

LnX_{1i} = natural log of household head's age (year)

LnX_{2i} = natural log of education (year)

LnX_{3i} = natural log of family size (No.)

$\text{Ln}X_{4i}$ = natural log of maize sown area (ha)

$\text{Ln}X_{5i}$ = natural log of seed rate (Kg/ha)

$\text{Ln}X_{6i}$ = natural log of fertilizer (Kg/ha)

$\text{Ln}X_{7i}$ = natural log of farm yard manure (Kg/ha)

$\text{Ln}X_{8i}$ = natural log of total family labor cost (MMK/ha)

$\text{Ln}X_{9i}$ = natural log of total hired labor cost (MMK/ha)

$\text{Ln}X_{10i}$ = natural log of total post harvest cost (MMK/ha)

β_0 = constant

β_i = estimated coefficient ($i = 1,2,3---,n$)

u_i = disturbance term

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Sample Farmers

4.1.1 Demographic characteristics of sample farmers

The farm household information and its characteristics were the important factors in crop production and marketing system. These factors were believed to influence production and marketing decision of farmers in different aspects. In order to get the general household information in the study area, the descriptive analysis results of mean, standard deviation and range values were presented in this section.

In the study area, the mean age of household head was around 51 years old, ranging from 22 to 85 years showing a high variability of ages among farmers. In order to know the management efficiency of farm, working experience in farming activities used to identify in which mean experience about 23 years was ranging from 1 to 60 years.

Education may have productive value, it helps the household's head to allocate the farm's resources, choosing which outputs to produce, how much of each output to produce, and in what proportions to use inputs in the production of any output. In this study, education level of sample household's head was classified into four groups, (i) primary school level (ii) secondary school level (iii) high school level, and (iv) graduated level. According to the survey results, 74 % of sample farmers were found to be having primary school level followed by secondary school level, high school level and graduated level respectively. Therefore, most of the sample farmers have only primary education level in the study area.

Farm family size was 5 persons on average, ranging from 2 to 9 persons. Number of family labors participated in maize production was ranged from 0 to 6 persons with average family labor of 2 persons. The mean value of total farm size was 1.84 hectares with minimum and 0.4 maximum up to 7 hectares. The average total maize sown area was 0.85 hectares with a range of 0.4 to 5.6 hectares. The results of the above variables were shown in Table 4.1.

Table 4.1 Demographic characteristics of sample farmers (n=120)

Item	Unit	Mean	Range	SD
Age	Year	51	22-85	13.4
Farming experience	Year	23	1-60	14.3
Family size	No.	5	2-9	1.5
Family labor	No.	2	0-6	1.1
Total farm size	ha	1.84	0.4-7	1.27
Total maize sown area	ha	0.85	0.4-5.6	0.66
<u>Education level</u>	<u>No.</u>	<u>%</u>		
Primary level	89	74		
Secondary level	18	15		
High school level	12	10		
Graduated level	1	1		

Source: Owned survey 2014

Table 4.2 Productive and household assets of sample farmers (n=120)

Item	% owned by farmers
Plough	87
Harrow	87
Cattle	81
Bullock cart	80
Power tiller	10
Water pump	96
Sprayer	87
TV	11
Motor cycle	63
Mobile phone	38
Solar plate	12

Source: Owned survey 2014

4.1.2 Productive and household assets of sample farmers

The percentage of the productive tools and machines owned by farmers for maize production and the household assets in the study area were listed in Table 4.2. In this table, nearly 90% of sample farmers possessed the farming tools such as ploughs, harrows and sprayers while cattles and bullock carts were owned by approximately 80% of the farmers. It can be seen that most of the sample farm households still possessed the conventional farming tools as their productive assets. In the case of farm machinery, 10 % of the sample farm households owned power tiller and 96 % possessed water pump. In the case of household assets of sample farmers, about 63 % of the sample farm households owned motor bikes, 38 % for mobile phone, 12 % for solar plate and 11 % for TV respectively.

4.1.3 Cropping pattern in the study area

Maize was the major crop grown in this area. Two types of land (Le and Yar) were found in the study area. Maize-eggplant pattern was grown in Yar and green gram-paddy pattern in Le. Mostly, maize growing in May/June and harvesting time was started in August/September. Time of growing and harvesting for the respective crops Calendar within a year were expressed in Figure 4.1

4.2 Socio-Economic Characteristics of Market Participants

4.2.1 Demographic characteristics of village brokers (commission men)

The demographic characteristics of village brokers (commission men) were described in Table 4.3. The mean age of the village brokers (commission men) was around 42 years old with the range of 25 to 57 years. The average working experience was 8 years with the range of 2 to 15 years. Among the sample village brokers (commission men), the high school education level was the highest around 47 percent followed by primary and secondary education levels. Most of the brokers live in villages far from 4.8 kilometer of Tatkon Township. Village brokers (commission men) collected the maize directly from the farmers at the village and the farmers did not need to go to the nearby town to sell their crop. They were involved as commission men between farmers and local wholesalers. They also received a commission fee around 1 % from local wholesalers. The village brokers (commission men) performed the market transaction beginning from the harvest where one broker

can collect about 60-90 metric ton of maize per season.

4.2.3 Demographic characteristics and marketing activities of local wholesalers

The demographic characteristics of the local wholesalers for Tatkon Township were shown in Table 4.4. The average age of the local wholesalers was 46 years old ranging from 38 to 65 years old. The average working experience was 16 years ranging from 7 to 30 years. Among the sample local wholesalers, the high school education level was the highest around 43 percent followed by graduated, secondary and primary education levels. Therefore, majority of the local wholesalers had higher education level indicating that they had more considerable knowledge and decision along the value chain.

The local wholesalers were the main intermediaries linking with the farmers who can get price information along the chain. They also had the connection with other wholesalers, exporters and Crop Exchange Center in Mandalay getting to know the buying and selling prices. Local wholesalers collected maize directly from the farmers and sometimes from brokers who collect crops for them. Some farmers directly sold their crops to the local wholesalers. In the study area, local wholesalers delivered maize directly to Mandalay by truck and some local wholesalers sold maize to Tatkon poultry farm. Their average capital investment was a range of 10 million to 50 million MMK in monsoon maize season especially from October to November.

Marketing activities such as purchasing, selling, mode of transport and destination of local wholesalers were shown in Table 4.5. In the case of purchasing actions, about 80 % of local wholesalers basically applied direct cash down payment to farmers while 20 % employed as commission agents with cash down payment. All local wholesalers were engaged with direct cash payment when they performed selling maize to Mandalay Wholesalers (exporters). So, the destination for maize was Mandalay for all sample local wholesalers. All local wholesalers used mobile phone to exchange the market information.

Cropping pattern	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Maize					G				H			
Paddy						G					H	
Green gram					G		H					
Eggplant						G					H	

G=Growing time, H=Harvesting time

Figure 4.1 Crop-calendar of maize-based cropping pattern

Table 4.3 Demographic characteristics of village brokers (commission men) (n=15)

Item	Unit	Mean	Range	SD
Age	Year	42	25-57	9.5
Experience	Year	8	2-15	19.5
<u>Education level</u>	<u>No.</u>	<u>%</u>		
Primary level	5	33		
Secondary level	3	20		
High school level	7	47		
Graduated level	0	0		

Source: Owned survey 2014

Table 4.4 Demographic characteristics of local wholesalers (n=14)

Item	Unit	Mean	Range	SD
Age	Year	46	38-65	7.3
Experience	Year	16	7-30	5.9
<u>Education level</u>	<u>No.</u>	<u>%</u>		
Primary level	1	7		
Secondary level	2	14		
High school level	6	43		
Graduated level	5	36		

Source: Owned survey 2014

4.2.4 Demographic characteristics and marketing activities of poultry farm in Tatkon

One of the final consumers among the maize value chain was poultry farm in Tatkon Township. Poultry farm bought maize directly from the local wholesalers in Tatkon Township. It was found that the age of the Tatkon poultry farm owner was 45 years old with a working experience of 8 years. He had a graduated education level. In case of purchasing activities, Tatkon poultry farm owner purchased maize for poultry feed from Tatkon wholesaler with cash down payment. Where there was no long distance within Township. Therefore, mode of transporting maize is normally used by truck. The demographic characteristics and marketing activities of the poultry farm were shown in Table 4.6 and 4.7.

4.2.5 Demographic characteristics and marketing activities of Mandalay wholesalers (exporters)

Another market participant along the maize value chain was wholesalers in Mandalay who exported maize to Muse Township at the border of China from where maize was exported to China. In this part, the demographic and marketing characteristics of the Mandalay wholesalers (exporters) were presented in Table 4.8 and 4.9. The average age, years of working experience of the Mandalay wholesalers (exporters) were 48 and 18 years, respectively. It showed that the high experience in their work with mature age with good decision making ability. Moreover, high level of education also supported the above ability.

Mandalay Crop Exchange Centre (CEC) was the main source of price information of maize markets in Myanmar. In addition, the Mandalay wholesalers (exporters) were members of the Crop Exchange Centre. They get the price formation from CEC centre. The amount of capital investment of the Mandalay wholesalers (exporters) varied from 1,500 million MMK to 2,000 million MMK of monsoon maize season. The Mandalay wholesalers (exporters) collected the crops from the local wholesalers of Tatkon Township by using cash down payment system. Most of the Mandalay wholesalers (exporters) traded maize from Mandalay to Muse. In case of selling activities, Mandalay wholesalers sold their maize by using cash down system. Mode of transportation system was truck. Their transportation cost was very high due to very long distance transportation.

Table 4.5 Marketing activities of local wholesalers (n=14)

Activities	% of local wholesalers
<u>Type of purchasing</u>	
Used cash down system	79
Used cash down system with commission agents	21
<u>Type of selling</u>	
Only cash down system	100
<u>Mode of transport</u>	
By truck	100
<u>Destination of selling</u>	
Mandalay	100

Source: Owned survey 2014

Table 4.6 Demographic characteristics of poultry farm in Tatkon (n=1)

Item	Unit	poultry farm in Tatkon
Age	Year	45
Experience	Year	8
<u>Education level</u>	<u>No.</u>	<u>%</u>
Primary school level	-	-
Secondary school level	-	-
High school level	-	-
Graduated level	1	100

Source: Owned survey 2014

Table 4.7 Marketing activities of poultry farm in Tatkon (n=1)

Activities	% of poultry farm in Tatkon
<u>Type of purchasing</u>	
Used cash down payment	100
<u>Mode of transport</u>	
Used by truck	100

Source: Owned survey 2014

Table 4.8 Demographic characteristics of Mandalay wholesalers (exporters)
(n=2)

Item	Unit	Mean	Range	SD
Age	Year	48	45-50	3.5
Experience	Year	18	15-20	3.5
<u>Education level</u>	<u>No.</u>	<u>%</u>		
Primary level	-	-		
Secondary level	-	-		
High school level	1	50		
Graduated level	1	50		

Source: Owned survey 2014

Table 4.9 Marketing activities of Mandalay wholesalers (exporters) (n=2)

Activities	% of Mandalay wholesalers (exporters)
<u>Type of purchasing</u>	
Used cash down system	100
<u>Type of selling</u>	
Only cash down system	100
<u>Mode of transport</u>	
By truck	100
<u>Destination of selling</u>	
Muse	100

Source: Owned survey 2014

4.3 Resources Use, Maize Yield, and Cost and Return Analysis

4.3.1 Resources use and yield of maize production

Table 4.10 described the mean sample values of average maize yield, farm gate price received by sample farmers, and resource used in maize production. Moreover, the items included in total variable cost such as total material cost, total family labor cost, total hired labor cost and interest on cash cost were also presented. According to the descriptive statistics, the maize yield received 5.22 metric ton with a wide range from 2.16 to 7.41 metric ton per hectare. Indicating that some of sampled farmers obtained higher yield of maize in comparison with national yield level. The farm gate price of maize was 212,190 MMK with a minimum price received 193,263 MMK and a maximum price up to 251,242 MMK per metric ton. The amount of seed rate used by sample farmers in maize growing was 12.56 kilogram ranging from 6.18 to 24.7 kilogram per hectare. The quantity of inorganic fertilizer applied by sample farmers was 271 kilogram with a varying level from 123.5 to 370.5 kilogram per hectare. It can be seen that the amount of farm yard manure application per hectare was about 700 kilogram.

The resource utilization of maize production was calculated based on the cost and return per unit analysis. The value of total material cost was discovered 207,514 MMK varying from 98,800 to 313,690 MMK per hectare of the sampled farmers. Calculating family labor as one of the opportunity cost indicated 108,870 MMK with a maximum of 269,230 MMK per hectare. The hired labor cost was 295,883 MMK found ranging from 74,100 to 500,175 MMK per hectare. The interest on cash cost found 60,408 MMK varying from 25,668 to 88,801 MMK per hectare.

4.3.2 Cost and return analysis of maize production

Enterprise budget was used to analyze cost and return analysis for maize production as shown in Table 4.11. To determine gross benefit for maize production, average yield and average unit price were multiplied. Variable costs of maize production were included as material input costs, family labor opportunity costs, hired labor costs and interest on cash costs. Total material costs included the costs of seeds of seed, urea fertilizer, compound fertilizer and farm yard manure in hectare basis. Calculation of total family labor costs is considered based on the family labor used in maize production activities such as plowing, harrowing, seeding, leveling, fertilizer

application, inter-cultivation, repair of bunds, weeding, harvesting, transportation, milling and drying, etc.

The benefit cost ratio was 2.05 indicating that return per unit of capital invested was 1.05. This means farmers can earn profit about more than one unit from maize production; if they invested a unit cash expense. Break-even yield and price is the point where the average yield and average price for maize production would need to cover the costs of maize production in which the share of profit obtained is excluded. Break-even yield was 3.17 MT per hectare and break-even price was 105,930 MMK per metric ton which can cover the total variable cost of production.

4.4 Maize Value Chain, Margin, Cost and Profit

4.4.1 Maize value chain in Tatkon Township

In order to know the information along the maize value chain, survey was conducted on all market participants along the chain from farmers to exporters. In the maize value chain, the main actors involved farmers, village brokers (commission men), local wholesalers and Mandalay wholesalers (exporters) in this study. Farmers were the first suppliers in the maize value chain. The buyers of the products were mainly local wholesalers and Mandalay wholesalers (exporters). Most of the village brokers were farmers who can facilitate the buying activities for local wholesalers. Tatkon poultry farm and Mandalay wholesalers (exporters) were the final link who deliver maize to final users in the maize value chain.

According to the survey results, 67 % of sampled famers sold out their products to village brokers and 33 % of famers directly sold to local wholesalers. In this study, all of the sampled village brokers (commission men) collected the crops for local wholesalers with commission fee. Among the sampled Tatkon local wholesalers, only 7 % of sampled local wholesaler distributed to Tatkon poultry farm and 93 % of sampled local wholesalers traded to Mandalay wholesalers (exporters). Here, Tatkon poultry farm and Mandalay wholesalers (exporters) were the last market participants along the maize value chain. The maize value chain with the percentage distribution of the sampled numbers in Tatkon Township mentioned in Figure 4.2.

4.4.2 Marketing margin, cost and profit of local wholesalers

Commodity prices and domestic marketing margins are important indicators of market activities. Marketing margins can be defined as the price of a collection of marketing services which is the outcome of the demand for and the supply of such services. The amount can be interpreted as the cost of providing a mix of marketing services (Tomek and Robison 1981).

The respective marketing margin can be calculated based on the observation found in the study area.

Chain 1: Farmers---Village Brokers---Local Wholesalers---Mandalay wholesalers

Chain 2: Farmers---Local wholesalers---Mandalay wholesalers

Chain 3: Farmers---Local wholesalers---Tatkon poultry farm

Along the maize value chain, traders including collectors, wholesalers and exporters play an important role in distributing products to consumers. In the maize value chain of Tatkon Township, the marketing margin, marketing cost and profit were calculated for individual market participants such as village brokers (commission men), local wholesalers, Tatkon poultry farm and Mandalay wholesalers (exporters). Village collectors in the study areas served as agents of Tatkon Township wholesalers due to lack of capital investment. The overall marketing cost and margin analysis was calculated based on one metric ton.

Marketing margin, cost and profit of local wholesalers for chain 1 were presented in Table 4.12. In this chain, local wholesalers bought 208,000 MMK while selling price of 249,333 MMK received by local wholesalers in one metric ton of maize. Marketing functions of local wholesalers included transportation, packaging, labor and cost for commission men. Among the total marketing cost, transportation was the highest cost per metric ton of maize traded from Tatkon to Mandalay. Marketing margin of local wholesalers was 41,333 MMK per metric ton in which total marketing cost of 24,200 MMK while profit of local wholesalers was 17,133 MMK per metric ton.

In chain 2, there was no link between farmers and village brokers because some local wholesalers purchased directly from farmers. In this calculation, marketing margin of local wholesalers was 41,333 MMK in which total marketing costs was 22,000 MMK counting such as transportation, packaging and labor costs and net profit was 19,333 MMK per metric ton obtained by local wholesalers. Table 4.13 showed that marketing margin, cost and profit of local wholesalers for chain 2.

Marketing margin, cost and profit of local wholesalers for chain 3 were described in Table 4.14. In this portion, there was no marketing link between local wholesalers and Mandalay wholesalers because some local wholesalers distributed maize within the township definitely to Tatkon poultry farm. Purchasing maize price of local wholesalers was 208,000 MMK even as selling price obtained by local wholesalers of 226,667 MMK. Marketing margin of local wholesalers was 18,667 MMK per metric ton where total marketing costs for local wholesalers was observed as 2,200 MMK in which only labor cost was included while the net profit received by local wholesalers 16,467 MMK per metric ton.

4.4.3 Marketing margin, cost and profit of Mandalay wholesalers (exporters)

The marketing margin, cost and profit of Mandalay wholesalers (exporters) were presented in Table 4.15. Mandalay wholesalers' buying price was 249,333 MMK whereas selling price received by Mandalay wholesalers (exporters) was about 300,000 MMK. The results showed that marketing margin of Mandalay wholesalers (exporters) was 50,667 MMK per metric ton of maize. Total marketing costs of Mandalay wholesalers (exporters) was 31,200 MMK which included the transportation cost of 30,000 MMK and labor cost of 1,200 MMK. The net profit received by Mandalay wholesalers (exporters) was 19,467 MMK per metric ton. Transportation cost was very high for Mandalay wholesalers because they traded from Mandalay to Muse. According to the comparison of these three chains, the profit received by farmers followed by Mandalay wholesalers and then local wholesalers and village brokers with commission fee.

Table 4.10 Resources use and average yield of maize production (n=120)

Item	Unit	Mean	Range	SD
Maize yield	MT/ha	5.22	2.16-7.41	1.06
Farm gate price	MMK/MT	212,190	193,263-251,242	11,983
Seed rate	Kg/ha	12.56	6.18-24.7	1.59
Fertilizer	Kg/ha	271	123.5-370.5	69
FYM	Kg/ha	699.83	0-1,235	614.55
Total material cost	MMK/ha	207,514	98,800-313,690	40,761
Total family labor cost	MMK/ha	108,870	0-269,230	63,465
Total hired labor cost	MMK/ha	295,883	74,100-500,175	79,187
Interest on cash cost	MMK/ha	60,408	25,668-88,801	11,239

Table 4.11 Cost and return analysis of maize production (n=120)

Item	Unit	Average value
Total gross return	MMK/ha	1,379,094
Total materials cost (a)	MMK/ha	207,514
Total family labor Cost (b)	MMK/ha	108,870
Total hired labor cost (c)	MMK/ha	295,883
Interest on cash cost (d)	MMK/ha	60,408
Total variable cost (TVC) (a + b + c + d)	MMK/ha	672,675
Total variable cash cost (TVCC) (a + c + d)	MMK/ha	563,805
Return above variable cost (TGR – TVC)	MMK/ha	706,418
Return above variable cash cost (TGR – TVCC)	MMK/ha	815,289
Benefit cost ratio (TGR/TVC)		2.05
Break-even yield (TVC/average price per MT)	MT/ha	3.17
Break-even price (TVC/average yield per ha)	MMK/MT	105,930

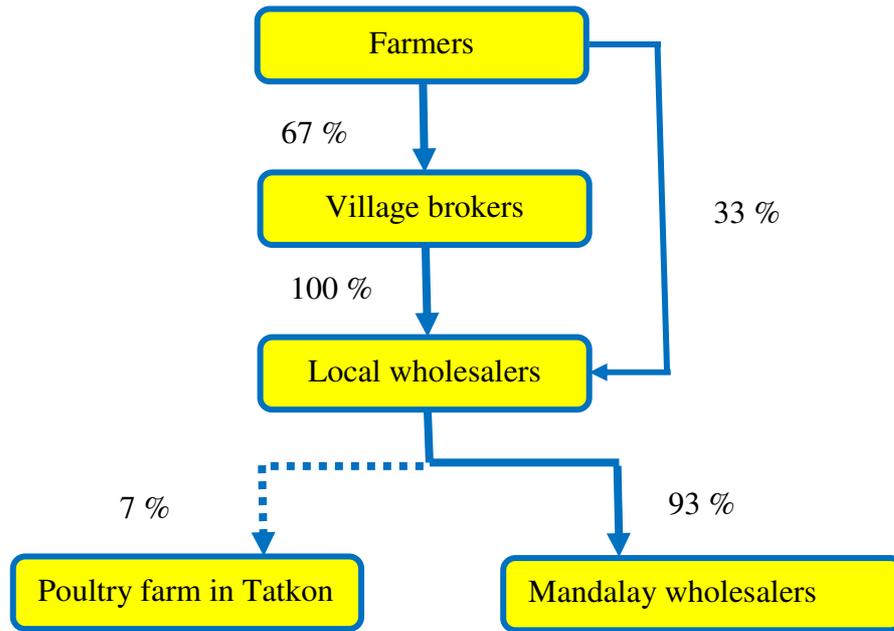


Figure 4.2 Percentage of market participants along the maize value chain

Table 4.12 Marketing margin, cost and profit of local wholesalers for chain 1

Item	Price (MMK/MT)
(1)Buying price of maize	208,000
(2)Selling price of maize	249,333
(3)Marketing margin (2-1)	41,333
(4)Total marketing cost	24,200
-Cost of transportation	17,600
-Cost of packaging	2,200
-Cost of labor	2,200
-Cost for commission men	2,200
(5)Profit (3-4)	17,133

Table 4.13 Marketing margin, cost and profit of local wholesalers for chain 2

Item	Price (MMK/MT)
(1)Buying price of maize	208,000
(2)Selling price of maize	249,333
(3)Marketing margin (2-1)	41,333
(4)Total marketing cost	22,000
-Cost of transportation	17,600
-Cost of packaging	2,200
-Cost of labor	2,200
(5)Profit (3-4)	19,333

Table 4.14 Marketing margin, cost and profit of local wholesalers for chain 3

Item	Price (MMK/MT)
(1)Buying price of maize	208,000
(2)Selling price of maize	226,667
(3)Marketing margin (2-1)	18,667
(4)Total marketing cost	2,200
-Cost of labor	2,200
(5)Profit (3-4)	16,467

**Table 4.15 Marketing margin, cost and profit of Mandalay wholesalers
(exporters)**

Item	Price (MMK/MT)
(1)Buying price of maize	249,333
(2)Selling price of maize	300,000
(3)Marketing margin (2-1)	50,667
(4)Total marketing cost	31,200
-Cost of transportation	30,000
-Cost of labor	1,200
(5)Profit (3-4)	19,467

4.4.4 Comparison of percent composition among the market participants

It was interesting to compare the percent composition profit in sharing for each market participants along the maize value chain.

The chain 1 which village brokers were involved as commission agents. The share of percentage difference between export and farm gate price was called total gross marketing margin which was about 30.67 %. Price received by farmer was 69.33 % in which total production costs of farmers was 34.18 % while profit obtained by farmers was 35.15 %. Marketing margin of local wholesalers was 13.78 % in which total marketing cost of 8.07 % and profit of 5.71 %. Marketing margin of Mandalay wholesalers (exporters) was 16.89 % whereas marketing cost of 10.4 % and profit 6.49 %.

In chain 2, composition of farm gate price to the export price was around 69.33 % at the same time total gross marketing margin composition was 30.67 %. Total production costs of farmers found to be 34.18 % as well as profit obtained by farmers about 35.15 %. Marketing margin of local wholesalers was 13.78 % while marketing cost of 7.34 % and profit of 6.44 % was observed. Marketing margin, cost and profit of Mandalay wholesalers (exporters) were 16.89 %, 10.4 % and 6.49 % respectively. Among the market participants from chain 1 and 2, it was clear that the highest profit percent obtained by farmers followed by Mandalay wholesalers, local wholesalers and profit percent of village brokers as commission fees. By assuming the percent composition on export price among the market participants for chain 1 and 2 was presented in Table 4.16 and 4.17.

Table 4.18 evaluated that percent composition based on export price for chain 3. In this calculation, Price received by farmer was 69.33 % in which total production costs of farmers was 34.18 % while profit obtained by farmers was 35.15 %. Marketing margin of local wholesalers observed 6.22 % together with marketing cost of 0.73 % and profit of 5.49 % in which 24.45 % was opportunity cost for market participants along the maize value chain. Based on the findings, it can be seen that the highest profit percent received by Mandalay wholesalers (exporters) after farmers among three chains. Comparison on percent profit share of market participants was shown in Table 4.19.

Figure 4.3 indicated that cost and profit composition of market participants along the maize value chain. According to the first chain, total production cost of farmers was 34.18 % and farmers obtained about 35.15 % profit share, total marketing

cost of local wholesalers with village brokers (commission men) was 8.07 % in which involved commission fee for village brokers and local wholesalers received 5.71 % profit share and total marketing cost of Mandalay wholesalers (exporters) was 10.4 % and Mandalay wholesalers (exporters) received 6.49 % profit share. Chain 2 indicated that total production cost of farmers was 34.18 % and farmers obtained about 35.15 % profit share, total marketing cost of local wholesalers was 7.34 % and local wholesalers received 6.44 % profit share and total marketing cost of Mandalay wholesalers (exporters) was 10.4 % and Mandalay wholesalers received 6.49 % profit share. According to the last chain, total production cost of farmers was 34.18 % and farmers obtained about 35.15 % profit share and total marketing cost of local wholesalers was 0.73 % and local wholesalers received 5.49 % profit share.

4.5 General Constraints of Maize Production Raised by Sample Farmers in the Study Area

Common constraints raised by sample farmers in maize growing of Tatkon Township were presented in Figure 4.4. Major constraints mentioned by the sample farmers were limited access to land, poor soil condition, poor quality seed, high input cost, declining in farm gate price and high transportation cost (field to home). Out of constraints, over 80 % of sample farmers were complained that declining in farm gate and high input cost. Declining price in farm gate and high input cost seemed to be the major constraints in the study area where 86 % and 82 % of the sample farmers respectively were complaining on these issues. In case of natural resource problems, about 31 % of sample farmers' complained in limited access to land and about 4 % for poor soil condition. About 28 % of sample farmers faced high transportation cost from field to home. In case of poor quality seed, only 2 % of sample respondent complained in the study area.

4.6 Measurement of the Factors Determining on Maize Yield

Regression model of Cobb-Douglas production function was used to determine the influencing factors on maize yield by SPSS version 16.0. Socio-economic characteristics of the farmers, amount of inputs used and its related costs, labor costs and post harvest costs for maize production were included as independent variables in the model.

Table 4.16 Percent composition on export price for chain 1

Composition	Value (MMK/MT)	Percent
Total Gross Marketing Margin	92,000	30.67
Export price	300,000	100
(1)Price received by farmer	208,000	69.33
Total production cost of farmers	102,528	34.18
Profit of farmers	105,472	35.15
(2)Marketing margin of local wholesalers	41,333	13.78
Marketing cost of local wholesalers	24,200	8.07
Profit of local wholesalers	17,133	5.71
(3) Marketing margin of Mandalay wholesalers (exporters)	50,667	16.89
Marketing cost of Mandalay wholesalers (exporters)	31,200	10.4
Profit of Mandalay wholesalers (exporters)	19,467	6.49

Table 4.17 Percent composition on export price for chain 2

Composition	Value (MMK/MT)	Percent
Total Gross Marketing Margin	92,000	30.67
Export price	300,000	100
(1)Price received by farmer	208,000	69.33
Total production cost of farmer	102,528	34.18
Profit of farmer	105,472	35.15
(2)Marketing margin of local wholesalers	41,333	13.78
Marketing cost of local wholesalers	22,000	7.34
Profit of local wholesalers	19,133	6.44
(3) Marketing margin of Mandalay wholesalers (exporters)	50,667	16.89
Marketing cost of Mandalay wholesalers (exporters)	31,200	10.4
Profit of Mandalay wholesalers (exporters)	19,467	6.49

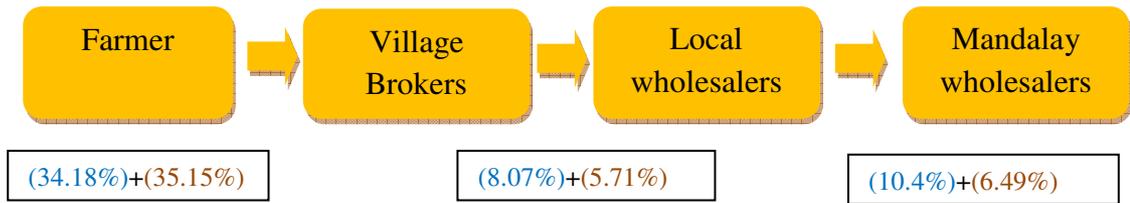
Table 4.18 Percent composition on export price for chain 3

Composition	Value (MMK/MT)	Percent
Total gross marketing margin	92,000	30.67
Export price	300,000	100
(1)Price received by farmer	208,000	69.33
Total production cost of farmer	102,528	34.18
Profit of farmer	105,472	35.15
(2)Marketing margin of local wholesalers	18,667	6.22
Marketing cost of local wholesalers	2,200	0.73
Profit of local wholesalers	16,467	5.49

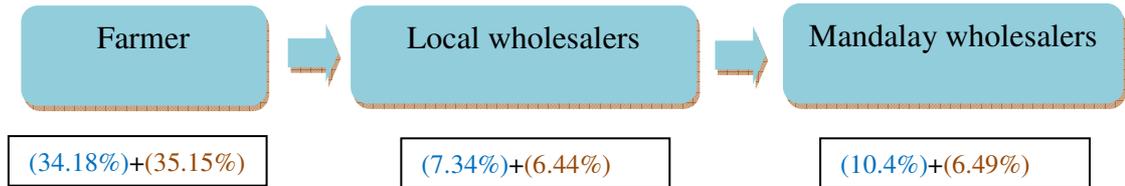
Table 4.19 Comparison on percent profit share of market participants

	Chain 1	Chain 2	Chain 3
% Profit share for farmers	35.15	35.15	35.15
% Profit share for Local wholesalers	5.71	6.44	5.49
% Profit share for Mandalay wholesalers	6.49	6.49	-

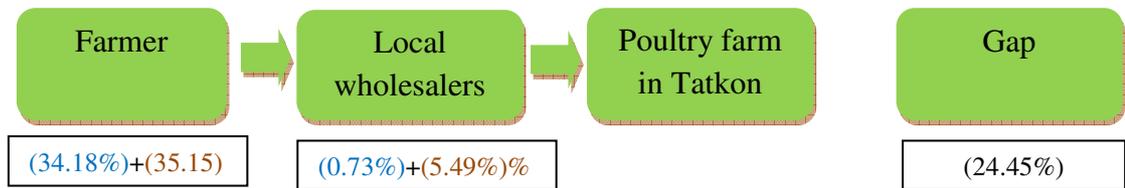
Chain 1



Chain 2



Chain 3



Note: blue is cost and brown is profit (%)

Figure 4.3 Cost and profit composition of market participants along the maize value chain

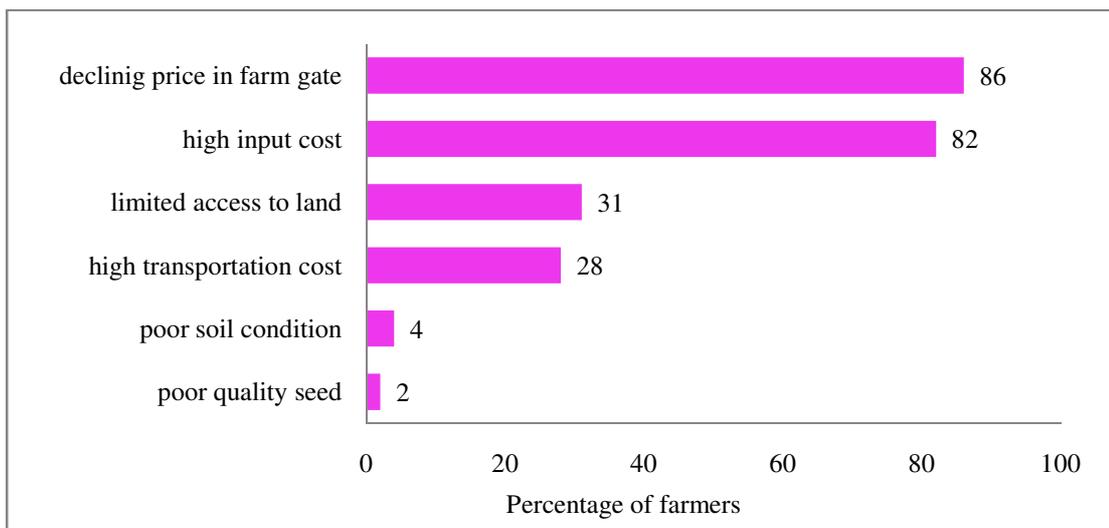


Figure 4.4 General constraints raised by sample farmers

4.6.1 Descriptive statistics of output and input characteristics of sample farmers

Table 4.20 showed mean values of dependent and independent variables for maize production in the study area. In the production function, age of household head, education level, family size, sown area of maize, amount of seed rate, amount of fertilizer, amount of farm yard manure, cost of total family labor, cost of total hired labor and cost of total post harvest were the independent variables and maize yield was dependent variable. According to the descriptive statistics, the average age of household head was around 51 years, average education level was 5 years, average number of family size was 4.81 person, average sown area of maize was 0.85 hectare, average amount of seed rate was 12.56 kilogram per hectare, average amount of fertilizer applied by sample farmers was 271 kilogram per hectare, average amount of farm yard manure was 699.83 kilogram per hectare, average cost of total family labor was 87,052 MMK per hectare, average cost of total hired labor was 181,179 MMK per hectare and average cost of total post harvest including transportation, drying and milling was 136,523 MMK per hectare.

Regression model was done to identify the factors influencing the maize yield in the study area. The results of the model were presented in table 4.21. The R square value of 0.907 with significant F value of 106.56 was statistically significant at 1 % level and this expressed the goodness of fit of the model. According to the result of maize yield regression analysis, the significant influencing factors were sown area of maize, cost of total post harvest and amount of seed rate. Maize yield was positively relationship with sown area of maize at 1 % significant level. It means if 1 % increased in sown area of maize, maize yield will be increased 0.968 %. Maize yield was positively influenced by total post harvest cost at 1 % significant level. It means if one unit increased by cost of total post harvest, maize yield will be increased 0.258 %. Amount of seed rate was positively related to maize yield at 10 % level. It means if one unit increase in amount of seed rate, maize yield will be increased 0.29 %. Although standard amount of seed rate was 5 to 7.5 kg per acre, almost farmers used 5 kg and somebody used 15 kg per ac, 2.5 kg per acre. The rest of the variables were positive and not significantly related with maize yield. However, age of household head and rate of fertilizer application were negatively but not significantly related with maize yield. In case of fertilizer application, recommended amount of compound fertilizer rate was 50 kg to 125 kg per ac mixed amount of urea 50 kg but almost farmers used only amount of urea 50 kg to 100 kg per ac.

Table 4.20 Mean values of dependent and independent variables (n=120)

Variables	Mean	Range	SD
Maize yield (MT/ha)	5.22	2.16-7.41	1.06
Household head's age (year)	51	22-85	13.41
Household head's education (year)	5	4-15	1.69
Family size (No.)	4.81	2-9	1.46
Maize sown area (ha)	0.85	0.4-5.6	0.66
Seed rate (Kg/ha)	12.56	6.18-24.7	1.59
Fertilizer (Kg/ha)	271	123.5-370.5	68.48
Farm yard manure (Kg/ha)	699.83	0-1,235	614.55
Total family labor cost (MMK/ha)	108,870	0-269,230	63,465
Total hired labor cost (MMK/ha)	295,883	74,100-500,175	79,187
Total post harvest cost (MMK/ha)	136,523	24,700-258,362	46,551

Table 4.21 Result of the parameters determinants on maize yield (n=120)

Independent variables	Unstandardized	Standardized	t-value	Sig.
	Coefficients (B)	Coefficients (β)		
Constant	-3.108***		-2.875	0.005
Household head's age (yr.)	-0.034	-0.015	-0.451	0.653
Household head's education (yr.)	0.073	0.032	1.009	0.315
Family size (No.)	0.061	0.031	0.942	0.348
Maize sown area (ha)	0.968***	0.899	25.909	0.000
Seed rate (Kg/ha)	0.290*	0.052	1.743	0.084
Fertilizer (Kg/ha)	-0.006	-0.003	-0.080	0.936
Farm yard manure (Kg/ha)	0.005	0.027	0.919	0.360
Total family labor cost (MMK/ha)	0.013	0.033	0.974	0.332
Total hired labor cost (MMK/ha)	0.062	0.037	1.054	0.294
Total post harvest cost (MMK/ha)	0.258***	0.169	5.625	0.000

$R^2 = 0.907$, $F = 106.56$ ***

Note:***, ** and * are significant level at 1 %, 5 % and 10% level respectively

CHAPTER V

CONCLUSION AND POLICY IMPLICATION

This study is carried to understand the maize value chain in Tatkon Township. Value chain analysis helps to identify the activities and value analysis of the produce to the consumers and how can be maximized this value. Moreover, maize is high priority crop after rice. Therefore, government promotes the production of maize for export and for animal feed, and for food security in some area. Thus, this study can fulfill the partial requirement of the smothering of the maize marketing in Myanmar.

5.1 Description of the Market Participants and their Functions

This section is based on the descriptive analysis of the maize market participants in the study area. The result showed that almost all of the maize growers were primary level education and they had good farming experience. The sample farmers grow maize on their own farm. They used irrigation for their maize field and depend on weather conditions. Most farmers usually sell their products immediately after harvest with low price to the village brokers who buy maize to the farmers.

Along the maize value chain, the middle men such as the primary village collectors, local wholesalers, local poultry farm and Mandalay wholesalers have an important participation in the distribution of crops. The collectors collected the crops at the harvesting season and serve as commission agents for the town wholesalers and using the direct payment system. The town wholesalers also buy maize directly from farmers. The truck mainly used for the transportation of crop in this area. From the value chain analysis, most of the maize is flowing from farmers to export market to China. The farmers have the lowest market power in the value chain because they sold the maize with low price at harvest time. The problems faced by marketing intermediaries in the study area are the limitation of working capital, storage facilities, poor communication infrastructure and inefficient market information system. Also they have to introduce, promote and adjust export and import programs for agricultural products and enhancing the collaboration among ministries for the improvement of marketing and trade policy. The high transportation cost is one of the main constraints in Myanmar. Because of inefficient transportation system, the product price goes up and down depending on the producing season.

According to the cost and return analysis, the benefit cost ratio was 2.05 indicating return per unit of capital invested was 1.05. This means farmers earned profit about more than one unit from maize production if they invested a unit cash expense. Break-even yield and price is the point where the average yield and average price for maize production would need to cover the costs of maize production in which the share of profit obtained is excluded. Break-even yield is the point at which the money value brought in from the sale of a product is equal to the cost of marketing the product. Break-even yield was 3.17 MT per hectare and break-even price was 105,930 MMK per metric ton which can cover the total variable cost of production. According to the comparison of these three chains, the highest profit percentage obtained by farmers followed by Mandalay wholesalers, local wholesalers and profit percentage of village brokers as commission fees.

Based on maize yield the result of regression analysis, the significant influencing factors were maize sown area, total post harvest cost and seed rate. Maize yield was positive relationship with maize sown area at 1% significant level. It means that if one percent increased in maize sown area, maize yield will be increased by 0.968%. Maize yield was positively influenced by total post harvest cost at 1% significant level. It means that if one unit increased by total post harvest cost, maize yield will be increased by 0.258. Seed rate was positively related to maize yield at 10% level. It means that if one unit increase in seed rate, maize yield will be increased by 0.290 %. The rest of variables were positive and not significantly related with maize yield. However, farmers' age and rate of fertilizer application were negatively but not significantly related with maize yield.

5.2 Policy Implication

According to the research findings, most of the sample farmers, fertilizer application to maize was seemed inefficient. As all known, maize is the heavy eater of fertilizer than other crops; efficient fertilizer application methods should be introduced. Advanced and modernized maize production technologies should be applied in the study area. Moreover, various ways of research and development programs should be driven because of its high potential yield in the study area. The agricultural extension system can enhance with well trained extension workers by uplifting the knowledge skills related to maize production. The lack of capital

investment for maize growing farmers is the major problem in production and marketing. Most of the farmers do not have financial resources for input purchasing and storage facilities. Farmers sold their products immediately after harvest even with low price of maize. The special loan for maize farmers or contract farming system should be provided to the farmers.

In Myanmar, market-oriented economy has been introduced in 1988. Still changing to the market economy, the development of market institution and infrastructure and information system need to be developed. As a result, producers receive low price and consumers pay high price. In the real economy, the agricultural markets are the basic factor to increase efficient in production and marketing. To raise the maize sector, the farmers, the private traders and the government are the main actors. Government should support the efficient market system with upgrading the marketing facilities, infrastructure development and well-organized market information system. This study showed there was a lower marketing margin from farmer to local poultry farm in the study area indicating the policy makers need to encourage the domestic small enterprise in order to reduced the import livestock feed from outside of the country. In addition, the high transportation cost in the marketing channel is one of the main obstacles in Myanmar. Because of the inefficient transportation system, the price goes up and down. Also the economic activities of marketing participants to get transparent price transmission should be taken into account. At last the weight and measurement system should be uniformed and standardized all over the whole country. This is also one of the important factors to consider in upgrading efficient marketing system.

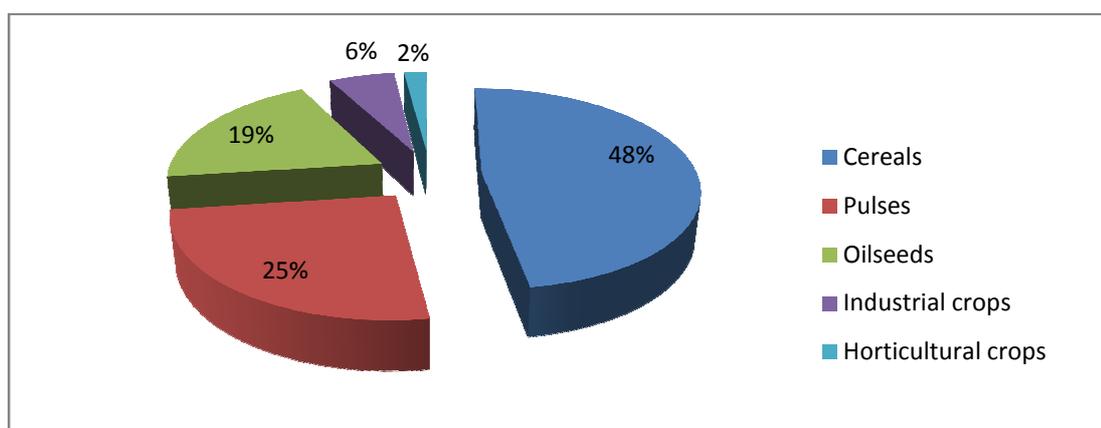
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APPENDICES



Appendix 1 Percent share of crops sown areas in Myanmar (MoAI 2014)

Appendix 2 Maize sown area, harvested area, yield and production of Myanmar and neighboring countries in 2013

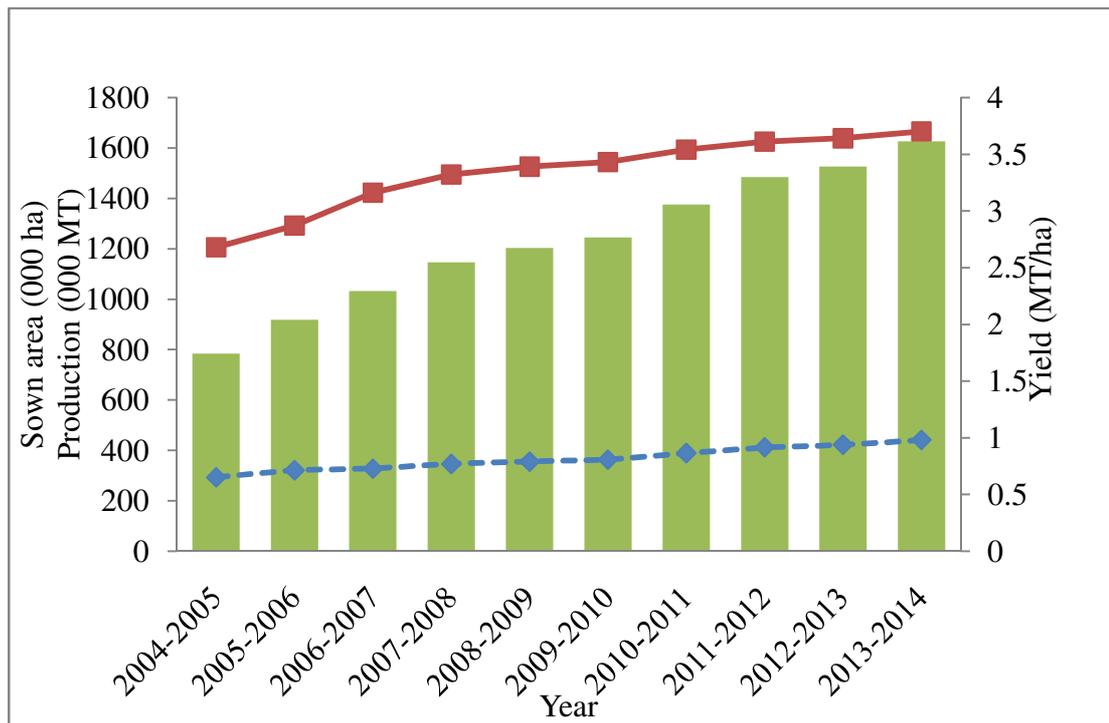
Country	Sown area (million ha)	Harvested area (million ha)	Yield (MT/ha)	Production (000 MT)
World	185.12	185.12	5.49	1,018,112
Asia	60.38	60.38	5.05	305,113
Myanmar	0.47	0.47	3.62	1,700
Thailand	1.15	1.15	4.42	5,063
Viet Nam	1.17	1.17	4.44	5,191
Indonesia	3.82	3.82	4.84	1,8512
Malaysia	0.01	0.01	8.97	88
Philippines	2.56	2.56	2.88	7,377
Lao	0.22	0.22	5.22	1,150
Cambodia	0.21	0.21	4.41	927
China	36.34	36.34	6.02	218,624
India	9.50	9.50	2.45	23,290

Source: FAOSTAT (2013)

Appendix 3 Sown area, harvested area, yield, production and export of maize in Myanmar (2004-2014)

Year	Sown area (000ha)	Harvested area(000ha)	Yield (MT/ha)	Production (000MT)	Export (000MT)
2004-2005	293	293	2.68	784	-
2005-2006	321	321	2.87	918	154
2006-2007	327	327	3.16	1,032	281
2007-2008	346	346	3.32	1,146	295
2008-2009	355	355	3.39	1,203	424
2009-2010	363	363	3.43	1,245	335
2010-2011	389	389	3.54	1,376	465
2011-2012	412	412	3.61	1,485	465
2012-2013	422	422	3.64	1,526	557
2013-2014	441	441	3.70	1,626	-

Source: Agriculture in Brief (2014)

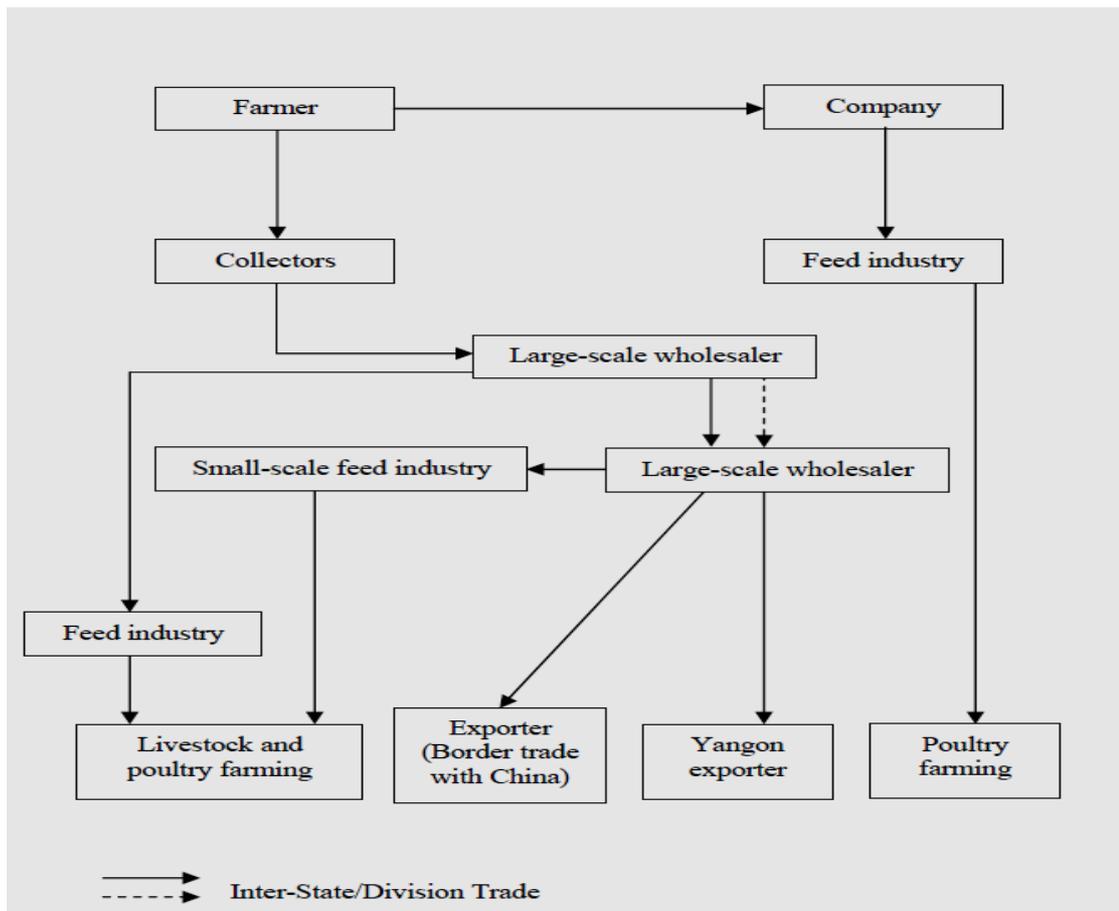


Appendix 4 Sown area, yield and production of maize in Myanmar (2004-2014)

Appendix 5 Sown areas, harvested areas, yield and production in Tatkon Township (2004-2014)

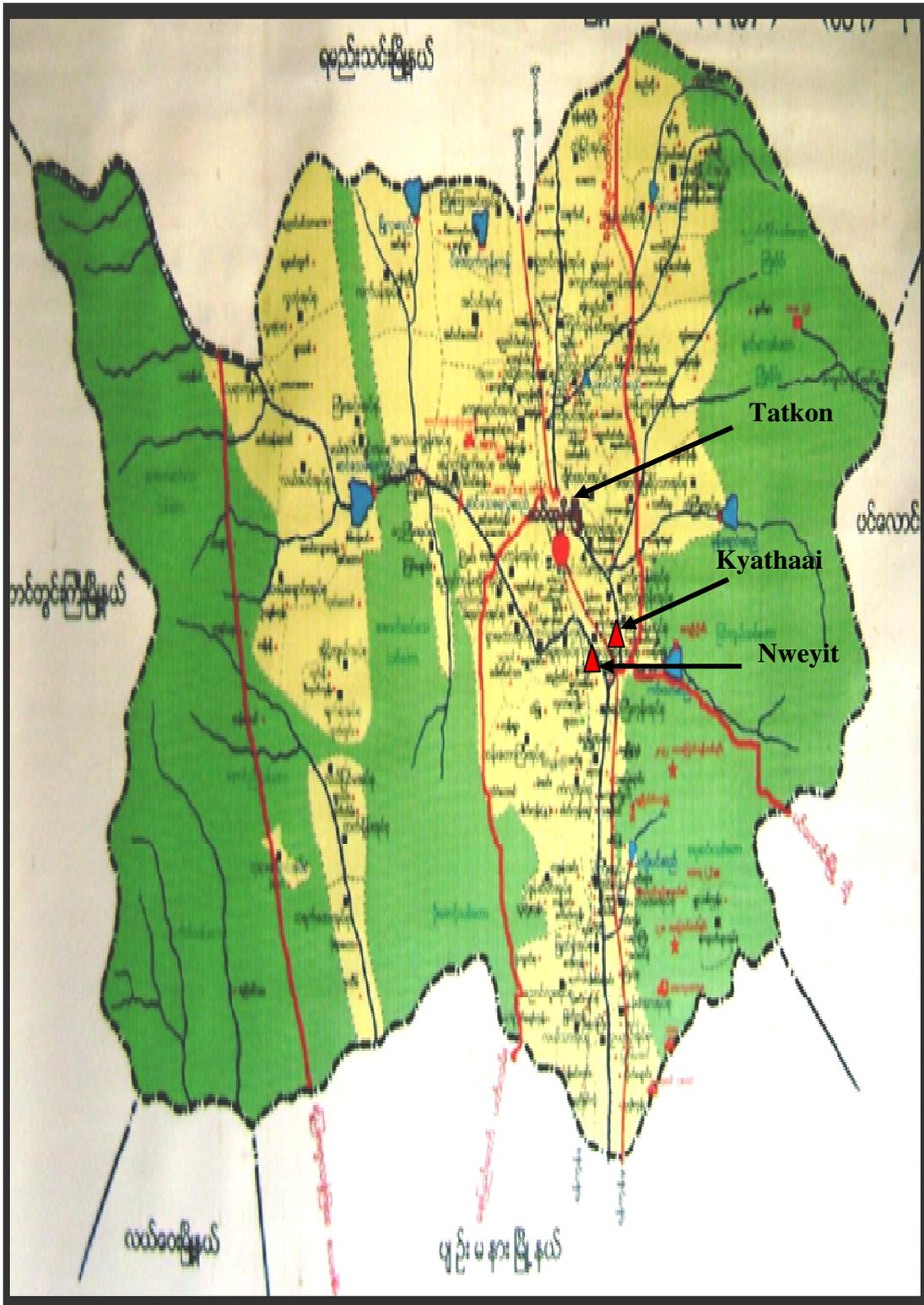
Year	Sown area (ha)	Harvested area (ha)	Yield (MT/ha)	Production (MT)
2004-2005	840	840	2.92	2,458
2005-2006	876	876	2.94	2,611
2006-2007	1,011	1,011	2.96	3,024
2007-2008	1,283	1,283	3.00	3,900
2008-2009	1,288	1,288	3.03	3,950
2009-2010	1,004	1,004	3.68	3,742
2010-2011	1,004	1,004	4.28	4,348
2011-2012	1,004	1,004	4.29	4,383
2012-2013	1,024	1,024	4.29	4,429
2013-2014	1,054	1,054	3.38	4,476

Source: DoA (2013-2014)



Source: Aung Kyi (2005)

Appendix 6 Value chain of maize in Myanmar



Appendix 7 Map of Tatkon Township and Sample Villages