

UNIVERSITY OF CO-OPERATIVE AND MANAGEMENT, SAGAING
DEPARTMENT OF CO-OPERATIVE STUDIES
HUMAN RESOURCE MANAGEMENT PROGRAMME
MASTER OF PUBLIC ADMINISTRATION

ANALYSIS OF GROUNDNUT PRODUCTION IN
BAGAN NYAUNG-U TOWNSHIP

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2MPA-15

DECEMBER, 2025

**ANALYSIS OF GROUNDNUT PRODUCTION IN BAGAN
NYAUNG-U TOWNSHIP**

This thesis is submitted to the Board of Examiners in partial fulfillment of
the requirements for the degree of Master of Public Administration

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ABSTRACT

Groundnut is cultivated primarily as a source of cooking oil for domestic consumption and serves as the main cash crop for rural households in the study area. The main objectives of the study are to study characteristics and condition of groundnut production and to analyze the influencing factors of groundnut production in Bagan Nyaung-U Township. The study used two-stage stratified random sampling technique, descriptive method and inferential statistics. The required sample of 197 farm households was selected from with proportionately in each village. Dependent variable is total groundnut production and independent variables are demographic factors, production factors, technological factors and institutional factors. The regression results reveal that total land size, cost per unit, and access to credit significantly influence total groundnut production, exhibiting a positive correlation. Conversely, the age of groundnut farmers and the use of machinery are found to be significant but negatively related to groundnut production. The most impactful factors affecting groundnut production are total land size, followed by per unit cost, access to credit, age of farmers, and machinery usage, in decreasing order of influence. To enhance the productivity of groundnut production, the government need to facilitate effective training on the application of fertilizers and pesticides, promote the adoption of hybrid seeds through knowledge-sharing initiatives, and strengthen agricultural extension services in Bagan Nyaung-U Township.

ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere appreciation to Dr. Moe Moe Yee, Rector of the University of Co-operative and Management, Sagaing, for granting permission to submit this thesis and for her role as the Chairman of the Master of Public Administration (MPA) Committee, as well as for her generous support.

Secondly, I wish to express my gratitude to Pro-rector (Admin) U Win Naing Tun and Dr. Kyi Kyi Win, Pro-Rector (Academic) of the University of Co-operative and Management, Sagaing, for providing an esteemed recommendation for my thesis.

Thirdly, I would like to thank Professor Dr. Yi Aye, Rector (Retired) and Visiting Professor at the University of Co-operative and Management, Sagaing, for her constructive feedback and suggestions regarding this study. I am particularly grateful to Professor Dr. Ni Ni Aung, Pro-Rector (Retired) at Monywa University of Economics, for her invaluable guidance, insightful comments, and ongoing encouragement throughout the thesis preparation process. Her academic expertise has significantly enhanced the quality of my research.

Additionally, I would like to acknowledge the contributions of Professor Dr. Cho Cho Wai, Visiting Professor at the University of Co-operative and Management, Sagaing, for her valuable advice concerning statistical tools and methods that improved the analysis of my study.

I would also like to express my deep appreciation to my supervisor, Dr. Kyi Kyi Lin, Associate Professor, Department of Economics at the University of Co-operative and Management, Sagaing, for her assistance, supervision, and the time she dedicated to guiding me towards the completion of this research. Furthermore, I am thankful to various websites and thesis papers that provided essential references for my work.

Finally, I would like to recognize those who encouraged me during the preparation of my thesis, including my teachers, parents, and friends.

Ma Hnin Wai Soe
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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ADS	Agricultural Development Strategy
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
IOSR	International Organization of Scientific Research
MLR	Multiple Linear Regression
MMK	Myanmar Kyats (Lakhs)
MOALI	Ministry of Agriculture, Livestock and Irrigation
NGO	Non-Government Organization
OLS	Ordinary Least Squares
SPSS	Statistical Package for the Social Sciences
SRS	Simple Random Sampling
VIF	Variance Inflation Factors

CHAPTER 1

INTRODUCTION

Myanmar remains fundamentally an agrarian economy, with the agricultural sector serving as the foundation of national economic activity, encompassing crop production, livestock, fisheries, and related agro-industries. For the fiscal year 2022–2023, this sector contributed a substantial share of national output and export earnings, underpinning rural livelihoods and economic stability. In this period, the agricultural sector accounted for approximately 23.7 % of Gross Domestic Product (GDP) and contributed 28.79 % of total export earnings, while employing about 61.13 % of the total labour force, emphasizing its role as a major employer and exporter of primary commodities. Government policy similarly prioritizes agriculture as one of its three core economic policy pillars, aiming to enhance agricultural and livestock productivity through the adoption of modern technologies and integrative development across sectors of the economy. The stated objective is to foster economic growth and structural transformation beginning with agricultural development and extending to other economic domains (MOALI, 2024).

The agricultural export profile of Myanmar is diversified across a range of food and cash crops. Principal export commodities include rice, maize, black gram, green gram, pigeon pea, chickpea, sesame, groundnut, onion, tamarind, raw rubber, vegetables, and fruits, reflecting the country's varied agro-ecological zones and cropping systems. These crops are often classified into major groups such as cereals, pulses, oilseeds, industrial crops, fruits, vegetables, culinary crops, and other minor crops. Among these, oilseed crops including groundnut, sesame, sunflower, mustard, and niger are particularly significant due to their dual role in domestic edible oil consumption and as cash crops for both domestic and export markets. In terms of dietary importance after paddy rice, oilseed crops constitute a major component of the agricultural landscape (Boughton et.al, 2024).

Within the oilseed crops, groundnut (*Arachis Hypogaea*) occupies a prominent role owing to its importance for domestic edible oil supply and rural incomes. National agricultural surveys indicate that groundnut production forms a significant share of oilseed cultivation, although the exact share varies by year and agro-ecological conditions, with crops like sesame often occupying a larger proportion of oilseed area in aggregate statistics. Groundnut is predominantly grown in the Central Dry Zone of

Myanmar, which includes Sagaing, Mandalay, and Magway Regions. These areas characterized by semi-arid climate and extensive rain-fed agriculture suited to pulses and oilseed crops. In this region, groundnut cultivation is typically rain-fed, with temporal and spatial variations in production across townships and seasons (Sasaki, 2019).

The Mandalay Region is a key production zone for groundnut within Upper Myanmar. Regional agricultural initiatives have supported the expansion of groundnut acreage e.g., plans to cultivate over 120,000 acres of winter groundnut across multiple townships, including -U District (which contains Bagan -U Township), reflect the strategic importance of groundnut cultivation in meeting both domestic edible oil needs and enhancing rural livelihoods.

In the Dry Zone's Bagan Nyaung-U Township, although comprehensive township-level official statistics on groundnut area are limited, available agricultural research and development documentation confirm that groundnut and other oilseed crops are included among the principal crops grown, alongside pigeon pea, green gram, and sesame, under primarily rain-fed conditions. The Dry Zone's climatic and soil conditions favor such upland crops, with local cropping patterns often reflecting combinations of groundnut, pulses, and sesame adapted to limited rainfall and dryland conditions typical of the region surrounding Bagan Nyaung-U.

The consumption of edible oil derived from groundnut and sesame is historically embedded in rural consumer's dietary preferences. Groundnut oil, in particular, remains a widely consumed cooking oil, contributing to household nutrition and food security. While domestic production has increased, it has historically not fully met national demand, resulting in periods of imported edible oils to supplement local supplies. Consequently, groundnut production in Bagan Nyaung-U is significant for the advancement of groundnut cultivation within the sector of oilseed crops.

1. 1 Rationale of the Study

Groundnut (*Arachis hypogaea*) represents a significant oilseed crop in Myanmar, playing a crucial role in the country's edible oil production, household incomes, and export revenues. The demand for edible oils in Myanmar is elevated due to factors such as population growth, urbanization, and changing dietary habits. Despite the high national demand, domestic production of edible oils has proven inadequate,

prompting the importation of approximately 200,000 metric tons of palm oil in recent years to satisfy consumption requirements (MOALI, 2023). This ongoing disparity between local production and national demand underscores the essential contribution of oilseed crops, particularly groundnut, to food security and the sustenance of rural livelihoods.

In Myanmar, oilseed crops occupy the third rank in terms of cultivated area, trailing behind rice and pulses, and are primarily grown in the Dry Zone, which encompasses the Sagaing, Mandalay, and Magway Regions (IFPRI/MAPS, 2024). The Dry Zone is characterized by low and erratic rainfall, high temperatures, and reliance on rain-fed farming systems, which favor drought-tolerant crops such as groundnut, sesame, and sunflower. Myanmar's total oilseed cultivation area spans 3,498,000 hectares, with groundnut covering 1,281,000 hectares, positioning it as the second-largest oilseed crop in terms of area, behind sesame. Groundnut production in Myanmar has reached approximately 2,017,000 metric tons, with about 177,800 metric tons exported, illustrating its significance for both domestic consumption and as a source of foreign exchange (MOALI, 2024).

Groundnut, in particular, is well-suited for these conditions due to its adaptability to dryland environments, relatively short growth cycle, and its dual yield of edible oil and protein-rich kernels for both domestic consumption and export (MOALI, 2024). The Mandalay Region ranks as the second-largest oilseed production area in Myanmar, following Sagaing Region. It is noted for the extensive use of a horizontal cultivation system, whereby farmers increase the area under cultivation rather than intensifying inputs per unit of land. This system is particularly relevant for dryland agriculture, where irrigation and mechanization options are limited (MOALI, 2024). These reflect the contribution of groundnut to household food security and income, as well as its strategic importance in fulfilling national edible oil needs.

The ability of groundnut to withstand climatic variability renders it especially suitable for regions like Bagan Nyaung-U, where farmers typically rely on residual soil moisture and seasonal rainfall due to limited irrigation facilities. Moreover, groundnut production is underpinned by various factors relating to local agro-ecology, economic motivations, and livelihood strategies. Located within the Central Dry Zone of Mandalay Region, Bagan Nyaung-U experiences constraints related to low rainfall and high temperatures, which limit the viability of water-intensive crops like paddy.

Groundnut's drought tolerance enables it to prosper in these conditions and presents an economically feasible option for smallholder farmers (IFPRI/MAPS, 2024).

Therefore, this study examines the characteristics and conditions of groundnut production in Bagan Nyaung-U Township, as well as the factors influencing this production.

1.2 Objectives of the Study

The objectives of the study are:

- (1) to study characteristics and condition of groundnut production in Bagan Nyaung -U Township
- (2) to analyze the influencing factors of groundnut production in Bagan Nyaung-U Township

1.3 Method of the Study

This study employed a two-stage stratified random sampling technique. In the first stage, six villages were selected from a total of 339 villages in Nyaung-U Township based on their high levels of groundnut cultivation. In the second stage, three villages, such as Min Nan Thu, Hpwardsaw (East), and Hpwardsaw (West), were purposively selected from among these villages, which represent the highest levels of groundnut production in the township. These villages cultivate larger areas of groundnuts and achieve higher production volumes compared to other groundnut-growing villages in the study area.

According to Yamane's (1967) formula for determining sample size, the total population of groundnut-growing households in the three selected villages was 387. The required sample of 197 households was drawn by using a combination of simple random sampling and proportional allocation methods. Both primary and secondary data sources were utilized in this study. Primary data were collected through structured questionnaires and interview techniques administered to the sampled households. Secondary data were obtained from the Bagan Nyaung-U Township General Administrative Department and the Bagan Nyaung-U Township Agriculture Office. Additional information was collected from relevant websites, books, and library sources.

1.4 Scope and Limitations of the Study

This study focuses on groundnut production at the household level in Bagan Nyaung-U Township, Mandalay Region. The scope of the research is confined to three major groundnut-producing villages such as Min Nan Thu, Hpwardsaw (East), and Hpwardsaw (West) which were selected due to their relatively high levels of groundnut cultivation and production. The study primarily examines the key factors influencing groundnut production and selected household characteristics of groundnut-growing farmers. Factors outside the scope of the selected variables, such as broader market dynamics, policy interventions, and environmental shocks, are not considered in this analysis.

1.5 Organization of the study

The study is divided into five chapters. Introduction, rationale of the study, objectives of the study, method of the study, scope and limitations of the study, and organization of the study are presented in Chapter 1. In Chapter 2 describes literature reviews including concept and theory of production, reviews on empirical reviews and conceptual framework of the study. Chapter 3 outlines the background of Bagan Nyaung-U Township, land utilization, major crops production and ground production. Chapter 4 shows profile of the study area, model specification, the result of demographic factors and the results of influencing factors multiple regression analysis of groundnut production in Bagan Nyaung-U Township. Chapter 5 presents a conclusion with findings, suggestions and recommendations and needs for further study.

CHAPTER 2

LITERATURE REVIEW

In this chapter represents the theory and production function, the influencing factors of groundnut production, the usage of groundnut, reviews on previous studies and conceptual framework of the study.

2.1 Theory and Production Function

The concept of production is fundamental in economics and refers to the process through which inputs are transformed into outputs that possess utility and economic value. Production involves the systematic use of land, labor, capital, and entrepreneurial ability, which are recognized as the primary factors of production (Samuelson & Nordhaus, 2009). The theory of production provides a framework for understanding the behavior of producers who make decisions regarding the allocation of scarce resources such as land, labor, capital, and management (Samuelson & Nordhaus, 2009).

According to Nicholson and Snyder (2012), production theory analyzes the physical relationship between inputs and outputs and examines how changes in input levels affect the quantity of output produced. This theory rests on the principle that producers aim to maximize output or profit while minimizing costs, given the constraints of available technology and resources. A central component of the theory of production is the production function, which expresses the maximum attainable output from a given set of inputs under existing technological conditions (Varian, 2010).

A production function shows the technological relationship between inputs and outputs. The output of a firm can be a final commodity or an intermediate commodity. Inputs are the resources used in the production of output. Inputs include labor, capital and land. Inputs can be classified into two categories: fixed and variable (Dominick 2004). The production function expresses the relationship between the quantities of productive factors such as land, labor, and capital utilized and the resulting output obtained. It specifies the amount of product that can be achieved from every combination of inputs, assuming the most efficient methods of production are employed (Samuelson & Nordhaus, 2010).

Production is determined by four fundamental factors: land, labor, capital, and entrepreneurial or organizational support. Each factor plays a vital role, as no commodity can be produced without the contribution of at least one of these inputs (Case & Fair, 2020). In practice, producers combine these factors according to technical ratios, reflecting the optimal proportions required for efficient production (Mankiw, 2021).

The firms produce possibilities of goods and services through various combinations of land, labor, capital, and raw materials to maximize their profits or maximize sales or growth. Therefore, a production function represents the technological relationship between inputs and outputs in the production process. Assuming that a firm produces only one type of output using three inputs of labor, capital, and a third input such as land, fertilizer, or machinery, the production function can be represented as:

$$Q = f(L, K, X)$$

where:

Q = quantity of output produced,

L = labor input,

K = capital input,

X = the third input (e.g., land, fertilizer, or machinery), and

$f(\cdot)$ = the production technology that defines the relationship between inputs and output (Mankiw, 2021; Case & Fair, 2020).

This functional representation summarizes the technological possibilities of production, indicating the maximum output obtainable from a given combination of inputs, assuming efficient utilization of resources. It allows firms to analyze input-output relationships, make decisions on the optimal allocation of resources, and evaluate production efficiency (Samuelson & Nordhaus, 2010). By explicitly incorporating multiple inputs, this model provides a framework for understanding how variations in labor, capital, and other productive factors influence the level of output in the production process.

2.2 Origin of the Groundnut

Groundnut commonly known as peanut, is to have originated in South America, specifically in the region encompassing present-day southern Bolivia, northern

Argentina, and Paraguay. Archaeological and botanical evidence suggests that wild relatives of cultivated groundnut existed in this region several thousand years ago. These wild species provided the genetic base from which domesticated groundnut evolved. The center of origin is supported by the high genetic diversity of *Arachis* species found in South America, indicating long-term natural evolution and cultivation processes in this area.

The cultivation of groundnut is to have occurred through the hybridization of two wild diploid species, followed by chromosome doubling, which resulted in the cultivated tetraploid species known today. Indigenous communities in South America played a crucial role in the selection and improvement of groundnut, valuing it as a food crop and for cultural purposes. Historical findings, including peanut remains discovered in ancient Peruvian tombs dating back over 3,500 years, demonstrate the early importance of groundnut in pre-Columbian civilizations. These findings indicate that groundnut was not only cultivated but also held symbolic and economic significance.

From South America, groundnut spread to other parts of the world primarily through European exploration and trade during the 16th century. Spanish and Portuguese explorers introduced the crop to Africa, Asia, and other tropical regions. Africa quickly became a secondary center of diversification due to favorable climatic conditions and widespread adoption by local farming communities. Over time, groundnut became deeply integrated into African farming systems, diets, and trade networks, particularly in West and East Africa.

In Asia, groundnut was introduced mainly through trade routes linking Africa and the Indian subcontinent. Countries such as India and China adopted the crop extensively due to its adaptability to warm climates and its value as an oilseed and food crop. Through continuous farmer selection and later scientific breeding efforts, groundnut varieties adapted to diverse agro-ecological zones emerged. These regions eventually became some of the world's largest producers, contributing significantly to global groundnut supply and consumption.

Today, although groundnut is cultivated worldwide, its genetic origin remains firmly rooted in South America. Modern breeding programs continue to rely on wild relatives from the crop's center of origin to improve traits such as drought tolerance, disease resistance, and yield potential. Understanding the origin and historical spread of groundnut is essential for appreciating its global importance and for guiding future

research, conservation, and crop improvement strategies aimed at ensuring sustainable groundnut production.

2.3 Types of Groundnuts

Groundnut (*Arachis Hypogaea* L.) is classified into different types based on growth habit, botanical characteristics, pod and seed features, and end-use. Broadly, cultivated groundnut is grouped into four main botanical types: Spanish, Valencia, Virginia, and Runner. Each type differs in plant architecture, maturity period, yield potential, and adaptability to environmental conditions.

The Spanish type of groundnut is characterized by an erect growth habit, small pods, and seeds with high oil content. It matures relatively early, usually within 90–120 days, making it suitable for areas with short rainy seasons or limited moisture availability. Spanish groundnuts are widely grown in Asia and Africa and are commonly used for oil extraction, confectionery products, and peanut butter. Their uniform pod size and high oil percentage make them particularly attractive for industrial processing.

The Valencia type also has an erect growth habit but differs from Spanish groundnut in that its pods usually contain three or more seeds. Valencia groundnuts have a sweet taste and are often consumed as boiled or roasted peanuts. They mature early and perform well in sandy soils with good drainage. This type is commonly grown in parts of Africa, Latin America, and the southern United States. Due to their taste and seed quality, Valencia groundnuts are preferred for direct human consumption rather than oil production.

The Virginia type groundnut has a spreading or semi-spreading growth habit and produces large pods and seeds. It requires a longer growing period, typically 120–160 days and performs best under well-managed conditions with adequate rainfall or irrigation. Virginia groundnuts are mainly used for roasting, snacks, and confectionery products because of the large seed size and attractive appearance. It is widely grown in the United States, China, and some parts of Africa.

The Runner type groundnut is like the Virginia type in growth habit but is more uniform in pod size and has a high yield potential. Runner groundnuts are extensively used in the production of peanut butter and oil due to their consistent quality and flavor. They are commonly cultivated in large-scale commercial farming systems, particularly

in the United States and other mechanized agricultural regions. The choice of groundnut type depends largely on climate, soil conditions, market demand, and intended use.

2.4 Determinants of Groundnut Production

Groundnut production is influenced by a multitude of factors spanning demographic characteristics, production and resource endowments, technological adoption, and institutional environments. These determinants not only shape farmers' decisions to cultivate groundnut but also affect the scale of production, input use intensity, and overall productivity outcomes. Understanding these factors is essential for providing identifying barriers to groundnut production.

Age: The age of the household head often reflects experience and risk preferences in farming. Studies have shown that age positively influences groundnut production and market supply, as older farmers tend to have accumulated skills and decision-making experience that enhance productivity and output marketing (Mossie et al., 2020; cited in Heliyon). However, other contexts indicate that younger farmers may be more receptive to modern technologies and innovations, enhancing output efficiency (IOSR Journal of Economics and Finance).

Gender: Gender dynamics affect access to productive resources and division of labor within groundnut farming systems. For example, men are more involved in land preparation and marketing, while women contribute significantly to weeding and harvesting, highlighting differentiated roles that influence production outcomes and income distribution (Discover Agriculture).

Education: Education level is a key socioeconomic determinant of productivity. Higher educational attainment enhances farmers' capacity to access information, adopt improved practices, and effectively utilize inputs. Evidence shows that more educated farmers are better positioned to understand and implement technological and credit options that can increase groundnut production (Northern Ghana study

Farming Experience: Experience in agriculture and specifically in groundnut farming equips producers with technical skills and practical knowledge that improve production decisions. Studies indicate that farming experience positively influences adoption of better practices and can enhance production efficiency (IOSR Journal of Economics and Finance).

Number of Family Labor: Household size, particularly the number of adult members, enhances the availability of family labor crucial for labor-intensive activities such as planting, weeding, harvesting, and post-harvest operations. Larger family labor endowments are associated with increased adoption of improved practices and higher production potential (Northern Ghana study).

Land Size: The size of land allocated to groundnut cultivation is a direct determinant of production volume. Larger farm or groundnut plot size increases total output simply through a greater area under cultivation. Empirical evidence shows that increased land allocation significantly raises groundnut supply to the market (Western Oromia study).

Cost of Production: The cost structure of production including expenditure on inputs, labor, and land preparation affects profitability and farmers' willingness to invest in groundnut cultivation. High input and labor costs often constrain expansion, whereas improved access to affordable inputs can raise production intensity (Homa-Bay County study).

Farm Ownership and Tenure: Secure land ownership encourages investment in land improvements, provision of collateral for credit, and sustained cultivation of groundnut. Land ownership positively influences farmers' willingness to adopt new technologies and allocate larger areas to cash crops like groundnut (Northern Ghana study).

Use of Machines and Mechanization: Adoption of mechanized tools for land preparation, such as plowing equipment, reduces labor bottlenecks and enhances timeliness of operations, which is critical for optimal groundnut planting windows. Studies highlight that mechanization, when combined with adequate labor and capital, improves production efficiency (general agricultural technology literature).

Fertilizer and Agrochemicals: Appropriate use of fertilizers and pesticides increases crop vigor, reduces pest and disease losses, and ultimately elevates yields. Access to and correct use of agrochemicals are influenced by access to credit and extension advice, and are significant predictors of productivity gains in groundnut production systems (Northern Ghana study).

Plowing and Land Preparation: Timely land preparation is essential for good crop establishment. Availability of draft animals, mechanized plows, or tractor services accelerates plowing and can increase land under cultivation, thereby influencing the total groundnut output (Western Oromia study).

Market Demand and Proximity: Access to markets and distance to the nearest market significantly determine producers' incentives to cultivate groundnut and scale

production. Proximity to markets reduces transportation costs, facilitates timely sale of produce, and influences variable input decisions (Western Oromia study).

Extension Services: Access to extension services is fundamental for disseminating improved practices, technical information, and innovation adoption. Extension agents bridge the gap between research and farmers, promoting better agronomic practices and input use, which contribute to increased groundnut productivity (Northern Ghana study).

Access to Credit: Availability of credit enhances farmers' ability to purchase quality seeds, fertilizers, machinery services, and other inputs. Empirical studies demonstrate that access to formal credit services positively and significantly affects both production and market supply of groundnut by relieving capital constraints (Western Oromia study).

Market Information: Institutional support in the form of market price information and networks enables farmers to make informed decisions on production scales, timing of sales, and selection of market channels, further strengthening their production incentives (Western Oromia market channel study).

Therefore, groundnut production is a multi-faceted agronomic and economic activity shaped by demographic attributes (age, gender, education, experience, family labor), production resources (land size, cost structure, farm ownership), technological adoption (machinery use, fertilizer, plowing, pesticides), and institutional environments (market demand, market access, extension services, and credit availability). These determinants interact to influence productivity, efficiency, and profitability, highlighting areas for targeted policy interventions such as improving access to credit, strengthening extension services, and enhancing market linkages to sustainably promote groundnut production.

2.5 Reviews on Previous Studies

Moe Swe Yee (2008) investigated the peanut production systems of rain-fed subsistence farmers in a riverine village in Myanmar's Dry Zone with the objective to describe and analyze the peanut production systems used by rain-fed subsistence farmers in a typical riverine village in the Dry Zone of Myanmar. Using a case-study approach in Nyaung Pin Win village, the study applied stratified random sampling of 30 households and collected both qualitative and quantitative data through group

interviews, semi-structured interviews, and field observations. Key variables examined included types of peanut production systems, cultivation practices, input use, yields, economic returns, landholding types, and the role of peanuts in household consumption and income. The study found that all households grow peanuts and rely on them for cooking oil, cash income, and livestock feed, and identified four production systems, with dry-season peanut cultivation on alluvial land providing the highest yields at the lowest input cost making it especially beneficial for landless or land-poor households while illustrating farmers' adaptive strategies to cope with uncertain rainfall in the Dry Zone.

Soe Soe Win (2008) analyzed the technical efficiency of groundnut production in Myanmar's central region. This study focuses on the technical efficiency of groundnut production across farmer sections and among farmers classified by social characteristics and other relevant characteristics in Myanmar's main groundnut production areas. The quantitative method used to answer the question and identify factors influencing groundnut production would have policy implications. The results of the maximum likelihood parameter estimate of the stochastic production frontier from Cobb-Douglas frontier functions for both Mandalay and Magway divisions indicate that quality of soil was the significant factor that affected the yield per hectare in both regions. Good quality of soil for groundnut production can increase groundnut yield in both areas. In addition, government should establish the rural credit program with extension service for groundnut farmers to improve better access to external inputs.

Raphy and Kyaw (2009) studied analysis of the Myanmar edible oil crops sub-sector and aimed to assess the structure, performance, and constraints of Myanmar's edible-oil sector to understand its production systems, market dynamics, and competitiveness, and to identify opportunities for improving domestic oilseed production and processing. The authors used a sub-sector/value-chain analysis approach that combined desk reviews of national statistics and international datasets with field investigations, interviews with farmers, millers, traders, and government officials. Key variables examined included the major oilseed crops, production volumes, processing capacity, input use, price structures, etc. The study found that Myanmar's edible-oil sector is characterized by low processing efficiency, inconsistent quality, limited technology, and strong competition from cheap imported palm oil.

Abdelaziz (2010), examined economic analysis of factors affecting crop production in Umkdada District, North Darfur State. This study aimed to identify the major agronomic and management factors that influence groundnut production and determine which practices most effectively improve farmers' yields. The study used a structured farm-level survey supported by questionnaires and interviews, along with regression analysis to examine how different variables relate to production performance. Key variables assessed included total cultivated area under groundnut, crop rotation practices, cropping period, and input use such as labor and seed. The findings showed that the most important factors affecting groundnut production were the total cultivated area, which significantly increased output; crop rotation, which enhanced soil fertility and reduced pests; and the cropping period, where proper timing and duration greatly improved productivity.

Htet Htet Htun (2013) investigated groundnut supply chain management in Magway Township. To identify the major constraints of groundnut production and marketing in Magway Township and to analyze the factors affecting groundnut supply and profit at the farm level. Regression analysis was used to determine factors affecting yield and farm profit. Key variables included farm characteristics (farm size, groundnut area, yield), input use (seed, labor, material costs), output price, marketed surplus, and marketing costs, as well as marketing chain factors like channels, transport, and margins. In the influencing factor analysis, groundnut yield was positively and significantly influenced by seed rate, price of groundnut, total labor and access to credit. Groundnut profit was positively and significantly influenced by yield and negatively influenced by total material cost.

Win Win Htet (2018) conducted research on study on groundnut and sesame production in the Magway Region, sought to examine the status and dynamics of groundnut and sesame production, including area cultivated, production levels, land-use, and overall role of these two oilseed crops in the region's agriculture. The researcher used a descriptive method based on secondary data collecting and analysing historical and official records about land use, shown area, yield per acre, and production volumes of groundnut and sesame in Magway Region. The main variables considered in the analysis included sown area (acreage) for groundnut and sesame, yield per acre, total production volume, land use patterns, soil and environmental characteristics, and input use as well as aggregate production trends over time. The findings show that groundnut and sesame dominate oilseed crop agriculture in Magway Region and that

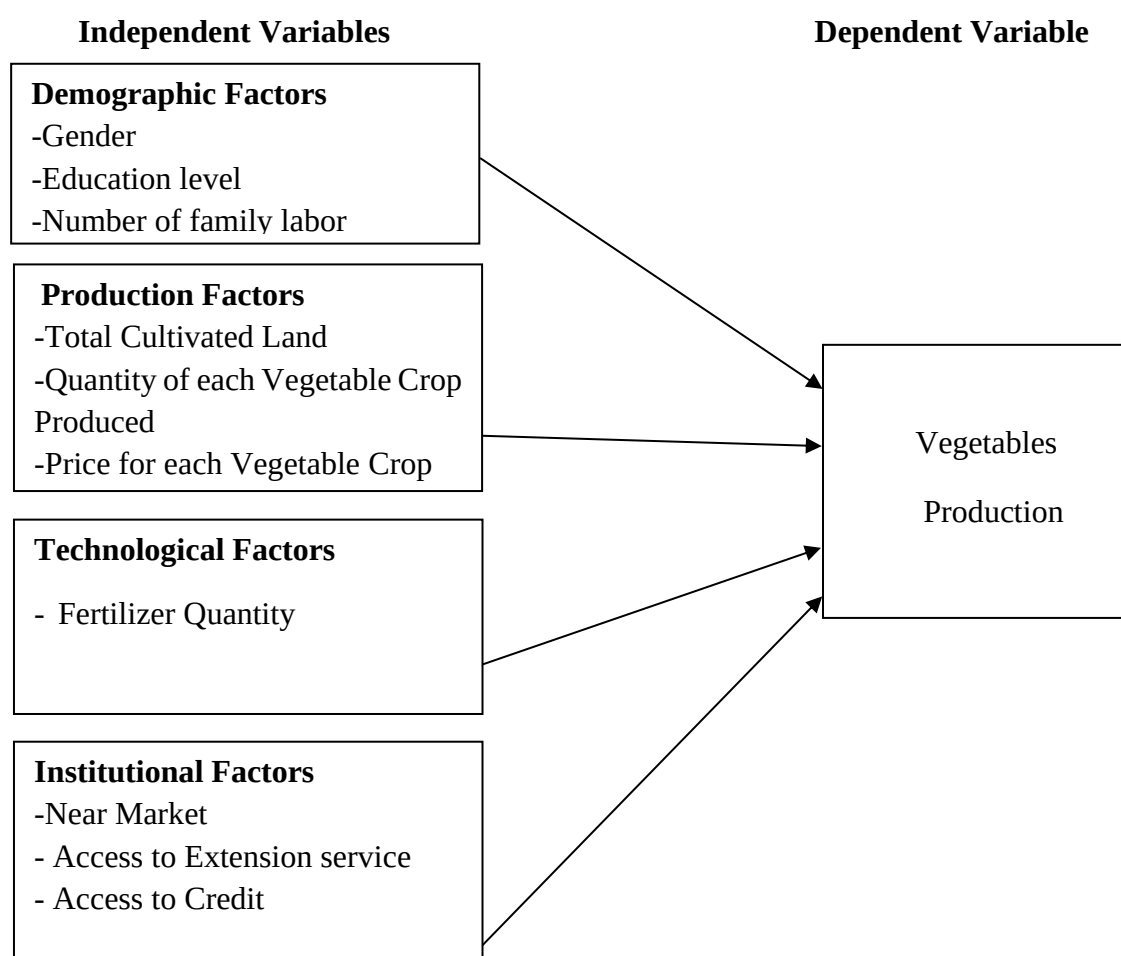
both crops remain major contributors to regional agricultural output, shaping land use, and supplying both domestic demand and markets as popular food and oilseed items.

Khant Phoo Wai (2018) investigated a study on groundnut production in the Bago Region. The objective of the study is to investigate groundnut cultivation and production in the Bago Region. The study employed a descriptive method that relied primarily on secondary official data (statistical year-books, regional agricultural records) rather than field surveys. The key variables considered included shown (cultivated) area for groundnut, harvested area, yield per acre, total production output, and price trends over time. The main finding was that groundnut cultivation in Bago Region experienced an increase in both sown acreage and production over the study period up until 2015–2016, although in 2016–2017 there was a decrease; groundnut remains an important oilseed crop for both domestic consumption and potential export, suggesting that with support (improved technology, infrastructure, financing) there is potential to further promote and stabilize groundnut production in Bago Region.

2.6 Conceptual Framework of the Study

The conceptual framework proposed by Xaba and Masuku (2013), comprises two principal components: dependent variables, specifically onion production, and independent variables, which demographic factors, production factors, technological factors and institutional factors.

Figure 2.1 Conceptual Framework of the Vegetables Production



Source: Xaba and Masuku (2013)

The independent variables exert an influence on vegetables production. The conceptual framework of Xaba and Masuku (2013) show in the above Figure 2.1. According to Xaba and Masuku (2013), the study's conceptual framework has been established. This framework comprises two primary components: independent variables and the dependent variable. The independent variables include demographic factors, production factors, technological factors, and institutional factors. The dependent variable is the groundnut production of farming households.

Demographic factors significantly influence groundnut production among farming households. Characteristics such as gender, age, education level, household size, availability of family labor, and farming experience affect farmers' capacity to manage their operations effectively. Individuals with higher education and more extensive farming experience are generally more inclined to adopt improved production techniques and make informed decisions, potentially leading to increased yields. Moreover, household size and family labor play a crucial role in ensuring the timely

execution of essential farm activities, including land preparation, planting, and harvesting. Additionally, demographic attributes impact farmers' access to information, extension services, and financial resources. Consequently, variations in demographic conditions among farmers lead to differences in their production levels and overall groundnut output.

Production factors significantly influence the level of groundnut output achieved by growers. Variables including land ownership, land size, and total production costs are critical to this process. Farmers who possess larger and securely owned plots of land are more inclined to invest in enhanced production practices. Moreover, the costs associated with essential inputs, such as quality seeds, fertilizers, and pesticides, also impact the feasibility of groundnut production activities. Consequently, these production factors collectively determine the overall yield potential of groundnut farming.

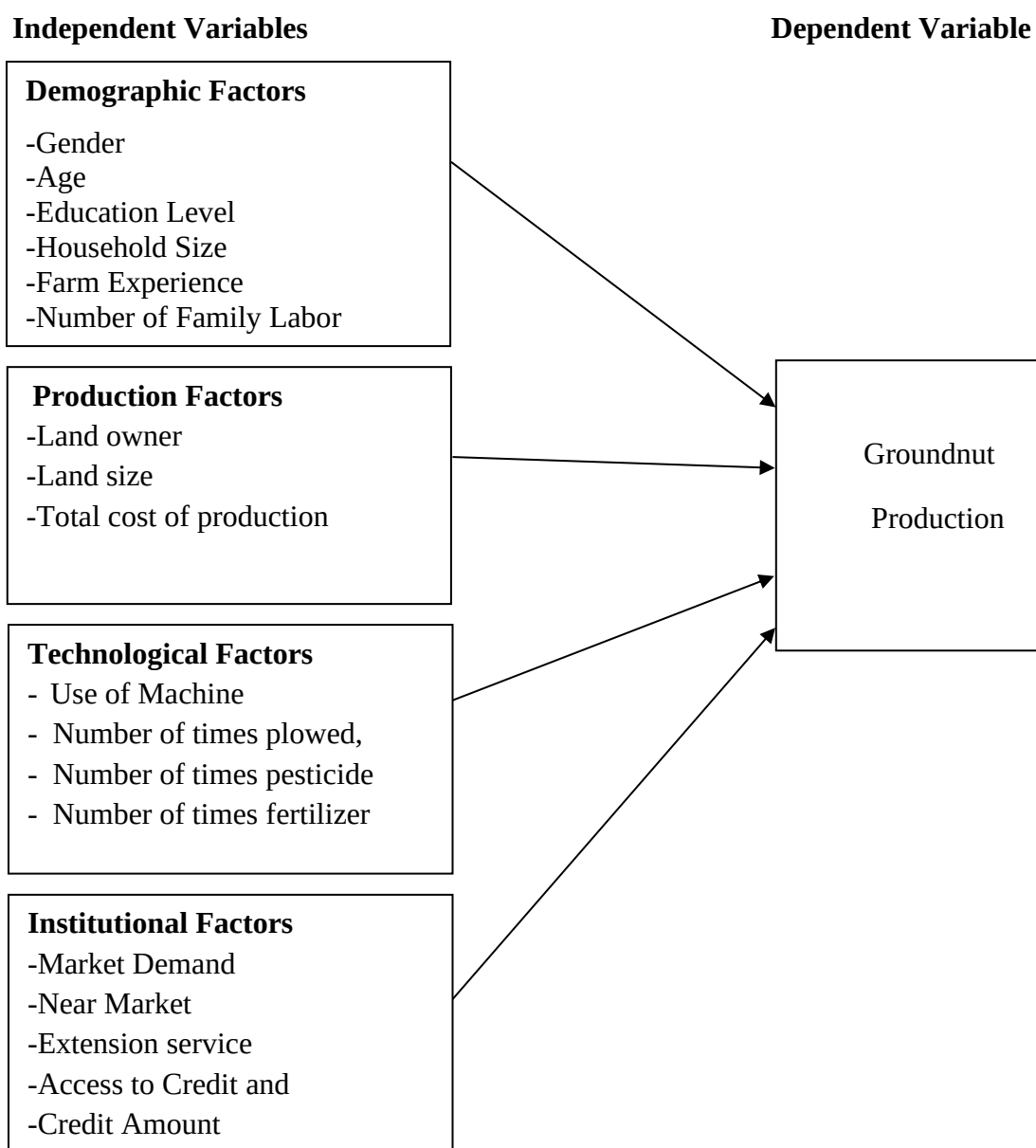
Technological factors significantly influence the agronomic conditions that facilitate groundnut production. The utilization of machinery enhances efficiency and reduces time expenditure. The frequency of land plowing contributes to soil structure improvement and prepares an optimal seedbed, thereby fostering healthy crop establishment. Consistent and appropriate application of pesticides is crucial for minimizing pest damage and averting yield losses. Likewise, the regularity and sufficiency of fertilizer application enhance soil fertility, leading to improved plant growth and increased yields. These agricultural technologies necessitate timely implementation, and farmers who effectively manage these practices typically achieve superior production results. Consequently, farm-related practices are essential in determining overall groundnut productivity.

Institutional factors play a crucial role in determining the extent to which farmers can access the necessary support and resources for efficient groundnut production. Market demand is a significant determinant influencing farmers' decisions related to groundnut cultivation. A high demand for groundnuts typically leads to improved prices for growers, encouraging them to expand their cultivation areas and invest more in production inputs. Additionally, robust demand incentivizes farmers to adopt advanced technologies, utilize quality seeds, and implement enhanced farm management practices to boost yields and satisfy market requirements. In contrast, low market demand and declining prices may compel groundnut farmers to reduce their cultivated area, limit input utilization, or transition to alternative crops that offer more

stable or profitable returns. Moreover, a consistent and strong market demand mitigates marketing risks and bolsters farmers' confidence in pursuing groundnut farming as a viable livelihood. Thus, market demand significantly impacts production decisions, investment levels, and long-term productivity within the groundnut farming sector.

Moreover, proximity to markets influences transportation expenses, access to inputs, and the potential to sell products at advantageous prices. Availability of extension services equips farmers with essential technical knowledge, training, and support that improve their production capabilities. Additionally, access to loans allows farmers to invest in necessary inputs and technologies, particularly when personal savings are insufficient. These institutional supports can improve the production performance of growers in terms of accessibility and effectiveness. Consequently, institutional factors are critical in enhancing the overall productivity and efficiency of groundnut farming. Therefore, all independent variables interact to determine the overall level of groundnut production.

Figure 2.2 Conceptual Framework of the Groundnut Production



Source: Adapted from Xaba and Masuku (2013), Myint Myint Than (2025)

CHAPTER 3

BACKGROUND OF THE STUDY

This chapter provides a comprehensive overview of groundnut production in Myanmar, with a focus on Bagan Nyaung-U Township. It covers the historical background of groundnut production, presents an overview of national production trends, and examines sectoral development within the agricultural economy. The chapter also discusses major crops alongside groundnut and details local production practices, varieties, and socio-economic significance and groundnut productions in Bagan Nyaung-U Township.

3.1 The Condition of Groundnut Production in Myanmar

Current situation, groundnut production is the largest cultivated land area after the cultivated area of sesame. The following table show sown area and production of during 6 years.

Table 3.1 The Groundnut Production in Myanmar

Year	Sown Area ('000ha)	Yield (MT/ ha)	Production ('000MT)
2020	1,058	1.50	1,588
2021	1,109	1.48	1,642
2022	1,141	1.43	1,621
2023	1,186	1.47	1,739
2024	1,216	1.47	1,783
2025	1,281	1.57	2,017

Source: Ministry of Agricultural, Livestock and Irrigation, (2025)

The data show a steady expansion of groundnut sown area in Myanmar from 1,058,000 ha in 2020 to 1,281,000 ha in 2025, reflecting increasing farmer interest and national prioritization of oilseed crops. Yield per hectare remained relatively stable between 2020–2024 (1.43 to 1.50 MT/ha) but increased markedly in 2025 to 1.57 MT/ha, representing the highest productivity level in the observed period. Consequently, total production grew from 1,588,000 MT in 2020 to 2,017,000 MT in 2025, with 2025 recording the largest production volume and highest yield, indicating significant improvement in output performance during that year.

3.2 Historical Background of Bagan Nyaung-U Township

This section highlights the background information of Bagan Nyaung- U Township which includes location, population, ethic group, climate, land utilization and socioeconomic condition.

3.2.1 Location

Bagan Nyaung-U Township consist of an Nyaung-U District township in Burma's Mandalay Region (Myanmar). Bagan Nyaung-U is its administrative center. It is the most southern township in the Mandalay Region. Bagan Nyaung-U is the biggest city in Nyaung-U District of the Mandalay Region of Myanmar.

Bagan Nyaung –U is the biggest city in Nyaung-U District of the Mandalay Region of Myanmar. The town is located on the eastern bank of Ayeyarwaddy River. It lies just 4 kilometers away from ancient old Bagan city. The rural population is over 211580 and urban population is 52010. Bagan Nyaung-U Township is situated between North Latitude 21°10' and East Longitude 94°51'. It is situated on the eastern bank of the Ayeyarwady River.

3.2.2 Population

Bagan Nyaung-U Township, which encompasses three townships, 17 wards, 75 village tracts, and 339 villages. Rural households and rural population are larger than urban area. The total number of housing and households are 56821of housing and 60540 of households respectively. This area is notably recognized for its substantial production of sesame and groundnut for edible oil, thereby establishing it as a significant oilseed-producing region in Myanmar.

Table 3.2 Distribution of Population in Bagan Nyaung-U Township

Particular	Male		Female		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Urban	24,144	9	27,866	11	52,010	20
Rural	98,183	37	113,397	43	211,580	80
Total	122,327	46	141,263	54	263,590	100

Source: General Administrative Department (2025)

The number of households and population in Bagan Nyaung-U Township for 2024–2025 are presented in Table (3.2). In the urban areas, there are 11,385 houses, 12,739 households, and a total population of 52,010. In contrast, the rural areas contain 45,436 households with a total population of 211,580. Most households are concentrated in rural areas, while only a smaller proportion is found in urban locations. Most households are in rural areas because people in these communities tend to engage in agriculture and related livelihoods that require living close to farmland. Meanwhile, fewer households are found in urban areas, where employment opportunities and living spaces are more limited. Additionally, in both rural and urban areas, the number of females is greater than the number of males.

3.2.3 Land Utilization of Bagan Nyaung-U Township

Farmland is principal source for food and agricultural production. Cultivated land means paddy land, farmland, slit land, hill-side cultivation land and vegetable land. The land utilization of Bagan Nyaung-U Township in 2024-2025 is expressed in the following Table (3.3).

Table 3.3 Land Utilization of Bagan Nyaung-U Township

No.	Type of Land	2020		2025	
		Frequency (Acres)	Percent (%)	Frequency (Acres)	Percent (%)
1	Farmland	24,738	2.90	27,429	3.22
2	Yar	433,333	50.87	448,291	52.62
3	Kaing/ Kyun	7,298	0.86	7,353	0.86
4	Gardening	205	0.02	205	0.02
5	Vacant land	17,741	2.08	17,741	2.08
6	Forest Land	54,029	6.34	54,029	6.34
7	Wild Land	3,793	0.45	3,793	0.46
8	Uncultivated Land	310,746	36.48	293,063	34.4
	Total	851,904	100	851,904	100

Source: General Administrative Department (2020, 2025)

The data presented in Table (3.3) indicates that there are eight categories of land use in Bagan Nyaung-U Township. The predominant category is yar land, which

accounts for nearly 53% of the total land area in 2025. The second most prevalent category is uncultivated land, comprising 34.4% of the total land area in Bagan Nyaung-U Township. Moreover, the table illustrates a steady increase in both farmland and yar land utilization from 2020 to 2025, while the area classified as uncultivated shows a slight decrease during this period.

3.3 Sectorial Development of Bagan Nyaung-U Township

Agricultural, industry and services are three main economic sectors that contribute to economic growth. The following Table (3.4) shows sectorial development in terms of GDP contribution in Bagan Nyaung-U Township from 2019-2020 to 2024-2025.

**Table 3.4 GDP Contributions by Sectors in Bagan Nyaung-U Township
(2020 to 2025)**

Years	Agriculture	Percent (%)	Industry	Percent (%)	Services	Percent (%)
2020	87,246.5	31	85,647.6	30.4	108,583.8	38.6
2021	89,577.0	33.9	78,454.0	29.6	96,517.1	36.5
2022	74,119.8	41.8	46,931.8	26.5	56,201.4	31.7
2023	95,800.9	32.6	88,319.1	30.0	110,206.1	37.4
2024	109,173.5	33.7	93,670.0	28.9	121,477.8	37.4
2025	115,483.4	32.8	101,249.0	28.8	134,893.4	38.4

Source: Bagan Nyaung-U Township, Planning Office (2020-2025)

In Table (3.4), the percentage contributions of agriculture, industry, and services from 2020 to 2025 exhibit noteworthy fluctuations. Agriculture recorded its lowest share at 31% in 2020 before experiencing a significant increase to 41.8% in 2022. This uptick indicates that agriculture gained relative importance during periods when the industry and services sectors faced slowdowns, potentially attributable to economic disruptions, whereas agricultural output, which is often weather-dependent, remained comparatively stable.

Conversely, the industrial sector reached its peak share of 30.4% in 2020 but subsequently declined to a minimum of 26.5% in 2022, reflecting diminished industrial activity, particularly in manufacturing and construction, amid global supply chain challenges. The services sector, having its highest contribution at 38.6% in 2020, fell

to a low of 31.7% in 2022, implying that it was significantly impacted by mobility restrictions, a decline in tourism, and decreased demand during the specified period. Post-2022, both the industry and services sectors began to show signs of recovery, while agriculture exhibited signs of stabilization, indicative of a gradual normalization of economic activity.

In Bagan Nyaung-U Township, the share of services income (38.4%) is higher than agriculture (32.8%) mainly because of the Bagan's strong tourism and urban-based activities. Bagan is a world-famous historical and cultural area, which creates many service jobs opportunities such as hotels, guesthouses, restaurants, tour guides, transport, handicraft trading and small businesses linked to tourism. These activities provide more regular income and employment opportunities compared to agriculture. On the other hand, agriculture in the area depends heavily on seasonal rainfall, limited irrigation and dry-zone conditions, which restrict farm productivity and employment. As a result, many people prefer to work in the service sector, which is more stable and profitable, leading to a higher percentage of employment in services than in agriculture in Bagan Nyaung-U Township.

3.4 Major Crops of Agricultural Production in Bagan Nyaung-U Township

The following Table (3.5) mentioned thirteen major cultivated crops in 2025 of Bagan Nyaung-U Township. There are thirteen major crops such as rice, groundnut, sunflowers, green gram, sesame, sorghum, cotton, chickpea, onion, maize, vegetable, toddy-palm and pigeon peas are cultivated in Bagan Nyaung-U Township.

According to the following Table (3.5), a dominant share of agricultural land is allocated to groundnut, covering 113,367 hectares, which accounts for 68.15% of the total cultivated area. This indicates that groundnut is the principal crop in the surveyed area, reflecting its high economic importance for rural households, particularly in Myanmar's Dry Zone regions such as the Mandalay area, where oilseed crops play a central role in livelihood strategies. The extensive land allocation suggests that farmers prioritize groundnut due to its profitability, strong market demand for groundnut oil, suitability to semi-arid conditions, and its role as a risk-mitigating cash crop that supports both household income and local consumption needs.

In comparison, green gram occupies 18,795 hectares, representing 11.3% of total cultivated land. While considerably smaller than groundnut, this area still reflects

meaningful engagement in pulse cultivation, consistent with diversification strategies among Dry Zone farmers. The presence of green gram as the second most widely cultivated crop after groundnut highlights its role in income smoothing, short crop duration, lower input requirements, and contribution to household food security. Green gram cultivation complements groundnut farming by providing an alternative revenue stream and reducing seasonal vulnerability, especially in households with limited assets or those seeking flexible labor allocation.

The remaining other crops collectively occupy 52,573 hectares, representing 31.58% of the total cultivated land area of 166,368 hectares. This distribution demonstrates that, beyond the dominance of groundnut and the substantial role of green gram, agricultural households allocate nearly one-third of their land to a diverse mix of cereals, oilseeds, pulses, and cash crops, reflecting supplementary livelihood strategies and ecological adaptation.

Table 3.5 Thirteen Major Crops Growing Status in Bagan Nyaung-U Township (2025)

No	Types of Crops	Cultivated Areas	
		Frequency	Percent (%)
1	Rice	1,940	1.17
2	Groundnut	113,367	68.15
3	Sunflower	126	0.07
4	Green gram	18,795	11.3
5	Sesame	1,633	0.98
6	Sorghum	13,479	8.1
7	Cotton	122	0.07
8	Chickpea	169	0.1
9	Onion	763	0.46
10	Maize	1,396	0.83
11	Vegetable	2,342	1.41
12	Toddy-palm	2,765	1.66
13	Pigeon Pea	9,471	5.7
	Total	166,368	100

Source: General Administrative Department (2025)

3.5 Groundnut Productions in Bagan Nyaung-U Township

Winter groundnuts are cultivated in September and harvested in late December to January, after the monsoon paddy has been collected. It is grown during the late rainy season, using traditional methods that involve preparing and plotting the land with the help of animals and labor. Winter groundnuts are considered more valuable than monsoon groundnuts because they grow under more favorable conditions, resulting in better yields.

Monsoon groundnuts are sown in May and harvested in late July, during the early part of the rainy season. Like winter groundnut, it also relies on land preparation with animals and labor, but it depends mainly on natural rainfall. It has a shorter growth duration of about 100 days and typically results in less output per acre. Table (3.6) shows the yearly production of groundnut in Bagan Nyaung-U Township from 2020 to 2025.

**Table 3.6 Groundnut Production in Bagan Nyaung-U Township
from 2020 to 2025.**

Years	Cultivated Arecas	Yields Per Acre (Bushels)	Total Production (Bushels)
2020	87,483	40.31	3,526,440
2021	93,907	40.00	3,812,624
2022	100,727	40.53	4,082,465
2023	102,612	40.68	4,174,256
2024	109,227	45.61	4,981,843
2025	113,367	47.87	5,426,878

Source: General Administrative Department (2025)

Although cultivated area increases over time, production grows at a much faster rate, demonstrating clear improvements in productivity. This implies that farmers are producing more output per unit of land, which can be attributed to better farming practices, improved varieties, technological adoption, and more efficient use of agricultural inputs. Rising productivity is an important economic indicator, as it reflects enhanced efficiency and increased returns to investment in agriculture. This productivity growth contributes to improved income opportunities for farmers and a more competitive agricultural market.

Over the six-years period, both the cultivated area and production of groundnut show a generally increasing trend, indicating steady expansion of the sector. This upward movement suggests that groundnut cultivation has become increasingly important economically, likely supported by growing domestic consumption and potential export market demand. Farmers' willingness to allocate more land to the crop reflects confidence in its profitability, while the consistent rise in production indicates that groundnut cultivation has been strengthening as a viable economic activity within the Bagan Nyaung-U Township.

CHAPTER 4

SURVEY ANALYSIS

In this section represents presents the survey design,the analysis of the groundnut production that it collected from 197 farmers in Min Nan Thu, Hpwardsaw (East) and Hpwardsaw (West) in Bagan Nyaung-U Township. It includes groundnut grower households' demographic, agricultural and institutional conditions, production costs and income, farm practices, and output levels. The chapter also includes an econometric analysis using various regression models to identify the main factors influencing onion production.

4.1 Survey Design

To comprehensively evaluate the characteristics and conditions of groundnut production, as well as the factors influencing this production in Bagan Nyaung-U Township, a structured survey design was implemented. The methodology employed a two-stage stratified sampling approach. In the initial stage, six villages known for intensive groundnut cultivation were randomly selected from the study area. During the second stage, three villages such as Min Nan Thu, Hpwardsaw (East), and Hpwardsaw (West) were purposefully chosen as the focus of the study due to their significance in groundnut cultivation. Following the sample size determination formula proposed by Taro Yamane (1967), a required sample size of 197 households was proportionately allocated across the selected villages.

The primary instrument employed for data collection was a structured questionnaire, organized into four distinct sections. The first section encompasses socio-economic factors, production factors, technological factors, and institutional factors. The demographic factors addressed include gender, age, education, and the farming experience of the household head. Production factors consist of farm size, family labor, and total production costs, which encompass expenses related to seeds, fertilizers, pesticides, labor, and machinery. Technological factors pertain to the use of machine, timing of plowing, and application of time pesticide and fertilizers. Institutional factors involve market demand, proximity to markets, extension services, and access to credit alongside the amount of loans available. The questionnaire comprised both closed and open-ended questions.

Data collection was executed through face-to-face interviews conducted by trained enumerators proficient in local dialects and agricultural terminology. Prior training sessions were organized for the enumerators to ensure consistency in data collection methods. The survey took place during the post-harvest season, enabling respondents to supply accurate and comprehensive information. Additionally, enumerators validated key responses through direct observation when feasible, thereby improving the reliability of the data.

Following data collection, the survey responses were assessed for consistency and completeness prior to their entry into Microsoft Excel and SPSS software for additional analysis. Descriptive statistics, including frequency distributions and percentages, were employed to analyze the data. The resulting information was subsequently arranged into tables and charts to identify trends, assess variations, and derive significant conclusions regarding the cost structure and productivity of groundnut farming within the study area.

4.2 Sample Size Determination

The total population of the Min Nan Thu, Hpwardsaw (East) and Hpwardsaw (West) consisted of 387 groundnut farmers. To determine the appropriate sample size, this study applied Taro Yamane's (1967) formula, which is expressed as:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = Sample size
 N = Total population
 e = Margin of error

By applying the formulation, the calculated sample size was:

$$\begin{aligned} n &= \frac{387}{1 + 387(0.05)^2} \\ n &= \frac{387}{1 + 387(0.0025)} \\ n &= \frac{387}{1 + 0.9675} \\ n &= \frac{387}{1.9675} \\ n &\cong 197 \end{aligned}$$

Thus, a total of 197 respondents were selected from the second batch population of 387 students, with a 5% margin of error. The sampling method was used Simple Random Sampling (SRS) to ensure every groundnut farmer had an equal chance of being selected. However, if the researcher wished to balance proportional allocation method could also be applied.

In this study, the respondents were selected from groundnut farmers of the Min Nan Thu, Hpwardsaw (East) and Hpwardsaw (West) in Bagan Nyaung-U Township. From a total of 116 farmers in Hpwardsaw (East) village, 135 farmers in Hpwardsaw (West) village and 136 farmers in Min Nan Thu village were chosen as the sample. This distribution ensured proportional representation across the three villages.

A total of 197 respondents were selected from population of 387 households, with a margin of error set at 5%. The sampling method employed was Simple Random Sampling (SRS), which ensured that every groundnut farmer had an equal opportunity to be included in the sample. Alternatively, if the researcher deemed it necessary to achieve balance, a proportional allocation method could have been applied. In this study, the respondents were drawn from groundnut farmers in the villages of Min Nan Thu, Hpwardsaw (East), and Hpwardsaw (West), located in Bagan Nyaung-U Township. From the overall population, 116 farmers in Hpwardsaw (East) village, 135 farmers in Hpwardsaw (West) village, and 136 farmers in Min Nan Thu village were selected as participants. This distribution aimed to ensure proportional representation across the three villages.

Table 4.1 Sample Size Determination

No.	Villages	Household	Sample Size	Percent (%)
1	Hpwardsaw (East)	116	59	30
2	Hpwardsaw (West)	135	69	35
3	Min Nan Thu	136	69	35
	Total	387	197	100

Source: General Administration Department (2025)

4.2.1 Multiple Linear Regression Analysis

Multiple regression is an extension of simple linear regression. It is used to predict the value of a dependent variable (also called the target or criterion variable) based on the values of two or more independent variables (also known as predictor or

explanatory variables). This technique allows researchers to determine both the overall fit of the model often expressed as groundnut production explained and the relative contribution of each predictor to that explained variance. For example, researchers may be interested in how much of the variation in groundnut production can be explained collectively by groundnut farmers, as well as the groundnut production impact of households.

Multiple linear regression (MLR), often referred to simply as multiple regression, is a statistical method that uses several explanatory variables to predict the value of a response variable. The main goal of MLR is to model the linear relationship between multiple independent variables and a single dependent variable. In essence, multiple regression extends Ordinary Least Squares (OLS) regression by incorporating more than one predictor variable.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_p X_{pi} + \varepsilon_i$$

$$\varepsilon_i: i = 1, 2, 3, \dots, n$$

This is called the multiple linear regression model. The parameters $\beta_1, \beta_2, \dots, \beta_p$ are the regression coefficient associated $X_1, X_2, X_3 \dots, X_p$ respectively and ε_i is the random error component reflecting the difference between the observed and fitted linear relationship.

The independent variables are age, farming experience, number of family labor, cast per acre, total land size, use of machine, time of plowing, extension services and access to credit while groundnut production is the dependent variable. Multiple Regression Analysis Formula as follows:

In the linear equation that represents the multiple regressions model is

$$\hat{Y}_i = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + \dots + b_9 X_9$$

Where: $\hat{Y}_i$ = Log Total Groundnut Production

b_0 = Constant

b = Coefficient

X_1 = Age

X_2 = Farming Experience

X_3 = Number of Family Labor

X_4 = Log Cost Per Acre

X_5 = Total Land Size

X_6 = Machine

X_7 = Time of Plowing

X_8 = Extension Services

X_9 = Access to Credit

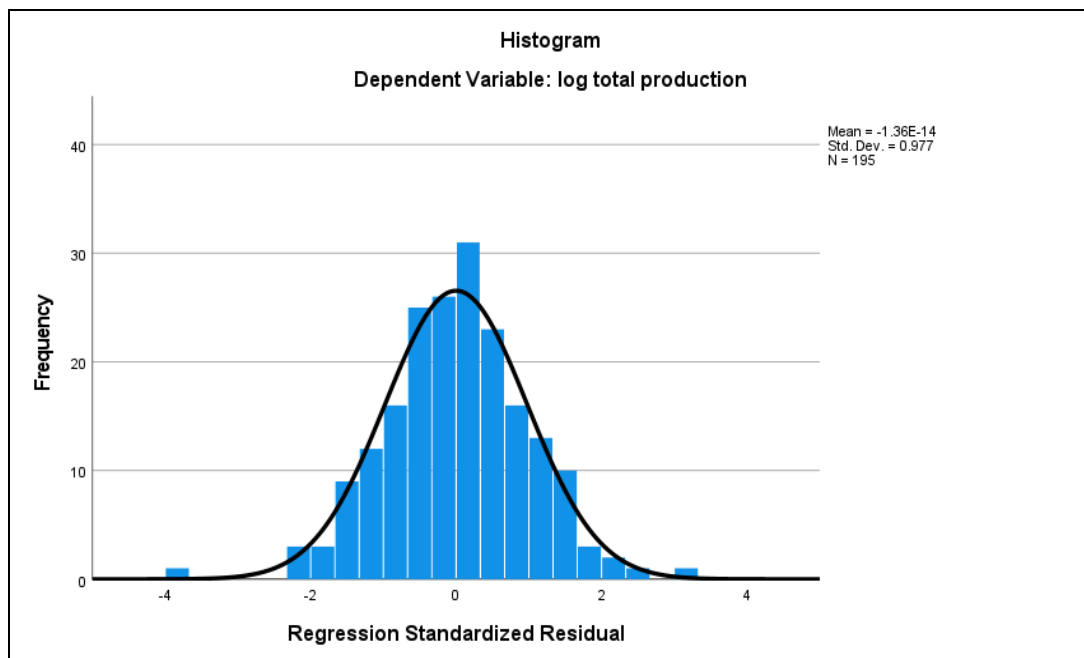
4.2.2 Testing for the Assumption

To determine the required assumption from the multiple regression models for groundnut production, the following procedures have been used.

(i) Test for Normality of Disturbances

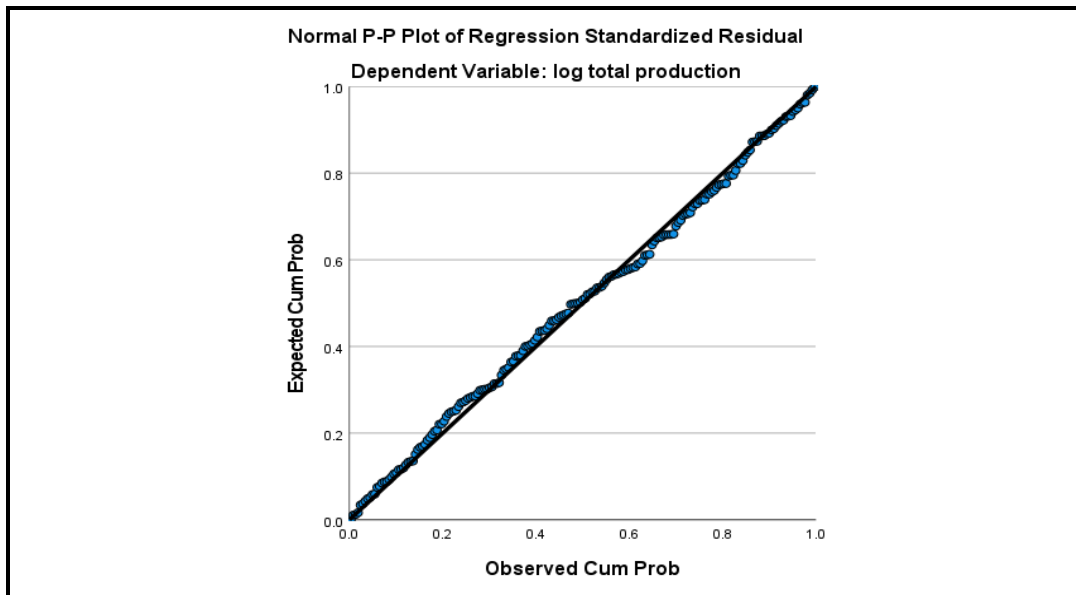
The first assumption of the Ordinary Least Squares (OLS) model is that the disturbance terms are normally distributed with a mean of zero and a constant variance. To assess whether this assumption is held, it is necessary to examine the distribution of the residuals. Accordingly, histograms and normal probability plots of the residuals for vocational training are presented in Figures 4.1 and Figure 4.2. These visual tools help determine whether the residuals approximate a normal distribution, thereby indicating whether the normality assumption of the OLS model is satisfied.

Figure 4.1 Histogram of Disturbances for Groundnut Production



Source: Survey Data (2025)

Figure 4.2 Normal Plot of Disturbances for Groundnut Production

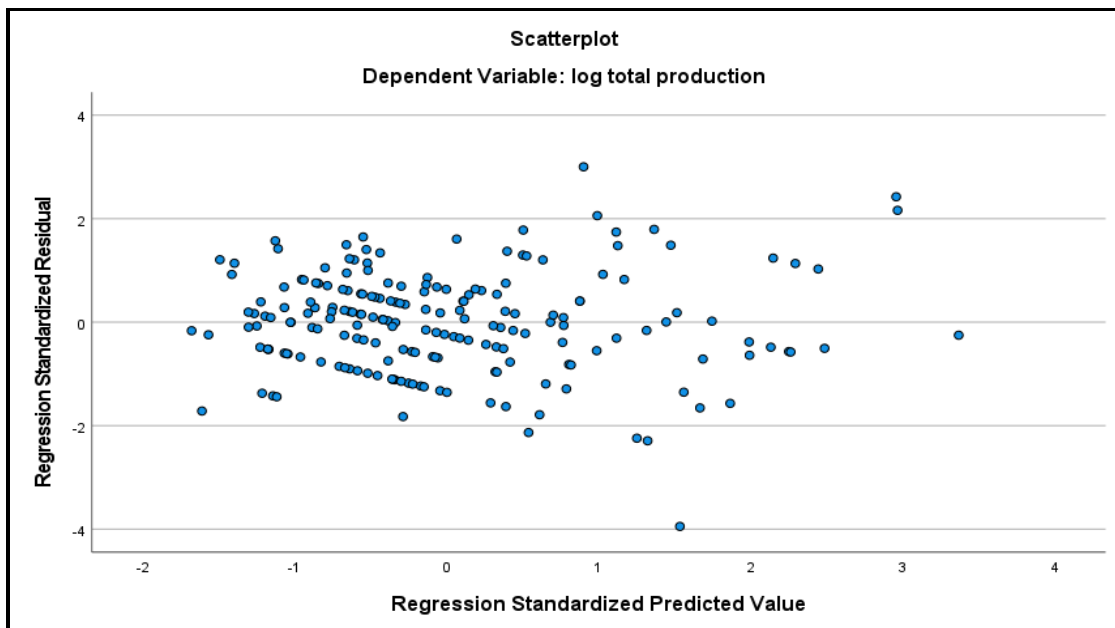


Source: Survey Data (2025)

(ii) Testing for Equal Variance

Another basic assumption of the multiple regression model is homoscedasticity. In the presence of homoscedasticity, the regression coefficients become less efficient. Homoscedasticity can often be detected by plotting the estimated Y values against the disturbances. Figure 4.3 presents the predicted groundnut production on the x-axis and the disturbance for residuals on the y-axis.

Figure 4.3 Residual Patterns for Heteroscedasticity



Source: Survey Data (2025)

According to the figure, the residuals appear to be randomly scattered without forming any discernible pattern. This suggests that the variance of the residuals in groundnut production is consistent across observations, confirming the assumption of homoscedasticity. The absence of a systematic pattern indicates that the spread of the residuals remains uniform, supporting the validity of the model.

(iii) Assessment of Multicollinearity

Multicollinearity, which refers to a strong correlation among the independent variables in a regression model, was also evaluated. This issue can be diagnosed using tolerance values and the Variance Inflation Factor (VIF). When the tolerance value is greater than 0.1 and the VIF is below 10, the model can be considered free from serious multicollinearity. The results of the analysis are presented in Table (4.2).

Table 4.2 Multicollinearity Analysis Results

Variable	Tolerance	VIF
Age	0.352	2.844
Farming Experience	0.359	2.789
Number of Family Labor	0.975	1.026
log Cost Per Acre	0.814	1.228
Total Land Size	0.853	1.172
Machine	0.778	1.285
Time of Plowing	0.895	1.118
Extension Services	0.982	1.018
Access to Credit	0.941	1.063

Source: Survey Data (2025)

As presented in Table (4.2), all tolerance values exceed the commonly accepted threshold of 0.10, and all VIF values fall well below the benchmark value of 10. These diagnostics collectively demonstrate the absence of serious multicollinearity among the predictor variables. Consequently, the regression coefficients can be interpreted with confidence, as the estimates are not adversely affected by redundancy or excessive correlation among the predictors.

4.3 Descriptive Results

In the results of descriptive analysis describe demographic factors, production factors, technological factor, institutional factors and the results of multiple regression analysis.

4.3.1 Demographic Characteristics of Groundnut Farmers

This section presents the general demographic characteristics of 197 groundnut farmers. These include variables such as age, gender, education level, family size, family labor, number of students, number of dependencies, and farming experience.

4.3.1.1 Demographic Factors of Groundnut Farmers

Table 4.3 shows some demographic factors of groundnut farmer households headed by a total sample of 197 groundnut farmers in Bagan Nyaung-U Township.

According to the results in Table (4.3), the distribution of household heads shows that male household head account for the highest (92.9%), while female household head represent only 7.1%. In many communities, men are traditionally recognized as the primary decision-makers and heads of the household. This cultural expectation results in most households being officially recorded under the name of a male member.

The age group from 50 to 60 represents the highest percentage at 43.7%, showing that middle-aged adults predominantly head households. Groundnut farmers between 60 years and 70 years are the second highest because many older farmers remain actively engaged in farming to support household needs, provide for dependents, or maintain family farmland. The youngest category (under 40) is the lowest at only 3.0%. This likely reflects cultural and economic patterns where leadership and decision-making within households are traditionally taken by older, more experienced individuals.

Many household heads have attained middle school education (37.1%), making it the highest category. In contrast, only 1.0% are university graduates, the lowest value. This pattern suggests limited access to higher education in rural areas and indicates that most household leaders possess basic to middle formal education. The low number of highly educated individuals could be due to economic constraints or the need for children to enter the workforce early instead of pursuing advanced studies.

Family size of the groundnut farmers between four to six members is 67.5% and the highest, indicating that medium families are common in the community. The

smallest is 2.5% from seven to nine members, larger families require more resources for food, education, healthcare, and daily expenses. Therefore, many households may prefer smaller family sizes to manage costs effectively.

Table 4.3 Demographic Factors of Groundnut Farmers in Bagan

Nyaung-U Township

Variables	Particulars	Frequency	Percent (%)
Gender	Male	183	92.9
	Female	14	7.1
Age	Under 40	6	3.0
	40-49	33	16.8
	50-59	86	43.7
	60-69	51	25.9
	70 and above	21	10.7
Education	Primary	59	29.9
	Middle	73	37.1
	High	63	32.0
	Graduated	2	1.0
Family Size	1-3	59	29.9
	4-6	133	67.5
	7-9	5	2.5
Number of Family Labor	1-2	36	18.3
	3-4	144	73.1
	5-10	17	8.6
Working Experience	5-20	14	7.1
	21-30	55	27.9
	31-40	67	34.0
	41-50	49	24.9
	51-60	12	6.1
Total		197	100

Source: Survey Data (2025)

The dominance of medium-sized families may reflect economic conditions that balance labor availability with manageable household expenses, while large families may be less common due to increasing cost of living or changes in reproductive behavior.

The distribution of family labor among households shows that the majority, 73.1% of households, have between three and four family laborers, indicating that most families maintain a moderate labor force sufficient to manage agricultural activities efficiently. In contrast, 18.3% of households have only one to two family laborers, reflecting labor constraints likely due to smaller family size, the presence of dependents. Finally, a small proportion, 8.6% of households, have between five and ten family laborers because of largest family size and few dependencies. The data highlights that most households strategically maintain a moderate number of family laborers to balance labor supply with production needs, while very small or very large labor groups are less prevalent due to economic and structural constraints.

The data on the number of students in households shows that 67 households (34.0%) have students, while 130 households (66.0%), do not have any students. This indicates that most households are either without school-aged children or that children have already completed their education. Households with dependents constitute the largest group 57.4%, while those without dependents represent 42.6%. This shows that more than half of the households' support children, elderly, or non-working members. A higher dependency rate places financial pressure on the working members and affects household economic decisions, particularly regarding labor allocation and savings.

The category with the highest proportion is 31-40 years of experience (34.0%), indicating that household heads are generally well-experienced in managing family and economic activities. The lowest is 51-60 years of experience (6.1%), which is expected because very long working experience typically aligns with older age groups that are fewer in number. This distribution shows that many households are led by mature individuals with significant work experience, contributing to stability in livelihood strategies.

The data suggests that households in the study area are primarily female-led, middle-aged, moderately educated, medium-sized, and supported by a labor force of three to four members. Dependents are common, and household heads generally have long experience in their occupation. These characteristics collectively reflect a community with stable household structures, moderate educational backgrounds, and traditional family arrangements influenced by demographic and economic factors.

4.3.1.2 Production Factors of Groundnut Farmers in Bagan Nyaung-U Township

This section outlines the production factors relevant to groundnut farmers, which include land ownership, total land size, types of groundnut seeds, lifespan of groundnuts, total groundnut production, total cost of production and. Table (4.4) presents the status of these various production factors in Bagan Nyaung-U Township.

Table 4.4 Land Ownership and Total Land Size of Groundnut Farmers

Variables	Category	Frequency	Percent (%)
Land Ownership	Ownership	191	97.0
	Rent	6	3.0
Total Land Size (Acres)	Under 5	36	18.3
	5-9	96	48.7
	10-14	36	18.3
	15-19	23	11.7
	20 and above	6	3.0
Types of Groundnuts Seed	Upright Groundnut	38	19.3
	Prostrate Groundnut	159	80.7
Life of Groundnut	Three Month	125	57.6
	Six Month	41	18.9
Total Groundnut Production (bushels)	Under 50	101	51.3
	51-100	76	38.6
	101-150	9	4.6
	151-200	8	4.1
	Above 200	3	1.5
Total		197	100

Source: Survey Data (2025)

Note: (Lakhs = MMK)

Based on Table (4.4), groundnut farmers under agricultural conditions are categorized into two groups: landowners and renters. Of the groundnut farmers surveyed, 97% are landowners. This indicates that the number of groundnut farmers who own land significantly exceeds those who rent land. Consequently, the majority of groundnut farmers in Bagan Nyaung-U Township possess land. Landowning groundnut farmers have greater opportunities compared to those without land.

The data on land distribution indicates that approximately 48.7% of farmers possess between 5 to 9 acres, highlighting the prevalence of medium-scale farming within the region. Further analysis reveals that approximately 18.3% of farmers own less than 5 acres, suggesting the existence of small and marginal farmers who may encounter greater economic difficulties. Additionally, around 15% of farmers have landholdings exceeding 15 acres, signifying that a smaller subset controls larger parcels of land, likely resulting in higher income from agricultural activities. In summary, the findings illustrate a farming community characterized by a predominance of medium-scale farming, with variations in land size correlating with differing levels of economic stability among the groundnut farmers.

Moreover, there are two types of groundnuts seeds that are upright groundnut and prostrate groundnut. The most farmers (80.7%) grow prostrate groundnut, while only 19.3% cultivate upright varieties. This indicates that farmers prefer the variety that likely offers higher yield or better adaptation to local conditions, reflecting rational economic decision-making aimed at maximizing returns. In terms of crop duration, many farmers (57.6%) grow three-month groundnut, whereas (18.9%) cultivate the six-month type. Short-duration crops suggest that farmers aim to reduce production costs, manage risk, and achieve quicker returns, which supports better cash flow and efficient resource use.

Groundnut production shows that more than half of the farmers (51.3%) harvest less than 50 bushels, and 38.6% achieve yields between 51 and 100 bushels, while only a small fraction attains more than 150 bushels. This pattern indicates generally low to moderate productivity, which limits farmers' income and reduces cultivated land and the ability to invest in improved input or technology. The yield distribution highlights issues such as limited access to resources, varying land quality, or insufficient technology adoption.

Regarding to Table (4.5), the distribution groundnut production cost and groundnut production income describe five group in each cost and income. Almost half of the producers (48.7%) have production costs below 10 MMK, with another 42.1% spending between 10 and 20 MMK. This indicates that most producers function within a relatively low to moderate cost structure, suggesting predominance of small to medium-scale operations. Only a small fraction incurs costs above 20 MMK, reflecting limited presence of large-scale, capital-intensive production units.

Table 4. 5 Total Groundnut Production Costs and Income

Variables	Category	Frequency	Percent (%)
Total Production Cost	Under 10 MMK	96	48.7
	Between 10 and 20 MMK	83	42.1
	Between 20 and 30 MMK	5	2.5
	Between 30 and 40 MMK	3	1.5
	Above 40 MMK	10	5.1
Groundnut Production Income	Under 15 MMK	33	16.8
	Between 15 and 30 MMK	133	67.5
	Between 30 and 45 MMK	14	7.1
	Between 45 and 60 MMK	7	3.6
	Above 60 MMK	10	5.1
Total		197	100

Source: Survey Data (2025)

Note: (Lakhs = MMK)

In terms of groundnut production income, the largest proportion of respondents earn between 15 MMK and 30 MMK, indicating that despite moderate production costs, many producers achieve relatively higher income levels. This suggests the potential for favorable cost-income margins, which consists of basic economic principles where efficient allocation of resources can lead to higher profitability. Furthermore, only (16.8%) fall under the lowest income (under 15 MMK), and a modest proportion (5.1%) report incomes above 60 MMK, highlighting income variability within the groundnut production in Bagan Nyaung-U Township.

In summary, with respect to groundnut factors, the majority of groundnut growers own land, possess small to marginal land sizes, and cultivate short-duration and prostrate groundnut varieties. Most groundnut farmers report a total production of fewer than 50 bushels, a total production cost of less than 10 MMK, and total earnings from groundnut production ranging between 15 and 30 MMK.

4.3.1.3 Technological Factors of Groundnut Production in Bagan Nyaung-U Township

The following Table (4.6) shows the technological factors of groundnut farmers in Bagan Nyaung-U Township. The variables encompass key production practices such

as the use of machine, the number of times land is plowed, the frequency of pesticide application, and the frequency of fertilizer application. These indicators provide insight into the intensity of input use and the management practices adopted by groundnut farmers, which are essential for understanding their production efficiency and overall economic performance.

Table 4.6 Technological Factors of Groundnut Production

Variable	Category	Frequency	Percent (%)
Use of Machine	Yes	174	88.3
	No	23	11.7
Number of Times Plowed	1-3	15	7.6
	4-6	169	85.8
	7-9	13	6.6
Number of Times Pesticide Applied	1	59	29.9
	2	107	54.3
	Above 3	31	15.7
Number of Times Fertilizer Applied	1-2	56	28.4
	3-4	133	67.5
	5-6	8	4.1
Total		197	100

Source: Survey Data (2025)

In Table (4.6), it is observed that 88.3% of groundnut farmers employed machinery for various technological factors. The patterns of input utilization among groundnut farmers illustrate significant economic behaviors pertinent to production efficiency and cost management. A substantial majority of the farmers (85.8%) engage in plowing activities ranging from four to six times, which indicates a preference for maintaining optimally prepared soil to promote crop growth. This behavior implies that farmers are committed to sufficient land preparation to enhance productivity, thereby balancing labor and machinery expenses with anticipated yield increases. A minimal proportion of farmers either plow insufficiently (7.6%) or excessively (6.6%), suggesting that the majority adhere to optimal cultivation practices consistent with the principle of diminishing marginal returns.

In terms of pesticide usage, more than half of the farmers (54.3%) apply pesticides twice, while 29.9% apply them once. This pattern reflects a moderate pest management strategy that aims to control crop damage without incurring unnecessarily high input costs. Only 15.7% apply pesticides more than three times, suggesting that most farmers avoid excessive chemical use, likely to minimize production costs and reduce risks associated with overuse, such as resistance development or environmental harm.

Additionally, the application of fertilizer by 133 farmers, with a frequency of 3-4 times, demonstrates an economically rational approach. This frequency effectively balances the necessity to improve soil fertility and optimize yields while avoiding excessive application, which could result in wasted resources and elevated production costs. A limited number of groundnut farmers, specifically 4.1%, apply fertilizers 5-6 times, indicating an understanding of the principle of diminishing returns, where additional fertilizer applied beyond a certain threshold does not yield a proportional increase in output.

Therefore, to enhance groundnut productivity, the majority of groundnut farmers in Bagan Nyaung-U Township engaged in four to six plowing sessions, applied pesticides twice, utilized fertilizers three to four times, and employed harvesting machines.

4.3.1.4 Institutional Factors of Groundnut Farmers in Bagan Nyaung-U Township

Table (4.7) outlines the institutional factors that impact groundnut farmers in Bagan Nyaung-U Township. Key aspects examined include the proximity of farmers to markets, market demand, access to extension services, and the availability of agricultural credit. These institutional elements are critical in shaping farmers' production efficiency, facilitating access to essential inputs, enabling effective market participation and ultimately determining their overall economic well-being and livelihood outcomes.

The market demand of groundnut is 94.4% of the respondent. Most farmers (94.9%) live near the market, which significantly reduces transportation costs and enables quicker access to buyers. However, the table reveals extremely limited access to institutional support services: farmers have no receive government services and an equal proportion benefit from NGO support.

However, all of the groundnut farmers have not access to agricultural extension service, especially groundnut farmers used traditional cultivating system. The access to new technologies, good agricultural farming practices, and vital market information that are crucial for enhancing productivity and achieving long-term agricultural development.

Table 4.7 Institutional Factors of Groundnut Farmers in Bagan Nyaung-U Township

Variable	Category	Frequency	Percent (%)
Market Demand	Yes	186	94.4
	No	11	5.6
Near Market	Near	187	94.9
	Far	10	5.1
Extension Services	Yes	0	0
	No	197	100.0
Access to Credit	Yes	102	51.8
	No	95	48.2
Credit Amount	Under 5 MMK	146	74.1
	Between 5 and 10 MMK	44	22.3
	Between 10 and 15 MMK	2	1.0
	Between 15 and 20 MMK	2	1.0
	Above 20 MMK	3	1.5
Total		197	100

Source: Survey Data (2025)

Access to credit is marginally greater for those engaged in groundnut farming compared to those who have not received any form of credit support. This nearly uniform distribution underscores a considerable limitation in financial accessibility, indicating the existence of imperfections in the credit market that are frequently observed in rural agricultural economies. Restricted access to credit can hinder farmers' capacity to invest in vital inputs such as seeds, fertilizers, pesticides, and agricultural machinery, thereby impacting their production capabilities and income potential.

Regarding the credit amount, most farmers (74.1%) obtain loans below 5 MMK. Small loan sizes may not be sufficient to meet the full working-capital requirements of groundnut cultivation, leading to underinvestment and reduced productivity. Additionally, 22.3% of farmers receive credit between 5 and 10 MMK, while only a marginal proportion (3.5%) access larger credit amounts above 10 MMK. This distribution reflects the risk-averse nature of rural financial institutions, which often limit loan sizes due to concerns about repayment capacity and collateral availability.

Consequently, groundnuts represent a product that is in demand within the domestic market. A significant number of groundnut farmers reside in proximity to this market; however, not all of these farmers have access to extension services. Furthermore, almost half of the groundnut farmers have obtained credit, yet approximately three-quarters of those who received credit reported that the amount was less than 5 MMK.

4.4 Challenges of Groundnut Cultivation in Bagan Nyaung-U Township

The various challenges faced by groundnut farmers in Bagan Nyaung-U Township. The table outlines the proportion of farmers encountering specific production and marketing constraints, including financial limitations, plant diseases, warehouse conditions, irrigation issues, labor scarcity, technological gaps, price volatility, weather conditions, water availability, and market demand. Understanding these challenges is essential for identifying the key factors that hinder agricultural productivity and economic efficiency in groundnut cultivation.

Table (4.8) indicates that groundnut farmers in Bagan Nyaung-U Township face multiple challenges, with some being more severe than others. The highest challenges include rainwater dependence, market demand, and weather conditions. Nearly all farmers (99.5%) report rainwater as a constraint, reflecting heavy reliance on rainfall for cultivation. This dependence exposes farmers to high production risks, as irregular or insufficient rainfall can reduce input efficiency, lower yields, and discourage investment in improved technologies. Similarly, 94.4% of farmers cite market demand as a challenge, highlighting the uncertainty in selling their produce at profitable prices. Weather conditions also affect 77.7% of farmers, demonstrating the sector's vulnerability to climatic variability, which further increases production risk and income instability.

Table 4.8 Challenges of Groundnut Cultivation in Bagan Nyaung-U Township

Variables	Yes		No	
	Frequency	Percent (%)	Frequency	Percent (%)
Challenges	158	80.2	39	19.8
Money Capital	34	17.3	163	82.7
Diseases	69	35.0	128	65.0
Warehouse	1	0.5	196	99.5
Irrigation	28	14.2	169	85.8
Scarcity of Labor	33	16.8	164	83.2
Technology	71	36.0	126	64.0
Price of Groundnut	19	9.6	178	90.4
Weather	153	77.7	44	22.3
Rainwater	196	99.5	1	0.5
Groundwater	33	16.8	164	83.2
Market Demand	186	94.4	11	5.6

Source: Survey Data (2025)

In contrast, the lowest challenges include warehouse availability, price of groundnut, and irrigation. Only 0.5 percent of farmers report warehouse issues, indicating that storage facilities are generally adequate or that most farmers sell their produce immediately after harvest, minimizing post-harvest losses. Similarly, a small proportion (9.6%) consider groundnut prices a challenge, suggesting relatively stable market prices for the majority, which reduces income uncertainty. Finally, 14.2 percent of farmers view irrigation as a problem, implying that most operations are adapted to rain-fed cultivation and are not significantly constrained by irrigation limitations.

4.5 The Result of Multiple Regression Analysis of Groundnut Production

In the following Table (4.9) displays the outcomes of a multiple linear regression analysis investigating the factors influencing groundnut production among farmers. The model encompasses significant demographic, production, technological, and institutional variables, which include age, farming experience, number of family laborers, cost per acre, total land size, machinery usage, plowing duration, extension services, and access to services. The F-value, R-square, and significance levels offer

insights into the model's explanatory power and the relative significance of each variable in influencing production levels.

Table 4.9 Result for Groundnut Production of Farmers

Independent Variables	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig
	Coefficient	Standard Error			
(Constant)	1.493	1.283		1.163	0.246
Age	-0.011*	0.006	-0.195	-1.940	0.054
Farming Experience	0.005	0.006	0.081	0.818	0.415
No. of Family Labor	-0.017	0.033	-0.031	-0.516	0.607
log Cost Per Unit	0.181**	0.086	0.138	2.089	0.038
Total Land Size	0.046***	0.007	0.431	6.689	0.000
Machine	-0.229*	0.116	-0.133	-1.976	0.050
Time of Plow	0.041	0.028	0.093	1.475	0.142
Extension Services	0.114	0.466	0.015	0.245	0.807
Access to Credit	0.169**	0.068	0.152	2.478	0.014
F - value	10.847***				0.000
R-square	0.345				
Adjusted R^2	0.314				

Source: Survey Data (2025)

***, ** and * statistically significant at 1%, 5% and 10% level, respectively.

The regression results indicate that the model is statistically significant at 1% level, suggesting that the included variables jointly explain variations in groundnut production. With an R-square of 0.345, the model explains approximately 34.5% of the total variation in farmers' groundnut output, while the adjusted R^2 of 0.314 confirms that the explanatory power remains strong after adjusting for the number of predictors.

According to the multiple linear regression result, the variables of total land size, cost per acre and access to credit are significant and related to groundnut production. Total land size is positively related and statistically significant at 1% level. It is exerting the strongest positive effects and on production. Total land size has a positive and statistically significant effect at the 1% level on groundnut production. A one-acre increase in total land size increases groundnut production by 4.6%.

Cost per unit (acre) has a positive and significant effect at the 5% level on groundnut production, implying that a 1% increase in cost per acre increases groundnut production by 18.1%. This result reflects the input intensification and production theory, where the higher expenditure per acre represents the greater productivity-enhancing inputs such as improved seeds, fertilizers, pesticides and better farm management practices.

Nevertheless, age of household head and used of machine are negatively related and statistically related to groundnut production at 10% level of significant. This indicates that a one-year increase in the age of a groundnut farmer leads to a 1.1% decrease in groundnut production, holding other factors constant. As farmers grow older, their physical strength and ability to perform labor-intensive farm operations tend to decline, and the ability of working may also be more risk-averse and less willing to adopt improved technologies, modern inputs, or recommended agronomic practices. Consequently, elder groundnut farmers may rely more on traditional methods, which reduces productivity and leads to lower groundnut output.

The technological factor, used of machine has a negative effect on groundnut production, significant at the 10% level, with production decreasing by 22.9 %. This mean that using machinery during harvesting causes wastage, which reduces the overall groundnut output.

Therefore, the variables of total land size, age, access to credit, cost per acre, and machine are primary factors affecting groundnut production. Among these, total land size is the most influential factor, showing the advantage of larger farms in utilizing resources efficiently. The second most influential factor is age, and the third most influential factor is access to credit, enabling farmers to purchase inputs and adopt modern technologies. The last influencing factors are cost per acre, reflecting the benefits of investing in quality inputs and improved farm practices and machine has a small effect on groundnut production. This result found that the other factors are not influencing on groundnut production in Bagan Nyaung-U Township.

CHAPTER 5

CONCLUSION

This chapter concludes with a comprehensive summary of the pivotal findings concerning the characteristics and conditions of groundnut production, alongside the significant influencing factors affecting this agricultural practice in Bagan Nyaung-U Township. Furthermore, it presents actionable suggestions and policy recommendations designed to enhance groundnut production, while also outlining potential avenues for future research studies.

5.1 Findings and Discussions

The findings of this study reflect the socio-economic characteristics of groundnut farmers and the detailed cost components involved in groundnut production across three selected villages such as Min Nan Thu Hpwardsaw, Hpwardsaw (East), Hpwardsaw (West) in Bagan Nyaung-U Township. The analysis provides valuable insights into various factors such as age, farming experience, number of family labor, cost per acre, total land size, machine, time of plow, extension services and access to credit affect the production of groundnut cultivation in the study area.

A significant proportion of groundnut farmers are typically aged between 50 and 60 years, an age at which they have amassed considerable experience in farming as well as economic responsibilities essential for managing both family and agricultural endeavors. At this stage of life, these farmers have generally accumulated a wealth of knowledge, resources, and social capital, positioning them as the natural leaders within rural communities. The highest level of education attained by many in this demographic is middle school, a reflection of the limited access to higher education in rural areas, compounded by economic constraints that prompt early entry into the workforce. Consequently, most heads of households possess only basic to moderate education prior to their involvement in farming activities.

The optimal family size typically ranges from four to six individuals. This size is characterized by its manageable nature, equipping households with the necessary labor force for groundnut farming activities. Most families strategically maintain a moderate number of working members, which enables them to effectively manage farm tasks. By doing so, groundnut farmers significantly diminish the necessity to engage external labor, often a costly or unavailable alternative during critical periods. Relying

on family members not only fosters better control over timing and labor quality but also enhances overall farm operations, facilitating a more efficient and dependable agricultural production process.

The predominant trend among groundnut farmers is their ownership of farmland, underscoring the critical economic significance of land security and autonomy in rural agricultural practices. The most substantial landholdings for groundnut farmers typically range between 5 to 10 acres, a size that facilitates easier management and requires fewer resources. The income generated by groundnut farmers is predominantly contingent upon the size of the cultivated area, which is vital for meeting household needs. Additionally, a smaller subset of groundnut farmers cultivates over 20 acres, achieving substantial income in accordance with the size of their cultivated land.

In terms of total production, it is noteworthy that a significant majority of groundnut production fall below 50 bushels, while only a minimal percentage exceeds 200 bushels. This indicates a strong dependence of groundnut production on land size. The prevailing groundnut farming system embodies an expansionary cultivation approach. Consequently, as land size increases, so too does the total volume of groundnuts production. This is important to highlight that the productivity of groundnut production appears to remain constant.

In addition, most groundnut farmers operate with relatively low production costs, that are mainly related to cultivated land size. The large cultivated land led to more cost of production. Similarly, their production income always dependent on cultivated land and the productivity of yield per acre. Regarding to access to credit, the results show that more than half of the groundnut farmers have access to credit, while a significant number do not receive any form of credit support. Most of credit amount is under 5 MMK, that is small amount of credit support. Therefore, receiving credit amount is not enough to invest in their farming.

According to the result of multiple linear regression analysis, groundnut production in Bagan Nyaung-U Township is mainly influenced by the availability and effective use of resources. The most positively effect of groundnut production is total land size, follow by the variables of access to credit and cost per acre. The negatively affect variables of groundnut production are age of groundnut farmers and use of machine variables. Others variables in the groundnut production function are not affection on groundnut production in Bagan Nyaung-U Township.

Therefore, the results finding shown that the most positively influencing factors of groundnut production are land size, the second influencing factors is access to credit, and followed by cost per unit. Moreover, the negatively influencing factors of groundnut production are age of groundnut farmers and use of machine. The age of farmers is a contributing factor to the negative impact on groundnut production. This issue is characterized by diminishing physical strength, lower rates of innovation adoption, decreased risk tolerance, and slower responses to economic and environmental shocks. The use of machinery also negatively affects groundnut production. Delays in the rental utilization of machinery, the lack of crop-specific machinery, soil compaction, high operational costs that displace other inputs, and plot fragmentation further exacerbate this situation.

5.2 Suggestions and Recommendations

Based on the findings of the study on groundnut production in Bagan Nyaung-U Township, several practical and policy-level suggestions are proposed to improve productivity, reduce costs, and enhance livelihoods activities. These suggestions and recommendations mainly support to the productivity of groundnut production.

One of the major challenges identified in this study is the weather, rainwater and market demand. To address these issues, producers adopt climate-resilient planning by using reliable weather-forecasting tools and scheduling production activities during favorable periods. Improving irrigation infrastructure is crucial, as farmers rely solely on rainwater, leaving them vulnerable to production risks and income volatility. Enhancing water access reduces uncertainty and encourages farmers to shift from risk-minimizing to profit-maximizing production strategies. Improving water-management systems such as installing drainage channels, rainwater-harvesting structures, or protective coverings can help minimize the negative effects of heavy rain on production quality and output.

Furthermore, improving market access through cooperatives and market information systems can strengthen farmers' bargaining power and reduce transaction costs, leading to better price realization and income stability. Building strong market linkages with buyers, distributors, or cooperatives further helps secure consistent demand. By integrating these strategies, producers can better manage environmental uncertainties and respond effectively to market fluctuations. Promoting climate-smart

practices and improved seed varieties can help farmers overcome declining marginal returns associated with traditional methods, which aligns with the regression result showing that higher production costs and land size significantly increase output. Finally, encouraging youth participation, improving training programs, and promoting efficient land management can support long-term agricultural sustainability.

The majority of groundnut farmers adhere to traditional farming systems characterized by land expansion practices, reliance on conventional seeds, and outdated cultivation techniques. Moreover, most of groundnut farmers face challenges such as inadequate extension services and insufficient access to credit, coupled with the underutilization of machinery in their agricultural practices.

It is imperative for groundnut farmers to transcend traditional farming practices and engage with advanced knowledge-sharing mechanisms related to groundnut cultivation. This includes the effective application of fertilizers and pesticides, the utilization of hybrid seeds, and the enhancement of extension services provided by both private and public sectors. Additionally, understanding the dynamics of market demand and pricing for groundnut crops is crucial for farmers to thrive in this evolving agricultural landscape.

Therefore, to enhance the productivity of groundnut production and to meet the domestic consumption of edible oil, it is imperative that the government implements advanced knowledge-sharing mechanisms concerning cultivation practices. Furthermore, the government must facilitate the effective application of fertilizers and pesticides, promote the use of hybrid seeds, and strengthen extension services offered by both the private and public sectors. Lastly, it is crucial for the government to regulate favorable pricing for groundnuts, ensure the dissemination of ample market information, and improve market linkages.

5.3 Needs for Further Study

The study offers important insights into groundnut production in Bagan Nyaung-U Township; however, several dimensions require more comprehensive investigation to enhance the robustness of these findings and to design more targeted and effective interventions. First, an expanded cost–benefit assessment of various production methods and input-use intensities is essential. Although the study identifies substantial variability in production costs, a more rigorous comparison of the

profitability of high-input systems (characterized by mechanization and intensive fertilizer and pesticide application) versus low-input systems (relying primarily on family labor and traditional techniques) would be particularly valuable.

Second, the study underscores the scarcity of labor to groundnut production, suggesting the need for further examination of labor efficiency and productivity. Future research could analyze the relative performance of family versus hired labor during harvesting periods, assess intra-household labor allocation patterns, evaluate the influence of household size on labor availability, and consider the opportunity costs associated with engaging family members in groundnut farming activities.

Lastly, given the generally low educational attainment of farmers and the limited participation of youth, more in-depth qualitative investigations are warranted. Focus group discussions and interviews with both older and younger farmers could help identify the specific constraints that hinder youth engagement, as well as their aspirations and training requirements. Likewise, exploring farmers' preferred learning approaches and existing knowledge gaps would be vital for developing practical, culturally appropriate, and accessible training initiatives. Such insights would ensure that proposed interventions related to capacity-building and youth involvement are both relevant and effective.

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APPENDIX (A)

QUESTIONNAIRE GROUNDNUT PRODUCTION IN BAGAN NYAUNG-U TOWNSHIP

Date -----

Questionnaire No. -----

Village -----

1. Respondent

- (a) Male/Female.....
- (b) Age
- (c) Education.....
- (d) Occupation.....
- (e) Number of students.....
- (f) Number of family labor.....
- (g) Number of experience (years).....

2. Family Topics

- (a) Number of family

No.	Gender	Age	Relation with Household Head	Education	Marital Status	Occupation	Income

3. Agricultural Conditions

- (a) (1) Land Owner (2) Rent (3) Lease

4. Land Ownership

Types of Land	Cultivated Land (acres)	Total Land (acres)
Stream		
Yar		

5. Groundnut Cultivation

Cultivated Season	Duration	Cultivation acres	Yield per acre (Bushel)	Total Yield (Bushel)	Total income
Winter					
Monsoon					

6. Expenses for Groundnut Cultivated

Type of Cost	Frequency	Price (1 Unit) (Kyats)	Total Expense
Seeds			
Plow Fees			
Agriculture Fees			
Fertilizer Fees			
Pesticide Fees			
Harvest Fees			
Other Fees			
Total Expense			

7. Used of Machine

1. Yes
2. No

8. Number of times plowed.....

9. Number of times herbicide applied.....

10. Number of times fertilizer applied.....

11. Do you have difficulty cultivation groundnuts? ☐ Yes ☐ No

If your difficulty; describe detail

1. ☐ Capital
2. ☐ Insects and Viruses
3. ☐ Storage Room

4. ☐ Irrigated Farming System
5. ☐ Labor Scarcity
6. ☐ Cultivation Technique
7. ☐ Price Fluctuation
8. ☐ Weather/ Climate Condition

12. Where do you get the water source for the groundnut field?

Please	Rain water	Tube well	Others
tick			

13. Market demand condition ☐ Good ☐ Not good

14. Distance to Market ☐ Near ☐ Far

15. Do you get extension services from government or private?

☐ Yes ☐ No

16. Expenditure of Sample Households

	Categories	Weekly Cost (Kyats)	Monthly Cost (Kyats)	Yearly Cost (Kyats)
Please fill in	Total Cost of Food			
	Total Cost of Non-food			
	Totally			

17. Did you get credit? ☐ Yes ☐ No

If you get credit; describe detail

Name of organization	Amount of Credit

18. What do you want to do to improve groundnut production?

.....

APPENDIX (B)

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.588 ^a	.345	.314	.46088

a. Predictors: (Constant), Access to Credit, Farming Experience, Extension Services, Number of Family Labor, log Cost Per Unit, Total Land Size, Time of Plow, Machine, Age

b. Dependent Variable: log total production

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.736	9	2.304	10.847	.000 ^b
	Residual	39.296	185	.212		
	Total	60.031	194			

a. Dependent Variable: log total production

b. Predictors: (Constant), Access to Credit, Farming Experience, Extension Services, Number of Family Labor, log Cost Per Unit, Total Land Size, Time of Plow, Machine, Age

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.493	1.283		1.163	.246		
	Age	-.011	.006	-.195	-1.940	.054	.352	2.844
	Farming Experience	.005	.006	.081	.818	.415	.359	2.789
	Number of Family Labor	-.017	.033	-.031	-.516	.607	.975	1.026
	log Cost Per Unit	.181	.086	.138	2.089	.038	.814	1.228
	Total Land Size	.046	.007	.431	6.689	.000	.853	1.172
	Machine	-.229	.116	-.133	-1.976	.050	.778	1.285
	Time of Plow	.041	.028	.093	1.475	.142	.895	1.118
	Extension Services	.114	.466	.015	.245	.807	.982	1.018
	Access to Credit	.169	.068	.152	2.478	.014	.941	1.063

a. Dependent Variable: log total production

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	(Constant)	Age	Experience	Variance Proportions						
							Farmer	Number of Family Labor	log Cost Per Unit	Total Land Size	Machinery	Time of Plow	Extension Services
1	1	8.078	1.000	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	2	1.001	2.841	.00	.00	.00	.00	.00	.00	.00	.00	.96	.01
	3	.450	4.237	.00	.00	.00	.00	.00	.00	.01	.00	.02	.90
	4	.210	6.196	.00	.00	.00	.00	.00	.56	.10	.00	.00	.04
	5	.094	9.255	.00	.00	.03	.10	.00	.22	.53	.01	.00	.01
	6	.078	10.191	.00	.01	.06	.75	.00	.02	.01	.01	.00	.00
	7	.053	12.327	.00	.01	.09	.03	.00	.02	.03	.66	.00	.00
	8	.028	16.898	.01	.00	.10	.10	.01	.13	.17	.23	.00	.01
	9	.007	34.065	.00	.98	.71	.00	.01	.02	.00	.00	.00	.02
	10	.000	149.487	.99	.00	.00	.00	.98	.02	.15	.09	.00	.01

a. Dependent Variable: log total production

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.4769	5.1263	4.0254	.32693	195
Residual	-1.81880	1.38409	.00000	.45006	195
Std. Predicted Value	-1.678	3.368	.000	1.000	195
Std. Residual	-3.946	3.003	.000	.977	195