YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

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THE CONSTRAINTS FACED BY FARMERS PRACTICING ORGANIC FARMING IN HMAW BI TOWNSHIP, YANGON REGION

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MAS - 35

MAS 2nd BATCH

JULY, 2022

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This thesis is submitted to the Board of Examination as partial fulfillment of the requirements for the Degree of Master of Applied Statistics

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ABSTRACT

The study was undertaken regarding the constraints faced by farmers practices organic farming in Hmaw Bi Township, Yangon Region. The sample constituted 96 organic farmers and 54 conventional farmers. Thus, a total number of respondents for present study were 150. The study indicated that cultivating vegetables as the main crop, family size, farm size, awareness farming, economic constraints, technological constraints, situational/environmental constraints and marketing constraints showed significant relationship with the adoption of organic farming practices by the farmers. Major constraints expressed by the respondent in adoption of organic farming practices of organic farming were lack of availability of cost, lack of training institutions, lack of specialized markets for organic produce. Nevertheless, more detail studies on facing by farmers for organic farming would be prominently needed for the future organic farming development designed for Myanmar sustainable agriculture and food safety for the future endeavors.

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LIST OF ABBREVIATIONS

AGE	Age
ANOVA	Analysis of Variance
EDC	Education
EXP	Experience
FAO	Food and Agricultural Organization
FSIZE	Farm Size
IFOM	International Federation of Organic Agriculture Movement
INGO	International Non-Government Organization
MLE	Maximum Likelihood Estimation
NGO	Non-Government Organization
OF	Organic Farming
TCP	Technical Cooperation Projects
USA	United States of America
VEG	Cultivating Vegetables as the Main Crop

CHAPTER I

INTRODUCTION

Organic agriculture is rapidly becoming more popular throughout the world. According to the International federation of organic agriculture movement (IFOAM), Organic agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of input that may have adverse effects in many ways (IFOAM, 2007).

1.1 Rationale of the Study

Organic agriculture includes all agricultural systems that promote the environmental, social and economic production of food and fibre on a sustainable basis. This system takes local soil fertility as a key to successful production. By respecting the natural plants, animals and the landscape, it aims to optimize quality in all aspects of agriculture and the environment. Organic agriculture dramatically reduces external inputs by refraining from the use of chemical/synthetic fertilizers, pesticides and pharmaceuticals. Instead, it allows the powerful laws of nature to increase both agricultural yields and disease resistance. Organic agriculture is also a rule based agricultural system in which the operator has to follow the standards of organic farming set by the certification organization.

Organic agriculture is one of several approaches to sustainable agriculture and many of the techniques used (e.g., inter-cropping, rotation of crops, mulching, integration of crops and livestock) are practiced under various agricultural systems. What makes organic agriculture unique, as regulated under various laws and certification programmes, is that (1) almost all synthetic inputs are prohibited, and (2) “soil building” crop rotations are mandated. The basic rules of organic production are that natural inputs are approved and synthetic inputs are prohibited. But there are exceptions in both cases. Certain natural inputs determined by the various certification programmes to be harmful to human health or the environment are prohibited (e.g., arsenic). As well, certain synthetic inputs determined to be essential and consistent with organic farming philosophy are allowed (e.g., insect pheromones). Many certification programmes require additional environmental protection measures in addition to these two requirements. While many farmers in the developing world do not use synthetic inputs, this alone is not sufficient to classify there operations as organic.

The process of intensification in agricultural production has increased soil pollution in agricultural systems up to a point in which it is a main agricultural externality and a main threat for agricultural sustainability, as it reduces the potential for agricultural production. Apart from its physical and climatic causes, there are frequently both social and economic factors behind the problem of soil pollution that have often been neglected in many technical studies. Regarding the failure to incorporate long term soil benefits, there are many factors that cause farmers not to care about soil pollution.

Farmers' responses to soil erosion and pollution will depend on many diverging factors, both technical (cropping patterns, slope, type of soil, etc..) and socio-economic (age, skill, wealth, etc..). One option is to do nothing, maintain the same technology, practices and level of input use, which leads to a continued soil loss and a decline in agricultural production. A second option is to intensify production substituting other inputs (such as fertilizers) for topsoil depth, which generally worsen soil loss and increases production costs. A third option is to adopt new practices to conserve soil, which may have a negative economic effect on the short run but a positive overall economic effect in the long run, although ambiguous evidence exists in this sense. The last option is to regenerate topsoil, which incurs even larger costs (Calatrava *et al*., 2007).

Agriculture in developing countries must undergo a significant transformation in order to meet the related challenges of achieving food security and responding to climate. Projections based on population growth and food consumption patterns indicate that agricultural production needs to increase by at least 70 percent to meet demands by 2050. Most estimates also indicate that climate change is likely to reduce agricultural productivity, production stability and incomes in some areas that already have high levels of food insecurity. In this scenario organic farming is thus considered to achieving future food security. Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. To the maximum extent feasible, organic agriculture systems rely upon crop rotations, crop residues, animal manure, legumes, green manure, off-farm organic wastes, mechanical cultivation, mineral bearing rocks, and aspects of biological pest control to maintain soil productivity, tilt, to supply plant nutrients, and to control insects, weeds, and other pests (USDA, 1980). Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including bio-diversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using wherever possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system.

In Myanmar, many different vegetables crops grown for the domestic market in backyard gardens, commercial plots and fields are subject to a range of insect pests and diseases. Farmers commonly use pesticides for controlling insect pests because chemicals have an immediate knock-down effect and are easily available in the local market. Spraying of in appropriate chemicals, excessive application, in appropriate timing, the wrong combination of chemicals, and spurious chemicals lead to insecticide resistance which causes farmers to spray even more pesticides.

It is thought that, with increasing pesticide use in regions with intensive agriculture, adverse effects will inevitably arise, as producers who are unaware of the negative effects of pesticides on human and environmental health may use excessive amounts and incorrectly. In contrast farmers aware of the harmful effects of pesticides are expected to behave differently with better selection of pesticides, amounts used and application practices. However, for various reasons, producers are sometimes unable to translate their level of awareness on this subject into their practices, that is, they may not behave consistently apart from pests developing resistance to pesticides, there are other harmful effects of pesticides that affect agricultural sustainability, the environment and the health of farmers as well as those living near farms.

Organic farming is being implemented under the guidance of a team of experts consisting of scientists, environmentalists and food management personnel in Myanmar. It is a method of farming system which primarily aimed at cultivating the land and rising creeps in such a way as to keep the soil alive and in good health by the use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilizer) to release nutrients to crops for increased sustainable production in an ecofriendly pollution free environment. Some of organic farming practices are (I) application of bio-fertilizer like rhizobium, azospirillum, BCA, etc. (ii) green manure like sun hemp, daincha, (iii) vermicompost (iv) crop rotation, mixed farming.

Therefore, this study is strategic research for the development of organic farming practices concerned with the sustainable agricultural production, environmental protection and food safety for human health. Hence, present study was undertaken by the study of the constraints faced by the farmers in adoption of organic farming practices in Yangon Region.

1.2 Objectives of the Study

The objectives of the study are

1. To describe the socio-economic characteristics of the farmers in Hmawe Bi Township, Yangon Region.
2. To investigate the relationship between socio-economic characteristics, attitude and behaviors and organic farming practices in Hmaw Bi Township, Yangon Region.
3. To assess the constraints faced by the farmers in the adoption of organic farming practices in Hmaw Bi township, Yangon Region.
4. To identify the factors that affecting farmers decisions to adopt organic farming practices in Hmaw Bi township, Yangon Region.

1.3 Method of Study

Firstly, descriptive statistics are used to describe the status of organic farming practices in Yangon region. Secondly, Chi-squared test was used to investigate the relationship between socio-economic factors, attitude and behaviors factors and constraints of organic farming practices. Wilcoxon rank sum-test and Kruskal Wallis test were used to assess the constraints faced by the farmer in the adoption of organic farming practices in Hmaw Bi Township of Yangon Region. Finally, logistic regression was used to identify the main factors that affect farmers decisions to adopt farming organic practices in Hmaw Bi township, Yangon Region.

1.4 Scope and Limitations of the Study

The study area of the research was Yangon Region, specification Hmaw Bi Township, where many agricultural activities are carried out. The total number of households was 46937 and total population was 202904. The total land area was 117619 acres and the total number of cultivated area was 63272 acres in Hmaw Bi Township

Two villages which are most engaged in agriculture were selected from a total of 10 villages in Than Nay Pin village tract in Hmaw Bi Township, Yangon Region. A sample of 150 farmers, including (90) farmers from Sein Shwe Gone and (60) farmers from Htein Son village were selected by applying a stratified random method from the existing list of the township General Administration Department.

1.5 Organization of the Study

This study consists of five chapters. Chapter I is introduction chapter including of rationale of the study, objectives of the study, method of study, scope and limitations of the study and organization of the study. Chapter II is literature review and theoretical background is discussed in chapter III. Chapter IV results and findings of the study. Finally, conclusions are presented in chapter V.

CHAPTER II
LITERATURE REVIEW

In this chapter an attempt has been made to gather the important findings of the previous research works related to organic farming. For convenience, the entire review has been sub-divided into six sub-heads i.e. (1) organic farming and (2) application of organic farming, organic farming practice in Myanmar, advantages of organic farming practice, review of related study and conceptual framework of the study.

2.1 Organic Farming

Organic farming (OF) is a farming system that uses environmentally friendly methods of weed, pest and disease control. The principles and practices of Organic Farming have been expressed in the standards of International Federation of Organic Agriculture Movements (IFOAM) as the principle of health, ecology, fairness, and care. The organic movement began after 1920, as a reaction by individual agricultural scientists and farmers against industrialized agriculture. Three important movements have been received within first half of the twentieth century: biodynamic, organic, and biological agriculture. In 1998, IFOAM adopted basic standards for OF and processing. Organic production methods are those where at least 95% of the ingredients of agricultural origin are organic. Organic content less than 70% in products may not refer to organic production methods.

Organic farming offers an alternative to more widespread, high input farming practices that use synthetic fertilizers, fungicides and pesticides. It is based on the idea that the soil is a living system so these synthetic products are largely excluded from organic farms. Organic agriculture relies on crop rotation, animal manures crop residues, green manures and the biological control of pests and diseases to maintain soil health and productivity. Organic farming is referring to the production methods that do not use synthetic pesticides, chemical fertilizers, or genetically modified organisms. As highlighted by Falls Brooks NTFP, organic techniques focus on improving soil quality, assuring crop diversity, protecting the health of workers and consumers, and reducing the environmental impacts of production. Organic farming activities contribute to the millennium development goal of improved health and food security, environmental conservation, and economic development. Organic agriculture is characterized by two main features, which are the recycling of nutrients and natural means of pest and disease control according to both traditional and modern scientific knowledge. Nevertheless, organic farming is more than just a system of production that includes or excludes certain inputs, particularly agrochemicals and genetically modified organisms, because it builds on and enhances the ecological management skills of the farmers, fishermen, and pastoralists, and it includes soil standards.

There are many explanations and definitions for organic agriculture but all converge to state that it is a system that relies on ecosystem management rather than external agricultural inputs. It is a system that begins to consider potential environmental and social impacts by eliminating the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation. These are replaced with site-specific management practices that maintain and increase long-term soil fertility and prevent pest and diseases. Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system (FAO / WHO Codex Alimentarius Commission, 1999).

Organic agriculture systems and products are not always certified and are referred to as "non-certified organic agriculture or products". This excludes agriculture systems that do not use synthetic inputs by default (e.g., systems that lack soil building practices and degrade land). Three different driving forces can be identified for organic agriculture:

- Consumer or market-driven organic agriculture. Products are clearly identified through certification and labelling. Consumers take a conscious decision on how their food is produced, processed, handled and marketed. The consumer therefore has a strong influence over organic production.

- Service-driven organic agriculture. In countries such as in the European Union (EU), subsidies for organic agriculture are available to generate environmental goods and services, such as reducing groundwater pollution or creating a more biologically diverse landscape.
- Farmer-driven organic agriculture. Some farmers believe that conventional agriculture is unsustainable and have developed alternative modes of production to improve their family health, farm economies and/or self-reliance. In many developing countries, organic agriculture is adopted as a method to improve household food security or to achieve a reduction of input costs. Produce is not necessarily sold on the market or is sold without a price distinction as it is not certified. In developed countries, small farmers are increasingly developing direct channels to deliver non-certified organic produce to consumers. In the United States of America (USA), farmers marketing small quantities of organic products are formally exempt from certification. (https://www.fao.org/organicag/oa-faq/oa-faq1/en/)

Organic agriculture started in early twentieth century by pioneers who observed the changes in practices and lifestyles and tried to develop systems that kept natural processes as their guide. Parallel to the intensification around mid-twentieth century, negative effects started to appear on environment and human and animal health and consequently whole planet. Today, major economic problems, food security, malnutrition, unemployment or food prices and risks imposed by land degradation, water pollution, climate change and agricultural systems are discussed together for a better world in the future.

Organic agriculture is defined in Codex Alimentarius as ‘holistic production management system’ which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. Organic on one hand reduces reliance on off-farm inputs and on the other hand requires locally adapted systems developed based on local and international knowledge and is governed by a legislative framework. The food and agricultural organization of the United Nations (FAO) closely following the advances in the field of organic production and trade carried out Technical Cooperation Projects (TCP) in central asian countries to help governments in establishing a legislative framework, institutional and capacity building and identifying market opportunities.

FAO is specifically interested in identifying opportunities and market niches of organically produced crops in developing countries and countries with emerging economies. These are of interest for the small-scale farmers, who still form the great majority of the farming community who supply our daily food. Currently there more than 2.4 million organic producers in the world. As in previous years, the countries with the most producers were India (585,200), Ethiopia (203,602) and Mexico (200,039).

The synthetic fertilizers and pesticides with organic, botanical or microbial inputs is not organic farming. True organic farming is diversified integrated farming, where use of synthetic agro-chemicals, Fossil fuels, Deep level groundwater and other non-renewable resources, non-indigenous plant and animal species etc. are minimized and cropping systems are adapted to agro-ecological regions, trees animals, aquatic organisms etc. are integrated with seasonal crop production, on farm production of biofertilizers, seeds, botanical agents etc. are encouraged and soil-water conservation is accorded highest priority. Only live soil and healthy ecosystem can produce stable high yield of nutritious food and generate higher employment per unit of capital invested, though cash returns may be lower per unit of land invested, though cash returns may be lower per unit of land.

2.2 Application of Organic Farming Practices

The influence of worldwide movement in organic production and marketing is contributing significantly to the promotion of organic agriculture practice in Nepal, although at a slower pace. At present, there are quite a good number of farmers involved in alternative farming practices and many more are joining after realizing the ill-effects of chemical practices and the good aspects of sustainable farming practices. Organic tea has come to the market and it is being exported. Organically produced cereals, vegetables and seasonal fruits are available in the market. There are concerted efforts in producing organic fine rice for export. More than these market-oriented activities, it is the general awareness and positive inclination of the farming.

The objectives of organic farming, and the practices adopted, represent one approach among several to achieving greater sustainability in agriculture. While sharing common goals with many of the other approaches, such as integrated crop management, that also emphasis the selective use of modern technologies to optimize production systems, organic farming represents a more critical approach and involves greater restrictions on the use of some of the technologies, in particular agro-chemicals and genetic engineering. The greater restrictions do result in additional environmental and resource use sustainability benefits compared with less restrictive approaches such as integrated crop management.

The influence of the household system on the production system is studied through detailed socio-economic data collection. Comparison from the case study gives an impression that the organic farms fare better on the financial and ecological criteria. The case studies reveal that the role of women on the farm in decision-making and sharing of work is influenced by the caste structure prevalent in India rather than by farm types. Thus, organic farms focus on the self-sufficiency on the production system; traditional farms go for family food self-sufficiency while the conventional farms go for financial self-sufficiency.

Although organic farming as a concept has existed for over 80 years, only since the mid1980s has it become the focus of significant attention from policy-makers, consumers, environmentalists and farmers in Europe. Consumer demand for organic food has risen sharply, leading to the active involvement of multiple retailers and substantially higher prices at the farm gate than those received in the conventional sector. Policy support for organic farming is now widely available across Europe, in recognition of its contribution to surplus reduction, environmental and rural development policy objectives. These factors have contributed to substantial growth in supply, helping market development by increasing availability of products and raw materials, but in some cases also leading to oversupply problems and downward price pressures.

2.3 Organic Farming Practices in Myanmar

Agriculture is the mainstay of Myanmar's economy. Over 65 percent of the foreign exchange earnings come from agriculture. Present agricultural systems in Myanmar follow the traditional methods which utilize the available natural resources combined with improved cultural practices. The use of natural resources for agricultural production has long been a traditional practice of farmers in Myanmar. Prior to the introduction of chemical fertilizers in the late 1960, agricultural production was solely dependent on the use of farmyard manure (FYM) and locally available organic manures. The type and quality of the organic manures used at different location varied greatly, depending upon their availability (Myint 2019).

Farmers in Myanmar are faced with increasing casts and uncertain availability of chemical fertilizers. Moreover, the continued use of some synthetic fertilizer has had adverse effects on soil productivity. In view of this, farmers are being encouraged to increase their use of available organic wastes and residues as organic or bio fertilizers. The use of animal waste, especially cattle manure, has long been practiced in Myanmar. The average amount cattle manure collected per head is about 18 lb per day.

Due to the high cost of fossil fuels, a program to increase the production of domestic fuels by means of biogas plants was initiated in 1994. The efficiency of gas consumption for both cooking and lighting has been improved over the last decade. The Agricultural Mechanization Department is designing a family size digester and is assessing the feasibility of using it as a suitable energy source in rural areas. The efficient from the gas plant is effectively used as organic Fertilizer (Myint 2019).

The most commonly used green manure plants are sun hemp, claincha, cowpea, black gram, and green gram. Data from several investigations have indicated that green manure has a positive effect on crop yields, especially paddy.

Green manuring by sowing and incorporating pules in hilly regions, especially in Shan state, not only increases the crop yield, but also effectively prevents soil erosion. The area under green manuring in Shan State amounts to about 3.240ha. Measures for expanding adoption of improved cropping practices and distribution of quality seeds are being under taken to increase the crop yields and to improve crop quality. The amounts of chemical fertilizers and pesticides distributed to farmers in Myanmar are much less than the recommended optimum rates. Therefore, the destruction of natural ecosystems and environmental pollution from excessive use of fertilizers and pesticides are not considered to be serious problems in Myanmar agriculture.

Organizational work is being carried out to increase widespread application of bio fertilizers and natural fertilizers. Adoption of cropping patters that are compatible with agro-ecological conditions in various regions is being encouraged for the benefit of the state as well as farmers. These measures are supplement by organizational activates to strengthen mass participating in the implementation of agricultural development programs.

In Myanmar, the organic market is only at the introduction stage for commercialization of the organic products because the organic products are perceived as the luxury for the elite social class with higher incomes. The potential for organic market seem great because of the new available type of products such as organic Myanmar chicken and natural eggs are now being provided by Shwe Taung Nyo Gi, Myanmar first organic certified poultry farm. Other available types of organic products in Yangon are vegetable and fruit, bean, honey, medicine and coffee. As national level, some organic products are available in supermarket chain such as city mark and Marketplace. Organic produce are sold in non- supermarket retail outlets and complementary retail such as Yangon on Myay Paday Ther Island every Saturday and Yangon framers Market.

And there are also other routes to access organic products such as organic specially store and shop, organic purchase schemes like Community Supported Agricultural System (CSA): customer buying a share or membership to the farm as exchange for a box of fresh vegetables every week for the length of the membership, direct relationship with the farmers who grow their food, learning together with the consumer though volunteering activities, field visit and home delivery. Although the consumers do have the positive perception and attitude towards organic products the actual buying is relatively low. High prices will be the main deterrent for most of the consumer to buy the organic products. For organic products, they are more likely to smaller than the conventionally grow vegetables and fruits.

The major constraint will be the high cost due to high labor usage in the process and certification cost and small volume of production. High costs lead to high prices which leads to barrier to reach towards mass market. Another factor is the lack of technology to support the organic farming. The most important thing is the education about the organic farming practices and making sure that compliance towards those practices by the growers.

2.4 Advantages of Organic Farming Practices

There are many advantages of organic farming and some of the advantages are as follow:

Economical: In organic farming, no expensive fertilizers, pesticides, or HYV seeds are required for the plantation of crops. Therefore, there is no extra expense.

Good return on Investment: With the usage of cheaper and local inputs, a farmer can make a good return on investment.

High demand: There is a huge demand for organic products in India and across the globe, which generates more income through export.

Nutritional: As compared to chemical and fertilizers-utilized products, organic products are more nutritional, tasty, and good for health.

Environment-friendly: The farming of organic products is free of chemicals and fertilizers, so it does not harm the environment.

Benefits of organic farming are Environment-friendly, promotes sustainable development, Healthy and tasty food, Inexpensive process, it uses organic inputs, generates income, generates income through exports, Source of employment, Organic farming is more labour intensive. Hence, it generates more employment.

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. The objective of this type of agriculture is to produce a more balanced food system through connecting natural biological and ecological processes. The practices of organic farming are strict, and are codified by law (Rigby and Caceres, 2001). In fact, the regulations instilled in organic farming are what set it apart from other practices. Organic farming highlights the use of management practices in preference to the use of off-farm inputs, while taking into account that regional conditions require locally adapted systems (Ziesemer, 2007).

It is generally thought that going organic means a drastic decrease in crop yields, but this is not the case when proper techniques are used for site-specific areas. In order to fully analyze comparisons of organic versus conventional yields, long-term studies measuring multiple variables must be used. This is because when a farming system initially switches over to organic agriculture, it takes about three years for the system to adjust and to see increases in yields (Ching, 2002). Agriculture systems, both organic and conventional, play an important role in current fossil fuel consumption and emission of greenhouse gases.

2.5 Review on Related Study

Borude (1998) studied that fertilization utilization pattern of sugarcane growers by using chi-square test. The result found that non-significant relationship between age of the respondents and their fertilizer utilization pattern. The results also found that education, land holding, annual income, socio-economic status, scientific orientation, extension contact showed significant relationship with adoption levels of organic farming practices by the farmers.

Singh (1999) reviewed the history of organic farming attempts in Malaysia, especially during the last 15 years, covering challenges in production, marketing and consumer acceptance of organic produce [specifically vegetables]. It then presents as overview of the current status, including efforts in kitchen gardening, and efforts by CETDEM to mainstream organic farming. It is found that describes the growing interest in organic produce and the challenges faced in getting better understanding of organic farming and development of Malaysian standards.

Yadav (1999) reported that CWDS is a full member of IFOAM since 1992. Agriculture, in Nepal, is complex due to uncertainty of monsoons, soil heterogeneity, fragile mountains with divergent ecosystems, small and fragmented holdings and farmers with poor socio-economic base. Besides all these constraints, agriculture has remained the dominant economic sector providing employment and livelihood to the majority of the people in the country. It is found that awareness and positive inclination of the farming communities towards organic farming practices which is the positive indication for expanding organic practices in Nepal.

Chander et al. (1999) described those Impacts and constraints evaluation of organic farming in west Bengal. The result found that the complementary, supplementary and sustainable relationship of man land-cattle ecosystem in India that is close to organic farming practices. The contribution of indigenous cattle and buffaloes in promoting sustainable agricultural practices has been discussed in the light of the well-defined organic agriculture standards, principles and practices. The organic livestock and organic dairying per se is yet to emerge in Asian countries including India unlike Europe but the potential is immense and this is the essence of the paper.

Hashimoto (1999) pointed out that Teikei is the organic movement that began in Japan 25 years ago. It means co-partnership between producers and consumers. When to talk about organic agriculture, often tend to focus only on the production system or its methodology. Those consumers and producers who changed production method is not enough to realize the society where agricultural production and environment keep in harmony came together and formed the Teikei movement. The results found that, all varieties of produce are distributed directly by the producers. The price and planting area are discussed with consumers and producers considering the profitability of farmers and the diet of consumers. Moreover, many consumers are required to visit and help farmers on the field to promote mutual understanding. Much of the cost for marketing, such as packing and selecting, are reduced to minimum so that the final prices become cheaper.

Ranganatha et al. (2001) analyzed the adoption of organic farming practices by small farmers. This study used the logistic regression. The result showed that socio-economic characteristic selected for study, only characteristics (education, extension participation, innovativeness) were having significant relationship with the adoption level of small farmers.

Sankaram Ayala (2001) reviewed that organic farming, eco-technological focus for stability and sustainability in India farming. There is an urgent need for a corrective action. The author rules out organic farming based on the absolute exclusion of fertilizer and chemicals, not only for the present, but also in the foreseeable future. There ought to be an appropriate blend of conventional farming system and its alternatives. The study found that the average yields under organic and conventional practices are almost the same and the declining yield rate over time is slightly lower in organic farming.

Chatterjee (2005) observed that ecological farming and NRM. This study reported that just substituting synthetic fertilizers and pesticides with organic, botanical or microbial inputs is not organic farming. True organic farming is diversified integrated farming, where use of synthetic agro-chemicals, fossil fuels, deep level groundwater and other non-renewable resources, non-indigenous plant and animal species etc. are minimized and cropping systems are adapted to agro ecological regions, trees animals, aquatic organisms etc. are integrated with seasonal crop production, on farm production of biofertilizers, seeds, botanical agents etc. are encouraged and soil-water conservation is accorded highest priority. The result also found that only live soil and healthy ecosystem can produce stable high yield of nutritious food and generate higher employment per unit of capital invested, though cash returns may be lower per unit of land.

Ahmad Rezvanfar et al. (2011) studied that determining factors of organic agriculture adoption among small farmers in Iran. The data for the research were obtained from two different groups using random sampling technique: one from a sample of 51 organic farmers and one from a sample of 50 farmers, who as far as could be ascertained, have not made the conversion to organic farming. The results show that through designed instruments, respondents rated multiple statements about their practices as well as their knowledge, awareness, motivation and attitudes regarding organic agriculture. Findings of the study points out that farmers attitude was significantly and positively correlated with some of the adoption variables that is prevention of detrimental factors to farms, mechanical-physical control and cultural control.

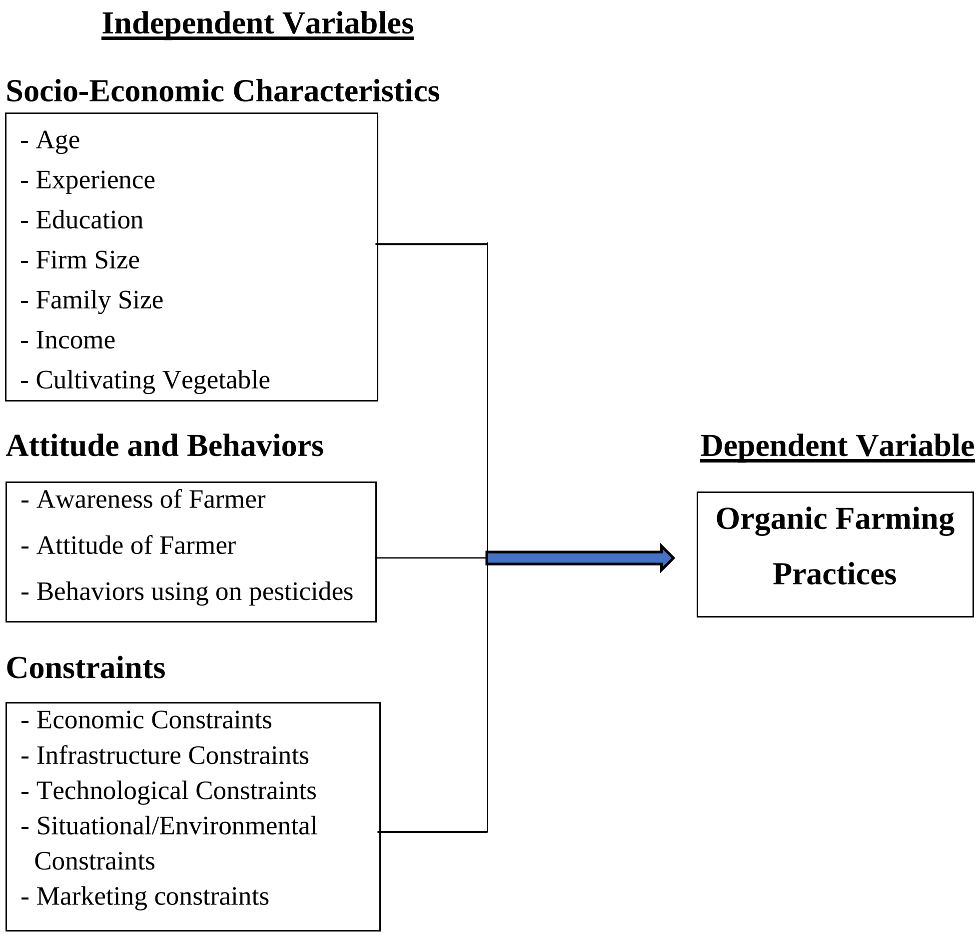
Litterick and Watson (2017) point out that organic farming offers an alternative to more widespread, high input farming practices that use synthetic fertilizer, fungicide and pesticides. The results found that the soil is a living system so these synthetic products are largely excluded from organic farms. Organic agriculture relies on crop rotation, animal manures crop residues, green manures and the biological control of pests and diseases to maintain soil health and productivity.

Vikas Raghuwanshi & Dr. Syed H Mazhar (2017) stated that the constraint's faced by the farmers in adoption of organic farming practices of soybean crop under ATMA programme in Guna district of Madhya Pradesh. The sample constituted 60 beneficiaries and 60 non-beneficiaries. Thus, a total number of respondents for present study were 120. The results indicated that non-significant relationship with adoption of organic farming in respect of age, family size, annual income and risk preference and the selected variables viz. land holding, education, extension contact, social participation, mass media exposer, innovativeness and economic motivation of farmers showed significant relationship with the adoption of organic farming practices by the farmers. The results also found that major constraints expressed by the respondent in adoption of organic farming practices of soybean crop were lack of capital, lack of bulk local demand for organic soybean, long process of organic manure preparation, lack of knowledge about bio-pesticides, application time, method and proper dose, lack of published information regarding various practices of organic soybean farming. (Mazar, 2017)

Hanglem et al. (2019) revealed that constraints faced by the organic farmers of Manipur state, India. From the available records it is found that the conversion from conventional to organic farming is increasing over time in Manipur; although in a very slow rate. The activities of different organizations had influenced the farmers over large areas to convert as an organic cohort. The result found that economic constraints were perceived highest followed by institutional and policy aspects, infrastructural and situational aspects, and managerial constraints. The lowest level of constraints faced on personal aspects. It is suggested that the government should establish organic input agencies, assured market for organic produce, setting up of policies to assure remunerative price to improve organic cultivation in Manipur.

2.6 Conceptual Framework

The conceptual framework of this study was developed based on the previous studies to identify the factor affecting the adoption of the organic farming practices and presented in Figure (2.1).



Source: Survey data 2020

Figure (2.1) Conceptual Framework of the Study

The main purpose of this part is to discover the important factors affected organic agriculture or general agricultural production by referring to the previous literature and to provide the basis for the empirical research and analysis. The main influencing factors are divided into three categories, which are socio-economic factors, attitude and behavior factors and constraints domain.

Socio economic conditions are conductive to the production and development at organic farming. The socio-economic factor consists of age, education, family size, farm size, experience and income. Attitudes are critical determinants responsible for human behaving providing direction and purpose to people's behavior and performance (Liaghati et al. 2008). Thus, information gathering and attitude of farmers are also important in their decisions. Attitude and behavior factors such as awareness of farmer are included in this study.

Namdev et al. (2011) reported the major constraints of organic farming included lower yield, organic farming was a slow process coupled with lack of knowledge about the recommended package of practices and lack of capital. Major constraints such as economic constraints, infrastructural, constraints, technological constraints, situational/ environmental constraints and marketing constraints are presented in this study. The dependent variable is organic farming practices and the independent variables are socio-economic factors, attitude and behavior factors and constraints factor are used for the effect of famers decisions to adopt farming organic practices in this study.

CHAPTER III
RESEARCH METHODOLOGY

This chapter describes general description of the study area, data source, measurement of dependent and explanatory variables and theoretical background of the statistical technique used in this study.

3.1 General Description of the Study Area

Hmawbi Township in Yangon Region was selected as the study area based on vegetables grown areas. The total number of households was 202,904 peoples. The total number of cultivated areas was 63,272 acres in Hmawbi Township. Among the total land areas, rice production area was 51,738 acre, kaing/kyun 379 acres, garden 18,989-acre, forest 1,843-acre, virgin soil 28 acres, uncultivated land 44,572 acres. The location of Hmawbi Township is N16’56” N to 17’ 17” N E 95’53” to 96’10” E. The present study was undertaken to assess the constraints faced by the farmers practices organic farming of Sein Shwe Gone village and Htein Son village in Than Nay Pin village tract of Hmawbi Township, Yangon Region. A sample size of 150 respondents were fixed for the study considering the limitation of time and after resources. There are 10 villages in Than Nay Pin village tract and selected two villages which are most engaged in agriculture. A total number of 150 respondents were identified from the selected 2 villages out of 10 villages in Than Nay Pin Village Tract by using stratified random method. The constraints faced by the farmers during the adoption of organic farming practices were listed during the pilot survey. The socio-economic factors are Age, education, family size, farm size, experience and income. The attitude and behaviors factors are awareness of farmers, attitude of farmers and behaviors using on pesticide. The constraint are economic constraints, infrastructural constraints, technological constraints and situational/environmental constraints and marketing constraints. A well-structured interview schedule was used for the collection of data.

Figure (3.1) Hmaw Bi Township Map

Source: Township General Administration Department

3.2 Data Source

The large amount of vegetables is produced in Hmawbi Township, Yangon Region. Having the limited size of the plots vegetables growers are using large amount of pesticides in the expectation of high yield. And people lack of knowledge about pesticides, and many of those who do know about it continue to indulge in unsafe applying and doing practices (Wai, 2005).

The population analyzed in the study consisted of vegetable farmers from the two selected villages who grew vegetables. The general description of Hmaw Bi township is shown in Table (3.1).

Table (3.1) General Description of Hmawbi Township

Item	Unit	Hmawbi Township
Village Tracts	No.	39
Villages	No.	195
Wards	No	4
Population	No.	202904
Number of households	No.	46937
Land area	acres	117619
Cultivated area	acres	63272

Source: Survey data 2020

3.2.1 Selected Village Tracts

The study area of the research is Yangon Region, specification in Hmaw Bi Township, where many agricultural activities are carried out. There are 10 villages in Than Nay Pin village tract and selected two villages which are most engaged in agriculture by villages. A sample of 150 farmers, including (90) farmers from Sein Shwe Gone and (60) farmers from Htein Son villages were selected by applying a stratified random method from the existing list of the Township General Administration Department. The general description of selected village tract is shown in Table (3.2).

Table (3.2) General Descriptions of Selected Village Tracts

Item	Unit	Than Nay Pin Village Tract
Villages	No.	10
Population	No.	23825
Number of households	No.	5581
Cultivated area	acres	1225

Source: Survey data 2020

3.2.2 Studied Villages

The two study villages are Sein Shwe Gone village and Htein Son village which are most engaged agriculture activities in Than Nay Pin village tract, Hmaw Bi township.

Table (3.3) Selected Studied Villages and Sample Size

Item	Unit	Sein Shwe Gone Village		Htein Son Village	
		Total	Sample Size	Total	Sample Size
Population	No.	1900		2700	
Number of households	No.	350	90	650	60
Land area	acres	50		120	
Cultivated area	acres	50		70	

Source: Survey data 2020

As a result of their lack of relevance for organic farming, following an intentionally broad literature review on organic agriculture, the questionnaire was developed. The pilot questionnaire contained several sections, each comprising multiple statements with different units of measurement, and/or differing precision.

The primary data collection tool during this research was questionnaires. The data collection tool consisted of both open and closed ended questions in line with the research questions. A five-point Likert scale was used for structured questions. The questionnaire was divided into 3 sections with the first section seeking to establish the respondent's demographic data and organic farming practices, while the other two sections sought to establish the respondent's attitude and behaviors using on pesticides and constraints face by farmers. The research questionnaire in this study was applied 5-point likert scale that labeled: Strongly Disagree =1, Disagree =2, Neutral=3, Agree=4, Strongly Agree =5. The questionnaire statements for analysis of constraints faced by farmers in adoption of organic farming practices in Yangon Region are attached in Appendix. A.

3.3 Measurement of Dependent and Explanatory Variables

The dependent variables is dichotomized with a value of 1 if a farmer was an adopter of organic farming (OF) and 0 if otherwise. The explanatory variables of the study were classified into three groups: socio-economic variables attitude and behavior factors and constraints. Socio-economic variables were age, education level, experience, family size, farm size and household income. Attitude and Behavior factors were Awareness of Farmer, Attitude of Farmer and Organic Farming practices of farmer. Constrains are economic constraints, infrastructure constraint, technological constraints, situational /environmental constraints and marketing constraints.

Table (3.4) Description of the Variables Used in the Logit Model

Variable	Type	Measurement
Dependent Variable		
Organic farming practice	Dummy	1: if farmer has adopted OF, 0: Otherwise
Explanatory variable		
Age Group	Dummy	1: If age more than 50 year old, 0 : less than equal 50"
Education Level	Continuous	Formal education of the household head (year of schooling)
Farm Experience	Discrete	Farming experiences of the household head (years)
Family Size	Discrete	Number of persons in the family
Farm Size	Discrete	Amount of land under cultivation (acre)
Income	Continuous	Amount of money earned by the family members in a year
Awareness of farmer	Continuous	Summated Scores
Attitude of farmer	Continuous	Summated Scores
Behaviors using on pesticides	Continuous	Summated Scores
Vegetable Cultivation	Dummy	1: if vegetables are the main crop, 0: otherwise
Economic Constraints	Continuous	Summated scores
Infrastructural Constraints	Continuous	Summated scores
Technological Constraints	Continuous	Summated scores
Situational/Environmental Constraints	Continuous	Summated scores
Marketing Constraints	Continuous	Summated scores

Source: Survey Data (2020)

3.4 Chi-Square Test of Independence

The Chi-Square test of independence is a statistical hypothesis test used to determine whether two categorical or nominal variable are likely to be related or not. The data can be displayed in a contingency table where each row represents a category for are variable and each column represents a category for the other variable. Before calculation the test statistic it is need to find the expected counts.

$$E_{ij} = \frac{R_i \times C_j}{N}$$

Where R_i = the row total for the i^{th} row

C_j = the column total for the j^{th} row

N = overall sample size

Then, to calculate the test statistic x^2 test

$$\chi^2 = \frac{\sum(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O_{ij} = the observed count

E_{ij} = expected count

This statistic follows χ^2 distribution with $(r-1)(c-1)$ degree of freedom, so that p value can be calculated.

3.5 Wilcoxon Rank-Sum Test

A nonparametric test that can be used to determine whether two independent samples were selected from populations having the same distribution.

Wilcoxon rank-sum test is used to compare two independent samples, while Wilcoxon signed – rank test is used to compare two related samples, matched samples, or to conduct a paired difference test of repeated measurements on a single sample to assess whether their population mean ranks differ.

Test for Wilcoxon Rank Sum Test

To test : $H_0 : \Delta = 0$,

1. Order the N observations from least to greatest and let R_i denote the rank of Y_j in this ordering.
2. Set: $$W = \sum_{j=1}^{n} R_j$$

The statistic W is the sum of the ranks assigned to the y's.

3. For a two-sided test of H_0 : $\Delta = 0$, Versus the alternative $\Delta \neq 0$, at the $\propto$ level of significance.

   reject H_0if W ≥ W (∝,m,n), or W ≤ $[n(m+n+1) - W(\propto_1, m, n)]$

   accept H_0if $[n(m+n+1) - W(\propto_1, m, n)]$ <W< $W(\propto_2, m, n)$

   Where $\propto = \propto_1 + \propto_2$

   Large Sample Approximation. Define

$$W^* = \frac{W - E_o(w)}{\left(Var_0(W)\right)^{\frac{1}{2}}}$$

When H_0 is true, the statistic. W* has an asymptotic [min (m, n) tending to infinity] N(0,1) distribution.

3.6 Kruskal-Wallis H-test

The single factor ANOVA compares population mean form number of independent groups. The normality assumption is required for one factor ANOVA. But the data is not normally distributed, the Kruskal-Wallis Test were used for comparing population mean provided that all of them have a similar distribution. This is much less strict assumption in comparison to the normality assumption.

The Kruskal-Wallis H Test is a nonparametric procedure that can be used to compare more than two populations in a completely randomized design.

- All $n = n_1 + n_2 + \cdots + n_k$ measurements are jointly ranked (i.e.treat as one large sample).
- We use the sums of the ranks of the *k* samples to compare the distributions.

Rank the total measurements in all k samples from 1 to n. Tied observations are assigned average of the ranks they would have gotten if not tied.

Calculate: **T_i = rank sum for the ith sample i = 1, 2,…,k**

And the test statistic

H_o: the k distributions are identical versus

H_a: at least one distribution is different

Test statistic: **Kruskal-Wallis H**

When H_o is true, the test statistic H has an approximate chi-square distribution with $df = k\text{-}1$.

Use a right-tailed rejection region or p-value based on the Chi-square distribution.

Nonparametric Methods

These methods can be used when the data cannot be measured on a quantitative scale, or when

The numerical scale of measurement is arbitrarily set by the researcher, or when

The parametric assumptions such as normality or constant variance are seriously violated.

Kruskal-Wallis H Test: Completely Randomized Design

1. Jointly rank all the observations in the k samples (treat as one large sample of size n say). Calculate the rank sums, T_i = rank sum of sample i, and the test statistic

$$H = \frac{12}{n(n+1)}\sum\frac{T_i}{n_i} - 3(n+1)$$

2. If the null hypothesis of equality of distributions is false, H will be unusually large, resulting in a one-tailed test.
3. For sample sizes of five or greater, the rejection region for H is based on the chi-square distribution with $(k-1)$ degrees of freedom.

3.7 Logistic Regression

Adoption of organic farming can be categorized through a dichotomous or binary dependent variable defined by the alternatives of the 'adoption' or 'non adoption' of organic methods. Logistic regression is a commonly used method for modelling binary dependent variables due to its robustness, flexibility, and ease of interpretation (Hair et *al*., 2014). Logistic regression was considered to be the best analytical tool to explore why farmers adopt organic farming in Malaysia because it can predict the probability of adoption based on a set of independent variables using a maximum likelihood estimation (MLE) approach (Greene 2013). Instead of minimizing the squared deviations (as in multiple linear regression), logistic regression maximizes the likelihood that an event will occur.

This study explores the factors that influence whether or not farmers will adopt organic farming. This logit model has been used widely in adoption studies, particularly in identifying the factors that influence farming decisions (Burton et *al*., 1999; D'Souza, 1993; Feder et ak.,1985; Geta et *al*.,2013, Lapple & Rensburg, 2011). A value of 1 was assigned to farmers who stated that their farming operation used only organic methods and 1 to farmers who either do not apply organic methods (conventional farming) or who use both conventional and organic methods. The logistic regression estimates the odds of an individual being an adopter or non-adopter based on the values of the independent variables. The odds are defined as the probability of a particular outcome occurring divided by the probability of the outcome not occurring (Gujarati & Porter,2009). The maximum likelihood method estimates the parameters of the logit model.

By following Gujerati & Porter (2009) and Tiwasing (2016), in order to generate an odds ratio, a probability model is required to satisfy the condition as follows:

$$P_i = E\left(OADOPT_i = {}^{1}/_{Z_i}\right) = \frac{1}{1+e^{-z_i}} \quad (3.1)$$

Z_i is a function of independent variables (like X_i) which can be expressed in linear form as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \quad (= 1, \ldots n) \quad (3.2)$$

$$P_i = E\left(OADOPT_i = {}^{1}/_{Z_i}\right) = \frac{1}{1+e^{-(\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots+\beta_k X_k+\varepsilon_i)}} \quad (3.3)$$

where:

- P_i is the probability of the i^{th} factor being adopt given by Z
- Z is a vector of explanatory variables, where Z = 1 if adopting organic practices and Z=0 otherwise
- OADOPT refers to organic adoption and
- e is an error term

If P_i – the probability of adopting organic farming – is given by Equation (3.1), then (1-P_i), the probability of not adopting organic farming is :

$$1 - P_i = 1 - \frac{1}{1+e^{-z_i}} = \frac{(1+e^{-z_i})-1}{1+e^{-z_i}} = \frac{e^{-z_i}}{1+e^{-z_i}} \quad (3.4)$$

Therefore, by dividing equation (3.1) by (3.4) , to obtain an odds ratio (OR) of adopting organic farming ,i.e that the ratio of the probability that a farmers will adopt organic farming to that of not adopting organic farming:

$$ln\left(\frac{P_i}{1-p_i}\right) = ln(e^{z_i}) = Z_i \quad (3.5)$$

In equation (3.5) ,P_i is non-linear ,not only in Z_i but also in the parameters β_i Which may lead to an estimation problem. Taking natural logarithms (ln) of the equation 3.5 given:

$$ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \quad (3.6)$$

The log of the odds ratio in the equation 1.7 is now linear in variables and parameters and this is the logit model. The logit model can be rewritten as:

$$Logit(P_i) = ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \quad (3.7)$$

To interpret the logistic regression, it is necessary to calculate the value of the odds ratio for each of the variables and then calculate the change in odds of the dependent variable that would be caused by a unit change in the value of the independent variable (Papadopoulos et al., 2015). This can be used to estimate the impact of a 1%increase in an independent variable on the value of the dependent variable (Fu & Simonoff, 2014)

3.7.1 Assumptions of Logistic Regression Model

Logistic regression does not make many of the key assumptions of linear regression and general linear models that are based on ordinary least squares algorithms particularly regarding linearity, normality, homoscedasticity, and measurement level. The assumptions of binary logistics regression model are as follow;

1. Logistic regression does not require a linear relationship between the dependent and independent variables
2. The dependent variable in logistic regression needs to be binary and it cannot be measured or an interval or ratio scale.
3. The error terms (residuals) do not need to be normally distributed
4. Homoscedasticity is not required
5. There is no multicollinearity among the independent variables
6. Logistic regression typically requires a large sample size.

3.7.2 The Likelihood Ratio Test

Overall fit of a model shows how strong a relationship between all of the independent variables, taken together, and dependent variables. It can be assessed by comparing the fit of the two models with and without the independent variables. A logistic regression model with the k independent variables (the given model) is said to provide a better fit to the data if it demonstrates an improvement over the model with no independent variables (the null model). The overall fit of the model with k coefficient scan be examined via a likelihood ratio test which tests the null hypothesis

$$H_0 : \beta_1 = \beta_2 = \cdots = \beta_K = 0$$

To do this, the deviance with just the intercept (-2 log likelihood of the null model) is compared to the deviance when the k independent variables have been added (-2 log likelihood of the given model). Likelihood of the null model is the likelihood of obtaining the observation if the independent variables had no effect on the outcome. Likelihood of the given model is the likelihood of obtaining the observations with all independent variables incorporated in the model. The difference of these two yields a goodness of fit index G, $\chi 2$ statistic with k degrees of freedom (Be wick, Cheek, & Ball, 2005). This is a measure of how well all of the independent variables affect the outcome or dependent variable. G=$\chi 2$ = (-2 log likelihood of null model) -(-2 log likelihood of given model) An equivalent formula sometimes presented in the literature is

$$= -2log\frac{likelihood\ of\ the\ null\ model}{ikelihood\ of\ the\ given\ model}$$

where the ratio of the maximum likelihood is calculated before taking the natural logarithm and multiplying by -2. The term 'likelihood ratio test' is used to describe this test. If the p-value for the overall model fit statistic is less than the conventional 0.05, then reject H_0 with the conclusion that there is evidence that at least one of the independent variables contributes to the prediction of the outcome.

Cox and Snell R-square

Cox and Snell's defines R square as a transformation of the statistic of $-2Ln[\frac{L(m_{Intercept})}{L(m_{full})}]$ that is used to determine the convergence of a logistic regression. The ratio of the likelihood reflects the improvement of the full model over the intercept model (the smaller the ratio, the greater the improvement). The Cox and Snell R-square is

$$R^2 = 1 - \left[\frac{L(m_{Intercept})}{L(m_{fill})}\right]^{2/n}$$

L(m) is the conditional probability of the dependent variable given the independent variables. If there are N observations in the dataset, then L(m)is the product of N such probabilities. Thus, taking $n^{th}$the root of the product L(m) provides an estimate of the likelihood of each V value. Cox and sell's pseudo R square has a maximum value that is not 1. If the full model predicts the outcomes perfectly and has a likelihood of 1, Cox and Snell's R-Square will be $1 - L(m_{Intercept})^{2/N}$, which is less than one.

Nagelkerke R-Square

It adject Cox and Snell's so the range of possible values extends to 1. To achieve this, the Cox and Snell's R-square is divided by its maximum possible value, $1 - L(m_{Intercept})^{2/N}$,

$$R^2 = \frac{1-[\frac{L(m_{Intercept})}{L(mfull)}]^{2/N}}{1-(m_{Intercept})^{2/N}}$$

Then, if the full model perfectly predicts the outcome and has a likelihood of 1, Nagelkerke R-square will equal 1.

CHAPTER IV

RESULTS AND FINDINGS

This chapter presents three sections, the first deals with descriptive analysis on characteristics of farmers. The second section presents finding from the Wilcoxon Rank-sum test and Kruskal-wallis H test. The third section is the results of logistic regression model.

4.1 Descriptive Statistics

This section describes socio-economic characteristics, attitude and behaviors and constraints factors of respondents in the sample. Table (4.1) presents the summary of socio-economic characteristics of respondents.

Table (4.1) Percent Distribution of Socio-economic Characteristics of Respondents

Variables (n=150)	Organic (n=96)		Conventional (n=54)		Total (100)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1. Age (years)						
<30	38	39.6	16	29.6	54	36.0
30-60	47	49.0	25	46.3	72	48.0
>60	11	11.4	13	24.1	24	16.0
2.Experience(years)						
<10	47	49.0	35	64.8	82	54.7
10-20	36	37.5	13	24.1	49	32.7
>20	13	13.5	6	11.1	19	12.7
3. Educational level						
Primary	44	45.83	41	75.93	85	56.66
Secondary	34	35.42	9	16.7	43	28.66
Higher	18	18.75	4	7.41	22	14.66

Table (4.1) Percent Distribution of Socio-economic Characteristics of Respondents (Continued)

Variables (n=150)	Organic (n=96)		Conventional (n=54)		Total (100)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
4. Farm Size (acre)						
<=1.5	86	89.6	48	88.9	134	89.3
>1.5	10	10.4	6	11.1	16	10.7
5. Family Size (numbers)						
1 - 3	23	24	15	27.8	38	25.33
4 - 6	36	37.5	22	40.7	58	38.67
7 - 9	37	38.5	17	31.5	54	36
6. Monthly Income (kyats)						
<150,000	37	38.5	25	46.3	62	41.3
150,000 to 300,000	41	42.7	23	42.6	64	42.7
>300,000	18	18.8	6	11.1	24	16

Source: Survey Data (2020)

According to the Table (4.1), the majority aged between 30-60 (49%). According to the experience, the experience of farmers in growing vegetables are different. For organic farmers, most 49% are in range <10 years, another 37.5% are 10 to 20 years, 13.5% are >20 years. For conventional farmers, farmers, most 64.8% are in range <10 years, another 24.1% are 10 to 20 years, 11.1% are >20 years. The education level of the respondents are classified by 3 categories. These are primary, secondary and high school. Among these categories, most of the respondents in which 45.83% are primary,35.42% are secondary and 18.75% are high school level in organic farming. For conventional farmer 75.93% are primary, 16.7% are secondary and 7.41% are high school education respectively. By comparing farm sizes between organic and conventional farms, the majority of the organic farmers have (less than equal 1.5 acre). According to the family size, the majority of the organic farmers have 7-9 family size, while most conventional farmers have 4-6 family size of the sample farmers. Monthly income was classified in 3 categories with the amount of income in this study. These included income under 150,000 kyats, income 150,000 kyats to 300,000 kyats income above 300,000 were shown in Table (4.1). The monthly incomes of sample growers based on organic farming and conventional farming. There were totally 3 types of vegetables were grown by selected farmers the highest income was 42.7% organic farmers which can earn 150000-300000 kyats per annual income and 46.3% are conventional farmer which can earn <150000 kyats per annual income in study villages.

4.2 Attitude and Behaviors

The descriptive statistics of attitudes and behaviors of farmers are presented in Table (4.2).

Table (4.2) Descriptive Statistics of Attitudes and Behaviors Factors

Variables (n=150)		Mean Score	Total Mean Score	Std. Deviation	Total Std. Deviation Score
Awareness of Farmer	You think the use of synthetic chemical in agriculture has effect on the environment	3.7	3.746	0.702	0.553
	You have heard or read about organic farming	3.92		0.871	
	You know the term organic farming	3.85		0.653	
	You have any knowledge of chemical residues in vegetables and fruits you grown	3.85		0.588	
	You know the existence of soil conservation practices	3.84		0.58	
	Organic Material are essential for crop and Profit of Production	3.38		0.682	
	Organic farming can reduce environmental pollution	3.58		0.678	
	Organic farming effective natural environment.	3.74		0.584	

Table (4.2) Descriptive Statistics of Attitudes and Behaviors (Continued)

Variables (n=150)		Mean Score	Total Mean Score	Std. Deviation	Total Std. Deviation Score
Attitude of Farmer	You want to grow organic farming	3.64	3.253	0.668	0.432
	You used physical soil conservation practice eg, terrace, counter bunds, grass strip, soil and stone bund etc...	2.99		0.596	
	You used the soil conservation practices by using organic materials (Cow dung, Em, Rhizobiu, farm yard manure….)	3.2		0.676	
	You want to receive the training related with organic farming	3.86		0.568	
	Organic farming should use sustain to income.	2.92		0.619	
	Organic farming should use to maintain nature resource for future generation.	3.2		0.655	
	Environmental conservation is needed to reduce impact of climate change.	3.19		0.631	
	Organic farming should use for protection of harmful effects of farmer	3.07		0.368	
Behaviors using on pesticides	You used of pesticides in your farm land	3.57	3.134	0.886	0.511
	You used pesticides according to the guideline	3.75		0.604	
	You wear PPE when you use the pesticides	2.16		0.635	
	You keep the pesticides out of reach of children and other family member	1.91		0.759	
	You wash the materials and hands after using the pesticides	4.29		0.747	

Source: Survey Data (2020)

According to the Table (4.2), the overall mean and standard deviation of awareness of farmers are 3.13 and 0.511 respectively. In addition, the overall mean and standard deviation of attitude of farmers are 3.75 and 0.55 respectively. Moreover, the overall mean and standard deviation of behaviors using on pesticides of farmers are 3.25 and 0.43 respectively.

4.3 The Relationship between Organic Farming Practices and its Covariates

Bivariate analysis is used to determine the association between organic farming practices and socio-economic factors. Table (4.3) shows the results of bivariate association on the basis of Chi-Square test.

Table (4.3) The Relationship between Organic Farming Practices and its Covariates

Factors	Variables	Chi-Square	P Value
Socio-Economic Characteristic	Age group	54.617	0.208
	Experience	24.092*	0.075
	Education	17.037*	0.074
	Farm Size	11.934	0.680
	Family Size	0.771	0.369
	Income	55.906***	0.002
Attitude and Behaviors	Awareness of farmers	27.574*	0.069
	Attitude of Farmers	20.542	0.152
	Behaviors using on Pesticide	27.824***	0.006
Constraints	Economic constraints	31.159***	0.001
	Infrastructural constraints	16.309**	0.012
	Technological constraints	28.400***	0.002
	Situational/environmental constraints	16.447	0.226
	Marketing constraints	19.293**	0.023

Source: Survey Data (2020)

From the results of Table (4.3), the socio-economic factors such as experience, education and income are associated with organic farming practices. These variables are statistically significant at 10% level and 1% level respectively. According to the attitude and behaviors factors, the statistical significant of relationship between awareness of farmers and organic farming practices was found at 10% level. Moreover, the relationship between organic farming pesticide and organic farming practices was found at 1% significant level.

From the results of constraints factors, economic constraints and Technological constraints are highly associated with organic farming practices. These variables are statistically significant at 1% level. And then, Infrastructural constraints and marketing constraints are associated with organic farming practices at 5% significant level.

4.4 Constraints Faced by Farmer Regarding Adopting of Organic Farming

This section deals with the constraints as experienced by the farmers for their non-adoption of organic farming practices. In accordance with the objectives, the constraints experienced by the respondents in the adoption of organic farming practices are presented under four heads namely, (a) economic constraints (b) infrastructural constraints, (c) technological constraints, (d) situational/environmental constraints and, (e)marketing constraints. The results are presented in Table (4.4).

Table (4.4) Constraints Faced by Farmer Regarding Adopting of Organic Farming

Constraints	Organic		Conventional		Total Mean Score	Std. Deviation	Wilcoxon rank sum test
	Mean Score	Rank	Mean Score	Rank			
Economic constraints					**2.893**	**0.721**	**W= -10.445*** **
Inadequate availability of cost	1.95	I	2.25	I			
Inadequate subsidies for organic cultivation of crops	1.92	II	2.22	II			
Initial yield loss	1.75	III	2.15	III			
Initial low price for the organic produce	1.64	IV	1.85	IV			
Higher cost involved in the certification charge	1.63	V	1.70	V			
Infrastructural constraints					**2.650**	**0.642**	**W= -10.638*** **
Lack of specialized institutes for doing research on organic farming	1.47	III	1.62	II			
Lack of training institutions	1.80	I	1.63	I			
Lack of indigenous certification agencies	1.7	II	1.6	III			

Table (4.4) Constraints Faced by Farmer Regarding Adopting of Organic Farming (Continued)

Constraints	Organic		Conventional		Total Mean Score	Std. Deviation	Wilcoxon rank sum test
	Mean Score	Rank	Mean Score	Rank			
Technological constraints					**3.186**	**0.522**	**W= -10.658*** **
Lack of timely research information about organic farming technologies	2.23	I	2.13	I			
Inadequate availability or shortage of quality disease free seeds/planting materials	2.23	II	2.00	II			
Non availability of organic inputs in time	1.33	III	1.20	III			
Lack of standard package of practices for practicing organic farming	1.3	IV	1.20	IV			
Situational/environmental constraints					**2.565**	**0.427**	**W= -10.638*** **
Non availability of labour	2.21	III	2.53	II			
Heavy incidence of pests and diseases	2.46	I	2.53	I			
Requirement of long period to get positive responses from the ecosystem	2.26	II	2.43	III			
Erratic onset of monsoon rain	2.00	IV	2.40	IV			
Marketing constraints					**2.860**	**0.618**	**W= -10.622*** **
Lack of reliable market information, regulation and distribution channels	1.23	VII	1.26	VI			
High transportation cost	2.28	II	2.12	II			
Lack of storage facilities	1.23	VI	1.27	V			
Lack of farming cooperatives for marketing	1.26	V	1.27	IV			
Interference of middlemen in the market	1.26	IV	1.27	III			
Lack of awareness about grading and different grades	1.28	III	1.26	VII			
Lack of specialized markets for organic produce	2.37	I	2.72	I			

Source: Survey Data (2020)

Each of the dimensions of constraints mentioned above have been studied and described in detail by describing the specific constraints under each dimension, based on the perception of farmers of severity of constraints to organic farming (see Table 4.4).

Economic Constraints

Data regarding economic constraints faced by the farmers is presented in the Table 4.4. On the basis of mean score, economic constraints in the order of severity were inadequate availability of for the famers (2.933), initial yield loss (1.75), credit initial low price (1.64), higher cost involved in the certification charges (1.63) and inadequate subsidies for organic cultivation of crops (1.92).

Majority of the respondents (150 persons) expressed Inadequate availability of credit as the most severe constraint having mean score of organic (1.95) and conventional (2.25). This is because the farmers suffer from inadequate subsidies for organic cultivation of crops, low yield and in addition, they don't have certification restricting them from getting premium prices for their produce. The farmers face difficulty in getting credit from any institute and for their credit needs, they mostly depend on the money lenders. Most of the respondents were not aware of the certification process and they also find it time consuming. According to the wilcoxon rank sum test, a two -tailed significance of p=0.000. The test results CW=-10.445, p<0.01) indicated that the organic farming practices and economic constraints were different at 1% level.

Infrastructural Constraints

Data regarding infrastructural constraints faced by the organic farmers is presented in the Table 4.4. On the basis of mean score, infrastructural constraints in the order of severity were lack of training institutions for organic (1.8) and conventional (1.63), lack of indigenous certification agencies organic (1.7) and conventional (1.6) and lack of specialized institutes for doing research on organic farming for organic (1.47) and conventional (1.62).

Majority of the respondents expressed lack of training institutions as the severe constraint having mean score of 1.8 (organic) and 1.63 (conventional).

Lack of indigenous certification agencies was expressed as severe constraint by farmers and lack of specialized institutes for doing research on organic farming was expressed as least severe constraint by farmers. A few of the farmers had attended trainings related to the field of agriculture that is because of the lack of training institutions. Farmers wanted to update and upgrade their knowledge on organic farming and learn new methods and techniques related to it. The results from the wilcoxon rank sum test, a two-tailed significance of p=0.000. The test results (w=-9.931, p<0.01) indicated that the organic farming practices and infrastructural constraints were significantly different at 1% level.

Technological Constraints

Data regarding technological constraints faced by the organic farmers is presented in the Table 4.4. On the basis of mean score, technological constraints in the order of severity were lack of timely research information about organic farming technologies for organic (2.23) and conventional (2.13), inadequate availability or shortage of quality disease free seeds/planting materials for organic (2.23) and conventional (2.0), non-availability of organic inputs in time for organic (1.33) and conventional (1.2) and lack of standard package of practices for practicing organic farming for organic (1.3) and conventional (1.2).

Majority of the respondents expressed lack of timely research information about organic farming technologies as the severe constraint having mean score for organic (2.23) and conventional (2.13). inadequate availability or shortage of quality disease free seeds/planting materials was expressed as severe constraint by farmers non availability of organic inputs in time was expressed as least severe constraint by farmers. Majority of the respondents expressed lack of standard package of practices for practicing organic farming as the least severe constraint having mean score for organic (1.3) and conventional (1.2). Quality seeds were not easily available to the farmers so they mostly used locally available materials.

Information related to organic farming technologies were not provided timely to farmers may be due to the lack of trainings. Only few farmers had attended trainings and most of them were not exposed to any training related to organic farming. Organic inputs such as farmyard manure were easily available to most farmers as they possess livestock. The results from the wilcoxon rank sum test, a two-tailed significance of $p=0.000$. The test results ($w=-10.658$, $p<0.01$) indicated that the organic farming practices and infrastructural constraints were significantly different at 1% level.

Situational/Environmental Constraints

Data regarding situational/environmental constraints faced by the organic farmers is presented in the Table (4.4). On the basis of mean score, situational/ environmental constraints in the order of severity were heavy incidence of pests and diseases for organic (2.46) and conventional (2.53), requirement of long period to get positive responses from the ecosystem for organic (2.26) and conventional (2.43), erratic onset of monsoon rain for organic (2.0) and conventional (2.4) and non-availability of labour for organic (2.21) and conventional (2.53).

Majority of the respondents expressed heavy incidence of pests and diseases as the most severe constraint having mean score for organic (2.46) and conventional (2.53). Heavy incidence of pests and diseases was expressed as severe constraint by respondents and requirement of long period to get positive responses from the ecosystem was expressed as least severe constraint by respondents. Majority of the farmers expressed Erratic onset of monsoon rain as the least severe constraint having mean score.

Farmers reported that the yield suffer from pest disease infestation was the most severe constraints faced by respondents, since the farmers had been practicing organic farming by default, so they do not have to wait long to get positive responses from the ecosystem. Most farmers and their family members work themselves on their fields and only few of them were working as labours on others field. The results from the wilcoxon rank sum test, a two-tailed significance of p=0.000. The test results (w=-10.638, p<0.01) indicated that the organic farming practices and infrastructural constraints were significantly different at 1% level.

Marketing Constraints

Data regarding marketing constraints faced by the organic farmers is presented in the Table (4.4). On the basis of mean score, marketing constraints in the order of severity were lack of specialized markets for organic produce for organic (2.37) and conventional (2.72), high transportation cost for organic (2.28) and conventional (2.12), lack of reliable market information, regulation and distribution channels for organic (1.23) and conventional (1.26), lack of farming cooperatives for marketing for organic (1.26) and conventional (1.27), interference of middlemen in the market for organic (1.26) and conventional (1.27), lack of awareness about grading and different grades for organic (1.28) and conventional (1.26) and lack of storage facilities for organic (1.23) and conventional (1.27).

Majority of the respondents expressed lack of specialized markets for organic produce as the most severe constraint having mean score. High transportation cost and lack of reliable market information, regulation and distribution channels were expressed as most severe constraints by farmers. The results from the Wilcoxon rank sum test, a two-tailed significance of p=0.000. The test results (w=-10.622, p<0.01) indicated that the organic farming practices and infrastructural constraints were significantly different at 1% level.

4.5 Comparison between Different Domains of Constraints

This section compares among the constraint domains. Table 4.5 shows the mean score of different domains calculated from 150 organic farmers along with the ranks. It is seen from the table that farmers perceived highest levels of constraints on technological constraints aspect with mean score (3.21), economic constraints mean score (2.93), marketing constraint mean score (2.87), infrastructural constraints mean score(2.65) and Situational/environmental constraints mean score (2.57).

Table (4.5) Comparison between Different Domains of Constraints

Constraints Domains	Mean Score	Rank	Mean Rank	Kruskal Wallis Test
Economic Constraints	2.93	II	88.21	H=7.447
Infrastructural and situational	2.65	IV	62.79	
Technological constraints	3.21	I	73.73	
Situational/environmental constraints	2.57	V	67.21	
Marketing constraints	2.87	III	85.45	

Source: Survey Data (2020)

According to the Table (4.5), the Kruskal-Walli's test value (H = 7.447, p>0.05) concluded that the extents of perception on different domains are not statistically different. The major constrains faced by the farmers are less price of products compared to the cost, extra cost for transportation and packaging, high cost of commercial organic inputs, less availability of organic inputs, lack of marketing and exporting channel, lack of knowledge about organic practice and low awareness about certain schemes, problem in disease and pest management in organic crops and problem in management of both organic and inorganic system, support from govt. or NGO for marketing/reluctant government, lack of expert advice in hour of need, no funding support (Govt. or NGO), lack of training facilities, lack of certification facility for expanding the products for distant market and price fluctuation. According to the Chi-

Square test, the major constraints such as, economic constraints infrastructural constraints, technological constraints, situational/environmental constraints and, marketing constraints are significant effect of the organic farming at 10% level.

4.6 Logistic Regression for Adoption of Organic Farming

The logit specification is based on the probability of a farmer adopting organic farming. Here, the 16 independent variables used in the model include socio-economic variables (age, education, family size, farm size, experience, income), attitude and behaviors factors (behaviors using on pesticides, awareness farmers and attitude farming and constraints (economic constraints, infrastructure constraints, technological constraints, situational/environmental constraints and marketing constraints).

The model is specified as follow:

$$Logit(P_i) = \beta_0 + \beta_1 AGE + \beta_2\, EXP + \beta_3 EDU + \beta_4 FSIZE + \beta_5 Family\ Size + \beta_6 Income + \beta_7 BP + \beta_8 AF + \beta_9 Attitude\ Farming + \beta_{10} VEG + \beta_{11} EC + +\beta_{13} IC + \beta_{14} TC + \beta_{15} SC + \beta_{16} MC + \cdots + \varepsilon_i$$

where:

P_i	=	Adoption of organic farming
AGE	=	Age of farmer
EXP	=	Farm Experience (years)
EDU	=	Level of Education
FSIZE	=	Farm size (acre)/Land Holding
Income	=	Monthly Income
BP	=	Behaviors using on pesticides
AF	=	Awareness of organic farmers
VEG	=	Cultivating vegetables as the main crop
EC	=	Economic Constraints
IC	=	Infrastructural and situational Constraints
TC	=	Technological constraints
SC	=	Situational Constraints
MC	=	Marketing Constraints
ε_i	=	Error term

The results of logistic regression of organic farming are shown in Table (4.6).

Table (4.6) Logistic Regression of Organic Farming Practices

Variables		Coefficient	Standard. Error	Odd Ratio (OR)
Socio-Economic Characteristic	Age of farmer	1.508	0.988	4.516
	Education level	0.622	0.811	1.863
	Vegetable Cultivation	-4.522*	2.444	0.011
	Family Size	1.684**	0.673	5.389
	Farm Size	2.684*	1.601	14.650
	Farm Experience	0.052	0.051	1.054
	Income	-0.751	0.955	0.472
Attitude and Behavior	Behaviors using on pesticides	-1.489	1.803	0.226
	Awareness Farming	4.703**	1.519	110.276
	Attitude Farming	0.058	1.207	1.060
Constraints	Economic Constraints	-0.170	0.728	0.843
	Infrastructure Constraints	-2.590**	1.069	0.075
	Technological Constraints	3.713**	1.554	40.990
	Situational/ Environmental Constraints	-3.854**	1.461	0.021
	Marketing Constraints	-1.603**	0.805	0.201
	Constant	-3.826	8.005	0.022
-2 LOG likelihood (-2LL) = 56.722, LR Chi-Square = 62.017(p<0.000), Pseudo R^2 = (COX & Snell R-Square = 0.411, Nagelkerke R-Square = 0.645)				
Note: ***Significant at 1% level of Probability, ** Significant at 5%levelof Probability, * Significant at 10% level of Probability.				
Number of Observation =150				

Source: Survey Data (2020)

According to the Table (4.6), the obtained log likelihood ratio is 56.722 and the chi-square statistic for the goodness of fit of the model is 62.017, statistically significant at the 1% level. The pseudo R^2 value of the model is 0.41. Thus, the overall model is significant and the explanatory variables used in the model are collectively able to explain the farmers decisions regarding the adoption of organic farming.

According to the results of table (4.6), 8 variables were found to be statistically significant: with eight based around socio economic factors (experience, farm size, family size and Income), three variables represent attitude and behavior factors (i.e. behaviors using on pesticides, awareness farming, attitude of farming) and five are constraints (economic constraints, infrastructure constraints, technological constraints, situational/environmental constraints and marketing constraints). The other variables included in the model are not statistically significant.

It was found that cultivating vegetables as the main crop (VEG) has a negative impact on organic farming. The negative sign for VEG suggests that less cultivating vegetables as the main crop people are less likely to grow organic farming compared to other crop with significant level at 10%. Because to grow the other crops are more income than vegetables to adopt organic farming by the perception of farmers. Moreover, family size has a positive impact on organic farming. It is found that the more family size are nearly 6 times more likely at 5% significance level to grow organic farming practices compared to less family size. According to the farm size, it was found that the odd ratio of more farm size tend to take up organic farming practices are increased by 14.650 compared less farm size with significant level at 1%. And then, awareness and attitude farming had positive coefficient values. This suggests that organic farmers awareness and attitude of the farm increased by 110.276 and 1.060 respectively. It is also found that organic farmers awareness and organic farmers adoption are positively relationship with significantly at 5% level.

Among constraints, (technological constraints, infrastructure constraints, situational/ environmental constraints and marketing constraints) had significant negative coefficient value at 5% level. Technological constraints have significant positive coefficient value at 5% level. To adopt organic farming, the farmers have technological difficulties such as the availability of quality seeds, biopesticide, packaging practices, provision of organic manure and trainings.

CHAPTER V
CONCLUSION

This study is conducted with the aim of analyzing the constraints face by farmer practicing organic farming in Yangon region. On the analysis of constraints face by farmers practicing organic farming are discussed in this chapter. Some recommendations are made based on findings and discussion along with a conclusion of the chapter**.**

5.1 Findings and Discussions

This study was undertaken regarding the constraints faced by farmer prating organic farming in Yangon Region. The sample constituted 96 organic farmer and 54 conventional farmers. Thus, a total number of respondents for present study were 150. Data were collected from January 2020 to February and analyzed using descriptive statistics, wilcoxon rank, sum test, kruskal wallis H- test and logistic regression.

According to the results of descriptive statistics, there are 6 variables, age, experience, education, farm size, family size and monthly income. Due to the analysis, most of the respondent's age were between 30 and 60 and most.10 years to 20 years of experiences were found in most. For education, the majority of respondents were primary level. Most farmers owned less than equal 1.5 acre and the rest of the farmers owned more than 1.5 acres. Among all respondents, 4-6 family size were most found. The highest monthly income of farmers in the study was 300000 kyat. Most of the respondents' monthly incomes were between range of 150000 to 300000 kyats.

Regarding Chi-square test there are relationship between the organic and conventional farmers, a statistically significant difference is found between the two groups for experience, education, income, awareness of farmers, behaviors using on pesticide, economic constraints, infrastructural constraints, technological constraints and marketing constraints. From the results of Wilcoxon rank sum test, the different between organic farming practices and economic constraints, infrastructural constrains, technological constraints, situational/environmental constraints and marketing constraints are statistically significant at 1 %level. And then, the Kruskal- wallis test concluded that the extents of perception on different domain are not statistically different.

And then, it has been observed that the most import economic constrains faced by the farmers is high cost involved in the certification charge. This is due to lack of marketing and distribution network of bio-fertilizers and bio pesticides are not so popular and also not readily available. The most important infrastructural and situational constraints faced by the farmers lack of training institutions.

Similarly, Vikas Raghuvanshi and Dr.syed H mazhar (2019) found that major constraints expressed by the respondent in adopting of organic farming practices of soybean crop were lack of capital, lack of bulk local demand for organic soybean, long process of organic manure preparation, lack of knowledge about bio-pesticides, application time, method and proper dose, lack of published information regarding various practices of organic soybean farming.

Farmers sell their products to middle men and get lower price for their products. In respect of the transfer of technology constraints, the respondents faced major constraints such as lack of published information regarding various practices of organic farming, lack of timely and appropriate transfer of organic growing practices by extension organization.

Lack of coordination between private agencies and various service, supply and marketing agencies/ organic promoting organizations. Most similar results were reported by Baker (2012), reported that low production of organic produce, lack of published information regarding various practices of organic farming, lack of timely and appropriate transfer of organic growing practices by extension organization.

According to the logistic regression, socio-economic factors such as VEG, farm size and family size and attitude/behavior factors such as organic farming practice, awareness farming and domain constraints such as infrastructure constraints, technological constraints, situational environmental constraint and marketing constraints were found to be statistically significant. This most suggested that experience was an important factor that positively influenced adoption of organic farming. This result is also in line with qualitative findings, which suggested the same response that experience and knowledge become essential in adopting organic practices. Farmers agreed that experience contributes to greater confidence in applying organic methods. This finding is also supported by Padel (2001) and Lappie (2010) who suggested that the increased stills and knowledge that come with experience can be helpful in supporting conversion.

Farmers who won their farm size are found to be more likely to adopt organic production. This result is similar to finding in Nepal and Bangladesh, where form size is the most important determinant when switching to organic farming. (Kark & Dhakals 2009, Sarker & Itohara 2008). In these finding, farm size determines the economic status of an individual and farmers who won larger farm generally have more capital to support conversion and pay for the certification. Thus, the lager the farm, the more likely it is to be organic. This study also showed that family size had a positive impact on adoption in the model, which suggests that these organizations are mainly for organic farmers. This result is similar to findings (Kark, Schleencecker & Humm 2011) this contradicts several studies where the family size of organizations increases the likelihood of adopting organic farming. This model also contradicts the results where organic farmers claimed that support from others was very important in organic adoption. Support from sources, such as farmers groups many therefore be important in encouraging conversion to organic farming.

The major constraints faced by the farmers are less price of products compared to the cost, extra cost for transportation and packaging, high cost of commercial organic inputs, less availability of organic inputs, lack of marketing, lack of knowledge about organic practice and low awareness about certain schemes, problem in disease and pest management in organic crops and problem in management of both organic and inorganic system. Among different domain constraints, it is seen that economic and marketing constraints are the most severe followed by infrastructural and situational environmental constraints.

5.2 Recommendations

The results of the present study demonstrate that farmers' perception of Organic Farming is a very important factor in decisions to adopt organic farming. Farmers perceive that organic farming systems lead to improved income, improved supply of safe food, and reduced environmental pollution. These beliefs are based on the logic that expensive agro-chemicals are not used in organic farming; consequently, the cost of production is relatively low and the price premium attained by organic produce leads to increased profit. Thus, it is essential to make farmers aware of the benefits of organic farming via intensive education campaigns. The present results also revealed that both public and NGO extension services are important in terms of farmers' decisions regarding the adoption of organic farming. Thus, it can be concluded that the adoption of organic farming systems is an information-intensive process and that there are likely to be opportunities for providing extension programs and localized information to increase the use of organic farming by farmers. Finally, to rapidly increase the rate of adoption of organic farming, it is essential for the government to formulate a National Organic Farming Promotion Policy, taking into account the determinants found to be influential in the present study.

Major constraints expressed by the respondent in adoption of organic farming practices of crop were lack of capital, lack of bulk local demand for organic, long process of organic manure preparation, lack of knowledge about bio-pesticides, application time, method and proper dose, lack of published information regarding various practices of organic farming. The field of training which must be offered by relevant organizations to the farmers to develop organic farming practices in the future. All vegetable farmers need some more market incentives to promote organic vegetable farms in the study area. The study revealed that economic constraints were perceived highest followed by marketing constraints, infrastructural and situational/environmental constraints. It is suggested that the government should establish organic input agencies, assured market for organic produce, setting up of policies to assure remunerative price to improve organic cultivation in Myanmar.

Majority of the respondents had lack of knowledge on the bio-control agents and no proper orientation by way of training have been given for their benefit. Organic farming depends more on the locally available practices with the use of locally and freely available raw materials and inputs. Organic approaches took greater gestation periods and with hidden benefits. Therefore, the yield of crops may reduce and given a great economic to them. There are not having conviction about the organic farming practices. Organic farming inputs like organic manure, green manure, green leaf manure is required in large quantities, when compared to chemical fertilizers and this creates the problem of difficulty in using organic manure by the trained organic farmers. The information achieved need to educate local farmers, by increasing awareness of the value of the organic farming for the human health and the local ecosystem.

Financial aids and loans from the relevant organizations such as government, NGOs and INGOs are required to resolve one of the constraints, the lack of capital. Provision of organic manure and trainings for the farmers to learn how to prepare and utilize organic manure and bio-pesticides are needed from same relevant organizations mentioned above. Information about various practices of organic farming should be distributed to farmers using multimedia including TV and radio programs, journals and pamphlets.

5.3 Need to Further Study

This study recommends that more research should be carried out on would make policy makers awareness of the importance of accurate and reliable data for the current agricultural practices and future plan of the organic farming in decision-making. This is the empirical basis of farmer’s constraints, awareness and attitude of organic farming on the influence of policy on future development of the organic farm production and organic food marketing for the environmental concerned, food safety for the local consumers as well as foreign exchange earnings for the national economy.

Therefore, it can be used as a decision tool for policy members. These data can be supplementary for the transformation from conventional farming to organic farming in Myanmar. This information achieved would be important to educate local farmers, by increasing awareness of the value of the organic farming for the human health and the local ecosystem. Nevertheless, more detail studies for farmer's constraints, awareness and attitude of organic farming in different areas and this would be prominently needed for the future organic farming development designed for Myanmar sustainable agriculture and food safety for the future endeavors.

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APPENDIX A

Organic_F = .00

Statistics[a]

		Age	Gender	EDU	Experience	Family_Size	Farm_size	Annual_Income
N	Valid	54	54	54	54	54	54	54
	Missing	0	0	0	0	0	0	0
Mean		45.72	1.20	3.96	15.07	2.0370	.79	2249815
Std. Deviation		12.642	.407	2.518	8.049	.77613	.416	1201261
Variance		159.827	.165	6.338	64.787	.602	.173	1.4E+12
Minimum		20	1	0	3	1.00	0	1300000
Maximum		79	2	10	30	3.00	3	7000000

a. Organic_F = .00

Organic_F = 1.00

Statistics[a]

		Age	Gender	EDU	Experience	Family_Size	Farm_size	Annual_Income
N	Valid	96	96	96	96	96	96	96
	Missing	0	0	0	0	0	0	0
Mean		45.49	1.14	5.36	12.66	2.1458	.91	2186771
Std. Deviation		13.643	.344	2.870	7.896	.78108	.584	972765.4
Variance		186.126	.118	8.234	62.354	.610	.341	9.5E+11
Minimum		21	1	0	4	1.00	0	1250000
Maximum		84	2	10	50	3.00	3	5340000

a. Organic_F = 1.00

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.230[a]	10	.093
Likelihood Ratio	18.599	10	.046
Linear-by-Linear Association	2.784	1	.095
N of Valid Cases	150		

a. 14 cells (63.6%) have expected count less than 5. The minimum expected count is .36.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.189[a]	17	.143
Likelihood Ratio	29.088	17	.034
Linear-by-Linear Association	1.249	1	.264
N of Valid Cases	150		

a. 27 cells (75.0%) have expected count less than 5. The minimum expected count is .36.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.115[a]	13	.300
Likelihood Ratio	16.978	13	.200
Linear-by-Linear Association	.184	1	.668
N of Valid Cases	150		

a. 19 cells (67.9%) have expected count less than 5. The minimum expected count is .36.

Logistic Regression

Dependent Variable Encoding

Original Value	Internal Value
.00	0
1.00	1

Block 0: Beginning Block

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	1.355	.229	35.002	1	.000	3.875

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Age1	.035	1	.852
		EDU1	3.292	1	.070
		pRACTISEsYSTEM	1.521	1	.217
		vec	4.237	1	.040
		Family_Size	1.152	1	.283
		Farm_size	.694	1	.405
		OFPractices	.000	1	1.000
		AWfarming	12.419	1	.000
		ATDFarming	.017	1	.895
		EConst	.003	1	.959
		IConst	1.707	1	.191
		TConst	5.068	1	.024
		SEConst	12.790	1	.000
		MConst	3.815	1	.051
		Experience	.688	1	.407
		Income	.168	1	.682
	Overall Statistics		48.352	16	.000

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	62.017	16	.000
	Block	62.017	16	.000
	Model	62.017	16	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	56.722[a]	.411	.645

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age1	1.508	.988	2.328	1	.127	4.516
	EDU1	.622	.811	.589	1	.443	1.863
	pRACTISEsYSTEM	.023	.824	.001	1	.978	1.023
	vec	-4.522	2.444	3.423	1	.064	.011
	Family_Size	1.684	.673	6.270	1	.012	5.389
	Farm_size	2.684	1.601	2.810	1	.094	14.650
	OFPractices	-1.489	1.803	.682	1	.409	.226
	AWfarming	4.703	1.519	9.585	1	.002	110.276
	ATDFarming	.058	1.207	.002	1	.962	1.060
	EConst	-.170	.728	.055	1	.815	.843
	IConst	-2.590	1.069	5.873	1	.015	.075
	TConst	3.713	1.554	5.706	1	.017	40.990
	SEConst	-3.854	1.461	6.955	1	.008	.021
	MConst	-1.603	.805	3.970	1	.046	.201
	Experience	.052	.051	1.045	1	.307	1.054
	Income	-.751	.955	.618	1	.432	.472
	Constant	-3.826	8.005	.229	1	.633	.022

a. Variable(s) entered on step 1: Age1, EDU1, pRACTISEsYSTEM, vec, Family_Size, Farm_size, OFPractices, AWfarming, ATDFarming, EConst, IConst, TConst, SEConst, MConst, Experience, Income.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Group	150	1.4000	.49154	1.00	2.00
EConst	150	2.9333	.65517	1.00	4.50

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
EConst - Group	Negative Ranks	0[a]	.00	.00
	Positive Ranks	144[b]	72.50	10440.00
	Ties	6[c]		
	Total	150		

a. EConst < Group

b. EConst > Group

c. EConst = Group

Test Statistics[a]

	EConst - Group
Z	-10.445[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics[a]

	IConst - Group
Z	-9.931[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics[a]

	TConst - Group
Z	-10.658[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics[a]

	SEConst - Group
Z	-10.638[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics[a]

	MConst - Group
Z	-10.622[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
EConst	150	2.9333	.65517	1.00	4.50
IConst	150	2.6500	.64180	1.00	5.00
TConst	150	3.2067	.36723	2.00	4.00
SEConst	150	2.5657	.42709	1.71	4.29
MConst	150	2.8733	.45148	2.00	4.33
Group	150	1.4000	.49154	1.00	2.00

Ranks

	Group	N	Mean Rank
EConst	1.00	90	67.68
	2.00	60	87.23
	Total	150	
IConst	1.00	90	76.58
	2.00	60	73.88
	Total	150	
TConst	1.00	90	69.53
	2.00	60	84.45
	Total	150	
SEConst	1.00	90	75.03
	2.00	60	76.20
	Total	150	
MConst	1.00	90	81.97
	2.00	60	65.80
	Total	150	

Test Statistics[a,b]

	EConst	IConst	TConst	SEConst	MConst
Chi-Square	7.512	.152	4.566	.028	5.374
df	1	1	1	1	1
Asymp. Sig.	.006	.697	.033	.868	.020

a. Kruskal Wallis Test

b. Grouping Variable: Group

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EConst	150	1.00	4.50	2.8933	.72082
IConst	150	1.00	5.00	2.6500	.64180
TConst	150	1.00	5.00	3.1867	.52231
SEConst	150	1.71	4.29	2.5657	.42709
MConst	150	1.00	5.00	2.8600	.61823
Valid N (listwise)	150				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AWF1	150	1	5	3.70	.702
AWF2	150	1	5	3.92	.871
AWF3	150	1	5	3.85	.653
AWF4	150	1	5	3.85	.588
AWF5	150	1	5	3.84	.580
AWF6	150	1	5	3.38	.682
AWF7	150	1	5	3.58	.678
AWF8	150	1	5	3.74	.584
ATD1	150	1	5	3.64	.668
ATD2	150	1	5	2.99	.596
ATD3	150	1	5	3.20	.676
ATD4	150	1	5	3.86	.568
ATD5	150	1	5	2.92	.619
ATD6	150	1	5	3.20	.655
ATD7	150	1	5	3.19	.631
ATD8	150	2	4	3.07	.368
OFP1	150	1	5	3.57	.886
OFP2	150	1	4	3.75	.604
OFP3	150	1	5	2.16	.635
OFP4	150	1	5	1.91	.759
OFP5	150	1	5	4.29	.747
Valid N (listwise)	150				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EConst	150	1.00	4.50	2.8933	.72082
IConst	150	1.00	5.00	2.6500	.64180
TConst	150	1.00	5.00	3.1867	.52231
SEConst	150	1.71	4.29	2.5657	.42709
MConst	150	1.00	5.00	2.8600	.61823
Valid N (listwise)	150				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
OrganicFP	150	1.00	5.00	3.1347	.51108
AWfarming	150	1.00	5.00	3.7458	.55344
ATDFarming	150	1.00	5.00	3.2533	.43252
Valid N (listwise)	150				

Ranks

	Group	N	Mean Rank
Organic_F	1.00	21	88.21
	2.00	17	62.79
	3.00	73	73.73
	4.00	17	67.21
	5.00	22	85.45
	Total	150	

Test Statistics[a,b]

	Organic_F
Chi-Square	7.447
df	4
Asymp. Sig.	.114

a. Kruskal Wallis Test

b. Grouping Variable: Group

Crosstab

Count

		EConst												Total
		1.00	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	
Organic_F	.00	7	3	0	7	4	15	4	7	0	5	1	1	54
	1.00	0	12	4	21	7	22	1	13	9	7	0	0	96
Total		7	15	4	28	11	37	5	20	9	12	1	1	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.159[a]	11	.001
Likelihood Ratio	37.939	11	.000
Linear-by-Linear Association	.678	1	.410
N of Valid Cases	150		

a. 13 cells (54.2%) have expected count less than 5. The minimum expected count is .36.

Crosstab

Count

		IConst							Total
		1.00	2.00	2.50	3.00	3.50	4.00	5.00	
Organic_F	.00	4	13	12	18	1	3	3	54
	1.00	0	21	35	35	3	2	0	96
Total		4	34	47	53	4	5	3	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.309[a]	6	.012
Likelihood Ratio	18.238	6	.006
Linear-by-Linear Association	.138	1	.711
N of Valid Cases	150		

a. 8 cells (57.1%) have expected count less than 5. The minimum expected count is 1.08.

Crosstab

Count

		TConst											Total
		1.00	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	5.00	
Organic_F	.00	3	3	2	0	3	11	16	9	3	2	2	54
	1.00	0	0	0	4	10	13	41	17	11	0	0	96
Total		3	3	2	4	13	24	57	26	14	2	2	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.400[a]	10	.002
Likelihood Ratio	33.114	10	.000
Linear-by-Linear Association	2.225	1	.136
N of Valid Cases	150		

a. 13 cells (59.1%) have expected count less than 5. The minimum expected count is .72.

Crosstab

Count

		SEConst														Total
		1.71	2.14	2.29	2.43	2.57	2.71	2.86	3.00	3.14	3.29	3.43	3.86	4.14	4.29	
Organic_F	.00	3	3	4	17	7	1	2	7	3	2	2	1	1	1	54
	1.00	8	4	5	41	14	1	9	10	4	0	0	0	0	0	96
Total		11	7	9	58	21	2	11	17	7	2	2	1	1	1	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.447[a]	13	.226
Likelihood Ratio	18.506	13	.139
Linear-by-Linear Association	5.754	1	.016
N of Valid Cases	150		

a. 19 cells (67.9%) have expected count less than 5. The minimum expected count is .36.

Crosstab

Count

		MConst										Total
		1.00	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	5.00	
Organic_F	.00	4	1	10	16	8	4	4	3	1	3	54
	1.00	0	1	15	36	29	7	5	3	0	0	96
Total		4	2	25	52	37	11	9	6	1	3	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.293[a]	9	.023
Likelihood Ratio	21.672	9	.010
Linear-by-Linear Association	.060	1	.806
N of Valid Cases	150		

a. 12 cells (60.0%) have expected count less than 5. The minimum expected count is .36.

APPENDIX B

The Constraints Faced by Farmers Practicing Organic Farming in Hmaw Bi Township, Yangon Region

Village: ____________ Village Tract :______________Township: ____________

Part I

1. Demographic Information of Household Head

1.Name:............................	5.No. of children:	
2.Sex: □ Male □ Female	6.Family size:	
3.Age:.................................	7.No. of students:	
4.Education Level:............ (Schooling Years)	8.Type of Major occupation:	
	9.Other occupation:	
	10.Farm size : Own	Lel( ) Yar( ) Kaing( ) acres
	: Rent	Lel( ) Yar( ) Kaing( ) acres

2. Assets of Farm Household

Household Assets				Farm Assets			
Kind	**No.**	**Kind**	**No.**	**Kind**	**No.**	**Kind**	**No.**
TV		Well		Tractor		others	
EVD		Others		Plough Harrow			
Motorcycle				Water pump			
Car				Sprayers			

3. Vegetable Cultivating (VEC)

Types of Crops	Cultivated Area/ Plant No.	Unit	Yield/ Acre	Total production	Price

5. Sources of income (for Head and all household members) (Profit)

Type of Source	Item	Average Profit/yr	Remark
Crop production			
Animal husbandry	Cattle		
	Pig		
	Poultry		
	Fishery		
	Others		
Non-farm activities (own investment)	Petty trade		
	Self-employed		
	Handicraft		
	Home based work		
	Others		
Wage labour:	Agriculture		
	Non-agriculture		
Pension			
Remittance			
Others			

Perceiving of Organic farming, environmental conservation

6. Are You Organic Farmer? (1=yes,0=No)

(1) Yes (0) No

7. Perceive of organic farming? (1=yes,0=No)

(1) Yes (0) No

8. Information for organic farming? (1=yes,0=No)

(1) Yes (0) No

9. Source of information for Organic Farming.

1. Radio FM, 2. TV, 3. Journals, 4. Friend,
5. Government organization, 6. NGO, 7. Company

10. Do you borrowed money from Microfinance in your village?

1. Yes 0. No

11. If yes, please mention the name of microfinance.

…………………………………………………………

12. How many percent of total loan used for organic farming?

………… %

Part II

I. Awareness of Famer

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	You think the use of synthetic chemical in agriculture has effect on the environment					
2	You have heard or read about organic farming					
3	You know the term organic farming					
4	You have any knowledge of chemical residues in vegetables and fruits you grown					
5	You know the existence of soil conservation practices					
6	Organic Material are essential for crop and Profit of Production					
7	Organic farming can reduce environmental pollution					
8	Organic farming effective natural environment.					

II. Attitude of Famer

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	You want to grow organic farming					
2	You used physical soil conservation practice eg, terrace, counter bunds, grass strip, soil and stone bund etc...					
3	You used the soil conservation practices by using organic materials (Cow dung, Em, Rhizobiu, farm yard manure…..)					
4	You want to receive the training related with organic farming					
5	Organic farming should use sustain to income.					
6	Organic farming should use to maintain nature resource for future generation.					
7	Environmental conservation is needed to reduce impact of climate change.					
8	Organic farming should use for protection of harmful effects of farmer					

III. Behaviors using on pesticides

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	You used of pesticides in your farm land					
2	You wear PPE when you use the pesticides					
3	You keep the pesticides out of reach of children and other family member					
4	You wash the materials and hands after using the pesticides					

Part III

Constraints for Organic Farming by Famer

1. Economic constraints

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a	Inadequate availability of credit					
b	Inadequate subsidies for organic cultivation of crops					
c	Initial yield loss					
d	Initial low price for the organic produce					
e	Higher cost involved in the certification charge					

2. Infrastructural constraints

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Lack of training institutions					
2	Lack of indigenous certification agencies					
3	Lack of specialized institutes for doing research on organic farming					

3. Technological constraints

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Lack of timely research information about organic farming technologies					
2	Inadequate availability or shortage of quality disease free seeds/planting materials					
3	Non availability of organic inputs in time					
4	Lack of standard package of practices for practicing organic farming					

4. Situational/environmental constraints

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Non availability of labour					
2	Heavy incidence of pests and diseases					
3	Requirement of long period to get positive responses from the ecosystem					
4	Erratic onset of monsoon rain					

5. Marketing constraints

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Lack of reliable market information, regulation and distribution channels					
2	High transportation cost					
3	Lack of specialized markets for organic produce					
4	Lack of farming cooperatives for marketing					
5	Interference of middlemen in the market					
6	Lack of awareness about grading and different grades					
7	Lack of storage facilities					