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THESIS

FARMERS' ATTITUDES TOWARDS MONSOON GROUNDNUT PRODUCTION IN PAKOKKU DISTRICT, DRY ZONE AREA, MYANMAR

MYINT MYINT AYE

A Thesis Submitted in Partial Fulfillment of
the Requirements for the Degree of
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The objectives of this research were mainly to study four main issues as follows; demographic, socio-economic and technological factors of farmers involved in the area extension of monsoon groundnut, the degree of farmers' attitudes towards monsoon groundnut production, the relationship between independent variables and farmers' attitudes, and the problems and suggestions of the farmers. An interview schedule was employed to collect data from 133 farmers, selected by simple random sampling methods. Data were analyzed by using descriptive and inferential statistics to test hypotheses at the 0.05 significance level.

The results revealed that the majority of farmers had grade 4 or less educational level and were over 40 years old with 20.07 years of average experience. The average total income was 913,722.74 kyats per year and 29,932.33 kyats per acre of groundnut income with 3.02 acres of average farm size. All respondents were land owners. The majority of farmers had more than one family labourer with off-farm employment in addition to farming and they obtained credit. Most farmers were at the medium level of participation in extension activities as well as technological assistances from extension workers and they obtained the information from media, other farmers and agro-chemical companies. The majority of farmers with a high level of knowledge used the inter-cropping system in groundnut cultivation. The overall degree of farmers' attitudes towards monsoon groundnut production was at medium level.

Concerning hypothesis testing, age was negatively related and level of education, credit and production system were positively related to the farmers' attitudes, especially total income of farm family, farm size, groundnut income, off-farm employment and participation in extension activities were significantly related to the farmers' attitudes towards monsoon groundnut production. The important main problems faced by farmers were: "lack of timely cultivation with the onset of monsoon rain", "lack of investment", "shortage of drought tolerant variety", "lack of timely inter-cultivation weeding", and "shortage of organic manure.

Based on the findings, some recommendations are proposed as follows; to find out the suitable sowing time for monsoon groundnut, to increase the amount of credit for groundnut farmers, to improve the distribution of drought tolerant varieties and good quality seeds, to train the farmers in suitable systematic herbicide application and to emphasize the demonstrations regarding organic fertilizers, group discussions, field days and field trips.

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Student's signature Thesis Advisor's signature

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Myanmar is geographically located between latitudes 09° 32' N to 28° 31' N and longitudes 92° 10' E to 101° 11'E. It has a total area of 677,000 square kilometers with three seasons: summer, rainy season and cold season. From March to mid- May are summer months; the rain falls from mid- May to the end of October and the cold season starts in November and ends in the end of February. The annual distribution of rainfall in the country ranges from 4850-5812 mm a year in the costal area, about 2997 mm in the delta, 1248-2323 mm a year on the hilly region to less than 1000 mm in the dry zone area (Ministry of National Planning and Economic Development, 2006).

The total population of Myanmar was estimated to be 55.40 millions. The total sown area of oil seed crops was 2.96 million hectare and per capita consumption of edible oil was 10 kg per year. In Myanmar, oil seed crops also play a vital role due to Myanmar's high consumption of cooking oil compared to other neighboring countries. Major oil seed crops in Myanmar include groundnut, sesame, sunflower, mustard and niger. Of them, sesame accounted for half of the area sown to oil seed crops. Next to sesame is the groundnut that covered around 27 percent of the total area under oil seed crops (Ministry of Agriculture and Irrigation, 2007).

Groundnut, one of the major oil seed crops, is widely grown in the world. The world total sown area, yield per hectare and production were approximately 25 million hectares, the average yield being about 1.42 metric tons/hectare and 36 million ton respectively in the crop year, 2005 (Ministry of Agriculture and Irrigation, 2007). At present, China and India which are neighboring countries of Myanmar are the world's largest producers of groundnut.

In Myanmar, the productivity of groundnut is very low if compared to that of neighboring country as China. In Myanmar, total sown area and average yield of

groundnut was about 756 thousand hectares and 1.46 Mt/ha in the crop year, 2006 (Ministry of Agriculture and Irrigation, 2008). The annual average production of vegetable oils in Myanmar is estimated at about 500,000 tons per year. As an inadequate amount of edible oil is being produced for local consumption, several tons of palm oil are being imported annually to fulfil the local requirement (Oil Crops Development Project, 2006).

Among the oil seed crops, groundnut is the highest oil-yielding crop per hectare, with the kernels having an oil content of about 40-45 percent and protein of 25-30 percent (Weiss, 2000). Nowadays, groundnut is not only used as a source of edible oil but, it is also consumed directly and forms an important base to the diet. In addition, it is popular as a huge range of snacks and confectionery. Therefore it is necessary to increase the groundnut production. At present, the plan for the increase of yield per hectare and sown area of oil crops is being implemented in Myanmar, including dry zone area. The groundnut is being substituted for sesame growing area in the early monsoon season. The main objective is to increase the edible oil production per unit area.

Statement of the Problem

In dry zone area, the average annual rainfall is less than 1000 mm (1997-2006) and unstable during the early monsoon season. The soil fertility is very low as an upland area for monsoon crops and thus the yield per unit area of early monsoon crops is unpredictable. Hein (1998) pointed to the fact that the yield potentials of early monsoon crops (such as groundnut, sesame, green gram...) might remain below the desired level as a result of the long dry spell. On the other hand, the cost of cultivation for groundnut is significant due to high investment for seed. Under this circumstance, most of the small- scale farmers are not favorably disposed to substitute groundnut in sesame areas in the early monsoon season because of high risk. Therefore, this project has reached only a slight improvement in both horizontal and vertical growth in recent years (Table 1).

Table 1 Sown area, harvested area, yield per hectare and production metric ton of monsoon-groundnut in dry zone area.

Year	Sown Area (Ha '000')	Harvested Area (Ha'000')	Yield/ha (M.ton/ha)	Production ('000'M.ton)
2002	185	185	1.08	200
2003	223	222	1.12	248
2004	230	230	1.16	266
2005	252	252	1.19	300
2006	265	265	1.22	324

Source: MOAI (2008) and Head Office (M.A.S.) (2007)

With these points of view, the area extension of monsoon groundnut in dry zone is taken into consideration. In this regard, it is necessary to conduct to answer the following questions. How are the farmers performing in monsoon-groundnut production? What are the demographic, socio-economic and technological factors affecting farmers' attitude towards monsoon groundnut production in dry zone area? What are the problems faced by farmers in monsoon-groundnut production? What are the farmers' suggestions to improve monsoon groundnut production in dry zone area? Therefore, it is essential to find out the local farmers' attitudes and the factors related to their attitudes towards monsoon groundnut production. Understanding of farmers' attitudes would improve the extension and implementation of oil crops development project in the future. This study would expect to contribute the information to the responsible personnel to find out the alternative solution to the problems of monsoon-groundnut production in dry zone area. This study would be able to identify the factors which would be able to use as a model for implementing the same kind of the project in other area.

Objectives of the Study

The general objective of this study is to study the demographic, socio-economic and technological factors which affect farmers' attitude towards monsoon groundnut production in dry zone area, the problems and suggestions of the farmers involved in the area extension of monsoon groundnut being substituted for sesame growing area. Specifically the study aims to:

1. To identify the demographic, socio-economic and technological factors of farmers participating in the extension of monsoon groundnut in dry zone area,

2. To determine the farmers' attitudes towards monsoon groundnut production in dry zone area,

3. To determine the relationships between demographic, socio-economic, and technological factors of farmers and their attitudes towards monsoon groundnut production in dry zone area,

4. To explore the problems faced by farmers and to obtain their suggestions for the improvement of monsoon groundnut production in dry zone area.

Expected Outcomes

This study opens a new perspective to implement monsoon groundnut production in dry zone area. Therefore expected outcomes were as follows:

1. To suggest to the agro related institutions that some impact of structure should be improved in order to increase groundnut production in dry zone area.

2. To propose the responsible personnel of Myanmar Agriculture Service that the alternative solutions to the problems of monsoon groundnut production in dry zone area should be improved.

3. The results of this study would be delivered to the local research area to find out the suitable sowing time for monsoon groundnut in dry zone area.

Limitations of the Study

This study is limited to farmers in two townships namely Pakokku and Seikphyu, who grew the groundnut being substituted for sesame growing area in the early monsoon season during 2007 crop year.

Operational Definition of Terms

Attitude means the mental state of farmers towards monsoon groundnut production being substituted for sesame growing area including 24 advantage aspects of growing groundnut in dry zone area.

Farmers mean all farmers in Pakokku district, dry zone area of Myanmar involved in the area extension of monsoon groundnut being substituted for sesame growing area in the early monsoon season.

Monsoon-groundnut production means the groundnut which is cultivated in rainy season as an early monsoon crop. It includes the sequential steps such as seed quality and variety, soil preparation, time of sowing, plant spacing and population/hectare, application of farmyard manure and fertilizers, inter-cultivation and weeding, pest and disease control and harvesting.

Farmers' Attitudes towards monsoon groundnut production refer to mental state of farmers towards monsoon groundnut production being substituted for sesame growing area in the early monsoon season.

Dry zone area means the central planes of Myanmar where receives less than 1000 mm of annual rainfall. The seasonal temperature variations in the magnitude of 40.6 -43.3 Celsius in hot season and 10-15.6 Celsius in cool seasons are not uncommon. The majority of monsoon groundnut area is in upland area.

Demographic factors refer to personal factors of groundnut farmers which are age, level of education, and experience in groundnut production.

Age of farmer refers to the age of groundnut farmer.

Level of education refers to level of education of groundnut farmers.

Experience means the number of working years of the farmers in monsoon groundnut cultivation.

Socio-economic factors refer to social and economic factors of groundnut farmers which are total income of farm family, income from groundnut production, farm size, land tenure, family labor, credit for cultivation, off-farm employment, and source of information.

Total income of farm family refers to income from the whole sources of farm family during one year.

Income from groundnut production refers to the net profit from monsoon groundnut cultivation.

Farm size refers to the area of groundnut cultivated by farmers in acres.

Land tenure refers to the status of farming land holding on which the farmer cultivated the groundnut being substituted for sesame area in the early monsoon season: owner of the land, joint owner, or tenant farmer.

Family labor refers to the number of family members who assist the farmer with the activities of monsoon groundnut production.

Credit for cultivation refers to the amount of money that the farmer obtained for monsoon groundnut cultivation.

Off farm employment of farmer refers to any other permanent or temporary employment in an organization or self- employment in addition to farming.

Source of information refers to from whom farmers generally get informations for groundnut cultivation which are extension worker, other farmers, media (daily newspaper, weekly agricultural newsletter, daily television program, radio broadcasting, pamphlets and leaflets) and agro-chemical companies.

Technological factors refer to production system of groundnut cultivation, knowledge of farmers, technological assistance from extension workers, and participation in extension activities of farmers.

Production system of groundnut cultivation refers to the systems of groundnut cultivation which are inter-cropping with other crop, and sole crop.

Knowledge of farmers refers to the awareness or understanding of groundnut farmers on the improved cultural practice for groundnut production.

Technological assistance from extension worker refers to the number of visits by extension workers to farmers, their discussions about technology, distribution of production inputs, the number of discussion meetings, training programs, demonstration programs, and field day sessions during the growing season to provide groundnut production technologies.

Participation in extension activities refers to the number of farmers' activities in which that were provided by extension worker for farmers to participate so as to increase knowledge and experiences including discussion meetings, training programs, demonstration programs, and field day sessions, participated by farmers.

CHAPTER II

LITERATURE REVIEW

This research studied the farmers' attitudes towards monsoon groundnut production in dry zone area, Myanmar. The related concepts and related researches are on the following issues:

1. Concept of Attitude
   - Attitude theories
   - Inference of Attitude
2. Components of Attitudes
3. Functions of Attitudes
4. Attitudes towards Behavior
5. Information about Dry Zone Area
6. Information about Study Area
7. Groundnut Cultivation in Myanmar
8. Monsoon Groundnut Production Technologies
9. Related Researches

Concept of Attitude

The perception in attitude of human is a mental process in their daily life, however, in academic perspective there are variety of explanations of attitude. The researcher would like to simply define the concept of attitude as follows:

Attitude is a settled way of thinking or feeling. Allport (1935) defined that "An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related".

Attitudes are like and dislike- favourable or unfavourable evaluations of and reactions to objects, people, events, or ideas (Atkinson, 2000).

Attitude Theories

An attitude is "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein and Ajzen, 1975).

1. Consistency theories:

In recent year's consistency theories of attitude change have drawn more attention and spread more research than any other group of theories which are first of all, cognitive theories, that is, they emphasize the importance of peoples' belief and ideas (Oskamp, 1977). The major ones are Heider's balance theory and Osgood and Tannenbaum's congruity theory.

1.1 Heider's balance theory:

Heider's theory concerns the way in which people perceive other people, objects, and ideas in their environment. For simplicity, he limits his discussion to three elements: the perceiver, P; another person, O and some object or idea, X.

Between each pair of elements there can be two types of relationships which follow (Figure 1).

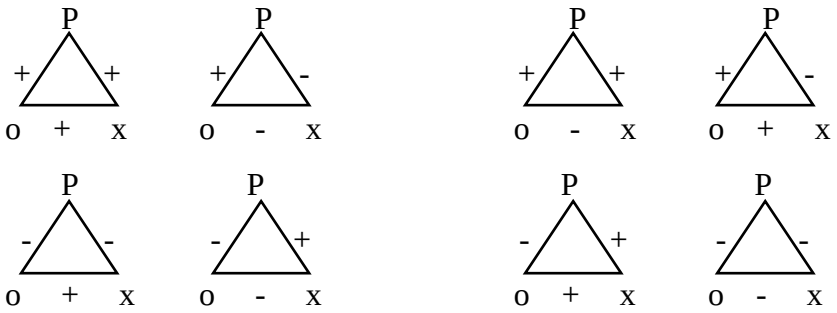

Figure 1 Balanced and unbalanced patterns according to Heider's theory

The Figure 1 showed: The lines between element represent either linking or unit relationship. Positive relationships are shown by (+) and negative relationships are expressed by (-).

1.2 Osgood and Tannenbaum's congruity theory:

Among consistency theories, Osgood and Tannenbaum (1955) have been unique in the degree of quantification of their approach. They have measured attitudes by means of the evaluative dimension of the semantic differential, and they have made precise predictions about the direction and amount of attitude change. Osgood's theory indicates that the amount of attitude change will occur as the result of a single communication, through it would not be expected to happen instantaneously.

Inference of Attitude

Oskamp (1977) has shown that "an attitude has the status of an intervening variable: that is, an attitude is a theoretical construct which mediates to explain the relationship between certain observable stimulus events and certain behavioral responses". A person's attitudes are the result of his past experiences (both vicarious and actual), and that they combine with the present stimulus situation to determine his response" (Figure 2).

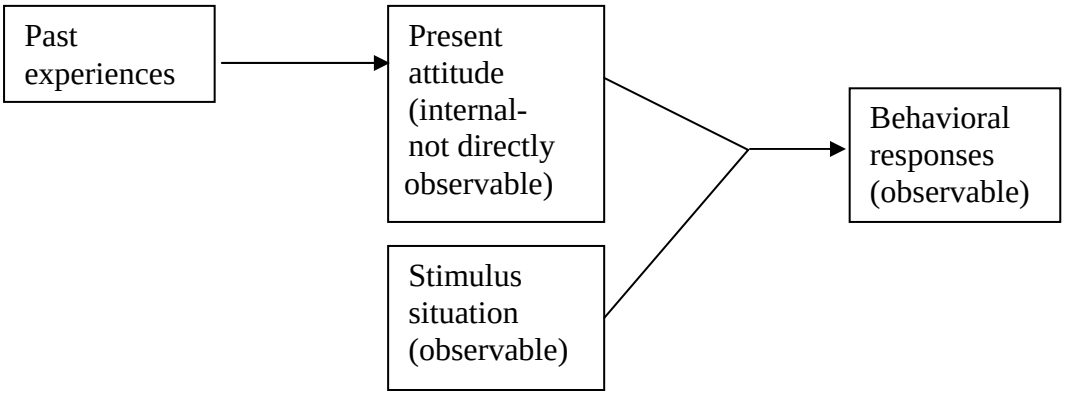

Figure 2 Attitudes are unobservable intervening variables which influence the relationship between stimulus events and behavioral responses.

Components of Attitudes

Oskampt (1977) classified components of attitude into three categories:

(1) A cognitive component, consisting of the ideas and beliefs which the attitude –holder has about the attitude object. For example, "Martians look strange- they have green skins and antennae coming out of their foreheads, you know."

(2) An affective (emotional) component: this refers to the feelings and emotions one has toward the object. For instance: Martians make me feel uncomfortable- I feel queasy to think of them reading my mine". "I don't like Martians".

(3) A behavioral component, consisting of one's action tendencies toward the object. For example: if I saw a Martians, I'd run away as fast as I could". I certainly wouldn't let one into my club or allow my daughter to marry one".

Functions of Attitudes

Attitudes serve many functions, attitudes that we hold for practical reasons serve an instrumental functions, those that help us make sense of the world serve a knowledge function; those that express our values or reflect our self-concepts serve a

value- expressive function; those that protect us from anxiety or threats to our self-esteem serve an ego-defensive function; and those that help us feel that we are a part of a social community serve a social adjustment function (Atkinson, 2000).

Attitudes towards Behavior

Attitudes tend to predict behavior best when they are (a) strong and consistent; (b) specifically related to the behavior being predicted; and (c) based on the person's direct experience; as well as (d) when the individual is aware of his or her attitudes. Cognitive dissonance theory proposes that when a person's behaviors are inconsistent with his or her attitudes; the discomfort produced by this dissonance leads the person to change the attitudes so that they are consistent with the behavior (Atkinson, 2000).

Information about Dry Zone Area

1. Dry Zone in Nature

Myanmar has several variant climate zones ranging from the temperate region of the north to the dry zone in Central Myanmar and the monsoonal belts in the northwest, west and south.

2. Location

The dry zone is a vast semi-arid low land between two higher regions, the Shan Plateau on the East and the Rakhine Yoma and Chin hills on the west. Two major rivers, the Ayeyarwady and the Chindwin flow through the dry zone from North to South. The hills in the dry zone with the exception of Mount Popa are low about 1000 feet high. They serve as local watersheds. Most of local streams in dry zone area have water only immediately after rain. It has an area of about 54,390 square kilometers or about 10 per cent of the country's total land area. It comprises lower Sagaing, Mandalay and Magway Divisions. There are altogether 13 districts and 57 townships in the dry zone area (Htoo, 1994).

3. Population

About 34 per cent of the union total population lives in Sagaing, Mandalay and Magway Divisions in dry zone area.

4. Climatic Conditions

The annual rainfall in the dry zone is between 500 mm and 1000 mm. The rainy season is typically divided into three periods; early-rainy season (May-June), mid-rainy season (July-August), and late-rainy season (September-October). The rainfall during early - rainy season for the most areas in dry zone is generally below the value of precipitation. The south-west monsoon is most developed and active for all parts of Myanmar except central dry zone. Climatological dry spell usually takes places from the second decade of June until the end of third decade of July. This is often referred to as July drought in dry zone areas. The dry spell is responsible for frequent crop failure in those areas.

The late monsoon usually lasts from September to October. During this period could enjoy the favorable water balance for dry land farming systems. The weather is generally dry in the rest of the year. The dry zone suffers intense heat of monthly temperature ranging from minimum of 10˚ C in the cool months to maximum of above 40˚C in dry months (Htoo, 1994).

5. Soil Condition

Sandy soils, sandy loam and clay soil are the features of the dry zone areas. Most of the soil in the dry zone is sandy and is vulnerable to wind and water erosion. The soil erosion is high during the intensive storm.

6. Water Utilization

Agriculture production is subject to the rainfall condition. As it implies, the rainfall in dry zone is poor and erratic. Under this circumstance, crop production and

productivity is far beyond the maximum possible level. Therefore, efforts are being made to exploit ground water, to lift the water from perennial streams by using diesel pumps and to harness the Ayeyarwady and Chindwin River by the Government in the dry zone. However, the government did try to exploit water, shortage of water still exists (Hein, 1998).

7. Crop Cultivation

The major crops grown in dry zone are long/short staple cotton, early/late sesame, groundnut, pulses and beans. Seasonal vegetables such as onion, garlic, chillies, and tomatoes are also grown on some alluvial soils on the banks along the Ayeyarwady and Chindwin River. A wide range of dry land crops are sown in dry zone areas. Accordingly, farmers in that area, based on their unique situations, have different attitudes towards the crop they cultivate. Therefore, preference of crop and choices of crop for production and marketing may differ from place to place and farmer to farmer. Similarly, yield per hectare of major crop varies from township to township in the dry zone areas (Hein, 1998).

Information about Study Area

1. Location

This study will be conducted in Pakokku district, Magway division in dry zone area of central Myanmar. In that district, biophysical and socio-economic characteristics are typical and representative for the whole area of dry zone. It has an area of 3205 square miles and is situated between North Latitude 20° 45' and 21° 45' and East Longitude between 94° 20' and 95° 35'. Although it is made up of five townships, there are only two townships which participated in the area extension of groundnut cultivation being substituted for sesame growing area in the early monsoon season during 2007 crop year.

2. Population

Total population of Pakokku district is about, 1442,000 and the population of monsoon groundnut farmers is about 12,916 (Office of Pakokku District, 2007).

3. Climatic Conditions

As the Pakokku district falls within the dry zone, it is very hot in the summer and is relatively cold in winter. The average temperature of April, which is the hottest month of the year, is 90˚ Fahrenheit and the temperatures during daytime range between 100˚-111˚Fahrenheit. The average temperature of January, which is the coolest month of the year, is 70˚ Fahrenheit and the temperature sometimes falls as low as 52˚ Fahrenheit. The annual average distribution of rainfall is 686 mm a year in that area (1997-2006) (Office of Pakokku District, 2007).

4. Sown Acreage and Crops Production

Total planted area is about 604 thousand hectares of multiple crops a year in Pakokku district. Agriculture is also important in that area. The major crops are rice, sesame, groundnut, sunflower, mung bean, pigeon pea, and chick pea. Other crops are cotton, sorghum, maize, virginia tobacco, toddy, chili and onion. About 6% of total groundnut area of dry zone lies in Pakokku district and it covers 6% of dry zone groundnut production (Table.2).

Table 2 Sown area, harvested area, yield per hectare and production metric tons of groundnut in Pakokku district, Dry zone area, Myanmar (2006).

Location/Crop	Sown Area (Ha '000')	Harvested Area (Ha '000')	Yield/ha (M.ton/ha)	Production ('000' M.tons)
1. Pakokku District	33	33	1.49	49
Groundnut (monsoon)	16	16	1.25	20
Groundnut (winter)	17	17	1.71	29
2. Dry Zone Area	518	518	1.46	758
3. Total	756	756	1.46	1105

Source: MOAI (2008) and Office of Pakokku District (2007)

Groundnut Cultivation in Myanmar

Although groundnut is grown all over the country the major growing area is the dry zone where is the central part of Myanmar. It is now a traditional crop having been introduced to the Shan State initially and then on to the central plains in the late nineteenth century and became popular in the early Colonial Era. It is planted in both upland area and lowland area. The early rainy season Spanish type **(**monsoon crop**)** is sown in May to June and harvested in September to October. The rainy season virginia type is sown in May to June and harvested in November to December. The winter spanish type is sown in November to December and harvested in March to April.

The pre-monsoon crop is mostly in upland areas, while the post-monsoon crop is grown in low-lying areas. As a post monsoon crop, it covers about 50% of total groundnut area relying solely on residual moisture. About 69% of total groundnut area lies in the dry zone and it covers about 35% of total groundnut area as a pre-monsoon crop (Table 3).

Table 3 Sown area, harvested area, yield per hectare and production metric tons of groundnut in Dry zone area (3 divisions) and other States / Divisions (2006).

State/Division	Sown Area (Ha '000')	Harvested Area (Ha '000')	Yield/ha (M.ton/ha)	Production ('000' M.tons)
1. Dry Zone Area	518	518	1.46	758
Groundnut (monsoon)	265	265	1.22	324
Groundnut (winter)	253	253	1.72	434
2. Other State/Division	238	238	1.46	347
Groundnut (monsoon)	75	75	1.28	96
Groundnut (winter)	163	163	1.54	251
Total	**756**	**756**	**1.46**	**1105**

Source: MOAI (2008) and Head Office (M.A.S.) (2007)

1. Production System

There are three main systems of growing groundnut: 1) inter-cropping with other crops such as pigeon pea/sunflower in low rainfall areas as a monsoon crop 2) as a sole crop which grow well under the favorable weather conditions in rainy season 3) inter-cropping with sunflower/ maize in lowland area after rice and other field crops in winter season.

2. Groundnut Seeds and Varieties

Breeder seed is produced at the Department of Agricultural Research and foundation and registered seeds are produced on Central Seed Farms. Certified seeds are produced in the fields of contact farmers (Shwe, 1996.). However, good seeds are not widely spread because the Department of Agricultural Research and Central Seed Farms cannot produce enough to meet the demand of entire country. No private farm commercially produces groundnut for seed.

The Spanish varieties of groundnut appear to be the most adaptable as they are determinate in growth habit and thus early maturing and can be grown all over the country. Current commercial varieties are Sinpadaytha-5, Sinpadaytha-6, Sinpadaytha-7, Magway-11, Magway-12 and Magway-15. The earliest of these varieties is Sinpadaytha-6 (S-6) with a maturity of 90-95 days. An improved virginia variety is Kyaunggon and Sp.121. Important characteristics of the varieties are shown in Table 4.

Table 4 Varietal characteristics of groundnut cultivars of Myanmar

Cultivar Characters	**Sinpadaytha 5**	**Sinpadaytha 6**	**Sinpadaytha 7**	**Magway 11**	**Magway 12**	**Magway 15**
1. Type	Spanish	Spanish	Spanish	Spanish	Spanish	Spanish
2. Duration (days)	120	90-95	105-115	105	115	115
3. Seed color	Pale pink	Pink	Pink	Pink	Pink	Pink
4. (1000) seed weight (gm)	36-40	40	41	38	41	40
5. Oil content (%)	51	40-51	40-50	50	55	52
6. Shelling (%)	65-68	74	74	75	73	71
7. Potential yield (M.ton/ha)	1.54	0.98	1.40	1.62	1.40	1.40

Source: Oil Crops Development Project (2006)

3. Extension System in Monsoon Groundnut Production

Conducting extension methods for educating farmers, Myanmar Agriculture Service commonly used pamphlet distribution, discussions, and demonstrations. The extension workers relied on contact farmers to diffuse technical information to their surrounding farmers. The village level extension workers meet with farmers individually or in group for discussions relating to the improved cultural practices and

arrange field visits and field demonstration programs. At present, the demonstration programs (DPs) are being carried out in rural areas by substituting sesame with groundnut in the early monsoon season. Eleven townships would directly benefit from DPs by receiving a total of 13,750 groundnut seed and fertilizer packages during the project. The package would be distributed to 13,750 farmers prepared to compare the economic performance of low yielding sesame areas with replacement by monsoon groundnut and demonstrate the benefits of certified groundnut seed and recommended economic rates of fertilizer. A further 13,750 farming households would conditionally receive second generation certified seed from the initial participating farmers (Oil Crops Development Project, 2006).

This program consists of sequential steps to be carried out are as follows:

(1) Selection of site: the selected site must be representative of the surrounding farmers and be clearly seen from the road so as to be easily visible for surrounding farmers.

(2) Selection of contact farmers: the contact farmers who will adopt the given technology as per recommendations are selected.

(3) Discussions and applications of technology package

The extension workers are responsible to carry out these activities regularly during the demonstration period.

(4) Distribution of required inputs

The extension workers are responsible for the provision of required inputs.

(5) Conducting field days

The contact farmers who participate in the field days section, play important role to share the experiences in the application of given technology. Joint evaluation

on recommendations is made by the participants. The main objective is to achieve faster and wider dissemination of technologies through exchange of information from farmer to farmer.

Monsoon Groundnut Production Technologies

The target yield (1.40 metric ton/hectare) of groundnut is laid down by Myanmar Agriculture Service. The improved cultural practices are recommended to achieve the target yield.

1. Use of High Yielding and Adaptable Varieties

Selection of suitable varieties should be emphasized for maximum utilization of resources. Drought resistant varieties especially Sinpadaetha- 6 is recommended for dry zone areas for a resistance to shortage of soil moisture. The seeds should have a germination rate of not less than 80 percent to achieve the recommended plant population per unit area. It is recommended to avoid the abnormal seed size and the seeds obtained from the plants suffered from drought at kernel formation time. For a better germination rate, it is also necessary to manually crack dry pod groundnut for seed before one week to sow. An improved virginia variety is “kyaunggon”.

2. Time of Sowing and Plant Population

Timely sowing influences growth and yields. Timely cultivation with the onset of monsoon rains is essential to economize the use of inputs and to maximize the use of natural resources. Time of sowing should be between early May/June, the earlier generally considered being the better so as to avoid harvest problems.

To achieve high yields, early sowing is essential so land preparation must be finished before the onset of the monsoon. Sowing in the first week of May gave yields of 1850 kg/ ha using fresh seed (from winter riverbank groundnut) where as old seed (seed from the previous year’s rainy season crop) sown at the same time gave

yields of 1,700 kg/ha. Sowing in the second week of May using fresh seed yielded 1,600 kg/ha and old seed sown in the same period yielded 1,385 kg/ha (Shwe, 1996).

The recommended plant population is 250,000 plants per hectare and it is recommended that the rows be 38 cm apart and that the seed be dropped 10 cm apart in the rows, at a depth of 1.5 to 5 cm, and for virginia varieties spacing must be 45 cm x 15 cm. Seed should be treated with rhizobial inoculums at the time of sowing. It is recommended to avoid earthing up operation to get enhancing peg formation.

3. Application of Farmyard Manure and Fertilizers

Groundnut requires a balanced nutrition for pod development including good soil calcium levels. In many areas, farmers have noted excellent responses to the addition of gypsum to enhance kernel development and prevent “pop” or empty hulls. The combination of fertilizer with organic manure such as cow dung, poultry manure and green manure produce the higher yield. The farmyard manure 2-7 tons per hectare and gypsum (270) lbs per hectare are recommended to apply at 45 days after planting. To obtain the optimum yield, upland growers should apply the following fertilizers at last harrowing before sowing.

Urea fertilizer 31 kilograms (kgs) per hectare, Super phosphate 62 kgs per hectare, and Potash 31 kgs per hectare

4. Care and Managements

4.1 Soil preparation

Soil preparation before sowing groundnut involves removing crop residues that may harbour pests and disease, creating good soil conditions to promote seed germination, and preventing weed emergence in the early stages of crop establishment. Good management practices for monsoon groundnut involve summer ploughing (ploughing one month in advance) that is advantageous to destroy the weed seeds and hibernating insects and disease organisms by exposing them to the heat of

summer. The land is then harrowed at the commencement of the early monsoon rains.

4.2 Inter-cultivation weeding

The first inter-cultivation should be carried out 5 days after sowing so that early weeds are suppressed, and the soil becomes loose to facilitate seedling emergence. The main priority after emergence is to keep the crop weed free. Young groundnut is highly sensitive to competition from weeds, and yields decline sharply. Weeds are estimated to reduce yield by 18-70%. Second and third inter-cultivations should be done 15 and 25 days after sowing. Fields of Spanish groundnut must be hand weeded 30 days after sowing, and virginia must be weeded 45 days after sowing. Spanish groundnut varieties can compete poorly with weeds and frequent weeding by "earthing up "with inter-row cultivation or hand chipping is necessary to produce good yields. Delayed weeding results in weeds shading groundnut from light and prevents kernel development as well as competes for nutrients and moisture.

4.3 Insect pests and diseases

The major area under groundnut is confined to the dry zone; fungal diseases such as leaf spot or Cercospora are seldom a problem. Therefore timely spray insecticide, seed dressing with fungicides are also recommended to farmers.

5. Harvesting

Harvesting at the optimum maturity stage is important in achieving best quality. Therefore it is recommended to harvest at the optimum maturity stage, over 70% mature pods in the field. The pods to be used for seed should be picked with hand. Good seed storage is necessary to preserve seed viability from harvest to planting. The pods to be used for seed should be dried for the first few days after harvesting by using Air- dry method. The pods should be stored in 6-9 % of moisture content.

Related Researches

Bagheri *et al*. (2008) studied on perception of paddy farmers towards sustainable agricultural technologies: case of Haraz catchments area in Mazandaran province of Iran. The total sample of 170 paddy farmers in Haraz catchments rural area of Mazandaran province was interviewed. The results of this study showed that there were significant negative relationships between age, experience, farm size, sharecropping, diversity of rice variety, contact with other farmers, and perception of farmers towards sustainable agricultural technologies. On the other hand, there were positive relationships between educational level, discipline, advisory contacts with district and country agricultural experts, researchers, study of agricultural publications, and extension participation and perception of farmers towards sustainable agricultural technologies.

Chizari and Omid (2008) studied on attitudes of Nahavand township, Iran wheat farmers towards on-farm water management (OFWM). The sample of 375 wheat farmers in the Nahavand township was interviewed to examine their attitudes regarding OFWM. The results of this study showed that the attitudes of a majority of the respondents towards OFWM were in the "relatively negative" range. According to the results of stepwise regression analysis, age, knowledge about OFWM, contact with information sources, and yield per hectare explained 71% of the variance in farmers' attitudes towards OFWM. In brief, there were negative relationships between attitudes of wheat farmers and their age, experience, and positive relationship with knowledge, level of education, yield per hectare, size of farm, size of irrigated farming and wheat cultivated land, economic status, extent of social participation and extension contact, access to information sources.

Ahmadvand (2008) studied on Perceptions toward sustainable agricultural practices: The case of potato farmers in Hamedan province, Iran. The total samples of 105 potato farmers in Hamedan province, Iran were interviewed to examine their perceptions toward sustainable agricultural practice. The findings revealed that little financial return to farmers, low knowledge of extension workers and farmers with respect to sustainable agriculture, and low level of farmers' education were the major

barriers to adoption of sustainable agriculture.

Olarinde *et al*. (2007) studied on attitudes towards risk among maize farmers in the dry savanna zone of Nigeria: some prospective policies for improving food production. The total sample of 350 maize farmers in the dry savanna zone of Nigeria was interviewed. The farmers' socio-economic, farming features and institutional characteristics were employed to define their categorical and behavioral attitudes and to explore the factors influencing the farmers attitudes towards the risk associated with maize production in the study area. Results showed that, about 8%, 42%, and 50% of the farmers are respectively lowly, intermediately and highly averse to maize risk. The results also indicate that thirteen (About 72%) out of the eighteen variables are statistically significant at a minimum of 5% level of probability. They are: age, maize farming experience, household size, leadership position, proportion of maize to total farm income, and first and second level of probabilities of sales (the socio-economic characteristics), the total number of farms that a farmer possesses, number of risk types faced by farmers, number of motivating traits or attributes of maize, and proportion of maize to total farm area (farming features), number of visits by extension agents to farmer per cropping season, and adequacy of maize market (institutional factors).

Subair (2006) studied on attitude of farmers towards cultivation of bambara groundnut in north-east Botswana and to determine the relationships between the attitude of the farmers and socio-cultural variables. A total number of 90 farmers were asked to rate their level of agreement with each of the 12 statements on a 6 point likert type scale. The results showed that farmers have a favorable attitude towards the cultivation of hybrid variety of Bambara groundnut. Educational level and farm size have a moderate influence on the attitude of farmers towards the cultivation of Bambara groundnut. Age, gender, tenure status, occupation, and social participation do not influence the attitude of farmers towards cultivating the hybrid variety of Bambara groundnut in north-east Botswana.

Olujide and Adeogun (2006) studied on assessment of cocoa growers' farm management practices in Ondo State, Nigeria. The samples of 123 farmers belonging

to the cocoa farmers' association of Nigeria in Ondo State were asked to complete a questionnaire on the farm hygiene and management practices they followed. The results of this study showed that there was a significant relationship between educational status and farmers' attitudes towards the adoption of appropriate crop growing practices. However, there were no significant relationships between age, marital status, years of farming experience, gender and attitudes of farmers towards the adoption of appropriate crop growing practices.

Noruzi (2006) studied on effective factors involved in adoption of sprinkler irrigation: A case study in wheat farmers in Nahavand township, Iran. A total number of 375 wheat farmers were interviewed to determine their opinions regarding the adoption and use of sprinkler irrigation. The results of the study showed that, among the individual characteristics, there is a significant difference between adoption of sprinkler irrigation with age, literacy, experience cultivating wheat and rate of farm land. Also the results indicate that among the social factors, there is a significant difference between rate of social participation, rate of communication channels and rate of extension contacts with adoption of sprinkler irrigation.

Isin and Bulent (2005) studied on farmers' attitudes toward crop planning in Turkey. The samples of 120 farmers producing at least two crops in Turkey were interviewed in order to determine variables affecting acceptance of guidance on crop planning. The results indicated that farmers' age, number of plots and regarding only price of crop in enterprise selection were negatively related to the adoption of crop planning while education level of farmers, membership of agricultural cooperatives, difficulties experienced in crop selection, playing games of chances and land tenure other than ownership were positively related.

Mendis (2005) studied on factors affecting adoption of recommended crop management practice in paddy cultivation in Kalutara district, Srilanka. The sample size of 388 farmers was interviewed to collect data. The results of this study revealed that farmers' level of education, land, land tenure, income, credit, source of information, participation in extension activities, extension officers' visits, and

membership in farmers' organization were the most important factors of farmers' adoption of crop management practices.

Agwu (2004) studied on the factors influencing adoption of improved cowpea production technologies in Nigeria. The total sample of 130 farmers in Bauchi and Gombe States of Nigeria was interviewed to determine the level of adoption of the cowpea technologies with each of the 8 statements of technologies. The results indicated that all the technologies significantly contributed to variations in total adoption. The result also showed that farm size and level of formal education positively and significantly influenced adoption of improved cowpea technologies ($p < 0.05$) and hence was important in predicting adoption behaviors. The result also showed that age, membership in farmer/cooperative organizations, farming experience and family size had no significant influence on the adoption of improved cowpea technologies.

Mensah (2002) studied on the factors that affect the adoption of Roundup Ready soybean technology in the U.S. This paper presented an empirical analysis of the factors that affect the adoption and intensity of adoption of Roundup Ready soybean technology. There were about 610 respondent farmers in the Midwest and South of U.S who planted at least 250 acres of soybeans in the year 2002. The results showed that experience, farm size, acreage in no-till, cost difference and yield difference between R R soybean and traditional varieties and the level of education significantly influenced the adoption of RR soybean technology. However, the total cost difference between the cultivation of RR soybean varieties and the traditional soybean varieties, market uncertainty had a negative impact on the adoption of RR soybean technologies.

Ganpat and Deokee (1999) studied on attitudes of farmers towards farming in Trinidad. A total number of 470 farmers were interviewed to examine farmers' overall attitudes towards agriculture, and determine the component factors that form these attitudes. The results showed that overall farmers' attitudes, through positive, were significantly different when categorized by farm size, education, farming region, and enterprise term. There were no significant differences between farmers' attitudes

and attitude component factors based on age, farming experience, land tenure status, enterprise type, gender, ethnicity and part time/ full time status. Also, from the three factors identified, technology belief showed the highest level of differentiation among farmers.

Nguyen (1999) studied on factors affecting farmer's attitude towards the raising of crossbred Goats in Thainguyen Province, Vietnam. The samples of 115 farmers in Thainguyen province were interviewed. The result had shown that there were significantly differences in farmer's attitudes between the low income and high income, low education and high education, low area of land and high area of land, low experience and high experience farmer groups, low income and high income from selling crossbred goats. There were no significantly differences in attitude of farmers towards the raising crossbred goats with respect to age of head of households, source of information and number of goats per households. The training on raising goat, technological assistance from extension workers and knowledge of farmers were the factors affected farmers' attitudes towards raising crossbred goats.

Luevitoonwetchakij (1999) studied on farmers' attitude towards soybean production technology transfer, in Sanpatong district, Chiang Mai Province. The samples of 150 soybean growers were interviewed to find out the relationships between independent selected variables and attitudes of farmers in Sanpatong district. Hypothesis testing indicated that age was related to the attitude towards soybean production technology transfer significantly. While education, farm size, soybean growing area, family labor, soybean growing experience and contact with the extensionists were not related to the attitudes of farmers towards soybean production technology transfer.

Hein (1998) recommended by the farming systems development pilot project in dry zone area, Myanmar that "according to the recent rainfall patterns, sesame and mung bean should be sown with the onset of rain because of their low cost production inputs which is attributed to low risk. Groundnut which is associated with lager investment on seed should be planted during mid-monsoon in which longer and higher wet decades exist. With this point in view, it is necessarily required to focus

the present cropping pattern and other relevant factors in order to make modification with the rainfall pattern".

In conclusions, the variables collected in this study included age, level of education, experience, total income of farm family, income from groundnut production, farm size, land tenure, family labour, credit for cultivation, off-farm employment, source of information, production system, knowledge of farmers, technological assistance from extension worker and participation in extension activities.

Research Hypotheses

Hypothesis testing was done to find out the relationship between demographic, socio-economic, and technological factors and farmers' attitudes towards monsoon groundnut production in dry zone area. The study was aimed to test the following null hypothesis at the .05 level of significance.

Hypothesis 1**:** There was relationship between demographic factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 1.1: There was relationship between age and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 1.2: There was relationship between level of education and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 1.3: There was relationship between experience and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2**:** There was relationship between socio-economic factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.1: There was relationship between total incomes of farm family and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.2: There was relationship between incomes from groundnut production and attitudes of farmers towards monsoon groundnut production in zone area.

Hypothesis 2.3: There was relationship between farm size and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.4: There was relationship between land tenure and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.5: There was relationship between family labor and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.6: There was relationship between credit for cultivation and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.7: There was relationship between off- farm employment and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2.8: There was relationship between source of information and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3**:** There was relationship between technological factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3.1: There was relationship between production system and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3.2: There was relationship between knowledge and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3.3: There was relationship between technological assistance from extension worker and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3.4: There was relationship between participation in extension activities and attitudes of farmers towards monsoon groundnut production in dry zone area.

Conceptual Framework

This study has a conceptual framework as follows;

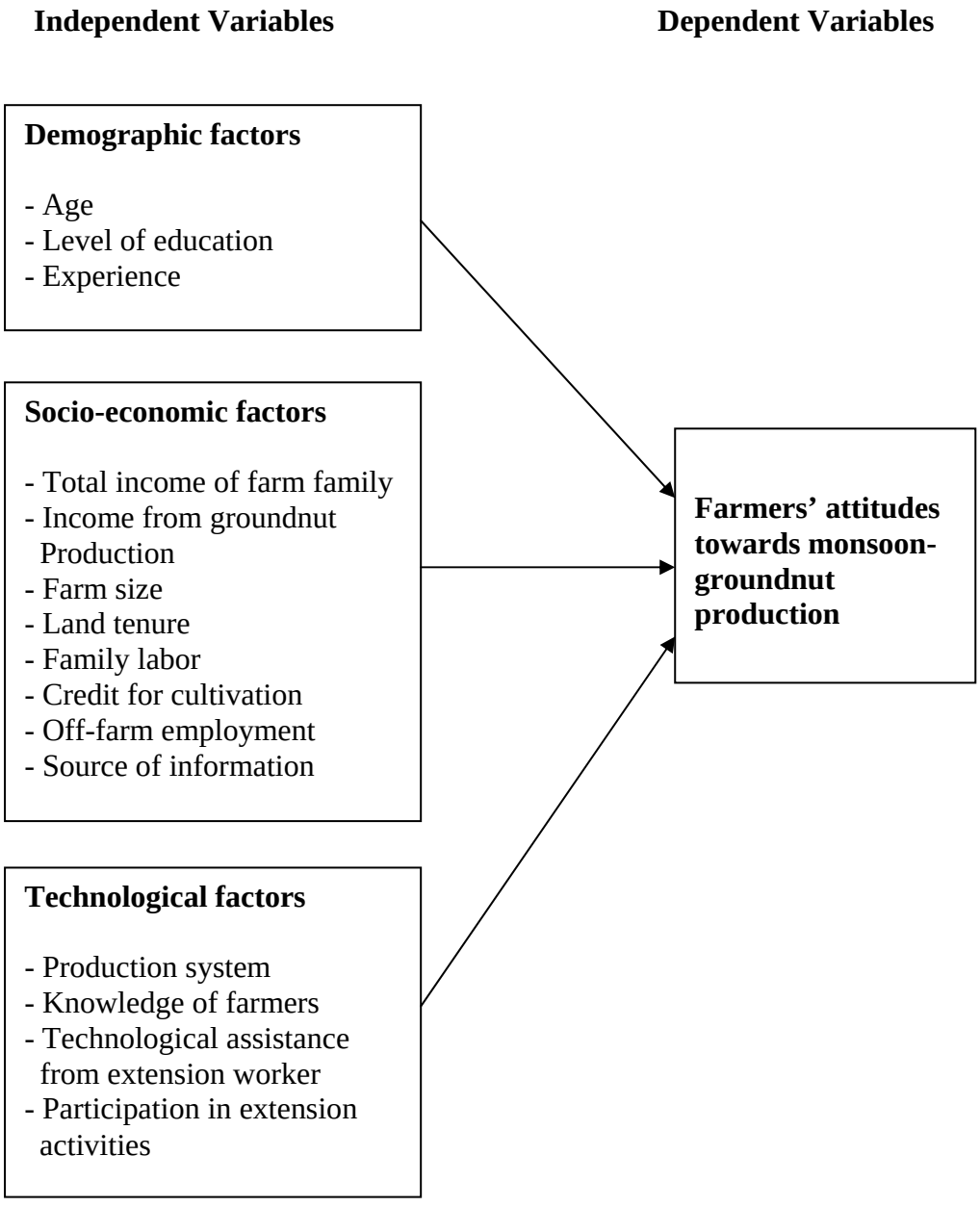

Figure 3 Conceptual framework showing the relationship of independent variables and dependent variable of the study.

CHAPTER III

RESEARCH METHODOLOGY

Research Design

This study used a survey research design. The survey was conducted among the farmers in Pakokku district in the dry zone area, due to the following reasons:

(a) It has the 6% of total groundnut area of dry zone and contribution from Pakokku district to dry zone groundnut production is 6 % (Office of Pakokku District, 2007).

(b) Its annual average rainfall is 686 mm (1997-2006) (Office of Pakokku District, 2007), it is therefore representative of the dry zone area.

(c) It is one of the intensive groundnut growing areas in Myanmar.

Population and Sample Size

The population of this research was 200 farmers who participated in the area extension of monsoon groundnut in Pakokku district during 2007 crop year. (Oil Crops Development Project, 2007).

1. The sampling frame was the lists of all farmers involved in the area extension of monsoon groundnut in Pakokku district. This research used a simple random sampling method. The number of samples for this research was calculated by using Yamane' formula (1970) which determined the error at the 0.05 significance level. From the total of 200 farmers, the sample size of 133 farmers was obtained. The computation was done as follows:

By Yamane Formula,

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

n = Sample size

N = Total number of population (farmers)

e = Error (0.05)

When N = 200

e = 0.05

Calculation

$$n = \frac{200}{1+ (200 \times 0.05^2)}$$

$$= \frac{200}{1+ 0.5}$$

$$= \frac{200}{1.50}$$

= 133 farmers

2. There are two townships which involved in the area extension of monsoon groundnut in Pakokku district named Pakokku and Seikphyu. Total sample size was distributed as follows:

$$\text{The sample size of each township} = \frac{\text{The farmers of each township} \times \text{The number of total sample size}}{\text{The number of whole population in Pakokku district}}$$

Table 5 Number of sample size of each township

Township	Population (Number of farmers)	Sample Size
1. Pakokku	100	66
2. Seikphyu	100	67
Total	**200**	**133**

Source: Oil Crops Development Project (2007)

The sample size of each township was drawn by a random procedure from the total of 100 farmers per township. Firstly, the names of 100 farmers per township were written on cards and then selected 66 farmers in Pakokku township and 67 farmers in Seikphyu township out of a hat.

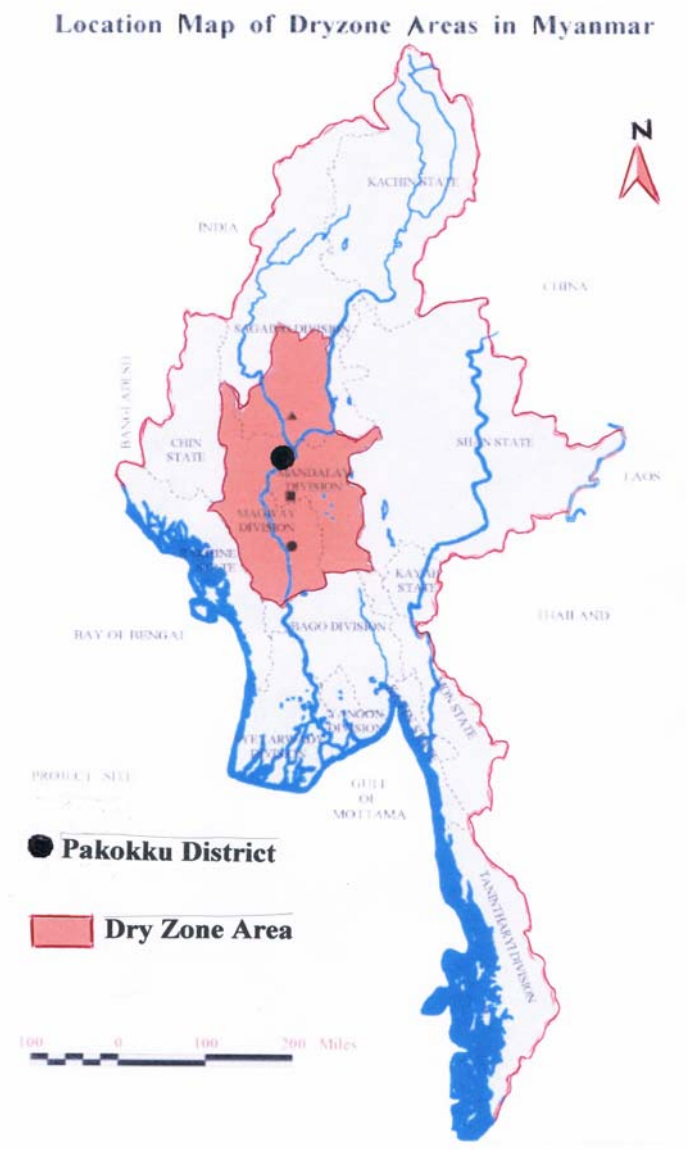

Figure 4 Map of Myanmar showing Pakokku District

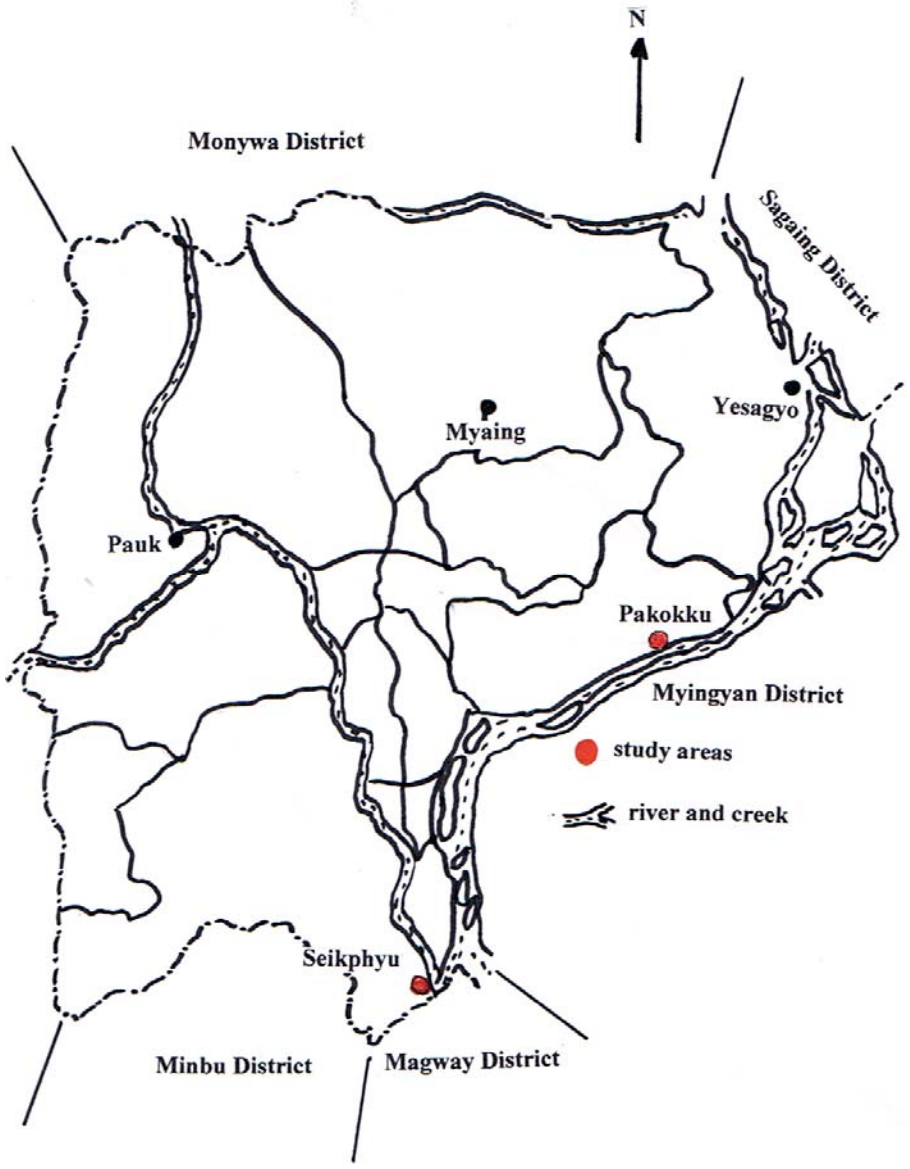

Figure 5 Map of Pakokku District showing Study Areas

Research Instrument

The questionnaire, which was originally prepared in English and then was translated into Myanmar, was used as an instrument to collect all data from 133 farmers. The questionnaire included open- ended and closed questions. It consisted of 4 parts as follows:

Part 1: Demographic and Socio-economic status of the farmers

The questions in this part concerned age, level of education, experience in groundnut cultivation, total incomes of farm family, income from groundnut production, farm size, land tenure, family labor, credit for groundnut cultivation, off-farm employment, and source of information for monsoon groundnut cultivation.

Part 2: Technological factors

The questions were about the technological factors which affect groundnut farmers such as production system of groundnut cultivation, knowledge of farmers, technological assistance from extension worker, and participation in extension activities.

Part 3: Farmers' attitude towards monsoon groundnut production

A 5-point Likert Scale ranging from very high to very low was used to measure the level of farmers' attitudes to each of 24 statements concerning monsoon groundnut cultivation in dry zone area. (Appendix A).

Part 4: Problems and suggestions of the farmers

The questions in this part concerned about the problems faced by farmers in monsoon groundnut production and their suggestions on the improvement of groundnut production in dry zone area.

Pre-testing the Research Instrument

The questionnaires were pre-tested among 10 groundnut farmers in Pakokku township to find out the validity, soundness, and the weakness of the questions, and modified accordingly, before being used. The Cronbach-Alpha reliability coefficient was computed for 24 attitude statements and was found to be 0.81, indicating a good degree of reliability. The reliability coefficient was also computed for 20 knowledge questions and it was also 0.53.

Data Collection

Preliminary data were gathered from the Oil Crops Development Project, and Head Office of Myanmar Agriculture Service. The existing documents from Head Office and Pakokku district office were used as a secondary source of data to supplement the primary data. Field data collection was conducted in April, 2008. List of names and addresses of farmers participating in the extension of monsoon groundnut being substituted for sesame growing areas were gathered from the office of respective townships.

Measurement of Selected Variables

Age was measured in years. It was grouped into: 30 and less than 30 years, 31 to 40 years, and above 40 years.

Level of education of household farmer was categorized into 5 groups: illiterate, primary (grade 1-4), middle (grade 5-8), high school (9-10), and higher level (Diploma and Graduate). It was regrouped into: Grade 4 and less than grade 4, grade 5 to grade 10, and above grade 10.

Experience in groundnut cultivation of the farmer was measured in years. It was categorized into 3 groups: 3 years and less than 3 years, over 3 to 5 years, and above 5 years. It was regrouped into: 5 years and less than 5 years, and over 5 years.

Total income of farm family was measured in kyats (ks) per year. Total incomes were categorized into 3 groups: 500 thousand ks and less than 500 thousand ks, over 500 thousand ks to 1000 thousand ks, and more than 1000 thousand ks.

Income from groundnut production was measured in kyats (ks) per acre. It was calculated as a net profit from groundnut cultivation by considering total income and total cost of groundnut cultivation per acre.

Total income= Output x price

Total cost= Cash paid for inputs and services for groundnut cultivation

Net profit = Total income – Total cost

Income from groundnut production was categorized into 2 groups: 30 thousand ks and less than 30 thousand ks per acre, more than 30 thousand ks per acre.

Farm size was measured in acres. This variable was categorized into 3 groups: 1 acre and less than 1 acre, more than 1 to 3 acre, and above 3 acre.

Land tenure was categorized into 3 groups: owner, tenant farmer, and joint owner. It was regrouped into 2 categories: owner and not owner.

Family labor was measured in number of family members who assist the farmer in monsoon groundnut cultivation. This variable was categorized into 2 groups: 1 and less than 1 supporter, more than 1 supporter.

Credit for groundnut cultivation was measured whether the farmer obtained credit or not. It was categorized into 2 groups: obtain credit and not obtain credit for cultivation.

Off-farm employment was measured whether respondent farmer is employed in: government sector, private sector, any other organization or self-employment in addition to farming. It was regrouped into 2 categories: employed and unemployed.

Source of information was measured as sources where the farmer gets information for groundnut cultivation. All the possible sources were grouped as: extension worker, other farmers, media (daily newspaper, weekly agricultural newsletter, daily television program, radio broadcasting, pamphlets and leaflets), and agro-chemical companies. It was regrouped into 2 categories: extension worker, and others.

Production system of groundnut cultivation was categorized into 2 groups: monsoon groundnut is cultivated as an inter-cropping with other crops, and as a sole crop.

Knowledge of farmers was measured by asking 20 questions relating to the improved cultural practice for groundnut production recommended by Myanmar Agriculture Service. On questions regarding knowledge of farmers, 1 point score was given for the one of correct answers and 0 (zero) point for the wrong answer. Upon their answers to the questions, the total score across 20 items ranged from 0 to 23. It was classified into 3 levels by using the class interval of Harshbarger (1977) as a formula.

$$\text{Class interval} = \frac{\text{The highest score} - \text{The lowest score}}{\text{The number of levels}}$$

$$= \frac{23 - 0}{3}$$

$$= 7.67$$

Score range		Meaning
0 – 7 scores	=	low level of knowledge
8 – 15 scores	=	medium level of knowledge
16 – 23 scores	=	high level of knowledge

Technological assistance from extension worker was measured by asking 7 main questions relating to the number of visits by extension worker to farmers (farm visits), their discussions about technology, distribution of production inputs, number of discussion meetings, training programs, demonstration programs, and field day sessions during the growing season to provide the groundnut technology. Upon their responses to the questions, the sum score ranged from 0 to 32. It was classified into 3 levels by using Harshbarger (1977) formula.

$$\text{Class interval} = \frac{\text{The highest score} - \text{The lowest score}}{\text{The number of levels}}$$

$$= \frac{32 - 0}{3}$$

$$= 10.67$$

Score range		Meaning
0 – 10 scores	=	low level of technological assistance
11 – 21 scores	=	medium level of technological assistance
22 – 32 scores	=	high level of knowledge

Participation in extension activities was measured by asking 4 main questions relating to the number of discussion meetings, training programs, demonstration

programs, and field day sessions, participated by farmers during 2007 growing season. The total score ranging from 0 to 16 depended on the answers to the questions. It was classified into 3 levels.

$$\text{Class interval} = \frac{\text{The highest score} - \text{The lowest score}}{\text{The number of levels}}$$

$$= \frac{16 - 0}{3}$$

$$= 5.33$$

Score range		Meaning
0 – 5 scores	=	low level of participation in extension
6 – 11 scores	=	medium level of participation in extension
12 – 16 scores	=	high level of participation in extension

Farmers' attitudes towards monsoon groundnut production were measured by asking 24 questions concerning groundnut production in dry zone area. The scores for all statements were assigned on the basis of Likert scale method as follows:

Very High	5
High	4
Medium	3
Low	2
Very low	1

Based on the scale indicated above, the interpretation of these responses were calculated by using the formula:

$$\text{Class interval} = \frac{\text{The highest score} - \text{The lowest score}}{\text{The number of intervals}}$$

$$= \frac{5 - 1}{5}$$

$$= 0.80$$

The ranges of rating were detailed as follows:

Mean range		Meaning
4.21 – 5.00	=	very high level of farmers' attitudes
3.41 – 4.20	=	high level of farmers' attitudes
2.61 – 3.40	=	medium level of farmers' attitudes
1.81 – 2.60	=	low level of farmers' attitudes
1.00 – 1.80	=	very low level of farmers' attitudes

Analysis of Data

All of the data were analyzed by a computer program to calculate statistical information. Then, descriptive statistics, such as frequency, percentage, mean and standard deviation were used to describe the farmers' demographic, socio-economic and technological factors and level of their attitudes.

For inferential statistics, Chi- square, Pearson correlation and Spearman's Rho statistics were employed to determine the relationships between each independent and dependent variables in hypothesis testing.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter discusses the data analysis generated from the computer program for statistical calculation. The results of this study are presented in five parts as follows:

Part 1: Results of the demographic and socio-economic information of farmers

Part 2: Results of the technological factors of farmers

Part 3: Results of the analysis on the degree of farmers' attitudes towards monsoon groundnut production in dry zone area

Part 4: Results of the hypothesis testing

Part 5: Problems and suggestions of the farmers in Pakokku district

Part 1: Demographic and Socio-economic Information of Farmers

Table 6 presented the results of the demographic and socio-economic information of the farmers.

Table 6 **Distribution of demographic and socio-economic status of the farmers**

(n =133)

Items		Frequency	Percent(%)
1**. Age** (years)			
≤ 30		5	3.8
31 – 40		15	11.3
> 40		113	85.0
$\bar{X}$ = 55.77	S.D. = 13.99	Minimum = 23	Maximum = 83
2**. Level of Education** (grade)			
≤ 4 (primary level)		72	54.1
5 – 10 (middle and high school level)		56	42.1
> 10 (higher level)		5	3.8
$\bar{X}$ = 5.62	S.D. = 2.98	Minimum = 0 (illiterate)	Maximum = 14 (graduate)
3. **Experience** (years)			
≤ 5		20	15.0
> 5		113	85.0
$\bar{X}$ = 20.07	S.D. = 12.38	Minimum = 1	Maximum = 55

Table 6 (Continued)

Items	Frequency	Percent (%)
4. **Total income** (kyats)		
≤ 500,000	24	18.1
> 500,000 – 1000,000	56	42.1
> 1000,000	53	39.8
$\bar{X}$ = 913722.74 S.D. =485068.401 Minimum = 50000 Maximum = 3110000		
5. **Groundnut income** (kyats per acre)		
≤ 30,000	102	76.7
> 30,000	31	23.3
$\bar{X}$ = 29932.33 S.D. = 10000.906 Minimum = 0 (no profit) Maximum = 50000		
6. **Farm Size** (acre)		
≤ 1	24	18.0
> 1 – 3	70	52.6
> 3	39	29.3
$\bar{X}$ = 3.0244 S.D. = 2.00517 Minimum = 0.75 Maximum = 13.00		
7. **Land tenure**		
Owner	133	100.0
Not owner	0	0.0

Table 6 (Continued)

Items		Frequency	Percent (%)
8. **Family labour** (number of supporter)			
≤ 1		34	25.6
> 1		99	74.4
$\bar{X}$ = 2.56	S.D. = 1.815	Minimum = 0 (no supporter)	Maximum = 11
9. **Credit**			
Obtain credit		103	77.4
Not obtain credit		30	22.6
10. **Off-farm employment**			
Employed		87	65.4
Unemployed		46	34.6
11. **Source of information**			
Extension worker		59	44.4
Others		74	55.6

According to the Table 6, the majority of the farmers (85%) were at the age of over 40 years followed by 11.3% who were between the age of 31 to 40 years. The number of farmers who were between the age of 30 years or less, was only 3.8%. The mean age of the farmers was 56 years, with the standard deviation of 13.99. The age of farmers ranged from 23 years to 83 years.

In terms of the educational level, over half of the farmers (54.1%) were educated in the range of grade 4 (primary level) or less, followed by 42.1% in the range of grade 5 to grade 10 (middle and high school level), while 3.8% of farmers

had higher level of education (diploma and graduate). The mean of educational level of farmers was 5.62 (middle school level) with the standard deviation of 2.98. The educational level of farmers ranged from illiterate (0) to graduate level (grade 14).

With regard to farmers' experiences in groundnut cultivation, the majority of the farmers (85%) had more than 5 years' experience followed by 15% who had 5 years' experience or less. The mean of experience was 20 years with the standard deviation of 12.38. The farmers' experiences in groundnut cultivation ranged from 1 to 55 years.

Regarding the total income of farm family per year, the largest group of farmers (42.1%) belonged to the total income range of over 500 – 1000 thousand kyats followed by 39.8% at the range of over 1000 thousand kyats while only 18.1% of farmers were in the range of 500 thousand kyats or less. The mean of total income of farm family was 913,722.74 kyats with the standard deviation of 485068.40. The total income of farm family ranged from 50000 kyats to 3110,000 kyats per year.

The majority of the farmers (76.7%) belonged to the groundnut income range of 30 thousand kyats per acre or less while 23.3% of farmers were more than 30 thousand kyats per acre. The mean of groundnut income was 29,932.33 kyats with the standard deviation of 10000.91. The groundnut income of farm family ranged from no profit (0) to 50,000 kyats per acre.

As regards the farm size of farmers, half of the farmers (52.6%) had medium farm size ranging from more than 1 to 3 acres followed by 29.3% and 18.0% at the range of over 3 acres, and 1 acre or less respectively. The farm size of farmers ranged from 0.75 - 13.00 acres and the mean of farm size and standard deviation were 3.02 acre and 2.01 respectively.

Regarding the land tenure status, all sample farmers (100%) were land owners.

Most farmers (74.4%) belonged to the family labour range of more than one supporter followed by 25.6% in the range of one supporter or less. The number of family labour ranged from no supporter (0) to 11 supporters. The mean of family labour was 3 supporters with the standard deviation of 1.82.

The majority of farmers (77.4%) obtained credit for groundnut cultivation while 22.6% did not obtain credit for groundnut cultivation.

Over half of the farm families (65.4%) had off-farm employment in addition to farming while 34.6% did not have off-farm employments.

As regards the source of information, over half (55.6%) of the farmers obtained their information concerned with groundnut cultivation from other sources such as other farmers, media, and private agro-chemical companies while nearly half of the farmers (44.4%) obtained their information from government extension workers.

Part 2: Technological Factors of Farmers

Table 7 presented the results of the technological factors of farmers.

Table 7 Distributions of technological factors of the farmers

(n = 133)

Items	Frequency	Percent (%)
1. **Production system**		
Inter- cropping	117	88.0
Sole crop	1 6	12.0
2. **knowledge of farmers**		
Low (0-7 scores)	0	0.0
Medium (8-15 scores)	31	23.3
High (16-23 scores)	102	76.7
$\bar{X}$ = 16.78 S.D. = 1.997	Minimum = 10	Maximum = 22
3. **Technological assistance**		
Low (0-10 scores)	2	1.5
Medium (11-21 scores)	82	61.7
High (22-32 scores)	49	36.8
$\bar{X}$ = 19.59 S.D. = 3.910	Minimum = 5	Maximum = 25
4. **Participation in extension activities**		
Low (0-5 scores)	44	33.1
Medium (6-11 scores)	77	57.9
High (12- 16 scores)	12	9.0
$\bar{X}$ = 7.06 S.D. = 3.272	Minimum = 0	Maximum = 12

With respect to the above data in Table 7, the majority of farmers (88.0%) used the inter-cropping system for groundnut cultivation while only a slight percentage of the farmers (12%) used sole cropping.

As regards the knowledge level of farmers, most farmers (76.7%) were at a high level of knowledge (16-23 scores) followed by 23.3% of farmers who were at a medium level of knowledge (8-15 scores). The mean score of knowledge was 16.78 with the standard deviation of 2.00. The knowledge scores of farmers ranged from 10 to 22 scores.

Regarding the technological assistance, most farmers (61.7%) obtained the medium level of technological assistance from extension workers (11-21 scores) and 36.8% were at a high level of assistance while 1.5% obtained the low level of technological assistance from extension workers. The mean of the scores which indicate the level of technological assistance was 19.59 with the standard deviation of 3.91. The scores which indicate the level of technological assistance from extension workers ranged from 5 to 25 scores.

With regard to the level of farmers' participation in extension activities, over half of the farmers (57.9%) were at a medium level of participation (6-11 scores) followed by 33.1% and 9.0% were at a low level (0-5 scores) and high level of participation (12-16 scores), respectively. The scores which indicate the level of participation ranged from zero (0) to 12 scores. The mean scores of farmers' participation were 7.06 with the standard deviation of 3.27.

Part 3: Degree of Farmers' Attitudes towards Monsoon Groundnut Production

This part focused on the degree of farmers' attitudes towards monsoon groundnut production in dry zone area. The degree of attitudes was divided into very low, low, medium, high, and very high.

Table 8 Degree of farmers' attitudes towards monsoon groundnut production

(n= 133)

Statements	1	2	3	4	5	$\bar{X}$	S.D.	Attitude level
1. Monsoon groundnut cultivation was more economical than sesame cultivation in early monsoon season.	-	-	32 (24.1)	55 (41.4)	46 (34.6)	4.11	0.76	high
2. It would be more convenient to substitute groundnut for sesame area in early monsoon season if the economic situation of most farmers allowed them to do so.	34 (25.6)	40 (30.1)	13 (9.8)	21 (15.8)	25 (18.8)	2.72	1.47	medium
3. The farmers involved in the area extension of monsoon groundnut should organize their colleagues to participate in this program.	32 (24.1)	43 (32.3)	37 (27.8)	16 (12.0)	5 (3.8)	2.39	1.09	low
4. Oil seed crop project should do more to help groundnut farmers to expand groundnut areas in early monsoon season.	22 (16.5)	24 (18.0)	24 (18.0)	42 (31.6)	21 (15.8)	3.12	1.34	medium
5. As a farm producer, the farmer was satisfied with the profit of groundnut production in early monsoon season.	47 (35.3)	52 (39.1)	14 (10.5)	17 (12.8)	3 (2.3)	2.08	1.08	low
6. Monsoon groundnut should be substituted for sesame area in early monsoon season due to high income.	41 (30.8)	63 (47.4)	16 (12.0)	12 (9.0)	1 (0.8)	2.02	0.93	low
7. The farmer was satisfied with the marketing facilities available for groundnut production.	29 (21.8)	23 (17.3)	57 (42.9)	20 (15.0)	4 (3.0)	2.60	1.08	low

Table 8 (continued)

(n = 133)

Statements	1	2	3	4	5	$\bar{X}$	S.D.	Attitude level
8. When the investment for seed was low, a farmer would be well disposed to substitute groundnut in sesame area in early monsoon season.	4 (3.0)	15 (11.3)	16 (12.0)	44 (33.1)	54 (40.6)	3.97	1.12	high
9. Monsoon groundnut cultivation in early monsoon season with project support was greatly advantageous to farmers.	37 (27.8)	40 (30.1)	23 (17.3)	24 (18.0)	9 (6.8)	2.46	1.26	low
10. Groundnut cultivation in early monsoon season was a low risk if the cost of cultivation was low.	-	1 (0.8)	3 (2.3)	64 (48.1)	65 (48.9)	4.45	0.58	very high
11. If a neighbouring farmer who was a sesame grower in early monsoon season sought the others' opinions on increasing his farm income, the other farmers would advise him to substitute groundnut in sesame areas.	26 (19.5)	52 (39.1)	25 (18.8)	29 (21.8)	1 (0.8)	2.45	1.06	low
12. A farmer would be well disposed to grow the groundnut in early monsoon season if there were favorable weather conditions in dry zone area.	26 (19.5)	34 (25.6)	11 (8.3)	24 (18.0)	38 (28.6)	3.11	1.54	medium
13. The substitution of monsoon groundnut for sesame growing area was a good practice for self-sufficiency of edible oil.	27 (20.3)	46 (34.6)	34 (25.6)	21 (15.8)	5 (3.8)	2.48	1.10	low
14. The monsoon groundnut area expansion during early monsoon season could improve the socio - economic conditions of the farmers in dry zone area.	34 (25.6)	44 (33.1)	29 (21.8)	24 (18.0)	2 (1.5)	2.37	1.10	low

Table 8 (continued)

(n = 133)

Statements	1	2	3	4	5	$\bar{X}$	S.D.	Attitude level
15. A farmer would expand groundnut cultivation in early monsoon season if the project provided more inputs than usual.	55 (41.4)	18 (13.5)	11 (8.3)	10 (7.5)	39 (29.3)	2.70	1.72	medium
16. It was easy for farmers who had enough investments for seeds to substitute groundnut in sesame area.	7 (5.3)	5 (3.8)	33 (24.8)	57 (42.9)	31 (23.3)	3.75	1.03	high
17. A farmer might think of increasing the investments on groundnut cultivation in early monsoon season.	27 (20.3)	25 (18.8)	45 (33.8)	28 (21.1)	8 (6.0)	2.74	1.18	medium
18. Groundnut growing area should be promoted as an early monsoon crop being substituted for sesame growing area in dry zone.	36 (27.1)	61 (45.9)	8 (6.0)	15 (11.3)	13 (9.8)	2.31	1.26	low
19. A farmer who substituted groundnut for sesame area could get maximum profit if there were favorable weather conditions in early monsoon season.	31 (23.3)	46 (34.6)	42 (31.6)	11 (8.3)	3 (2.3)	2.32	1.00	low
20. The self-sufficiency of edible oil could be boosted by expending groundnut growing area during early monsoon season.	49 (36.8)	38 (28.6)	25 (18.8)	19 (14.3)	2 (1.5)	2.15	1.12	low
21. Monsoon groundnut cultivation in early monsoon season normally gets high yield.	50 (37.6)	40 (30.1)	22 (16.5)	21 (15.8)	-	2.11	1.08	low

Table 8 (continued)

(n = 133)

Statements	1	2	3	4	5	$\bar{X}$	S.D.	Attitude level
22. A farmer who substituted groundnut for sesame area in early monsoon season with project support would effectively apply both his time and money.	36 (27.1)	29 (21.8)	43 (32.3)	24 (18.0)	1 (0.8)	2.44	1.10	low
23. Groundnut farmers should attend the training/ field day sessions to be more effective on groundnut production.	39 (29.3)	26 (19.5)	16 (12.0)	12 (9.0)	40 (30.1)	2.91	1.64	medium
24. The care and management for groundnut cultivation was easier than sesame cultivation.	50 (37.6)	18 (13.5)	28 (21.1)	30 (22.6)	7 (5.3)	2.44	1.33	low
Overall						**2.76**	**0.68**	**medium**

Remark: - numbers in ( ) refer to percentage values.

- 1, 2, 3, 4, and 5 refer to very low, low, medium, high and very high respectively.

Table 8 revealed the attitudes of the farmers towards monsoon groundnut production in dry zone area. The groundnut farmers were asked to indicate their perceptions regarding twenty four attitudinal statements concerned with monsoon groundnut production. The results of the overall analysis showed that the degree of the farmers' attitudes towards monsoon groundnut production was at medium level as presented by the mean of 2.76. This implied that the farmers were disposed to cultivate monsoon groundnut in dry zone area even though the degree of attitudes was at medium level. The means of the 24 attitudinal statements ranged from 2.02 to 4.45.

On the other hand, there were three main points wherein the farmers' attitudes were considerably higher. It was found that the first point was "Groundnut cultivation in early monsoon season was a low risk if the cost of cultivation was low" with a

mean of 4.45. In study areas, the investment for groundnut seed was very high, thus the majority of farmers felt that groundnut cultivation in early monsoon season was a high risk due to high cost of cultivation. Secondly, “monsoon groundnut cultivation was more economical than sesame cultivation in early monsoon season” with a mean of 4.11. This seems to conflict with the previous statement. The farmers in study area believed that there might be more profit from groundnut cultivation than sesame in early monsoon season. Thirdly, “When the investment for seed was low, a farmer would be well disposed to substitute groundnut in sesame area in early monsoon” which obtained a mean of 3.97. At present, the investment for groundnut seed was very high, thus it could be assumed that the farmers were reluctant to substitute groundnut in sesame area in early monsoon season.

The last item with a mean of 2.02 which was a lowest mean, as the farmers had lowest confidences in this item “monsoon groundnut should be substituted for sesame area in early monsoon season due to high income.”

With these points of view, it could be assumed that the majority of the farmers believed that monsoon groundnut cultivation was more economical than sesame cultivation. Otherwise, the farmers might felt well disposed towards monsoon groundnut cultivation, but they were reluctant to expand groundnut cultivation being substituted for sesame area due to high cost of cultivation and unfavorable weather conditions in early monsoon season. Thus they did not dare to take risks since they were small-scale farmers in dry zone area.

Part 4: Hypothesis Testing

This part focused on hypothesis testing as follows:

Hypothesis 1: There was relationship between demographic factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Table 9 Relationship between demographic factors and attitudes of farmers towards monsoon groundnut production in dry zone area

(n= 133)

Variables	Attitudes		
	Pearson Correlation (*r*)	**Spearman's rho (r_s)**	***P***
Age	- 0.18*	-	0.039
Level of education	-	0.20*	0.024
Experience	- 0.03	-	0.762

* Significant at .05 level

Hypothesis 1:1 There was relationship between age and attitudes of farmers towards monsoon groundnut production in dry zone area.

Regarding the relationship of variable age and attitudes of farmers towards monsoon groundnut production, Pearson's Product Moment Correlation statistic was calculated at the 0 .05 significance level, $r = -.18$, $p = .039$ ($P < .05$). The direction of correlation was negative, which means that young farmers were more likely to have high level of attitudes towards monsoon groundnut production and vice versa. Therefore, age was negatively related to the attitudes of farmers towards monsoon groundnut production in dry zone area. Consequently, the hypothesis was accepted.

This finding implied that the young farmers were deemed to be more willing to take risks and were therefore more open to substitute groundnut even though it was not sure whether the substitution of groundnut for sesame area would be of great benefit to them or not. In a similar study conducted by Bagheri *et al.* (2008), it was

found that age was negatively related with perception of paddy farmers towards sustainable agricultural technologies in Mazandaran province of Iran.

Furthermore, the above findings were in line with the finding of Isin and Bulent (2005) who found that age of farmers was negatively related to the attitudes of farmers towards adoption of crop planning in Turkey.

Hypothesis 1.2: There was relationship between level of education and attitudes of farmers towards monsoon groundnut production in dry zone area.

The analysis of relationship between level of education and attitudes of farmers towards monsoon groundnut production was determined by the Spearman's rho statistic. As shown in Table 9, the results indicated $r_s = .20$, $p = .024$ ($\propto = .05$, $p < .05$) wherein the statistic significance level was at .05. The direction of correlation was positive which means that the farmers who have high level of education tend to have high level of attitudes towards monsoon groundnut production and vice versa. Hence, the hypothesis was accepted. Likewise, it could be concluded that level of education was related to the attitudes of farmers towards monsoon groundnut production in dry zone area. Moreover, this finding point to the fact that those who were able to read instructions about new technologies tend to apply it in order to determine its utility in his own situation easier than those who were unable to read.

This finding was in line with the finding of Subair (2005) who found that "education has a moderate influence on the attitude of farmers towards the cultivation of the hybrid variety of Bambara groundnut in north- east Botswana".

Besides, Ganpat and Bholasingh (1995) also found that "farmers with secondary level education were significantly more positive in their overall attitudes towards farming in Trinidad than those with none / primary education at the .001 significance level.

Hypothesis 1.3: There was relationship between experience and attitudes of farmers towards monsoon groundnut production in dry zone area.

In Table 9, the results of Pearson's Product Moment Correlation analysis presented that experience in groundnut production was not related to the attitudes of farmers towards monsoon groundnut production, at the 0.05 significance level, in which the Pearson Correlation Coefficient (*r*) was - .03, and $p = .762$ ($\propto = .05$, $p > .05$). Thus, the hypothesis was rejected. Therefore, there was no relationship between experience and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 2: There was relationship between socio-economic factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Table 10 Relationship between socio-economic factors and attitudes of farmers towards monsoon groundnut production in dry zone area

(n = 133)

Variables	Attitudes	
	Pearson Correlation (*r*)	***P***
Total income	0.41**	0.000
Groundnut income	0.33**	0.000
Farm size	0.41**	0.000
Family labour	0.06	0.508

** Significant at .01 level

Hypothesis 2.1: There was relationship between total incomes of farm family and attitudes of farmers towards monsoon groundnut production in dry zone area.

Considering the variable of total incomes of farm family and farmer's attitudes towards monsoon groundnut production in Table 10, it was found that Pearson Correlation Coefficient (*r*) was .41, and $p = .000$ ($\propto = .05$, $p < .05$). The direction of correlation was positive which means that the farmers who had high incomes of farm family tend to high level of attitudes towards monsoon groundnut production and vice versa. Therefore, hypothesis was accepted and it could be summarized that

the variable of total incomes of farm family was related to the attitudes of farmers towards monsoon groundnut production in dry zone area.

This finding implied that the farmers who obtained high income were more likely to substitute groundnut in sesame area, regardless of the high investment, than those who obtained low income. This might be due to the reason that groundnut cultivation in early monsoon season was a relatively high risk.

Hypothesis 2.2: There was relationship between incomes from groundnut production and attitudes of farmers towards monsoon groundnut production in dry zone area.

With respect to the relationship between incomes from groundnut production and attitudes of farmers towards monsoon groundnut production, the results in Table 10 showed that Pearson Correlation Coefficient (r) was .33 and $p = .000$ ($\propto = .05$, $p < .05$). The direction of correlation was positive which meant that the farmers who earned high income from groundnut cultivation tended to have a high level of attitude towards monsoon groundnut production and vice versa. Hypothesis was therefore accepted and it could be concluded that the variable of income from groundnut production was related to the attitudes of farmers towards monsoon groundnut production in dry zone area.

This finding was in line with the findings of Ahmadvand (2008) who found that little financial return to farmers was one of the barriers to adoption of sustainable agricultural practices in Hamedan province, Iran.

Hypothesis 2.3: There was relationship between farm size and attitudes of farmers towards monsoon groundnut production in dry zone area.

Regarding the relationship between farm size and attitudes of farmers towards monsoon groundnut production, Pearson Product Moment Correlation statistic was calculated at the 0.05 significance level, $r = .41$, $p = .000$ ($p < .05$). The direction of correlation was positive which meant that the farmers with larger farm size tended

to have higher attitudes than the farmers with smaller farm size. Therefore, farm size was related to the attitudes of farmers towards monsoon groundnut production in dry zone area. Consequently, the hypothesis was accepted.

Based on the interview with farmers, the majority of the farmers in study area were favorably disposed to cultivate groundnut in mid-monsoon season but not early monsoon season recommended by project. Furthermore, the project provided inputs such as seeds and fertilizers for maximum one acre per farmer so as to achieve wider dissemination of technologies to farmers. Therefore, the farmer with larger farm size, who participated in this program mostly cultivated one acre of groundnut being substituted for sesame growing area in early monsoon season, and the rest in mid- monsoon season to avoid high risk. In the light of past experience of the farmers in study area, they were more likely to achieve the more stable and reliable income from groundnut cultivation in mid-monsoon season than early monsoon season.

Hein (1998) pointed to the fact that "the growing season in almost every region in the dry zone area is determined by the onset and termination of rainfall. The probabilities of consecutive wet decades are relatively higher and extend for a longer period during mid monsoon season. This suggests that the success of early rainy season crops is unpredictable as compared to that of mid monsoon crops. Sesame and mung bean thus should be sown with the onset of rain because of their low cost production inputs which is attributed to low risks and groundnut which is associated with larger investment on seed should be planted during mid monsoon in which longer and higher wet decades exist.

Hence, the farmers with larger acreages tended to have a higher attitude than the farmers with smaller farm sizes. This finding was in line with the finding of Noruzi (2006) who found that there was a significant difference between adoption of sprinkler irrigation with size of wheat cultivated land holding of the farmers in Nahavand township, Iran at the 0.01 significance level.

This finding was supported by the study of Agwu (2004) showed that farm size positively and significantly influenced adoption of improved cowpea technologies ($p < .05$) and hence was important in predicting adoption behaviors among farmers in Bauchi and Gombe States of Nigeria.

Hypothesis 2.4: There was relationship between land tenure and attitudes of farmers towards monsoon groundnut production in dry zone area.

According to the collected data, the variable land tenure status of farmers was found that all of the respondent farmers in study area were land owners. Therefore, no measures of association were computed for land tenure and attitudes of farmers due to only one category of variable. Hence, the hypothesis 2.4 was neglected.

Hypothesis 2.5: There was relationship between family labour and attitudes of farmers towards monsoon groundnut production in dry zone area.

As regards the relationship between family labour and attitudes of farmers, the results of Pearson Product Moment Correlation analysis presented that the variable of family labour was not related to the attitudes of farmers towards monsoon groundnut production, at the .05 significance level, in which the Pearson Correlation Coefficient (r) was .06, and $p = .508$ ($\propto = .05$, $p > .05$). Thus, the hypothesis was rejected. Therefore, there was no relationship between family labour and attitudes of farmers towards monsoon groundnut production in dry zone area.

Table 11 Relationship between socio-economic factors and attitudes of farmers towards monsoon groundnut production in dry zone area

Variables	Attitudes				
	Low level	**High level**	**n**	χ^2	***P***
Credit				6.07	0.014
Obtain credit	79	24	103		($p < .05$)
Not obtain credit	29	1	30		
Total	108	25	133		
Off-farm employment				12.73	0.000
Employed	63	24	87		($p < .001$)
Unemployed	45	1	46		
Total	108	25	133		
Source of information				3.34	0.068
Extension workers	52	7	59		($p > .05$)
Others	56	18	74		
Total	108	25	133		

Hypothesis 2.6: There was relationship between credit for cultivation and attitudes of farmers towards monsoon groundnut production in dry zone area.

The analysis of relationship between credit for cultivation and attitudes of farmers towards monsoon groundnut production was determined by the Chi- square statistic. As shown in Table 11, the results indicated that the farmers who obtained credit and not obtain credit were significantly different to the attitudes towards monsoon groundnut production in dry zone area at the 0.05 significance level ($p = .014 < .05$). Thus, the hypothesis was accepted.

This finding point to the fact that those who obtained credit were more likely to accept groundnut cultivation than those who did not obtain credit. This might be due to the reason that the governments' credit schemes were a useful supplement to the production cost to some extent for small-scale farmers in dry zone area. This finding was supported by the findings of Mendis (2005) which showed that the credit for cultivation was one of the most important factors of farmers' adoption concerning recommended crop management practice in paddy cultivation in Kalutara district Srilanka.

Hypothesis 2.7: There was relationship between off- farm employment and attitudes of farmers towards monsoon groundnut production in dry zone area.

Regarding the relationship between off-farm employment and farmers' attitudes, the results of Chi-square statistic showed that the farmers who had off-farm employment and did not have off-farm employment were significantly different to the attitudes of farmers towards monsoon groundnut production since $p = .000 < .001$. Therefore, the hypothesis was accepted.

Hypothesis 2.8: There was relationship between source of information and attitudes of farmers towards monsoon groundnut production in dry zone area.

According to the data in Table 11, there were no differences between sources of information and farmers' attitudes towards monsoon groundnut production since $p = .068$ ($p > .05$). Hence, the hypothesis was rejected and there was no relationship between source of information and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3: There was relationship between technological factors and attitudes of farmers towards monsoon groundnut production in dry zone area.

Table 12 Relationship between technological factors and attitudes of farmers towards monsoon groundnut production

Variables	Attitudes				
	Low level	**High level**	**n**	χ^2	***P***
Production system				4.21	0.040
Inter-cropping	92	25	117		($p < .05$)
Sole crop	16	-	16		
Total	108	25	133		

Hypothesis 3.1: There was relationship between production system and attitudes of farmers towards monsoon groundnut production in dry zone area.

With respect to the relationship between production system and attitudes of farmers towards monsoon groundnut production, the results of Chi-square statistic in Table 12 showed that inter-cropping and sole crop were significantly different to the attitudes of farmers towards monsoon groundnut production in dry zone area at the 0.05 significance level ($p = .040 < .05$). Thus, the hypothesis was accepted.

From this finding it could be inferred that those who intercropped the groundnut with other crops such as pigeon pea or sunflower might have additional income from inter cropping. This might be due to the reason that additional income from inter-crop was a supplement to the production cost, and thus those farmers were more likely to grow the groundnut in early monsoon season regardless of high investment than those who grew the groundnut as a sole crop.

Table 13 Relationship between technological factors and attitudes of farmers towards monsoon groundnut production

(n = 133)

Variables	Attitudes	
	Pearson Correlation (*r*)	***P***
Knowledge of farmers	0.10	0.270
Technological assistance from extension worker	0.09	0.286
Participation in extension activities	0.28**	0.001

** Significant at 0.01 level (2-tailed)

Hypothesis 3.2: There was relationship between knowledge and attitudes of farmers towards monsoon groundnut production in dry zone area.

The analysis of relationship between knowledge and attitudes of farmers towards monsoon groundnut production was determined by the Pearson Product Moment Correlation statistic. As shown in Table 13, the results indicated that Pearson Correlation Coefficient (r) was .10, and $p = .270$ ($\propto = .05$, $p > .05$). The hypothesis was therefore rejected and it could be concluded that there was no relationship between knowledge and attitudes of farmers towards monsoon groundnut production in dry zone area.

According to the results, most of the farmers in the study area have high level of knowledge about groundnut production technology and they clearly assumed that it is difficult for small-scale farmers to plant groundnut in early monsoon season due to high investment on seed. By and large, the farmers in the study area make production decisions for dry land crops in uncertain circumstances and most of the problems with groundnut production are mostly related to unfavorable weather conditions and their economic situations even though they follow the recommended improved cultural practice. Under these circumstances, increasing farmers' knowledge concerning groundnut production technology would not improve their

attitudes in this regard. This might be the reason that knowledge of farmers was not related to their attitudes towards monsoon groundnut production in study area.

Hypothesis 3.3: There was relationship between technological assistance from extension workers and attitudes of farmers towards monsoon groundnut production in dry zone area.

As regards the relationship between technological assistance and attitudes of farmers towards monsoon groundnut production, the results of Pearson Product Moment Correlation statistic in Table 13 showed that Pearson Correlation Coefficient (r) was .09, and $p = .286$ ($\propto = .05$, $p > .05$). Hence, the hypothesis was rejected and there was no relationship between technological assistance from extension workers and attitudes of farmers towards monsoon groundnut production in dry zone area.

Hypothesis 3.4: There was relationship between participation in extension activities and attitudes of farmers towards monsoon groundnut production in dry zone area.

The results for the relationship between participation in extension activities and attitudes of farmers in Table 13 showed that Pearson Correlation Coefficient (r) was .28 , and $p = .001$ ($\propto = .05$, $p < .01$). Therefore, the hypothesis was accepted and it could be concluded that there was relationship between participation in extension activities and attitudes of farmers towards monsoon groundnut production in dry zone area.

This finding could be inferred that those who participated in extension activities were more likely to accept groundnut cultivation than those who did not participate. This might be due to the reason that the extension activities were a source of information about technology and its effectiveness. Therefore, the farmers who participated in extension activities might have more information about new technology and its effectiveness than those who did not participate in extension

activities. Thus, the farmers with more information about technology were more likely to apply it in order to determine its utility in their own situations than the farmers with less information about technology who did not participate in extension activities.

The above finding was in line with the findings of Bagheri *et al*. (2008) which indicated that extension participation and perception of paddy farmers towards sustainable agricultural technologies were positively correlated in Mazandaran province of Iran.

This finding was also supported by the findings of Mendis (2005) which showed that farmers' participation in extension activities was one of the most important factors of farmers' adoption of crop management practices for paddy cultivation in Kalutara district because there were significantly differences between farmers' participation in extension activities and adoption of soil fertility improvement and sustenance at the 0.001 significance level, adoption of fertilizer management practices at 0.01, adoption of cultural and preventive weed control practices at the 0.05, and adoption of insect pest management practices at the 0.05 significance level respectively.

Part 5: Problems and Suggestions of the Farmers

According to the collected data of interviews with respondent farmers, five main problems in groundnut cultivation being substituted for sesame growing area in dry zone and suggestions of the farmers were presented in Table 14.

Table 14 Problems and Suggestions of the Farmers in Pakokku District

(n = 133)

Problems	Suggestions of the farmers	Number of farmers	Percent (%)
1. Lack of timely cultivation with the onset of monsoon rain due to insufficient soil moisture and thus harvest problem with rain.	1. Sowing time should be mid-monsoon season to avoid high risk	104	78
2. Lack of investment for production inputs	2.1. The government should increase the amount of credits for groundnut farmers. 2.2. The oil seed crops project should do more to help groundnut farmers for seeds, fertilizers, and agro-chemicals.	97	73
3. Shortage of good quality seeds and drought tolerant variety to fit local condition	3. The relevant department should provide a drought tolerant variety and good quality seeds.	96	72
4. Lack of timely inter-cultivation weeding due to shortage of labour in growing season	-	54	41
5. Shortage of organic manure such as cow-dung, poultry manure	-	27	20

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Farmers' attitudes towards monsoon groundnut production in Pakokku district, dry zone area, Myanmar was conducted to identify the demographic, socio-economic and technological factors of farmers participating in the extension of monsoon groundnut production in dry zone area, to determine the farmers' attitudes towards monsoon groundnut production, to determine the relationships between demographic, socio-economic, and technological factors of farmers and their attitudes, and to explore the problems faced by farmers and their suggestions to the problems.

This study used a survey research design that involved interviews with 133 groundnut farmers participating in the area extension of monsoon groundnut during 2007 crop year. The survey was conducted in Pakokku district, in the dry zone area.

All of the collected data were analyzed by using descriptive and inferential statistics including percentage, means, and standard deviations. Furthermore, Chi-square, Pearson Correlation Coefficient, and Spearman's rho statistics were used in order to test hypothesis at the 0.05 significance level.

Conclusions

Demographic and Socio-economic Information of Farmers

The results of this study revealed that the majority of farmers were over 40 years old and they were educated at grade 4 or less educational level. The average experience in groundnut cultivation of farmers was 20.07 years and the average total income of farm family was 913,722.74 kyats per year. The average income from groundnut was 29,932.33 kyats per acre with 3.02 acres of average farm size. All of the respondent farmers were land owners. The majority of farmers had more than one

supporter of family labourer and they obtained credit for groundnut cultivation and they had off-farm employment in addition to farming. The largest proportion of the farmers obtained their information from media, other farmers, and agro-chemical companies, while the rest obtained their information from extension workers.

Technological Factors of Farmers

The majority of farmers used the inter-cropping system and they had high level of knowledge in groundnut cultivation. Most farmers obtained the medium level of technological assistance from extension workers and they also participated in extension activities at medium level.

Degree of Farmers' Attitudes towards Monsoon Groundnut Production

The overall degree of farmers' attitudes towards monsoon groundnut production was at medium level. Based on the findings of this study, it can be concluded that the farmers in the study area clearly assumed that groundnut cultivation in early monsoon season was a high risk, thus they were reluctant to substitute groundnut in sesame areas even though they fully accepted it was more economical than sesame cultivation. Moreover, they were not satisfied with the profit of groundnut production in early monsoon season. Therefore, they didn't dare to take risks since they were small-scale farmers.

Hypothesis Testing

In summary, there were nine factors from three main hypotheses related to the attitudes of farmers towards monsoon groundnut production. Concerning demographic factors, age was negatively related while level of education was positively related to the attitudes of farmers towards monsoon groundnut production.

Regarding socio-economic factors, total income of farm family, farm size, income from groundnut and off-farm employment were significantly related while credit was also related to the attitudes of farmers towards monsoon groundnut production.

Concerning technological factors, participation in extension activities was significantly related while production system was also related to the farmers' attitudes towards monsoon groundnut production.

On the other hand, the results of demographic factors presented that there was no relationship between experience and farmers' attitudes towards monsoon groundnut production. Regarding the socio-economic factors, there were no relationships between family labour, source of information and farmers' attitudes towards monsoon groundnut production. Concerning technological factors, there were no relationships between knowledge of farmers, technological assistance from extension worker and farmers' attitudes towards monsoon groundnut production in dry zone area.

Problems and Suggestions of the Farmers

The important main problems faced by groundnut farmers in dry zone area are: "lack of timely cultivation with the onset of monsoon rain due to insufficient soil moisture", "lack of investment for production inputs", "shortage of good quality seed and drought tolerant variety", "lack of timely inter-cultivation weeding due to shortage of labour in growing season", and "shortage of organic manure (cow-dung, poultry manure, etc..)".

The farmers' suggestions on the problems were "sowing time should be mid-monsoon season", "government should increase the amount of credit for groundnut cultivation", "oil seed crop project should do more to help farmers for seeds, fertilizers, and agro-chemicals", and "the relevant department should provide draught tolerant varieties and good quality seeds" to overcome first priorities of three main problems.

Recommendations

Based on the findings of this study, the following recommendations are proposed for the improvement of monsoon groundnut production in dry zone area.

It is essential to find out the suitable sowing time (early monsoon or mid-monsoon season) for monsoon groundnut in the study areas based on the farmers' access to resources, soil types, and current rainfall pattern which differ from place to place and year after year. Therefore, the local extension office should practise the demonstration-cum-trials for different sowing times of monsoon groundnut on contact farmers' fields in cooperation with researchers. Furthermore, monitoring and evaluation of the activities should be regularly conducted for further improvement.

Myanma Agricultural Development Bank should increase the amount of credit for groundnut farmers so as to cover the production costs which is considerably high in order to overcome the problem of lack of investment for production inputs.

The distribution of drought tolerant varieties and good quality seeds should be strengthened by both involving departments and agro-chemical companies in order to overcome the problem of shortage of drought tolerant varieties and good quality seeds. Using the drought tolerant varieties and good quality seeds could increase yield per unit area as well as farm incomes of the farmers in dry zone area. Moreover, the farmers also should be encouraged to produce groundnut seeds for their own use to reduce the problems of shortage of good quality seeds. However, for this to happen successfully, they should be given training in seed production, processing and good storage methods for groundnut seeds.

The local extension offices should train the farmers in suitable systematic herbicide application if labor and time are limited in order to overcome lack of timely inter-cultivation weeding due to shortage of labour in growing season. Furthermore, the farmers also should be encouraged to carry out summer ploughing to reduce weed problems as well as insect and disease problems.

The shortage of organic manure could be addressed through more emphasis on demonstrations (methods and results) regarding organic fertilizers, group discussions, field day and conducting visit to organic farming stations. The local extension offices should carry out such kind of activities in cooperation with OISCA international, one of the NGOs in dry zone area, namely Organization for Industrial Spiritual and Cultural Advancement, being practicing the organic farming technology in agriculture.

According to the results of this study, the degree of farmers' attitudes towards the training/ field day sessions was at medium level. The local extension offices therefore need to organize farmers to participate more in extension activities through providing effective and efficient training/field day sessions in order to improve the attitude in the future for the improvement of monsoon groundnut production.

Because of the positive relationship between participation in extension activities and farmers' attitudes, the local extension office should expand its coverage to reach more farmers by means of relevant extension methods in different areas. It was noted that age was negatively and educational level was positively related to the attitudes of farmers. Therefore, more aged and low-educated farmers who are the majority of farmers in study areas should especially be organized to improve their attitudes towards monsoon groundnut production in dry zone area.

According to the results of this study, the degree of farmers' attitudes towards the marketing facilities available was at low level. An appropriate system for the dissemination of marketing information to groundnut farmers should hence be improved by means of distribution of current price information and demand forecasts of the different market outlets in local areas. Furthermore, the local authorities should strive to improve infrastructure that can improve marketing facilities as well as farming operations such as rural roads, water, electricity, and telephone connections.

Recommendation for Further Study

This study was conducted in only one district; it would be more representative of dry zone area to study the attitudes of farmers in other districts involved in the area extension of monsoon groundnut in dry zone area.

Furthermore, it would be of more interest to study the relationships between farmers' attitudes towards monsoon groundnut production and other socio-economic factors of farmers such as family size, land holding, material possession, social participation, risk orientation, decision making, level of aspiration, and mass media exposure, and other physical factors such as climate, rainfall, soil fertility, water resources of the farmers are suggested.

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APPENDICES

Appendix A

Interview schedule

INTERVIEW SCHEDULE

Title: Farmers' Attitudes towards Monsoon Groundnut Production in Pakokku District, Dry Zone Area, Myanmar

Date of interview---------- Interviewer ----------

Name of farmer ---------- Address ----------

Part 1: Questionnaire for demographic and Socio-economic factors

Direction: Put (Â) in front of the item matching your true information.

1. Sex

( ) Male ( ) Female

2. Age ---------- years

( ) 30 and less than 30 years ( ) 31- 40 years ( ) more than 40 years

3. Level of education ----------

( ) Illiterate ( ) Primary (Grade 1-4) ( ) Middle (Grade 5-8)

( ) High school (Grade 9-10) ( ) Higher level (Diploma & graduate)

4. Experience in groundnut cultivation ---------- years

( ) 3 years and less than 3 years ( ) over 3 to 5 years ( ) over 5 years

5. Total income of farm family ---------- kyats/year

( ) 500 thousand kyats & less than 500 thousand kyats ( ) over 500 to 1000 thousand kyts ( ) more than 1000 thousand kyts

6. Income from groundnut production ---------- kyats per acre

( ) 30000 kyts & less than 30000 kyts/ acre ( ) over 30000 kyts/acre

6 (1). Expenditure on groundnut cultivation and income of selling groundnut yield

Total expenditure:--------- kyats , Total amount of selling yield ------ kyats

7. Land holding of the family

( ) 2 acres and less than 2 acres ( ) more than 2 to 5 acres ( ) above 5 acres

8. Farm size ---------- acres

( ) 1 acre & less than 1 acre ( ) more than 1 to 3 acres ( ) above 3 acres

9. Land tenure

( ) owner ( ) Tenant farmer ( ) Joint owner

10. Material possession

( ) Bullock cart ( ) Water pump ( ) Radio

( ) Cycle ( ) Motor cycle ( ) Any other…

11. Number of family members

( ) 2 and less than 2 members ( ) 3-5 members ( ) over 5 members

12. Family labour ---------- supporter

( ) 1 and less than 1 supporter ( ) More than 1 supporter

13. Credit for groundnut cultivation

( ) Obtain credit ( ) Not obtain credit

14. Source of Credit

( ) Government bank ( ) Private bank ( ) Private lenders

( ) Lending co-operatives ( ) Others ( ) Friends and relatives

15. Off- farm employment ( ) Yes ( ) No

( ) Government sector ( ) Private sector ( ) Other organization
( ) Self- employment

16. Source of information

( ) Extension worker ( ) Farmer to farmer ( ) Media

17. Mass Media Exposure

( ) Daily newspaper ( ) Weekly agricultural newsletter ( )Radio

( ) Television program ( ) Pamphlets, Leaflets ( ) Others..(Please specify)

Part 2: Questionnaire for technological factors

Direction: Put (Â) in front of the item matching your true information.

(A) Production system of groundnut cultivation

1. Production system

( ) inter-cropping with ---------- crop ( ) sole crop

(B) Groundnut cultivation knowledge of farmers

1. Do you know how many baskets of target yield of groundnut?

( ) 50 baskets/ acre (1.40 metric tons/hectare) [True] 1 score

( ) less than or more than 50 baskets/ acre [False] 0 score

2. What percent of seed germination rate should be at least?

( ) 80 percent [True] 1 score

( ) less than or more than 80 percent [False] 0 score

3. What kind of seeds are recommended to avoid for groundnut cultivation by Myanmar Agriculture Service?

( ) The seeds which obtained from the plants suffered from drought at kernel formation time [True] 1 score

( ) Other answers [False] 0 score

4. What is the best sowing time of monsoon groundnut in early monsoon season to achieve high yield?

( ) Early sowing time with the onset of monsoon rain is essential to achieve high yield in early monsoon season. [True] 1 score

( ) Other answers [False] 0 score

5. What kind of seeds (fresh seeds or old seeds) should be used to get more yield?

( ) the fresh seeds (seed which is harvested during current year) [True] 1 score

( ) the old seeds (seed obtained last year rainy season) [False] 0 score

6. Do you know how many plant populations per acre which is recommended by Myanma Agriculture Service?

( ) (100000- 130000 plants/acre) [250,000 plants/hectare] [True] 1 score

( ) Less than or more than 100000- 130000 plants/ acre [False] 0 score

7. What should you do in your field before sowing time to prevent weed emergence and to create good soil conditions?

( ) summer ploughing
(one ploughing operation, one month in advance) [True] 1 score

( ) Other answers [False] 0 score

8. What variety did you grow in 2007 monsoon season?

( ) Magway 11 (M-11), M-12, M-15, Sinpadaetha-5 (S-5), S-6, S-7 (one of those varieties) [True] 1 score

( ) Other varieties [False] 0 score

9. What is your sowing time of monsoon groundnut in 2007 crop season?

( ) the time with the onset of monsoon rains [True] 1 score

( ) Other times [False] 0 score

10. What is the row spacing of groundnut in your field?

( ) 15 to 18 inches (38 to 45 cm) [True] 1 score

( ) less than 15 and more than 18 inches [False] 0 score

11. What should you apply (use) in your field in addition to organic fertilizers to achieve optimum yield in monsoon groundnut cultivation?

( ) Using any chemical fertilizers such as Urea, TSP, Potash [True] 1 score

( ) Nothing to use [False] 0 score

12. What kinds of fertilizers and how many lbs did you use in your field?

( ) Urea (12.5 kilo) + T-super (25 kilo) + Potash (12.5 kilo) [True] 3 score
(1 score for one kind of fertilizers)

( ) One kind of compound fertilizers (at least 2.5 kilo) [True] 1 score

( ) Nothing to use [False] 0 score

13. What is the organic fertilizer that can enhance kernel development and prevent "pop" or empty hulls?

( ) Gypsum [True] 1 score

( ) No [False] 0 score

14. How many lbs of gypsums did you use in your field?

( ) 100- 250 lbs per acre [True] 2 score

( ) Less than 100 lbs per acre [False] 1 score

( ) Nothing [False] 0 score

15. When did you use the gypsum in your field?

( ) During 45 days after sowing [True] 1 score

( ) Over 45 days after sowing [False] 0 score

( ) Nothing [False] 0 score

16. What is the important cultural practice that can keep the plant weed free or reduce weed problems during crop season?

( ) Timely inter-cultivation weeding [True] 1 score

( ) No / other answers [False] 0 score

17. How many days after sowing is especially important to do weeding so as to meet good yield?

( ) during 30-45 days after sowing [True] 1 score

( ) less than 30 and more than 45 days after sowing [False] 0 score

18. What is the one kind of important inter-cultivation weeding which is necessary to produce good yield in groundnut cultivation?

( ) Frequent weeding by “earthing up” with inter-row cultivation or hand chipping [True] 1 score

( ) Other answers [False] 0 score

19. What should you do when damage observed in your field?

( ) Any steps to control any insect pest and disease [True] 1 score

( ) No [False] 0 score

20. When did you harvest the groundnut in your field in 2007?

( ) At the optimum maturity stage (over 70% mature pods in the field) [True] 1 score

( ) Other times [False] 0 score

(D) Technological assistance from extension worker

1. How many times did extension worker come to your farm and guide the groundnut production technology in 2007 crop season? [Total = 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

2. What did they discuss? [Total = 7 scores]

( ) To use drought resistance varieties ( ) Time of sowing and plant population

( ) To use farmyard manure and fertilizers ( ) Soil preparation and weeding

( ) Insect pest control ( ) Harvesting time ( ) Early land preparation

3. Did they provide you with good seed and any fertilizer package?

( )Yes [True] 1 score

( ) No [False] 0 score

3(1). If yes, how many of them did you receive? [Total = 5 scores]

( ) groundnut seed------- kg/ acre ( ) Urea fertilizer -------- kg/ acre

( ) T-super fertilizer----- kg/acre ( ) Potash fertilizer-------kg/acre

( ) other (please specify)----------

4. Did they provide you to attend the discussion meetings on the groundnut production technology in 2007?

( ) Yes [True] 1 score

( ) No [False] 0 score

4(1). If yes, how many times did thay provide? [Total= 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

5. Did they provide you to attend the training programs concerning with groundnut production technology in 2007?

( ) Yes [True] 1 score

( ) No [False] 0 score

5 (1). If yes, how many times did they provide? [Total= 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

6. Did they provide you to visit the demonstration programs in 2007?

( ) Yes [True] 1 score

( ) No [False] 0 score

6 (1). If yes, how many times did they provide? [Total= 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

7. Did they provide you to attend the field day sessions on the groundnut production technology in 2007?

( ) Yes [True] 1 score

( ) No [False] 0 score

7 (1). If yes, how many times did they provide? [Total= 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

(E) Participation in extension activities

1. Have you undergone the discussion meetings on the groundnut production technology in 2007?

( ) Yes [True] 1 score

( ) No [False] 0 score

1 (1). If yes, how many times did you attend the discussion meetings? [Total= 3 scores]

( ) 1 time [1 score] ( ) 2 times [2 scores] ( ) more than 2 times [3 scores]

2. Have you undergone the training programs for groundnut production technology?

( ) Yes [True] 1 score

( ) No [False] 0 score

2 (1). If yes, how many times did you attend the trainings? [Total= 3 scores]

( ) 1 time ( ) 2 times ( ) more than 2 times
[1 score] [2 scores] [3 scores]

3. Have you undergone the demonstration programs on groundnut production?

( ) Yes [True] 1 score

( ) No [False] 0 score

3 (1). If yes, how many times did you attend the demonstration programs?
[Total= 3 scores]

( ) 1 time ( ) 2 times ( ) more than 2 times
[1 score] [2 scores] [3 scores]

4. Have you undergone the field day sessions on the groundnut production?

( ) Yes [True] 1 score

( ) No [False] 0 score

4 (1). If yes, how many times did you attend the field day sessions? [Total= 3 scores]

( ) 1 time ( ) 2 times ( ) more than 2 times
[1 score] [2 scores] [3 scores]

Part.3: Farmers' attitudes towards monsoon groundnut production

Direction: Put (A) in the true box (only 1 answer) of each statement presented below. Check the box that describes your feeling. The measurement scale is divided into the following:

5= Very High, 4= High, 3= Medium, 2= Low, 1 = Very Low

Statements	1	2	3	4	5
1. Monsoon groundnut cultivation was more economical than sesame cultivation in early monsoon season.					
2. It would be more convenient to substitute groundnut for sesame area in early monsoon season if the economic situation of most farmers allowed them to do so.					
3. The farmers involved in the area extension of monsoon groundnut should organize their colleagues to participate in this program.					
4. Oil seed crop project should do more to help groundnut farmers to expand groundnut areas in early monsoon season.					
5. As a farm producer, the farmer was satisfied with the profit of groundnut production in early monsoon season.					
6. Monsoon groundnut should be substituted for sesame area in early monsoon season due to high income.					
7. The farmer was satisfied with the marketing facilities available for groundnut production.					
8. When the investment for seed was low, a farmer would be well disposed to substitute groundnut for sesame area in early monsoon season.					
9. Monsoon groundnut cultivation in early monsoon season with project support was greatly advantageous to farmers.					
10. Groundnut cultivation in early monsoon season was a low risk if the cost of cultivation was low.					
11. If a neighboring farmer who was a sesame grower in early monsoon season sought the others' opinions on increasing his farm income, the other farmers would advise him to substitute groundnut in sesame area.					
12. A farmer would be well disposed to grow the groundnut in early monsoon season if there were favorable weather conditions in dry zone area.					

Statements	1	2	3	4	5
13. The substitution of monsoon groundnut for sesame growing area was a good practice for self-sufficiency of edible oil.					
14. The monsoon groundnut area expansion during early monsoon season could improve the socio-economic conditions of the farmers in dry zone area.					
15. A farmer would expand groundnut cultivation in early monsoon season if the project provided more inputs than usual.					
16. It was easy for farmers who had enough investments for seeds to substitute groundnut for sesame area.					
17. A farmer might think of increasing the investments on groundnut cultivation in early monsoon season.					
18. Groundnut growing area should be promoted as an early monsoon crop being substituted for sesame growing area in dry zone.					
19. A farmer who substituted groundnut for sesame area could get maximum profit if there were favorable weather conditions in early monsoon season.					
20. The self-sufficiency of edible oil could be boosted by expanding groundnut growing area during early monsoon season.					
21. Monsoon groundnut cultivation in early monsoon season normally gets high yield.					
22. A farmer who substituted groundnut for sesame area in early monsoon season with project support would effectively apply both his time and money.					
23. Groundnut farmers should attend the training/field day sessions to be more effective on groundnut production.					
24. The care and management for groundnut cultivation was easier than sesame cultivation.					

Part 4: Problems and suggestions of the farmers relating to the monsoon groundnut production in dry zone area

Direction: Put (Â) in front of the item matching your true information.

1. What are the following problems relevant to groundnut cultivation did you encounter in 2006-07 crop season?

( ) Good seed available in local area ( ) Early land preparation

( ) Achievement of recommended plant population ( ) Timely cultivation

( ) Application of farmyard manure ( ) Inter-cultivation weeding

( ) Application of fertilizers ( ) Application of gypsum

( ) Insect pest and disease control ( ) Harvesting at optimum maturity stage

( ) Others (Please specify)----------

1(1). What are the reasons for the problems faced by you?

---

2. What are your suggestions on the improvement of groundnut production in dry zone area?

Appendix B

Photos of interview schedule

Appendix Figure 1 Discussion with respondent farmers in Seikphyu township

Appendix Figure 2 Interview schedule with respondent farmers in Seikphyu township

Appendix Figure 3 Interview schedule with respondent farmers in Seikphyu township

Appendix Figure 4 Discussion with respondent farmers in Pakokku township

Appendix Figure 5 Interview schedule with respondent farmers in Pakokku township

Appendix Figure 6 Interview schedule with respondent farmers in Pakokku township

BIOGRAPHICAL DATA

NAME	: Miss Myint Myint Aye
BIRTH DATE	: March 30, 1961
BIRTH PLACE	: Yesagyo Township, Pakokku District, Myanmar
EDUCATION	: **YEAR INSTITUTION DEGREE**
	1984 Yezin Agricultural University B.Ag
POSITION	: Deputy Supervisor
	Myanmar Agriculture Service,
	Ministry of Agriculture and Irrigation
	Myanmar
WORK PLACE	: Yesagyo Township, Pakokku District,
	Magway Division, Myanmar
SCHOLARSHIP	: FAO Scholarship 2007-2009