# KNOWLEDGE ASSESSMENT FOR DEVELOPMENT OF ELEPHANT FOOT YAM VALUE ADDED ENTERPRISE IN HAKHA TOWNSHIP

**TIN MAUNG LWIN**

**NOVEMBER 2019**

# KNOWLEDGE ASSESSMENT FOR DEVELOPMENT OF ELEPHANT FOOT YAM VALUE ADDED ENTERPRISE IN HAKHA TOWNSHIP

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**A Thesis Submitted to the Post Graduate Committee of the Yezin Agricultural University in Partial Fulfillment of the Requirements for the Degree of Master of Agricultural Science in Agricultural Extension**

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The thesis attached here to, entitled **"Knowledge Assessment for Development of Elephant Foot Yam Value Added Enterprise in Hakha Township"** was prepared under the direction of the supervisor of the candidate supervisory committee and has been approved by all members of that committee as a requirement for the degree of **Master of Agricultural Science in Agricultural Extension.**

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## CERTIFICATE

This is to certify that **Mr. Tin Maung Lwin**, a *bona fide* student of Yezin Agricultural University, Yezin vide Roll No. **M.AE - 6** carried out the original research work entitled **"Knowledge Assessment for Development of Elephant Foot Yam Value Added Enterprise in Hakha Township"** for M.Sc. degree programme in **Agricultural Extension** at the **Division of Participatory Knowledge Management** of Indo-Myanmar Advance Centre of Agricultural Research and Education of YAU. The facilities provided by the India–Myanmar Friendship Project of ACARE for conducting research is duly acknowledged by the student.

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## DECLARATION OF ORIGINALITY

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

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**DEDICATED TO MY BELOVED PARENTS,**
**U CHIT LWIN AND DAW NANG WAI MON**

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## ABSTRACT

This study was aimed to explore the knowledge level of Elephant foot Yam (EFY) farmers in value added enterprise in Hakha Township. Hence, the study was designed to analyze the personal, socio-economic, psychological and communication factors related to farmer's participation in EFY value addition, to assess the knowledge of EFY value addition for different actors in Hakha Township, to study the relationship between knowledge with personal, socio-economic, psychological characteristics and communication behavior of EFY farmers regarding to value addition and to measure the profitability of producing EFY. The qualitative and quantitative data were collected from randomly selected 134 respondents (producers and processors) in seven villages of Hakha Township, Chin state. Descriptive analysis such as mean and standard deviation was used to categorize the level of their socio-economic, psychological and communication characteristics. Thirty-two statements were developed for knowledge test to measure the knowledge level of EFY farmers for EFY value addition. Chi square test, correlation analysis and benefit cost analysis were used for respective objectives. Based on the findings, the overall knowledge level of the EFY farmers was found below medium level. It is clear that majority of the respondents belonged to low education level but possessed high level of innovativeness, risk orientation and medium level of economic orientation. Out of sixteen independent variables studied, size of family, risk orientation and level of education showed a positive and significant association with knowledge level of EFY farmers. For profitability analysis BCR for fresh EFY production were 2.5, 1.7 and 1.5 for the farmers in high, medium and low knowledge group respectively. ROI for fresh EFY production were observed as 19, 16, and 10 for high, medium and low knowledge group respectively. If they added value to fresh EFY, the ROIs were raised significantly by 9, 10, 5 for each group. According to this result, value addition of EFY should be promoted at large scale for income enhancement and livelihood improvement of the rural households.

**Keyword: knowledge level, attitude level, risk orientation level, elephant foot yam, value addition, BCR, ROI**

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| CORAD | The Choklei Organisation for Rural and Agricultural Development |
| DALMS | Department of Agricultural Land Management and Statistics |
| DoA | Department of Agriculture |
| EFY VA | Elephant Foot Yam Value Addition |
| FAO | Food and Agriculture Organization |
| FY | Fiscal Year |
| GDP | Gross Domestic Product |
| HKG | High Knowledged Group |
| INGO | International Non-Government Organization |
| LKG | Low Knowledged Group |
| MADB | Myanmar Agricultural Development Bank |
| MFVP | Myanmar Fruit, Flower, and Vegetable Producer and Exporter Association |
| MIID | Myanmar Institute for Integrated Development |
| MKG | Medium Knowledged Group |
| MMK | Myanmar Kyat |
| MOALI | Ministry of Agriculture, Livestock and Irrigation |
| NGO | Non-Government Organization |
| RTC | Root and Tuber crops |
| SHG | Self Help Group |
| UNDP | United Nation Development Program |
| USAID | United State Agency for International Development |
| WB | World Bank |

## CONVERSION FACTORS

| | |
|---|---|
| One acre | 5,000 plants (EFY) |
| One ton of EFY | 907.18 kg |
| One viss of dried EFY | 5 viss of fresh EFY |
| One viss of EFY | 1.63 Kg |

# CHAPTER I
# INTRODUCTION

Root and tuber crops (aroids, yam, cassava and sweet potato) are the second most important groups of cultivated species, after cereals, and grown throughout the world in hot and humid regions (Paulino & Yeung, 1981). Tuber crops are an important group of staple food in the tropical world (Sheaffer & Moncada, 2012). In some parts of West Africa, East Africa, the Caribbean, South America, India and South East Asia, one or more of the tropical tuber crops feature as major food items in the diet of the people, and in some of these regions, tropical tubers constitute the major staple food. They can be produced with very low inputs and are generally consumed by the poor people. They contribute significantly to food security and also used for animal feed or as raw material for processing industries (Palaniswami & Peter, 2008). Tubers are the important staple food rich in starch and widely used as a vegetable. The tubers play a major role in supplementing staple foods with micronutrients and can constitute a "Safety Net" during the periods of food shortage (Santosa et al., 2002). Among tubers, aroids are a rich and cheap source of energy, minerals and vitamins (Sunitha, Ravi, George, & Suja, 2014). The major edible aroids that are cultivated and used as food in various parts of the tropics, including Myanmar are: elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson), taro (*Colocasia esculenta* (L.) Schott.) and tannia (*Xanthosoma sagittifolium* (L.) Schott.) etc.

Among tuberous crop, elephant foot yam (EFY) is one of the important and popular tropical tuber crops as a food security and as a remunerative cash crop (Suja, Sundaresan, John, Sreekumar, & Misra, 2012). It belongs to the Araceae family, known for the supply of famine foods (Palaniswami & Peter, 2008). Its common names are Elephant yam, Elephant bread, Suran, Sweet yam, Jimikand etc. Other common names are Karak-kavanai (Tamil); Konjac, Konniaku, Konnyaku (Japan); Mo-yu (China); Ol (Assam), etc., which varies from region to region. In India, it is commonly known as "Suran" or "Elephant foot yam". *Amorphophallus campanulatus* variety of elephant foot yam (EFY) is largely cultivated throughout the plains of India for using its corm (bulb) as food. It is referred to as "king of tuber crops" because of its culinary properties, therapeutic values, medicinal utility and higher yield potential (Sengupta, Chowdhary, Singh, & Ray, 2008). It is known as "arsoghna" in Sanskrit because of its pile-curing properties (Dey, 1896) and also has antioxidative, hepatoprotective and uterus

stimulating effect (Kumar, 2015). The elephant foot yam tubers may serve as anodyne, hemostatic, anti-haemorrhoidal, carminative, anti-inflammatory, expectorant, digestive, stomachic, anthelmintic, liver tonic, appetizer, aphrodisiac, and rejuvenating medicine (Hathan, 2016). So, this tuber is consumed by many people as a food and widely used in many Ayurvedic preparations (Hedrick, 1972).

## 1.1 Background Information

Myanmar is an agriculture-based country with 61.2% of the labor force engaged in agriculture or depends on it for their income to a significant extent (Ministry of Agriculture and Irrigation, 2012). Although the country's root and tuber crop (RTC) production has gradually increased since the late 1990s, they still lag behind other major crops like rice. In fact, RTCs are not included in the country's list of primary important crops, even though potatoes are regularly consumed in daily meals. At the same time, demand for other RTCs like cassava, elephant foot yam (EFY), and sweet potato are growing in both local and export markets (Aung, 2018).

EFY, locally called Wa-u or phyan-u, thrives in natural forests and is identified as a Non-Timber Forest Products (NTFP). They are found in many areas of Myanmar especially evergreen forests in Kachin, Chin, Rakhine, Shan and Mon States, Tanintharyi, Bago and Yangon Regions. However, over-extracting from forests has resulted in production declines between late 2000 and early 2010 (Foppes, Aung, & Soe, 2011). It was usually harvested or extracted from the forest, processed and transported in a traditional manner, but as demand grew, more people took advantage by harvesting without replanting. As a consequence, production of EFY from natural forests has gradually declined in terms of quality (i.e. tuber size) and quantity (i.e. total volume).

Today, EFY is largely cultivated as a cash crop to avoid over-extraction from forests and to meet higher market demand. Three varieties of EFY are found in Myanmar, which can be identified by color: white, yellow, and red/pink. The quality of EFY is defined by its glucomannan ratio and according to research carried out by traders, the red/pink EFY variety which can only be found in Chin State had the highest glucomannan ratio of above 60%. In this regard, EFY from Chin State is more attractive to traders, especially those who export to Japan.

According to United Nations Development Program (UNDP), the Chin state is called the poorest of all the states and regions in Myanmar. The World Bank also

reported that it is the poorest state in Myanmar, with a poverty rate of more than 70% (WB, 2014).

The demand for EFY is dominated by the Chinese and Japanese markets for dried chips. The Chinese market was the first to develop through traders from Mandalay who have link between China and Myanmar, while the Japanese market only emerged in 2006, based on a tax exemption for export from Yangon. As a result, EFY production in Chin State has increased in recent years and village growers have increased the farm income and experienced some livelihood improvement. Now there is a growing trend that many upland rice farmers tend to shift from rice cultivation to EFY cultivation (Arr Yone Oo & TGH, 2014).

There are two specific methods for the drying EFY: sun drying or grilling by using firewood. Farmers often prefer the sun drying method, but lack of sunshine and presence of frost during the winter season cause farmers to use firewood instead. In some cases, farmers would use sulfate (locally called kant) to reduce drying times and to obtain whiter colored chips. The use of sulfate was widely practiced in Myanmar and was not a problem for the China market in the past, but it has been a major obstacle for expanding the export market to Japan.

Value addition has the potential to generate more local jobs, better income, and better services (Ravald & Grönroos, 1996). Therefore, postharvest technologies and value addition of EFY could play an important role in improving income and generating employment in certain rural areas of Myanmar. Moreover, due to ongoing policy reforms, Myanmar is gaining worldwide interest for business investments and tourism. With the worldwide increase in tourism, immigration, and international trade, the role of provenance has become more important not only in business and consumer behavior (Rossiter & Chan, 1998), but also in food culture and the food industry (Lee, Hwang, & Mustapha, 2014).

### 1.2 Elephant Foot Yam Production in Myanmar

Elephant foot yams can be planted across the country. Over 13,000 acres of land is under yam cultivation in the current fiscal year (Global News Light of Myanmar, 2019). EFY production can make a pretty good profit, plus earning foreign income. Over US$ 2.5 million were attained from export of EFY during last Fiscal Year 2016-2017. China, Thailand and Japan purchased dried EFY which is used in food stuff and medicines. A viss of EFY sells for up to 500 MMK and an acre of EFY can earn above

1.5 million MMK during a year. Those plants are commercially grown in Yangon Region, Taninthayi Region, Rakhine State and Chin State, which are also naturally found in Shan, Kachin, Chin and Kayin states and Mandalay, Sagaing, Bago and Ayeyawady regions. Yams produced in Chin State are getting a higher price than those from other regions as they have better quality and taste. Elephant foot yams are the main product of Chin State, where they are cultivated on over 8,800 acres of land. Kanpetlet, Mindat, and Matupi townships produce about 1 million viss of EFYs. The yams are also grown in Northern Chin State. The total production and quantities of EFY cultivation in Chin State can be seen in Table 1.1.

### 1.3 Export of Dried Elephant Foot Yams

EFY production has become a lucrative business. Therefore, value-adding technology is crucial for boosting EFY production and expanding its market, according to the Myanmar Fruit, Flower, and Vegetable Producer and Exporter Association (MFVP). MFVP is planning to promote the dried EFY, a vegetable tuber plant, for the export sector. Local farmers are growing EFY tubers on their farms. The USAID, MFVP and Dana Association are promoting a farming project for EFYs, coffee and better farms. EFY tuber cultivation training has been planned (Global News Light of Myanmar, 2019). Myanmar exported 4,200 tons of EFYs in the 2014-2015 fiscal year, 1,300 tons in the 2015-2016 FY, and 20,000 tons in the 2016-2017 FY, according to data from the Ministry of Commerce.

There are currently seven factories for drying EFYs in Myanmar. Additionally, two more EFY drying factories, with a production capacity of 30 tons per day, are being constructed in Mon State, according to the Ministry of Commerce.

### 1.4 Rationale of the Study

In southern Chin state, trade in EFY (EFY) has increased dramatically over the past decade. As Chinese and Japanese food manufacturers have increasingly sourced Myanmar EFY for processed food manufacturing, the price of EFY has risen and Chin farmers have taken up cultivation of the tuber in large numbers. Today EFY is a major cash crop in this region of intense poverty, and uptake has approached 100% of households in villages where it is produced. Whereas farmers once foraged the tuber

**Table 1.1 Total production and quantities of EFY in Chin State**

| Year | Sow (ac) | Harvest (ac) | Yield (kg/ac) | Total Production (tons) |
|---|---|---|---|---|
| 2014-2015 | 6,788 | 2,877 | 2413.98 | 7,655.62 |
| 2015-2016 | 7,343 | 3,801 | 2093.75 | 8,772.62 |
| 2016-2017 | 7,634 | 5,299 | 2912.27 | 17,011.10 |
| 2017-2018 | 8,391 | 6,045 | 2568.78 | 17,117.10 |

Source; DoA (Hakha) 2018

and sold it fresh, today most growers process and dry and chip EFY themselves in order to capture more value in the value chain. As a result, EFY production in Chin State has increased in recent years and village growers have experienced some livelihood improvement. Furthermore, growers remain enthusiastic about EFY production as a source of income and they view an increased cultivation as a pathway to economic improvement. Therefore, there has been a need to examine the status of farmers' realization upon the importance of acquiring knowledge about EFY cultivation and value addition. The factors still hinder agribusinesses like EFY from exploiting this link to improve value addition to their products is not clear. Analytical studies on growth of value chain in case of EFY in Chin state are limited, which could provide the empirical based policy outlines for improvement of EFY Value Chain Development. However, one of the major challenges of such approaches is the need of different knowledge categories covering on various levels of product qualities and processing characteristics of stakeholders along the EFY value added enterprise. In this backdrop the present study has been designed to assess the knowledge level of EFY value addition development in Hakha Township.

## 1.5 Objectives of the Study

Based upon above research questions the following specific objectives have been formulated for this study.

i. To analyze personal, socio-economic, psychological characteristics and communication behavior related to EFY farmer's participation in EFY value addition
ii. To assess the knowledge of EFY value addition for EFY producers in Hakha Township.
iii. To study the relationship between knowledge and personal, socio-economic, psychological characteristics and communication behavior of EFY farmers.
iv. To compare profitability of fresh and dry EFY in order to analyse the benefits of EFY value addition.

## 1.6 Limitation of the Study

This study is an academic research work as a partial fulfillment of a Master degree, and hence, there is a limitation of time and resources. Moreover, the respondents of the study area have their unique language and behavior. Collected data

were done with the help of local language translators. Therefore, the findings of the study cannot be generalized to other areas and other population of EFY value enterprise as a whole.

# CHAPTER II
# LITERATURE REVIEWS

Research/Literature reviewing is a data gathering exercise to enrich the knowledge of the present or new researchers. An extensive survey of all available past studies relevant to the field of investigation is an essential condition for the formation of hypotheses. Knowledge of what others have found in the related area and how they have done shall motive one to contribute something new to the existing body of knowledge. Past reviews help in assessing the earlier efforts completeness and validity and allow the researcher to begin the compilation of relevant bibliography.

With this view in mind, sincere efforts have been made to collect relevant literature in accordance with the objectives and are presented under the following sub-heads.

1. Defining the terms of variables
2. Value addition
3. Enterprise budget analysis
4. Empirical reviews of the study.

## 2.1 Defining the Terms of Variables

### 2.1.1 Dependent variables

#### 2.1.1.1 Knowledge

Knowledge was operationally defined as those behaviors and test situations which emphasized the remembering either by recognition or by the recall of ideas and material on some phenomenon (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). (Röling & policy, 1992) described the emergence of knowledge systems thinking, in which an articulated set of actors, networks and organizations are expected or managed to work synergistically to support knowledge processes. Ro¨ling and Jiggins (1998) described three types of knowledge systems: transfer of technology, farm management development and the ecological knowledge system. The most common and conventional knowledge system is the transfer of technology, which views desirable farming practice as using science-based component technologies, farmer learning as the adoption of external innovations and facilitation as the delivery of these innovations. Farm management development operates within strategic rationality and aims to support the practices of the farmer as an entrepreneur engaged in an economic

enterprise focusing on the farm as a whole. The main purpose of the ecological knowledge system is to help land users to become experts at managing complex ecosystems in a sustainable manner. It assumes that farmers are experts on their own farm and take decisions based on knowledgeable interference from observation and analysis through social learning (Ro¨ling & Jiggins 1998).

Farmers can have knowledge about the existence of a new technology, how to apply it, and what the outcomes are in terms of products, yield, potential environmental benefits, risks and costs. The information an individual has about a new technology then forms the basis of the perceptions and attitudes this individual develops towards the technology. Fishbein and Ajzen (1977) described three processes that underlie the formation of beliefs. First, a link between an object and an attribute can be established on the basis of direct observation, which is called a descriptive belief. Second, an attribute might be linked to an object through a process of inference from some other belief about the object, which is referred to as an inferential belief. Third, a link between an object and an attribute may be formed by accepting information from an external source, which is known as an informational belief.

Azman, D'Silva, Samah, Man and Shaffril (2013) noted that knowledge can be referred to as organized or processed information or data and is crucial in any innovation process. Knowledge is often created by a combination of education and experience and farmers use knowledge to arrive at decisions that influence agricultural management practices (Mangan, Mangan, & Values, 1998; Brosius et al., 1986; Grossman, 2003). Calvo-Iglesias, Crecente-Maseda, Fra-Paleo, & Planning (2006) added that an understanding of farmers' knowledge is useful for understanding changes that occur in the landscape at a local level, especially the terms of changes in land-use and cultural practices. If agricultural change agents do not understand the knowledge and priorities of producers, improved management will be difficult, if not impossible, to realise (Morales, Perfecto, & Values, 2000; Grossman, 2003).

The perceptions of farmers concerning with an innovation are very closely related to the knowledge they have about it. Whereas knowledge refers to factual information and understanding of how the new technology works and what it can achieve, perceptions relate to the views farmers hold about it based on their felt needs and prior experiences; and these do not necessarily align with reality. The knowledge and perceptions about an innovation then together determine the attitude towards it. In accordance with the theory of planned behaviour, the attitude component comprises not

only the attitude towards the behaviour, but also the attitudes with regard to the subjective norms and perceived behavioural control. In this case, we expect that a positive attitude towards an agricultural innovation will increase the likelihood of adoption and a negative attitude to reduce the probability of adoption. There are a large number of extrinsic variables which help shape the knowledge, attitudes and perceptions. The extrinsic variables can be grouped into three categories: characteristics of the farmer, characteristics of the external environment, and characteristics of the innovation. First, knowledge, attitudes and perceptions are influenced by the characteristics of the farmer, which include personal characteristics (gender, age, marital status, etc.), socio-economic characteristics (income, assets, education, etc.), personality characteristics (self-confidence, independence, etc.), position in social networks (network size, connectedness, frequency of interaction, etc.), status characteristics (control over political power or economic resources) and familiarity with the technology. Second, the characteristics of the external environment affect the development of knowledge, attitudes and perceptions as well, which include geographical settings (ecology, topology, soil conditions, climate, demography, proximity to markets, roads and forests, etc.), societal culture (language, tribal background, religion, ideologies, norms, values, etc.) and political conditions (land tenure and access rights, national policies, the structure of government, bureaucracies, the political character of a state and the existence of political freedoms and laws). Third, the characteristics of the new technology also shape the knowledge, attitudes and perceptions. In the case of agricultural innovations, it is the benefits and costs of the new practice, such as the contribution it can make to household income, food security, soil fertility improvement, health and nutrition, firewood and building materials and the costs such as purchasing inputs, equipment, managing pests and diseases, etc., which influence knowledge, perceptions and attitudes (Meijer, Catacutan, Ajayi, Sileshi, & Nieuwenhuis, 2014).

### 2.1.2 Psychological variables

#### 2.1.2.1 Attitudes

Attitudes have played a central role in the psychological literature on understanding human thought and behavior. Attitudes are usually defined as ‘general and enduring favorable or unfavorable feelings about, evaluative categorizations of, and action predispositions toward stimuli’ (Cacioppo & Berntson, 1994). Clearly, attitudes

are not per se synonymous with behavior, though a meta-analysis by (Kraus & bulletin, 1995) confirms that attitudes significantly and substantially predict future behavior. Recent work confirms that attitudes are more closely associated with behavior when they are related to risks than when they are related to benefits (Sjöberg, 1999). Attitudes can be strong predictors of behaviours or the acceptance of ideas (Ajzen, 1991;Dietz, Fitzgerald, & Shwom, 2005; Arbuckle, Morton, & Hobbs, 2013). Policy-makers have recognised that the way in which farmers adjust to changes in agricultural policy depends partially on the latter group's attitudes and mind-sets (Gorton, Douarin, Davidova, & Latruffe, 2008). When providing new technology to farmers, understanding their perceptions and attitudes can shed light on why farmers adopt technologies beyond their economic benefits and which industry researchers should focus on to encourage the adoption of these technologies (Adrian, Norwood, Mask, & agriculture, 2005). Many historians have argued that the evaluation of farmers' knowledge and perceptions is essential for the development of management strategies that match farmers' aspirations and are thus likely to be adopted (Chitere & Omolo, 1993; Rubia, Lazaro, Heong, & Norton, 1996;Tanzubil & Yakubu, 1997; Nyeko, Edwards-Jones, Day, & Raussen, 2002). Yang, Iles, Yan, & Jolliffe (2005) added that the evaluation of farmers' knowledge, perception and practices regarding a new technology is essential for the development of strategies to sustain.

#### 2.1.2.2 Decision-making

There is a broad range of the literature with regard to theories about decision-making processes. The expected utility theory of Daniel Bernoulli predicted that the decision-maker chooses between risky and uncertain prospects by comparing the expected utility values of their outcomes to maximize profit (Schoemaker, 1982). Theoretical and empirical literatures have shown that risk and uncertainty play an important role in the adoption of new agricultural technologies (Marra, Pannell, & Ghadim, 2003; Mercer, 2004). This is especially true for marginal farmers in Africa, who have to manage risks on an everyday basis to secure their livelihoods. Other sources of risk are important in agricultural decision making. Government programs, environmental regulations, tenancy position, family plans, concerns about the health and safety of themselves and family were of greater concern to farm managers than price and production The expected utility theory has been used as a framework for studying farmer decision-making in various contexts (Oglethorpe, 1995;Babcock

&Hennessy, 1996;Gómez-Limón, Riesgo, & Arriaza, 2004) and to further develop the thinking about decision-making processes and development of alternative models.

#### 2.1.2.3 Innovativeness

Innovativeness was operationalized as the degree to which an individual adopts new ideas relatively earlier than other members in the social system as stated by Rogers, (1983). Rogers (1995) described how innovations are adopted over time in his 'diffusion of innovations' theory. Diffusion refers to the process by which innovations are spread among the members of a social system over time. An innovation can be an idea or concept, technical information or an actual practice that is perceived as new by the individual. He identified five characteristics that determine the rate of adoption of the innovation: the relative advantage, compatibility, complexity, trialability and observability. The decision to adopt an innovation is a mental process consisting of five stages: knowledge, persuasion, decision, implementation and confirmation. Rogers (1995) suggested that the innovativeness of an individual determines when the individual adopts the innovation and recognized five successive adopter categories: innovators, early adopters, early majority, late majority and laggards. The adoption process is also affected by the so-called receiver variables, such as personality characteristics, social characteristics and the perceived need for the innovation. The diffusion of innovations theory has guided many studies that try to understand the uptake of new agricultural technologies and it has been applied in the development of farmer decision-making models in the tropics (Mercer 2004, Edwards-Jones 2006, Pannell et al., 2006;Reed, 2007).

#### 2.1.2.4 Risk orientation

Risk affects the choice set of farm operators and various classifications of sources of risk and management responses to these risks relevant to agricultural businesses are available (Barry et al., 1985; Baquet, Hambleton, & Jose, 1997; Hardaker, Lien, Anderson, & Huirne, 2015). Farming offers a very interesting case study to investigate risk behavior, since it is increasingly confronted with risk and uncertainty arising from various sources such as production risk, price volatility, personal risks and policy changes (Hardaker et al. 2005). Furthermore, decisions are made largely by a single person aiming not only at maximizing production and profit but also at sustaining the farming vocation (Willock et al., 1999). Therefore, the

individual's choice of risk management strategies is of vital importance for the viability and continuation of the farm business.

### 2.1.3 Communication variables

#### 2.1.3.1 Communication role

The role of extension and training is crucial in the development of knowledge, perceptions and attitudes about agricultural innovations. Scherr (1992) described five basic models for extension for agroforestry practices: 'media-based extension', 'commodity-based extension', 'training and visit', 'farming systems research and extension' and 'community-based extension'. As agricultural production systems can vary considerably in nature and complexity in different settings, it is important to take these differences into account in tailoring extension interventions (Bernet, Ortiz, Estrada, Quiroz, & Swinton, 2001). There has been a growing emphasis on farmer-led extension, in which farmers are the principal agents of change in their community and help disseminate the new technology to other farmers (Franzel, Cooper, & Denning, 2001; Kiptot, Franzel, Hebinck, & Richards, 2006)

This was initiated by the 'farmer first' approach, which stressed the importance of local knowledge and farmer innovation to complement the traditional transfer of technology approaches to agricultural research and extension (Pacey & Thrupp, 1989). Although the approach has faced considerable criticism, the idea to link agricultural research to farmers' knowledge has been generally accepted (De Wolf, 2010). Nevertheless, a factor that has often been neglected in adoption studies is the extent to which farmers themselves are involved in the development of and experimentation with the new technology. Often, a new technology is considered to be a 'finished product' and farmers are assumed to either adopt or not adopt the technology. However, often farmers experiment with different adaptations of the technology, which tends to be neglected by scientific research institutions (De Wolf, 2010). When farmers are able to adapt the new technology themselves and apply it in their local context, the potential of successful and sustained adoption will increase (Versteeg, Amadji, Eteka, Gogan, & Koudokpon, 1998; Douthwaite, Keatinge, & Park, 2001;Mekoya, Oosting, Fernandez-Rivera, & Van der Zijpp, 2008).

## 2.2 Value Addition

Value-added agriculture is an important strategy to both agricultural entrepreneurship and rural development (Coltrain, Barton & Boland, 2000; Kilkenny & Schluter, 2001; Womach, 2005). Several federal and state programs support entrepreneurs' and communities' value-added agriculture efforts (Amanor-Boadu & Zereyesus, 2007; Kilkenny & Schluter, 2001). However, current definitions of value-added agriculture lack a framework establishing economic linkages between consumers' preferences and farm practices. Thus, policies and grant programs targeting value-added agriculture may be ineffective in assessing consumers' propensity to spend, farmers' goals and assets, and community development strategies. Similarly, farmers may be chasing fads mismatched to their resources and advantages.

Traditionally, value-added agriculture was associated with the processing of raw products (Coltrain, Barton, & Boland, 2000; Amanor-Boadu, 2003). Over the years, value-added options for farmers have expanded to include enhancing value through the agricultural products' identity characteristics - traits that may not be physically seen, including local and organic designations (Womach, 2005; Ernst &Woods, 2011; USDA, 2015). In fact, local foods are currently a popular component of value-added agriculture (Liang, 2015; Woods et al., 2013; Hardesty, 2010; Onken & Bernard, 2010).

Punjabi (2007) observed that it has become clear worldwide that the most rapid growth in agriculture has been occurring on the part of post-production activities. This is being driven by growth of middle-income consumers even in low income countries and their demands for better-quality value-added products. Absence of agro-industry and agribusiness resulting in low levels of value addition of agricultural commodities has been one of the main causes of stagnation in rural incomes. A substantial agribusiness sector generating a high outflow of value-added commodities is always correlated with high agricultural GDP and high rural incomes.

McEachern and Schroeder (2004) observed that superior knowledge of customers' perceptions of value is recognized as a crucial success factor in today's competitive market place. Despite this, the voice of the consumer is often poorly integrated in the value chain. Few studies have assessed value created for consumers. Value-added agriculture generates several billion dollars in economic impact for the

state of Texas each year. In fact, the economic impact of adding value beyond the farm gate is usually several times the value of agricultural production at the farm gate alone.

## 2.3 Enterprise Budgeting

### 2.3.1 Enterprise budget analysis or decision-making tool for farmers

Enterprise budget analysis is important decision-making tool. They can help individual producer determines the most profitable crops to grow, develop marketing strategies, obtain financing necessary to implement production plans, and make other farm business decisions (Olson 2009).

An enterprise budget projects the costs and returns of growing and selling a particular crop or livestock over a period of time. It comprises of a simple listing of income and expenses, based on a set of assumptions (Afeworki et al. 2015). Enterprise budgets estimate profitability for agricultural enterprises while documenting management practices and the resources and technology used (Smith et al. 2013). An enterprise budget is an estimate of the costs and returns associated with the production of a product or products-referred to as an enterprise.

An enterprise, or profit center one, is a distinct part of the farm or ranch business that can be analyzed separately. An enterprise is usually based on some production input unit- an acre of land for most crop enterprise budgets, or an individual animal unit for livestock enterprise budgets. In some cases, two enterprises may be merged into one, such as grazing wheat pasture and growing wheat for harvest. Enterprise budgets estimate costs and returns based on a specific complement of machinery, land, labor and technology (Smith et al. 2013).

Doye and Sahs (2015) reported that enterprise budgets project costs and returns for an activity such as raising livestock, producing grain, or growing vegetables for a production period. Each budget specifies a system of production, inputs required, and the annual sequence of operations, as well as summarizes the costs and returns associated with the process. Most budgets are based on one year. For enterprises where production spans more than one year (for example, pecans or cow calf), a budget generally includes income and expenses for a representative one-year period.

An enterprise budget is a physical and financial plan for raising and selling a particular crop or livestock commodity. It is a physical plan because it indicates the type and quantity of production inputs and the output, or yield, per unit. It is also a

financial plan, because it assigns costs to all the inputs used in producing the commodity (Richard 2008).

Greaser and Harper (1994) stated that enterprise budget represents estimates of receipts (income), costs, and profits associated with the production of agricultural products. The information contained in the enterprise budgets can be used by agricultural producers, extension specialists, financial institutions, governmental agencies, and other advisers making decisions in the food and fiber industry. Enterprise budgets contained several cost components. Determining the costs of production practices can be difficult. Individuals often disagreed over which costs to include and how they should be measured. Understandably, these differences arise because production costs are unique to each resource situation. An important financial distinction was the concept of variable and fixed costs.

In economic terms, enterprise budgets help to allocate land, labor and capital, which are limited, to the most appropriate use (Chase, 2006). Enterprise budgets require less data than the whole farm budget, and when realistic and accurate cost allocations can be made by enterprise, the comparative profitability of enterprises can be measured. Enterprise budgets also can be used to derive breakeven prices and break-even yields (Smith et al. 2013).

## 2.4 Empirical Reviews of Study

Numerous studies have attempted to investigate farmers' knowledge and attitude towards new agriculture technology. Nyeko et al. (2002) investigated farmers' knowledge and perceptions of pest problems in agroforestry in Kabale district, Uganda, to provide the information necessary to promote the development of appropriate technologies and strategies to improve local systems of plant protection. Gorton et al. (2008) studied farmers' attitudes towards techniques for improving oestrus detection in dairy herds in southwest England to identify the causes of the low implementation rate of this technology and to improve the design of future knowledge transfer activities in this field. Odeyinka, Torimiro, Oyedele, & Asaolu (2007) investigated crop farmers' perceptions of Moringa oleifera in Nigeria to improve strategies to popularise this plant among Nigerian farmers. Brown & Khamphoukeo (2007) studied farmers' rodent management knowledge, attitudes and practices in the upland and lowland farming systems of the Lao People's Democratic Republic to better understand rodent management problems, which are a serious constraint for poor farmers in these farming

systems. Litsinger, Libetario, & Canapi (2009) studied how farmers' knowledge, attitudes and practices were elicited in the development of integrated pest management programs for rice in Asia. Stuart, Prescott, Singleton, & Joshi (2011) studied farmer's knowledge, attitudes and practices related to rodent pests and their management in the lowlands of the Sierra Madre Biodiversity Corridor, Philippines, to understand the attitudes of farmers towards community actions for rodent management. Bruijnis, Hogeveen, Garforth, & Stassen (2013) studied dairy farmers' attitudes and intentions towards improving dairy cow foot health to improve the approaches used to address foot disorders in dairy cattle.

Numerous studies have attempted to investigate farmers' knowledge and attitudes towards fertilisers (Enyong, Debrah, & Bationo, 1999; Farouque, 2007; Zhou, Yang, Mosler, & Abbaspour, 2010;Okoedo-Okojie & Aphunu, 2011; Chouichom & Yamao, 2011;Cavane, 2016). Among these studies, several have attempted to explain the attitudes of farmers belonging to different groups. Farouque & Takeya (2007) assessed farmers' attitudes in different samples based on landholder (landless or holding marginal, small, medium-sized or large farms). Similarly, Alam, Furukawa, & Mika (2010) also assessed farmers' attitudes towards four different farm sizes according to landholder class (marginal, small, medium-sized and large farms). Cavane (2011) assessed farmers' attitudes in the highlands and lowlands of the Manica district, Mozambique. However, little research has explored farmers' knowledge of fertilisers. Zhou et al. (2010) studied farmers' knowledge of chemical fertilisers in northern China. Okoedo-Okojie and Aphunu (2011) recently studied farmers' knowledge of organic fertiliser use in the northern agricultural zone of Delta State, Nigeria.

Kowsalya (2014) conducted during 2013-14 in Mandya district of Kamataka to study the knowledge and attitude of trained farm women on value added products of Ragi. Total sample of 120 trained farm women were selected from 6 villages of Mandya and Sriangapatana taluks. Majority of the respondents were found to be young, having middle school education, married, small family, nuclear type, belonging to other back ward caste, small land holding, with medium levels of annual income, decision making, innovativeness, aspiration, social participation, extension participation, extension contact and mass media exposure, majority of the respondents attended more than three trainings of 2-3 days, most of the respondents were preparing value added products of ragi since two years and utilized own funds for preparation. It was found that 43.33% of trained farm women were having high knowledge and 41.67% of trained farm

women were found to have more favourable attitude towards value added products of ragi. All the trained farm women had appropriate knowledge on method of cooking with correct quantity of ingredients to prepare products, Independent variables viz., innovativeness, extension participation, extension contact and mass media exposure had a positive significant relationship with the knowledge and attitude of trained farm women,

Research study entitled “Knowledge and Adoption levels of paddy farmers in East Godavari district of Andhra Pradesh” was undertaken by by (Praveen Babu, 2014) to study the profile characteristics of Paddy farmers, find the knowledge and adoption level of Paddy farmers. Further it aims to elucidate the constraints faced by Paddy farmers and suggestions. The study was taken up in four blocks of East Godavari district with a sample size of 120 Paddy farmers. Fourteen independent variables with knowledge level and extent of adoption as dependent variables were studied. The respondents were interviewed personally by a well-structured and pre-tested interview schedule. The profile of Paddy farmers revealed that majority of the respondents were medium aged, educated up to High school level, medium level of Farming experience, semi-medium land holdings, medium level of social participation, annual income, market orientation, economic orientation, extension contact, cosmopoliteness, cropping intensity innovativeness, mass media exposure and risk orientation were found in medium level. Majority of the respondents had medium level of knowledge followed by the higher level. An overwhelming majority of respondents had knowledge about the Pest management practices, nursery preparation, irrigation management, nutrient management and main field preparation. The variables viz., age, annual income, educational status, economic orientation, mass media exposure, social participation, extension contact, market orientation, innovativeness and risk orientation, showed a positive and significant association with knowledge as well as Adoption.

“A study on knowledge and adoption of potato growers in Hassan district of Karnataka state” was conducted by (Shilpa, 2010) district of Karnataka during 2009-10 to analyze the knowledge and adoption of recommended potato cultivation practices among farmers, to enlist the marketing channels utilized by potato growers and to understand the constraints in the production, marketing and storage of potato. The findings revealed that majority (45.55%) of the potato growers had medium overall knowledge followed by high (32.22%) and low (22.23%). Further, more than 90% of farmers had correct knowledge regarding earthing up, name of the pest and disease

attacked, height of ridges, plant to plant spacing, suitable month for sowing and seed rate per acre. Majority (44.45%) of potato farmers had medium adoption level. Whereas, 34.44% and 21.11% of the respondents belonged to high and low adoption category, respectively. About 65 to 70% of farmers had fully adopted the practices like plant protection against disease and seed rate per acre. Education, age, extension contact, extension participation mass media participation and risk orientation of potato growers were significantly associated with their knowledge level. Age, education, extension participation, social participation, mass media participation and risk orientation of potato growers were significantly associated with their knowledge and adoption level.

Based on previous studies, it is widely accepted that information about farmers' knowledge and attitudes towards such agricultural practices will provide a better understanding of how to encourage farmers to implement cropping strategies and to improve their delivery approaches. In the context of Myanmar, EFY production and processing technology is a popular practice among the value-added crops for its remunerative properties; however, no research has been conducted to determine farmers' knowledge and attitudes towards EFY value addition. Therefore, this study investigated EFY farmers' knowledge and attitudes towards value added enterprise in Hakha Township, Chin State in Myanmar.

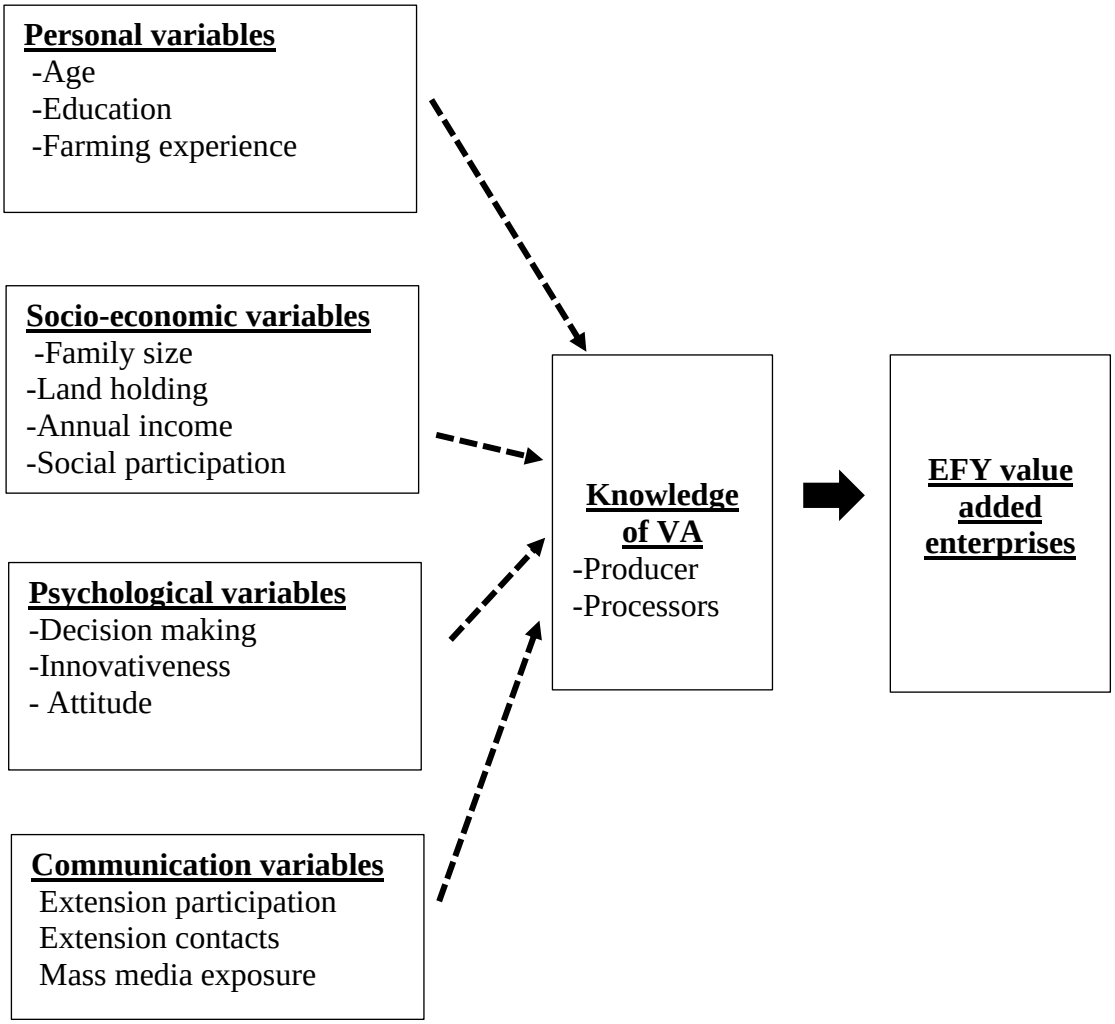
# CHAPTER III
# RESEARCH METHODOLOGY

## 3.1 Conceptual Model of the Study

Conceptual model is a diagrammatic representative outline of the dominant elements of a system and their relationships with respect to a criterion variable. Conceptual model is formulated on the basis of experience or intuition. It represents the researcher's understanding of a particular set of circumstances and of the simplification that the researcher feels may be made to inherently complex relationship. The present investigation is an attempt to study the profile characteristics, knowledge level of EFY farmers and extent of involvement in recommended technology of EFY value addition. There was a need to understand the relationship between the selected independent and dependent variables.

The relationship was diagrammatically represented in Figure 3.1 which helped to derive hypothesis for empirical testing. Exposure to mass media, extension contact and extension participation (communication factors) can influence an individuals' understanding of the functioning and interrelationship between factors such as weather, soil, and crop production as individuals collect and encode this information in their minds over time. Additionally, these real world experiences are mediated by socio-economic factors, (such as age, education and farm size, family members, farming experiences and HH total income) and psychological factors (such as decision making, attitude, innovativeness, market orientation and economic orientation) which, in part, influence what information is relevant and the behaviors that lead an individual's collection and encoding of the environment over time. It is conceived that the dependent variables viz., knowledge is influenced by the independent variables viz., personal, socioeconomic factors, psychological and communication factors.

By observing the difference in knowledge level about EFY VA of EFY farmers, we intend to demonstrate how different understanding of the dynamics of agricultural systems of EFY VA and A comparison of mental models from different EFY farmers' groups can explicitly identify knowledge gaps and incongruent beliefs. Identifying these gaps will facilitate and improve the sharing of information, contribute to clearer communication for improvement of EFY value added enterprise.




Source: Presumed by author

**Figure 3.1 Conceptual model of the study**

## 3.2 Sampling Procedure

### 3.2.1 Location of the study area

Hakha, the capital of Chin State, arranged within the Northern portion of Chin State. It is settled over the mountains. The entire region of Hakha Township has an area about 12.50 square miles. Its area lies between scope of 22° 01' and 22° 50' North and longitude of 93°32' and 94° 45' East. It has width of 35 miles from East to West and length of 45 miles from North to South. It lies close to the India and Bangladesh borders as well as with Rakhine State and Sagaing and Magway Regions. This state has a unique social, cultural, and an ecological background, which to some extent influenced the living standard and behavioral pattern of the people. Besides, Chin State has about 53 ethnic tribes and have several different tribal languages. The area of investigation belonged to Hakha Township (Figure 3.2).

### 3.2.2 Selection of the Township

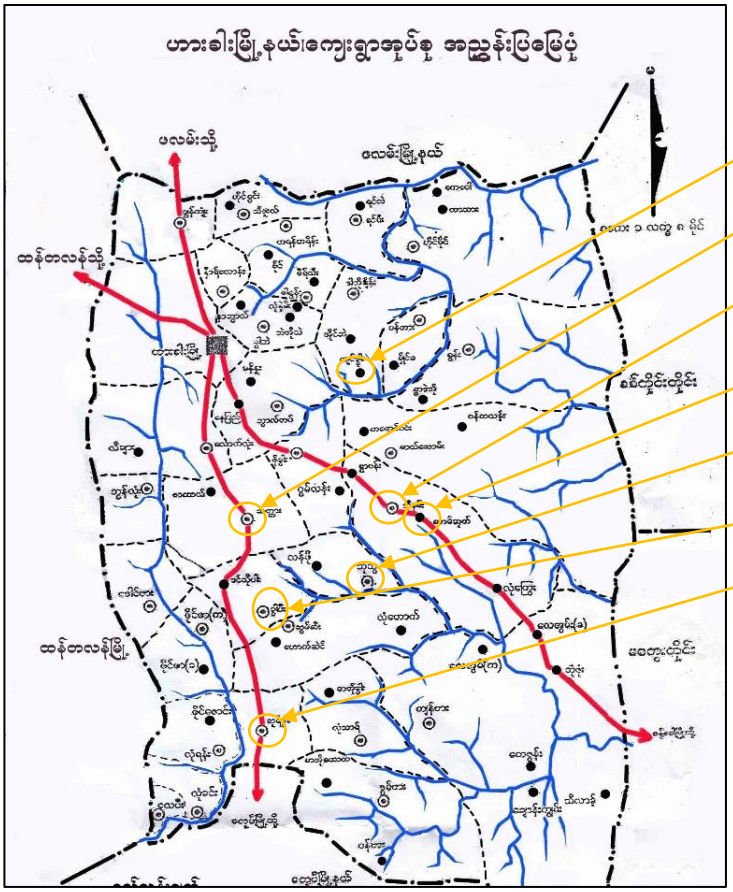
The study was conducted in Hakha Township in Northern Chin state (Figure 3.2). It was purposively selected for the study because of the following reasons.

i. It is one of the major EFY producing Townships of Hakha.
ii. EFY cultivation area have been gradually increasing in 2013-18 according to DoA. (Figure 3.3)
iii. Myanmar Institute for integrated Development (MIID), provides financial support for the research study in this area.

### 3.2.3 Selection of Villages

Seven villages that are mainly growing EFY and interested in cultivation of EFY were purposively selected with the help of MIID and Chokhlei Organization for Rural and Agricultural Development (CORAD) projects.

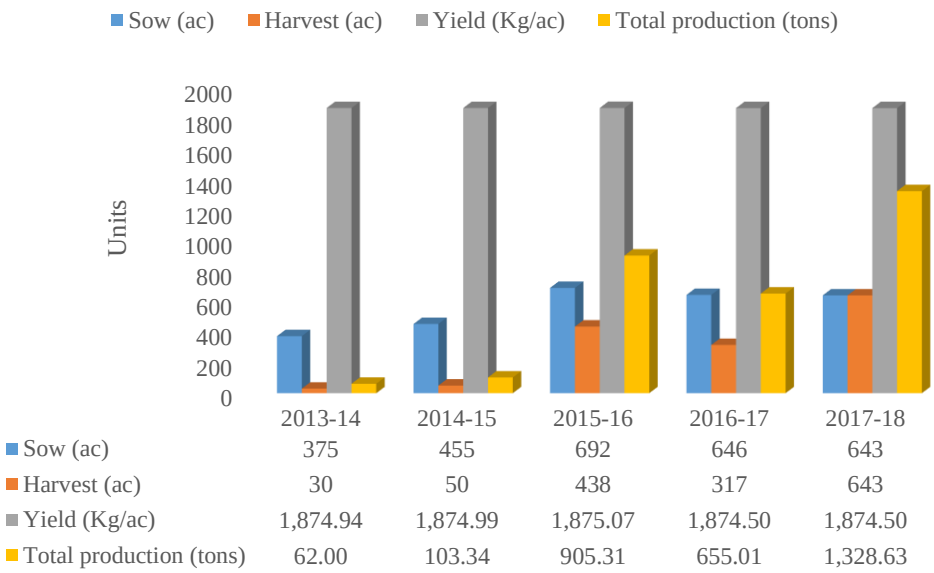

Source; Free Burma Rangers, 2013




Source; DALMS, 2019

**Figure 3.2 Study area of villages in Hakha Township**

**Elephant foot yam production from 2013 to 2018 in Hakha Township**




| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| Sow (ac) | 375 | 455 | 692 | 646 | 643 |
| Harvest (ac) | 30 | 50 | 438 | 317 | 643 |
| Yield (Kg/ac) | 1,874.94 | 1,874.99 | 1,875.07 | 1,874.50 | 1,874.50 |
| Total production (tons) | 62.00 | 103.34 | 905.31 | 655.01 | 1,328.63 |

Source; DoA (Hakha) 2018

**Figure 3.3 Elephant foot yam production in Hakha Township (2013-2018)**

### 3.2.4 Sampling method and sample

Both primary and secondary data were used for this study. During the field survey, a total sample respondent of 134 (producers and processors) from seven villages of Cinkhua, Shurkhua, Khuapi, Sakta, Tinam, Bungtuah and Lamtuk were selected through simple random sampling. In fact, primary data were collected by using a set of structured interview schedule and direct observation. Data collection study was taken in seven villages of Hakha Township from 21$^{st}$, October 2018 to 15$^{th}$, November 2018 (26 days). The sample size was determined by using the formula which was developed by Yamane (1967) as follows:

Sample size (N) = $N/(1+Ne^2)$ = 636 / [1+636(0.1)$^2$ ] = 86

N= populations size

N = population size

p = precision (0.1)

According to this formula, the study needed only sample of 86 but 134 respondents were collected by simple random sampling using a set of structured interview schedule and direct observation in this study for more reliable result. List of sample size and its population from each village is presented in Table 3.1.

## 3.3 Data Collection

### 3.3.1 Selection of variables

Knowledge was selected as a dependent variable for the study. Appropriate independent variables were also identified by reviewing the past results and in consultation with the experts. The details of the variables and their empirical measurement are presented as below.

Dependent variable: which considered was knowledge level for EFY production and value addition.

Independent variables: Sixteen independent variables which supposed to influence the dependent variables were identified by discussion with scientists and review of literature. The details of these selected variables and the techniques employed for measurement are shown below.

### 3.3.2 Operationalization and measurement of variables

The variables for the study were selected based on the relevant review of literature on the subject, in consultation with experts in the field of research and

extension, members of supervisory committee. The variables selected and an empirical measurement followed was given in Table 3.2.

### 3.3.3 Operationalisation and measurement of dependent variable

Knowledge was operationally defined as those behaviors and test situations which emphasized the remembering either by recognition or by the recall of ideas and material on some phenomenon (Bloom et.al,1956).

The knowledge of the respondents regarding the recommended technology was measured by using structured schedule for EFY farmers, consisting of questions which were prepared after thorough references from the recommended package of practices, information and discussions with experts in the respective fields.

Total 32 knowledge items relating to the value addition of EFY were selected for the purpose and each practice and information was put in the question form to the respondents (producers and processors) to obtain the response. The answers elicited from the respondents were quantified by assigning one score if "Yes" and zero if "No".

The score of all the individual items which were answered correctly by the respondents were summed up to get the knowledge score of the respondents. The maximum score a respondent could obtain is 32 and minimum score is 0 with respect to knowledge items. The raw knowledge score of each individual respondent was converted into knowledge index by using the formula, which was formulated by Savitha (1999).

$$\text{Knowledge index} = \frac{Number\ of\ correct\ responses}{Total\ number\ of\ knowledge\ items} \times 100$$

Based on the index, the respondents were categorized into low, medium and high knowledge levels by considering mean and standard deviation as a measure of check (Table 3.10).

### 3.3.4 Operationalisation and measurement of independent variables

A total of sixteen independent variables were selected according to the respondent's profile characteristics. They are operationalised in Table 3.2.

The age of the EFY farmers was operationalized as the number of completed years at the time of investigation. Education refers to the formal education (the total schooling years) had by the respondent (s). The minimum and maximum schooling years of the respondents were 0 and 16. Based on responses using class interval method, the respondents were grouped into three categories viz., low, medium and high

education to calculate education level of EFY farmers. Number of years of experience a respondent had in EFY cultivation was considered farming experience. Based on the responses obtained, the respondents were classified into three groups by using mean and standard deviation. Family size refers to the number of members living in a family. The respondents were grouped into small, medium and large family structure based on the mean and standard deviation. The extent of land actually possessed by the farmers was recorded in acre and according to land holding of respondents, they were grouped into three categories based on the mean and standard deviation. Annual income was operationalised as the total income obtained by household family from main and secondary occupation. It was measured by adding up the income obtained by household in MMK.

Social participation was operationally defined as the degree of involvement of the respondents from membership to any organization and taking any position and his active participation in the activities, such as meetings of village, co-operatives, SHG and so on. For the purpose of study, the social participation, scale developed by Trivedi (1963) was used with suitable modifications. The modified social participation consisted of nine items measured to know the membership details and extent of participation. Membership was categorized in terms of member or non-member. Extent of participation was considered on a three-point continuum viz., regular, occasional and never. The scoring pattern adopted is as follows (Table 3.3). By adding the scores of all statements, the individual total score was worked out. The maximum and minimum possible scores of an individual respondent were 30 and 12, respectively.

Decision making refers to the decision taken by the respondent on home and farm aspects such as menu purchase of household articles, children's education, crop selection etc., Based on the extent of participation in decision making, responses were expressed in terms of percentage. The procedure followed Neena (1991) was used with slight modification in Table 3.4. The possible minimum and maximum scores would be 19 and 76.

Innovativeness was operationalized as the degree to which an individual adopts new ideas relatively earlier than other members in the social system as stated by Rogers, (1983). The scale developed by Rao, (1985) was adopted with suitable modifications in quantifying the variable. The instrument consists of nine statements and responses were on three-point continuum viz., agree, undecided and disagree. The weightage of 3, 2 and 1 were assigned to the response categories in case of positive statements and

the scoring was reversed for negative statements (Table 3.5). The total score of the farmers in their innovativeness was arrived by summing up the weightage of responses for each statement. The minimum and maximum possible score would be 9 and 27.

Risk orientation operationalized as the degree to which the farmer was oriented towards encountering risk and uncertainty in adopting any new ideas or innovations. The schedule was prepared consisting six statements with four positive statements and two negative statements. The responses of respondent were obtained against each statement in terms of agreement and disagreement. The positive statements were scored 3, 2, and 1 for agree, undecided and disagree respectively. Whereas, the scoring system was reversed in case of negative statements (Table 3.6). The score obtained on each statement was summed up to get individual respondents risk orientation score. The maximum and minimum possible score would be '18' and '6', respectively.

Attitude scale followed by Savitha (1999) was used with little modifications to measure attitude. The scale consisting of 2 positive and 6 negative statements was administered to 134 respondents. The responses were collected on the five-point continuum viz., strongly agree, agree, undecided, disagree and strongly disagree as a scoring pattern of 5, 4, 3, 2 and 1, respectively for positive statements and reverse order of scoring for negative statements (Table 3.5). The individual score of the respondents was obtained by summing up the responses of all items. The maximum score a respondent could obtain is 40 and minimum score is 8 with respect to knowledge items.

Market orientation was operationalised as the judgment taken by an individual EFY farmer to sell his produce for better price by analyzing the various prevailing infrastructural and market intelligentia. The schedule was prepared and it consists of 5 statements out of which 2 negative and 3 were positive. The individual response was obtained on three-point continuum for each statement i.e. Agree (A), Undecided (UD), and Disagree (DA) with corresponding weightages 3, 2, and 1 respectively and was reversed for negative statements. The scoring was done according to Table 3.6 and the score obtained for each statement was summed up to get individual respondents market orientation score. The maximum and minimum possible score would be '15' and '5' and respectively.

Economic orientation was operationalized as the degree to which a farmer was oriented towards profit maximization in farming and the relative value placed by a farmer on economic ends. It was measured with the help of scale developed by Supe (1969). The scale consisted of 4 statements of which three were positive and one was

negative. The responses for each statement were rated on a five-point continuum which ranged from strongly agree to strongly disagree. The scoring was done as follows in Table 3.5. The maximum score an individual could obtain on this scale was 20 and the minimum score could be four.

Mass media exposure was operationalized as the extent of accept or use of respondent to the mass media such as radio, television, newspapers, agricultural books, information material, and farm magazines etc. For the purpose of studying the mass media exposure, schedule is prepared. It contains four statements measured on a three-point continuum viz., daily, occasionally and never. The scoring pattern adopted is as shown in Table 3.7. By adding the scores of all statements, the individual total score was worked out. The maximum and minimum possible scores of an individual respondent would be 12 and 4 respectively.

Operationalization of extension participation was quantified by following procedure suggested by Daliwal (1963). Lists of extension activities were prepared and the respondents were asked to indicate their extent of participation in each of them. The scoring procedure followed in Table 3.8. Thus, the maximum score one could get was 14 and minimum being zero.

Extension contact was operationalized as the degree to which an individual maintained contact with the personnel of formal or informal sources for the purpose of getting information on scientific technologies related to EFY crop. Scoring was given with a weightage according to the frequency of contact (Table 3.9). The possible minimum and maximum scores would be 0 and 14 respectively.

Based on the total scores of all variables (16 variables), the respondents were classified into three categories using mean and standard deviation in Table 3.10.

**Table 3.1 Sample size and its population from each village**

| No | Village name | Total population | Respondents | | Total respondents |
|---|---|---|---|---|---|
| | | | Male | Female | |
| 1 | Khuapi (ခွက်ပီး) | 112 | 21 | 10 | 31 (23.1) |
| 2 | Tinam (သီနမ်) | 96 | 7 | 23 | 30 (22.4) |
| 3 | Lamthod (လမ်သုတ်) | 128 | 16 | 11 | 27 (20.2) |
| 4 | Cinkhua (ကျင်ခွိး) | 70 | 8 | 9 | 17 (12.7) |
| 5 | Sakta A (ဆတ္တား) | 120 | 6 | 9 | 15 (11.2) |
| 6 | Bonthung (ဘုံသွ) | 40 | 7 | 4 | 11 (8.2) |
| 7 | Sukhua (ဆူခွိး) | 70 | 2 | 1 | 3 (2.2) |
| | Total | 636 | 67 | 67 | 134 (100) |

Source: a DOA, Hakha Township, 2018. Note: Value in the parentheses indicates percentage

**Table 3.2 Variables and their empirical measurement**

| No. | Variables | Empirical measurement |
|---|---|---|
| **I** | **Dependent variables** | |
| 1 | Knowledge | Procedure followed by Savitha (1999) with suitable modification |
| **II** | **Independent variables** | |
| ***A.*** | *Personal variables* | |
| 1. | Age | Chronological age of the respondents |
| 2. | Education | Scale developed for the study |
| 3. | Farming experience | Schedule developed for the study |
| ***B.*** | *Socio-economic variables* | |
| 4. | Family size | Procedure followed by Hosamani (1993) |
| 5. | Land holding | Scale developed by Shashidhara (2003) |
| 6. | Annual income | Schedule developed for the study |
| 7. | Social participation | Procedure followed by Saradha (2001) |
| ***C.*** | *Psychological variables* | |
| 8. | Decision making | Procedure followed by Neena (1991) |
| 9. | Innovativeness | Scale developed by Moulik & Rao (1973) |
| 10. | Attitude | Scale developed by Savitha (1999) |
| 11. | Risk orientation | Schedule developed for the study |
| 12. | Market orientation | Schedule developed for the study |
| 13. | Economic Orientation | Schedule developed for the study |
| ***D.*** | *Communication variables* | |
| 14. | Extension participation | Scale developed by Daliwal (1963) |
| 15. | Extension contact | Procedure followed by Byrareddy (1971) |
| 16. | Mass media exposure | Scale developed by Trivedi (1963) |

(Source; Savitha, 1999; Kowsalya, 2014)

**Table 3.3 Scoring pattern for social participation of EFY farmers**

| Member/ non-member | Score | Extent of participation (Score) | Score |
|---|---|---|---|
| Non-member of an organisation | 0 | Never | 0 |
| Member of an organisation | 1 | Occasional | 1 |
| | | Regular | 2 |

Source; Saradha (2001)

**Table 3.4 Scoring pattern for Decision makers in HH**

| No. | Items | Decision makers | | | | |
|---|---|---|---|---|---|---|
| | | Wife alone | Husband alone | Both together | Family members | Others |
| | | **1** | **2** | **3** | **4** | **5** |
| **1.** | **Farm related** | | | | | |
| | a. Purchase of Farm implements | 1 | 2 | 3 | 4 | 5 |
| | b. Land preparation | 1 | 2 | 3 | 4 | 5 |
| | c. Crop selection | 1 | 2 | 3 | 4 | 5 |
| | d. Farm Inputs | 1 | 2 | 3 | 4 | 5 |
| | e. Monitoring at field level | 1 | 2 | 3 | 4 | 5 |
| | f. Marketing of farm produces | 1 | 2 | 3 | 4 | 5 |
| **2.** | **Household related** | | | | | |
| | a. Type of food to cook | 1 | 2 | 3 | 4 | 5 |
| | b. Taking care of children | 1 | 2 | 3 | 4 | 5 |
| | c. Children education | 1 | 2 | 3 | 4 | 5 |
| | d. Marriage of children | 1 | 2 | 3 | 4 | 5 |
| | e. Purchase of household grossery | 1 | 2 | 3 | 4 | 5 |
| | f. Purchase of household goods | 1 | 2 | 3 | 4 | 5 |
| | g. Purchase of clothes | 1 | 2 | 3 | 4 | 5 |
| | h. Purchase of assets | 1 | 2 | 3 | 4 | 5 |
| | i. Family planning | 1 | 2 | 3 | 4 | 5 |
| **3.** | **Other decision** | | | | | |
| | a. Participation in religious function | 1 | 2 | 3 | 4 | 5 |
| | b. Outside employment | 1 | 2 | 3 | 4 | 5 |
| | c. Casting vote | 1 | 2 | 3 | 4 | 5 |
| | d. Saving for future | 1 | 2 | 3 | 4 | 5 |
| | e. Taking loan | 1 | 2 | 3 | 4 | 5 |

Source; Neena (1991)

**Table 3.5 Scoring pattern of 5-ponint scale for attitude and economic orientation of EFY VA**

| Response | Strongly agree | Agree | Undecided | disagree | Strongly disagree |
|---|---|---|---|---|---|
| Score for positive statement | 5 | 4 | 3 | 2 | 1 |
| Score for negative statement | 1 | 2 | 3 | 4 | 5 |

Source; Savitha (1999)

**Table 3.6 Scoring pattern of 3-point scale for innovativeness, market orientation and risk orientation of EFY farmers**

| Response | Agree | Undecided | disagree |
|---|---|---|---|
| Score for positive statement | 1 | 2 | 3 |
| Score for negative statement | 3 | 2 | 1 |

Source; Moulik and Rao (1973)

**Table 3.7 Scoring system for mass media exposure of EFY farmers**

| No. | Statement | Daily | Occasionally | Never |
|---|---|---|---|---|
| 1 | Reading agricultural relatednews in the News Paper, leaflets | 2 | 1 | 0 |
| 2 | Reading of Farm Magazines | 2 | 1 | 0 |
| 3 | Listening to Radioprogrammes | 2 | 1 | 0 |
| 4 | Watching farmer channelProgrammes on Television | 2 | 1 | 0 |

Source;Trivedi (1963)

**Table 3.8 Scoring pattern for extension participation of EFY farmers**

| No. | Activities | Yes/No | Participation | | |
|---|---|---|---|---|---|
| | | | Regular | Occasional | Never |
| 1 | Group meeting | 1/0 | 2 | 1 | 0 |
| 2 | Demonstration | 1/0 | 2 | 1 | 0 |
| 3 | Training programme | 1/0 | 2 | 1 | 0 |
| 4 | Local field day | 1/0 | 2 | 1 | 0 |
| 5 | Exposure visit | 1/0 | 2 | 1 | 0 |
| 6 | Exhibition/Campaign | 1/0 | 2 | 1 | 0 |
| 7 | Others (Specify) | 1/0 | 2 | 1 | 0 |

Source; Daliwal (1963)

**Table 3.9 Scoring pattern for extension contact of EFY farmers**

| No. | Source | Frequently | Occasionally | Rarely |
|---|---|---|---|---|
| **1** | **Formal** | | | |
| **a.** | Agricultural extension officer | 2 | 1 | 0 |
| **b.** | Village secretary | 2 | 1 | 0 |
| **c.** | Scientists | 2 | 1 | 0 |
| **2** | **Informal** | | | |
| **a.** | Friends & relatives | 2 | 1 | 0 |
| **b.** | Input dealers | 2 | 1 | 0 |
| **c.** | Any other (please specify) | 2 | 1 | 0 |

Source; Byrareddy (1971)

**Table 3.10 Category of score criteria for all variables**

| No. | Category | Scores |
|---|---|---|
| 1 | Low level of Knowledge | Below Mean – ½ S.D |
| 2 | Medium level of Knowledge | Mean ± ½ S. D |
| 3 | High level of Knowledge | Above Mean + ½ S.D |

Source; Kowsalya (2014)

## 3.4 Data Analysis Methods

The data collected from the respondents were scored, tabulated and analyzed using the following statistical tools and techniques. Microsoft Excel program was used for tabulating collected data. Descriptive and correlation analyses were employed by using SPSS version 25.0 Software. Descriptive statistics used include frequency maximum, minimum, means, standard deviation and percentages. Budgeting technique was used to estimate income generated from EFY production. The specific type of budgeting technique used was the Return above total variable costs (RATVC) or gross margin above total variable costs. Return above total variable costs is the difference between gross revenue and the total variable costs of production.

### 3.4.1 Percentage

Percentage was used to make the simple comparison of different groups where ever needed.

### 3.4.2 Arithmetic mean

It is defined as the sum of all values of the observations divided by the total number of observations. Symbolically it is represented as $\bar{X}$.

$$Arithmetic\ mean\ (\bar{X}) = \frac{\sum xi}{n} = \frac{\sum x_1 + \sum x_2 + \ldots \sum x_n}{n}$$

Where, $\bar{X}$ = Arithmetic mean

$x_i$ = Value of $i^{th}$ item of x

Where, i = 1, 2……n

n = Total numbers of respondents.

### 3.4.3 Standard deviation

It is positive square root of the mean of the squared deviations taken from arithmetic mean. It is represented by symbol (σ)

$$SD\ (\sigma) = \sqrt{\frac{1}{n}\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]}$$

### 3.4.4 Frequency

Frequency was used to know the distribution pattern of the respondents according to the objectives under study.

### 3.4.5 Pearson's correlation coefficient

This test was used to study the relationship between the scores of independent variables and the scores of dependent variables. It measures the degree of relationship between the two sets of variables.

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left[\sum x - \frac{(\sum x^2)}{n}\right]\left[\sum y^2 - \frac{\sum y^2}{n}\right]}}$$

$r$ = Correlation coefficient

$\sum x$ = Sum of scores of independent variables

$\sum y$ =Sum of scores of dependent variable

$\sum x^2$ =Sum of the squares of scores of an independent variable

$\sum y^2$ = Sum of the squares of scores of a dependent variable

$\sum xy$ =The sum of productivity of x and y

The calculated 'r' value was verified for its by using 'r' table value for 5% and 1% level of significance at n –2 degrees of freedom.

### 3.4.6 Enterprise budgets

The evaluation and focus on the economic and technical performance of an individual farm enterprise is called an enterprise budget which is used to examine the profitability of specific farm enterprise and to compare the profitability of existing and proposed enterprises. Enterprise budget enables to evaluate the cost and return of production process. The purpose of enterprise budgeting was to show the differences in net benefits under several resources' situations in such a way as to help one make management decision (Olson 2009). Enterprise budget analysis was used to assess the profitability of EFY production in the study area on an average basis. In this analysis, the variable cost of the EFY production was divided into two categories, cash cost and opportunity cost. Cash cost includes (1) cash items for material cost; (2) hired labor cost. Opportunity cost included (1) non-cash items for material cost such as owned seeds and so on; (2) family labor cost; (3) interest on cash cost. Opportunity cost is an economic concept, not a cost that can be found in an accountant's ledger or on an income tax return. However, it is an important and basic concept that needs to be considered when making managerial decisions. Opportunity cost is based on the fact that once an input has been acquired, it may have one or more alternative uses. Once an input is committed to a particular use, it is no longer available for any other

alternative use, and the income from the alternative must be foregone. Opportunity cost can be defined in one of two ways: (1) the income that could have been earned by selling or renting the input to someone else, or (2) the additional income that would have been received if the input had been used in its most profitable alternative use.

Opportunity costs are widely used in economic analysis. For example, the opportunity costs of a farm operator's labor, management, and capital are used in several types of budgets used for analyzing farm profitability. The opportunity cost of farm family labors would be what that labor would earn in its next best alternative use. That alternative use could be nonfarm employment, but depending on skills, training, and experience, it might also be employment in another farm or ranch enterprise. Some operators state that their own time is "free", but it should be given a value at least as high as the value that they put on leisure time (Kay, Edwards, & Duffy, 2011). The interest was normally charged on cash expense for early in the growing season. This reflects that cash invested has an opportunity cost. Using the money to grow this crop precludes investment elsewhere (Olson 2009). In this study, the counted interest rate was 8% for cropping period.

To compare the profitability of EFY fresh and dry with different level of knowledge of the respondents towards EFY production and value-added technologies, the concept of enterprise budget was used. Profitable measures were estimated by using the following formulae:

1. Gross margin per unit of land = Total Gross Benefit-Total Variable Cost
   GM = GB-TVC
2. Benefit Cost Ratio = Total Gross Benefit/ Total Variable Cost
   BCR = GB / TVC
3. Return on investment = Total Gross Benefit/Total Cash Cost
   ROI = GB/TCC

Other measurements used in economic analysis are as follows;

Total variable cost = Total material cost + Total labor cost

Total cash cost = Total material cost (cash for bought seed corms) + Total hired labor cost

## 3.5 Hypothesis of the Study

### 3.5.1 Null hypothesis

There will be no significant relationship between the selected profile characteristics and the knowledge level of EFY farmers.

### 3.5.2 Alternative hypothesis

There will be a significant relationship between the profile characteristics and the knowledge level of EFY farmers.

# CHAPTER IV
# RESULTS AND DISCUSSION

## 4.1 Profile Characteristics of EFY Famers

In social science, it is essential to analyse the profile characteristics of farmers, which would give a basic and clear picture about the background of the farmers. This would help in interpreting the data gathered in an effective way. The profile characteristics of the EFY farmers are presented in detail.

### 4.1.1 Personal characteristics of the sample respondents in the study area

#### 4.1.1.1 Age

Age is an important factor as it reveals the maturity of an individual to take decisions for achieving their needs. Results in Table 4.1 highlights that 28.4% of the respondents were in young age group followed by 43.3% of the respondents (middle age group) and 28.4% of the respondents (old age group). It could be seen from the Table 4.1, that majority (43.3%) of the respondents were found in the middle age category, followed by 28.4% in the old age category, and 28.4% fell under young age category. These middle-aged farmers were actively involved in the farm activities. Usually farmers of middle age are enthusiastic and they have more work efficiency than the older or young ones.

#### 4.1.1.2 Education

Education is another important factor that influences knowledge and attitude of individuals. It could be seen from Table 4.1 that 56.7% of respondents had low education level, followed by 41.0% had medium education level and 2.2% were graduated ones, respectively. Thus, the findings revealed that majority of the respondents found to be educated as low level of schooling years followed by Middle level of schooling years. This trend might be due to the fact that majority of the respondents were small and medium farmers and could not go for higher education because of their financial problems and non-availability of higher educational facilities in the villages. This finding was not in line with the finding of Reddy (1994).

**Table 4.1 Profile Characteristics of Respondents**

| Characteristics | Categories | Respondents (N=134) | | Mean | SD |
|---|---|---|---|---|---|
| | | n | % | | |
| Age | Young (<39 yr) | 38 | 28.4 | 46.28 | 13.25 |
| | Middle (39-53 yr) | 58 | 43.3 | | |
| | Old (>53 yr) | 38 | 28.4 | | |
| Educational level | Low (0-5 yr) | 76 | 56.7 | 7.2 | 3.9 |
| | Middle (6-11 yr) | 55 | 41.0 | | |
| | High (>12 yr) | 3 | 2.2 | | |
| Family size | Small (<3) | 24 | 17.9 | 4.75 | 2.03 |
| | Medium (3-5) | 68 | 50.7 | | |
| | Large (>5) | 42 | 31.3 | | |
| Farming experience | Low (>16 yr) | 46 | 34.3 | 23.39 | 14.26 |
| | Medium (16-30 yr) | 55 | 41.0 | | |
| | High (>30 yr) | 33 | 24.6 | | |
| Land holding | Small (>2.3 ac) | 50 | 37.3 | 1.80 | 3.22 |
| | Medium (2.3-4.13 ac) | 53 | 39.6 | | |
| | Big (>4.13 ac) | 31 | 23.1 | | |
| Annual income | Low (<6,771,323) MMK | 45 | 33.6 | 9,541,324 | 5,540,003 |
| | Medium (6,771,323-12,311,326) MMK | 60 | 44.8 | | |
| | High (>12,311,326) MMK | 29 | 21.6 | | |
| Decision making | Low (<45.89) | 34 | 25.4 | 50.78 | 9.759 |
| | Medium (45.89-55.65) | 49 | 36.6 | | |
| | High (>55.65) | 51 | 38.1 | | |
| Social participation | Low (<5.3) | 46 | 34.3 | 2.63 | 3.04 |
| | Medium (5.3-9.0) | 54 | 40.3 | | |
| | High (>9.0) | 34 | 25.4 | | |
| Innovativeness | Low (<22.7) | 30 | 22.4 | 23.76 | 2.06 |
| | Medium (22.7-24.7) | 43 | 32.1 | | |
| | High (>24.7) | 61 | 45.5 | | |
| Risk orientation | Low (>14.71) | 7 | 5.2 | 15.23 | 1.04 |
| | Medium (14.71-15.75) | 45 | 33.6 | | |
| | High (>15.75) | 82 | 61.2 | | |
| Market orientation | Low (<11.66) | 39 | 29.1 | 12.64 | 1.96 |
| | Medium (11.66-13.62) | 55 | 41.0 | | |
| | High (>13.62) | 40 | 29.9 | | |
| Economic orientation | Low (<13.5) | 21 | 15.7 | 14.26 | 1.47 |
| | Medium (13.5-14.9) | 73 | 54.5 | | |
| | High (>14.9) | 40 | 29.9 | | |
| Attitude | Less favorable (<20.9) | 42 | 31.3 | 22.72 | 3.60 |
| | Favorable (20.9-24.5) | 54 | 40.3 | | |
| | More favorable (>24.5) | 38 | 28.4 | | |

Table 4.1 continued

| Characteristics | Categories | Respondents (134) | | Mean | SD |
|---|---|---|---|---|---|
| | | n | % | | |
| Extension Participation | Low (>0.97) | 32 | 23.9 | 2.29 | 2.65 |
| | Medium (0.97-3.62) | 75 | 56.0 | | |
| | High (>3.62) | 27 | 20.1 | | |
| Extension Contact | Low (<0.82) | 60 | 44.8 | 2.19 | 2.72 |
| | Medium (0.82-3.54) | 34 | 25.4 | | |
| | High (>3.54) | 40 | 29.9 | | |
| Mass Media exposure | Low (<0.76) | 41 | 30.6 | 1.43 | 1.33 |
| | Medium (0.76-2.75) | 65 | 48.5 | | |
| | High (>2.75) | 28 | 20.9 | | |

#### 4.1.1.3 Size of the family

Availability and amount of family labor play a vital role in determining adoption and intensity of use of agricultural technologies. The influence of labor availability on adoption depends on the characteristics of the technology to be adopted. It is observed that a majority (50.7%) of EFY farmers had medium family size followed by large (31.3%) and small (17.9%) family size in Table 4.1. Data indicates that the majority of the respondents had medium family size followed by large and low family size.

#### 4.1.1.4 Farming experience

It is evident from Table 4.1 that majority (41.0%) of the EFY farmers had medium level of farming experience followed by high (34.3%) and low (24.6%). It can be observed from the table that majority of the respondents had medium level of farming experience. This might be due to the fact that majority of the respondents belonged to middle age categories. Hence most of the respondents were falling under medium experience. This result is in line with (Sajith Kumar, 2004) and (Man & Sadiya, 2009).

#### 4.1.1.5 Land holding

A large number (39.6%) of the EFY farmers were cultivating medium size land holding followed by 37.3% having small size of land holding and 23.1% of EFY farmers were having big size of land holding (Table 4.1). The above table shows-that the majority of respondents possess medium and small land holding. The possible reason could be the fact that the ancestral lands were broken into smaller parts due to increase in family size. The finding was in accordance with the finding reported by Vanitha (2002).

#### 4.1.1.6 Annual income

It is also observed from Table 4.1 that 44.8% of the respondents were found to be under low annual income category. Whereas, 33.6% and 21.6% of the respondents belonged to medium and high annual income category respectively. The possible reason that could be attributed was their land holding conditions due to the majority of respondents engaged in small to medium size of land holding with medium experience and their income may be low.

### 4.1.2 Psychological characteristics of the sample respondents of the study area

#### 4.1.2.1 Decision making

Decision making is the act or process of deciding something especially with a group of people in family. The results in Table 4.1 reveals that 38.1% of the respondents belonged to high decision-making level followed by 36.6% and 25.4% belonged to medium and low decision-making level. The above result may be due to the fact that medium and old age respondent had medium experience in value addition and their involvement in financial matters when a decision in household is usually made by older people. The above findings are not in line with the past findings of (Upayana Singh et al. ,2010) and (Nataraju, 2012).

#### 4.1.2.2 Social participation

More than half of the respondents (40.3%) fall under medium social participation category while, 34.3% of them had low level social participation and 25.4% had high level social participation. The medium level of social participation of farmers may be due to the conservative nature like lack of motivation, lack of time, ignorance, lack of opportunities, lack of awareness, lack of social mobility and lack of self-confidence which have made them to isolate themselves with medium participation in formal organizations. The findings of present study are in conformity with the findings of (Kumar, 2005; Hiremath, 2007; Netravathi, 2007; Gopal, 2010 & Yavana ,2010). Whereas, it was against the findings of (Gowda, 2005; Kundu & Mehta, 2008).

#### 4.1.2.3 Innovativeness

Innovativeness is the degree to which an individual (or other unit of adoption) is relatively earlier in adopting new ideas than other members of a system. It indicates the overt behavioral change and bottom-line behavior in the diffusion process. Findings from Table 4.1. shows that majority (45.5%) of the respondents had high innovativeness followed by medium (32.1%) levels and low (22.4%) of innovativeness. The possible reasons might be due to the fact that majority of the farmers involved in farming were of middle and old aged category. The innovativeness is generally associated with younger age. But it was observed that the farmers were curious about new cultivation methods as they were cultivating the crop from generations together and they have shown more interest in the latest developments of EFY technology. This result is in agreement with (Ramu, 2005; Naik, 2006).

#### 4.1.2.4 Risk orientation

Risk orientation of farmers was a major determinant for decision making to adopt new information and agricultural practice technologies. The risk orientation nature of the respondents was studied and the results are depicted in Table 4.1. It revealed that 61.2% of the EFY farmers had high risk orientation followed by medium (33.6%) and low (5.2%) levels of risk orientation. Majority of the EFY farmers were found to have high level of risk orientation. This showed that the middle and old, educated and interested respondents with high levels of innovativeness were ready to face the risk while adopting the EFY technology. This finding is in line with the findings of (Subramanian, 2000).

#### 4.1.2.5 Market orientation

Market orientation is an approach to business that prioritizes identifying the needs and desires of consumers and creating products that satisfy them. The findings that embellished in Table 4.11 revealed that 41.0% of the EFY farmers had medium market orientation followed by high (29.9%) and low (29.1%) levels of market orientation. The possible reason for this trend might be due to the fact that majority of respondents had medium to high extension participation and mass media exposure and they wanted to gain more profits out of their produce. The findings were in concurrence with the studies reported by (Palaniswamy, 2001; Rajendra Kumar, 2002; Gopinath, 2005).

#### 4.1.2.6 Economic orientation

Economic orientation is one of the psychological factors for accepting the economic oriented farming system. About fifteen four% of the EFY farmers had medium economic orientation followed by high (29.9%) and low (15.7%) levels of economic orientation. The results reveal that majority of the respondents had medium level of economic orientation. The possible reason for this result is that the farmers are still considering the agriculture as a subsistence occupation and not looking at it commercially. This may also be due to narrow range of opportunities and avenues for improvement prevailing in the area. This finding is in agreement with the findings of (Reddy, 1998).

#### 4.1.2.7 Attitude

With respect to attitude of the respondents it was observed from Table 4.1 indicates that, 40.3% of the respondents had favourable attitude towards EFY production. Whereas, 31.3% and 28.4% of the respondents towards EFY production had less favourable and favourable attitude, respectively. The probable reason behind this result may be due to the fact that medium age level of respondents participates in medium land holding of EFY production, creation of additional employment and increase in risk orientation and high level of innovativeness might have contributed for majority of respondents falling under favorable attitude. The findings are in conformity with the finding of (Manjula & Belli 1994), whereas, it is contradictory to the findings of (Esele, 1986); Sharma & Khan,1997).

### 4.1.3 Communication behavior of sample respondents in the study area

#### 4.1.3.1 Extension participation

The role of extension and training is crucial in the development of knowledge of famers. The result in Table 4.1 reveals that 56.0% of the respondents belonged to medium extension participation category. Whereas, 23.9% and 20.1% had low and high extension participation category, respectively. The above finding showed that the majority of respondent had medium level of extension participation due to their religion and they almost are Christians, they wanted to attend extension activities even though they had some work on farm on Sunday.

#### 4.1.3.2 Extension contacts

From Table 4.1 it could be seen that, 25.37% of the respondents had medium extension contact. Whereas, 29.9% and 44.8% had high and low extension contact, respectively. The possible reason for the low level of extension contact could be due to the fact that majority of the respondents were living in villages where we could see poor transportation, lack of mobility so it has been restricted their contact with the extension personals from respective departments for accessing new information. Another possible reason could be due to the fact that medium and high percentages of respondents depend on mass media for source of information.

#### 4.1.3.3 Mass media exposure

Mass media possesses the enormous potentiality to partners for changing and upgrading knowledge of value addition technologies. The result in Table 4.1 revealed that 48.5% of the respondents had medium mass media exposure, followed by 20.9% and 30.6% had high and low level of mass media exposure, respectively. Majority of farmers were having medium exposure in mass media which explained that they were very much dependent on mass media not only as a source of news and information, but also as a source of entertainment and leisure. In general, it raised the awareness level among the famers for processing. They helped to update latest developments which are a good sign and speak about the interest of respondents to view the things. But, lack of interest, lack of time, inconvenient timings and irrelevant information of the programme might be attributed to the low use of mass media which is sometimes being dubbed as media bias. The observation made by (Fami, 2000); Neelaveni et al. ,2002; Yavana, 2010) were in line with the present study. But according to (Vanitha Chethan, 2002; Nataraju, 2012) the mass media participation was high and low which is not reported in this study.

## 4.2 Knowledge Level of Farmers on Improved EFY Production and Processing

Knowledge is a powerful tool to adopt the new agricultural technologies for farmers. There were 32 statements for knowledge test for EFY production and processing: 5 statements for general knowledge, 18 for cultural practices, 4 for post-harvest handling methods and 5 for EFY value additions. In general knowledge among five statements, 90.3% of the EFY farmers had correct knowledge to commercially grown local variety and 87% of EFY farmers had correct answer to preferred weather condition for red EFY having 3-30 leaf bulbs and 76.12% of EFY farmers knew about growing regions of EFY in Myanmar but 58% of the sample farmers did not have the correct knowledge about commercially grown area in the world and only 36.57% of EFY farmers knew about 12 cultivated species among 130 species.

Among 18 statements regarding cultural practices of EFY production, more than 90% of the respondents had correct knowledge about intensive weeding in the first year, planting EFY from leaf bulb, EFY growing season, covering the hay at the base of EFY plants for developing the corms, recommended depth of sowing, recommended soil type, preferred soil type of EFY and covering the soil at the base of EFY plants not to damage to roots. 80-88.81% of the respondents had known about planting EFY sprouts,

**Table 4.2 Knowledge of farmers regarding elephant foot yam production and processing**

Respondents=134

| No. | Statements | Correct answer | |
|---|---|---|---|
| | | N | (%) |
| **A** | **General Knowledge** | | |
| 1 | Among the white, red and yellow color varieties of EFY in Chin state, red variety are economically grown. | 121 | 90.3 |
| 2 | Red EFY prefer cold weather and it can have 3-30 leaf bulbs. | 117 | 87.31 |
| 3 | It is grown in Kachin, Kayah, Chin, Taninthayi, Mon, Rakhaine and Shan states in Myanmar. | 102 | 76.12 |
| 4 | EFY is commercially grown in India, Myanmar, China, Indonesia and Japan. | 78 | 58.21 |
| 5 | Among the 130 species of EFY, 12 species are exploited and grown. | 49 | 36.57 |
| **B** | **Cultural practices** | | |
| 1 | EFY is weeded two or three times per year, with more intensive weeding in the first year. | 133 | 99.25 |
| 2 | It can be grown from leaf bulbs. | 132 | 98.51 |
| 3 | EFY is grown during May and April. | 130 | 97.01 |
| 4 | To develop the corms, it needs to cover with hay at the base of the plant. | 128 | 95.52 |
| 5 | It is no need to grow deeply in the soil. | 126 | 94.03 |
| 6 | Clayey and waterlogged soils are not suitable. | 125 | 93.28 |
| 7 | The preferred soil type is one that is naturally fertile, probably with significant humus content, and well drained. | 124 | 92.53 |
| 8 | Not to damage to roots, covering the soil at the base of plants. | 121 | 90.29 |
| 9 | Sprout of EFY can be cut and sown. | 119 | 88.81 |
| 10 | For small to medium sized tuber, spacing between pits can be reduced to 2′ x 2′. | 117 | 87.31 |
| 11 | Pits size of EFY is 2′ x 2′ x 1.5′. | 116 | 86.57 |

Table 4.2 continued

| | | | |
|---|---|---|---|
| 12 | Seeds from bunches of flowers can be collected and nursed during 1st year and 2nd year, after getting 30 tickles size of bulb, it can be grown. | 114 | 85.07 |
| 13 | To grow EFY, about 25-30 tickles size of bulbs can be used directly. | 111 | 82.84 |
| 14 | It is need to cut and remove the decay spot and only after putting lime into that point it should be grown. | 108 | 80.62 |
| 15 | It should be grown intercropping with Avocado, corn, coffee. | 99 | 73.88 |
| 16 | EFY should be applied with well-decomposed FYM at the rate of 1.2 viss to 1.8 viss / pit. | 98 | 73.13 |
| 17 | The best mixed crops for EFY plantation are leguminous plants. | 84 | 62.69 |
| 18 | In good leveling soil, it needs to rotate into 45 degree and sown. | 74 | 55.22 |
| **C** | **Post-harvest handling methods** | | |
| 1 | Corms harvested in Nov should be stored in well ventilated place. | 128 | 95.52 |
| 2 | Growers dig tubers out of the ground with a narrow blade or other iron hand implement, taking care not to puncture the exterior as this can lead to lead to rotting. | 125 | 93.28 |
| 3 | If damaged after harvesting, cut that damaged portion and put lime into that place and needs to keep systematically with stand in the shade. | 122 | 91.04 |
| 4 | Due to soften of bulb where the joint between corms and stem, it needs to wait about 2 weeks for hardening these bulbs and then can be dug. | 105 | 78.36 |
| **E** | **EFY value addition** | | |
| 1 | EFY corms can be dried with solar, sundry and putting with stand and zinc roof. | 127 | 94.78 |
| 2 | Raw EFY is chopped into slice for more price. | 125 | 93.28 |
| 3 | It requires to remove and wash the portion of rot of corms and cut into 3-6 mm thick slices and dry them. | 116 | 86.57 |
| 4 | Powder EFY is better price than slices of it. | 92 | 68.66 |
| 5 | EFY can be made EFY noodles. | 82 | 61.19 |

recommended spacing for small to medium tubers, sowing EFY form seed material in nursery, size of the bulb to be sown, cutting and removing the decay spot and growing only after putting lime into that point. Over 70% of the EFY farmers know proper application FYM, intercropping with suitable crops and the best mixed crops for EFY and 62.69% of EFY farmers were family with the best mixed crops for EFY however only 55.2% of the respondents knew about rotating 45 degree for sowing EFY in good leveling.

Among four statements for post-harvest handling methods, over 90% of the respondents had correct answer to recommended harvesting time and stored place after harvest, harvesting techniques, cutting damaged portion after harvesting and putting lime into that point and keeping systematically with stand in the shade. 78% of the respondents knew that 2 weeks hardening time for harvesting the corms if the bulb where the joint between corms and stem is soft and it is not ready to harvest the corm.

Among five statements of EFY value addition, over 90% of the respondents had correct knowledge about drying EFY corms with solar, sundry and putting it with stand and zinc roof, and getting better price for dried chips (slices) than raw EFY (fresh). 86% of the respondents knew about removing and washing the rot portion of corms and cutting into 3-6 mm thick slices and drying them, and 68% of the respondents knew about better price of powder than slices. Only 61.19% of EFY farmers had knowledge about being able to make EFY into noodles.

According to the result of knowledge test, most of the farmers were quite enthusiastic and interested in knowing and learning about EFY farming technologies and had medium to high knowledge about EFY production and processing. So, whenever they got the chance to attend the training programme conducted by department of agriculture, they participated actively. The farmers of the study area involved in scientific cultivation of the crop since few years ago and their past experience in cultivating the crop also added to their present levels of knowledge about recommended EFY cultivation practices.

### 4.2.1 Overall knowledge level of the producers and processors with respect to elephant foot yam (producers and processors)

It was observed in the Table 4.3 that the majority (38.81%) of the respondents had the medium level of knowledge followed by high (30.6%) and low (30.6%) level of knowledge categories.

The possible reason might be due to their higher extension participation level, medium level of economic orientation behavior and adequate farming experience. The respondents want to increase their farm income; this would motivate them to gain more knowledge on EFY cultivation.

The other reason for this trend was that majority of the farmers had medium land holdings with medium mass media exposure, medium social participation and favorable attitude toward EFY production. The agricultural department and extension agencies conduct training programmes on EFY farming and take the farmers to research stations and demonstration plots, progressive farmer's fields and inspiring them to have more extension contact, social participation and mass media exposure. As a result, these farmers can improve their knowledge about recommended package of practices. Similar findings were reported by (Gopinath, 2005; Shakya et. al., 2008).

## 4.3 Association and Frequency Distribution of Qualitative and Quantitative Variables Groups with Knowledge Level Groups

The association between knowledge on EFY value addition and age categories was indicated in Figure 4.1. The finding shows that young (39.6%) and old (42.1%) groups belonged to the medium knowledge level. whereas middle age group (36.2%) belonged to the highest knowledge level. In general, middle age group was seemed to be more knowledgeable than the others. But chi square value showed no significant difference among three groups.

The association between knowledge on EFY value addition and education level of categories was described in Figure 4.2. Although 55.3% respondents from low-level education group had medium knowledge level, but 45.4% respondents from medium and 66.7% respondents from high-level education groups had high knowledge level. Thus, education level groups and knowledge level groups were positively and significantly different in chi-square test.

The association between knowledge on EFY value addition and family size of categories was showed in Figure 4.3. Most of the small families (62.5%) were found in low knowledge level and, 42.8% and 38.2% of large family groups were existed in medium and high knowledge level groups. According to the result in chi-square test, a highly significant difference was found in family size categories and knowledge level groups.

**Table 4.3 Overall knowledge index of the farmers with respect to elephant foot yam (producers and processors)**

| Characteristics | Category | Respondents | |
|---|---|---|---|
| | | n | % |
| Knowledge level | High (>0.89) | 41 | 30.6 |
| | Medium (0.77-0.89) | 52 | 38.8 |
| | Low (<0.77) | 41 | 30.6 |
| Total | | 134 | 100 |
| Mean | (Index value) | 0.83 | |
| SD | | 0.12 | |
| Mini. | | 0.5 | |
| Maxi. | | 1 | |

The association between knowledge on EFY value addition and land holding level was presented in Figure 4.4. Large (45.2%) and medium (43.3%) sized land holding were found in medium knowledge level group, respectively. Small landholdings (38.0%) were found in the lowest knowledge level group. It seems to be that bigger land holding of respondents had more knowledge level but chi square value had non-significant different among these three groups.

The association between knowledge on EFY value addition and household total income categories was presented in Figure 4.5. About thirty-five (35.5%) of the low and 41.3% of the high household income groups were seen in high knowledge level, respectively. Medium (43.3%) household income group had medium knowledge level. As a result in chi-square test, there is no significant among household income groups and knowledge level groups.

The association between knowledge on EFY value addition and social participation behavior of EFY famers was explained in Figure 4.6. In low knowledge level group, 41.2% of famers had high social participation behavior followed by 30.4% of them had medium range of social participation behavior and 24.0% of them with low social participation behavior. In medium knowledge group, 41.3% of famers had high market orientation behavior followed by 41.2% of them had low range of social participation behavior and 35.2% of them with medium social participation behavior. In high knowledge group level, 40.7% respondents had medium level social participation behavior, followed (28.3%) and (17.6%) for low and high level of social participation behavior respectively. However, social participation behavior difference among three knowledge level group were found to be not significant in chi square test.

The association between knowledge on EFY value addition and farming experience categories of the EFY farmers was presented in Figure 4.7. In low knowledge level group, low farming experience level of the respondents, the highest percentage among the groups, was (39.1%), followed by high level of farming experience with (30.3%) and then medium level of farming experience (23.6%). In medium knowledge group, the highest percentage among the other farming experience groups was medium level of (40.1%) farming experience group, followed by (39.2%) for low level farming experience group and (36.3%) for high level of farming experience group respectively. In high knowledge group level, (36.3%) was the highest percentage and it had medium level of farming experience group, followed (33.3%) and (21.7%) for high and low level of farming experience groups respectively. However,

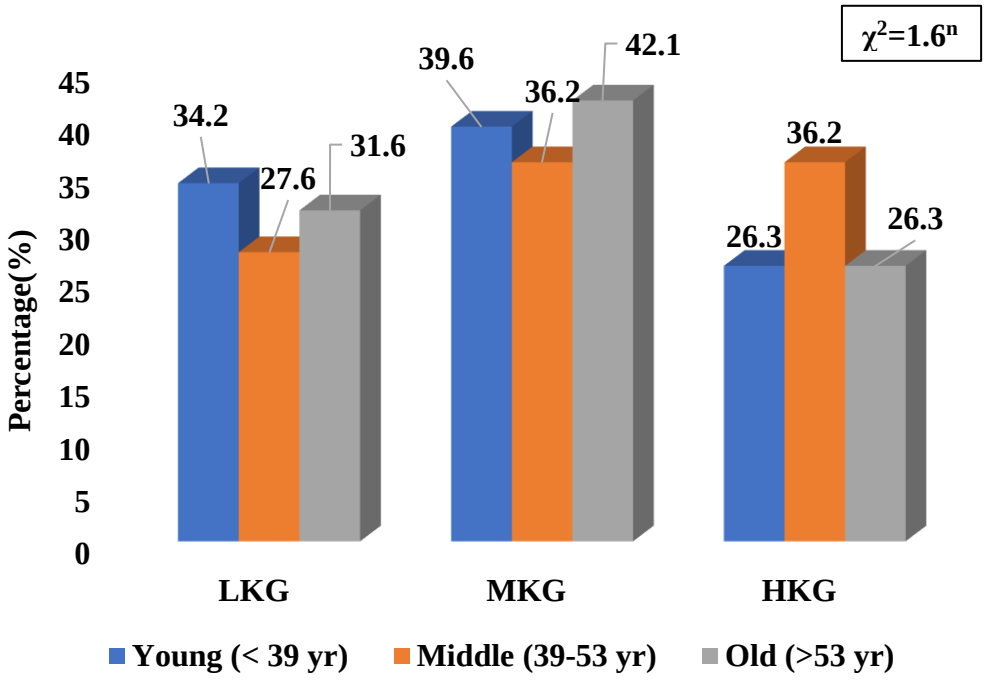



**Figure 4.1 Relationship between knowledge level on EFY VA and different age group**

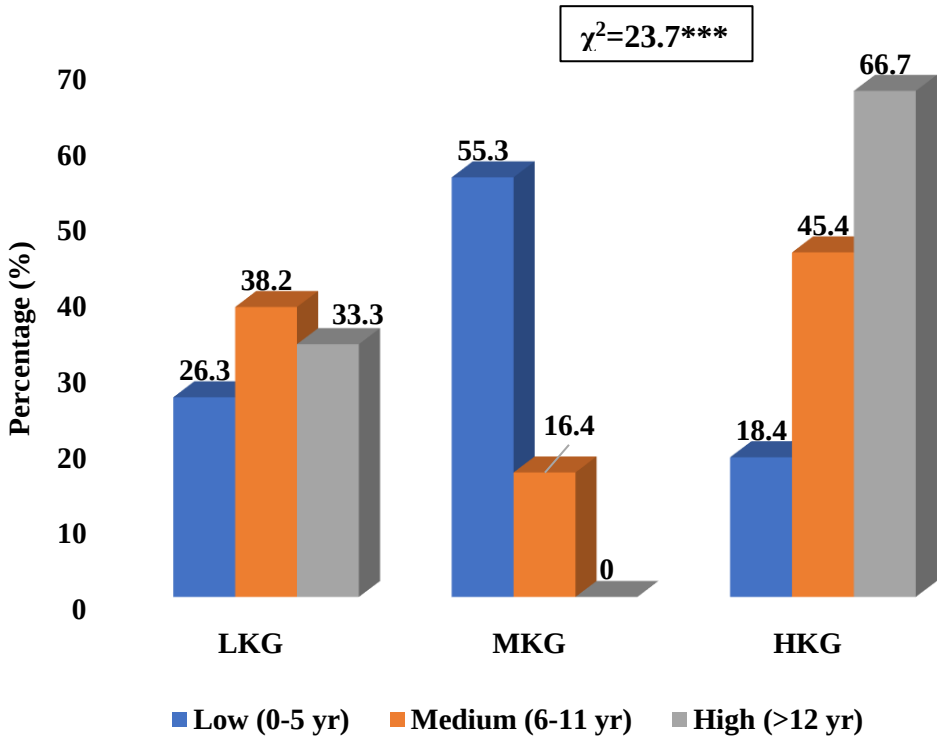



**Figure 4.2 Relationship between knowledge level on EFY VA and their education level groups**

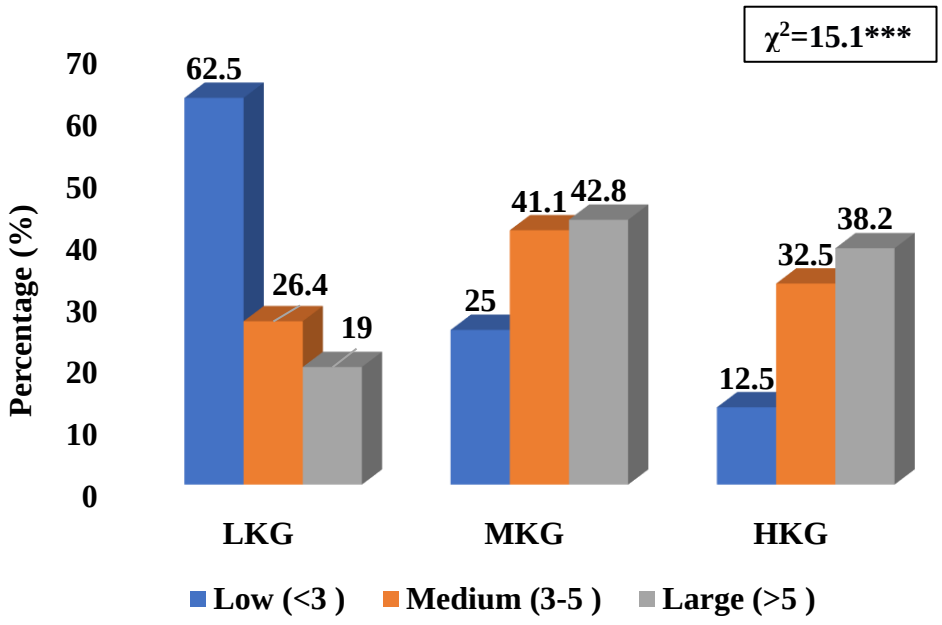



**Figure 4.3 Relationship between knowledge level on EFY VA and family member level group**

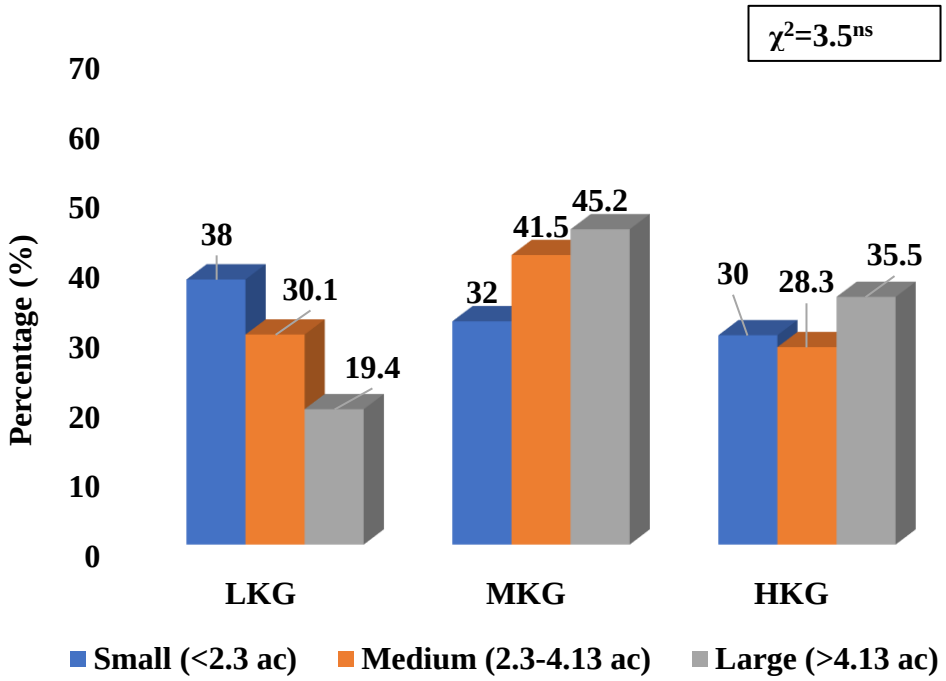



**Figure 4.4 Relationship between knowledge level on EFY VA and land holding level group**

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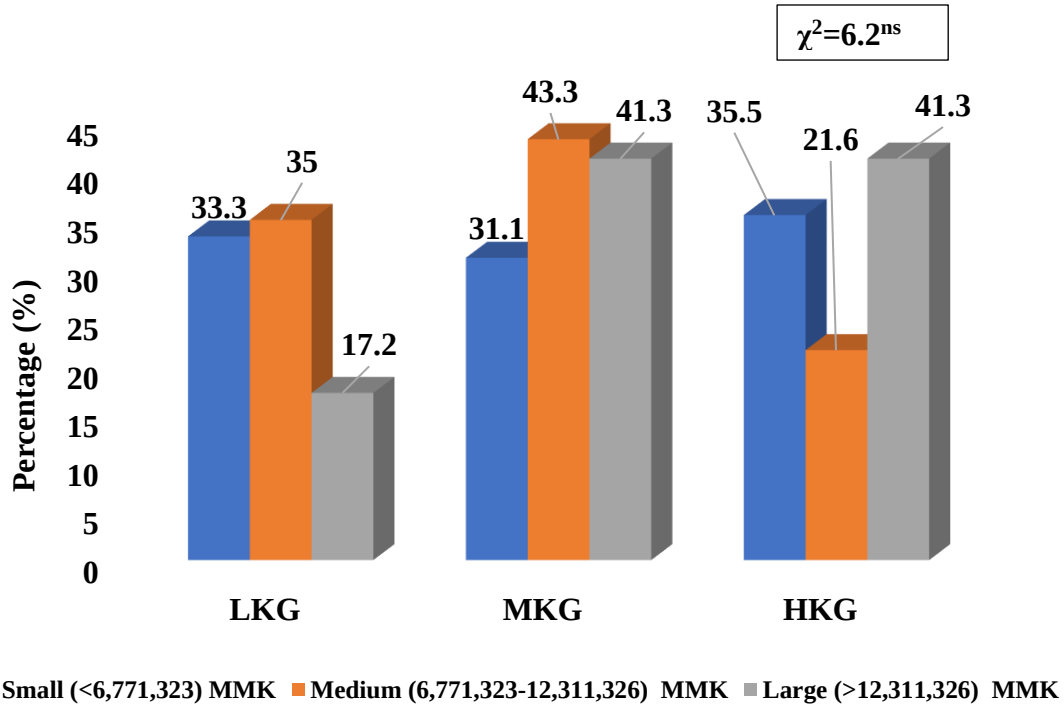


**Figure 4.5 Relationship between knowledge level on EFY VA and HH total income level groups**

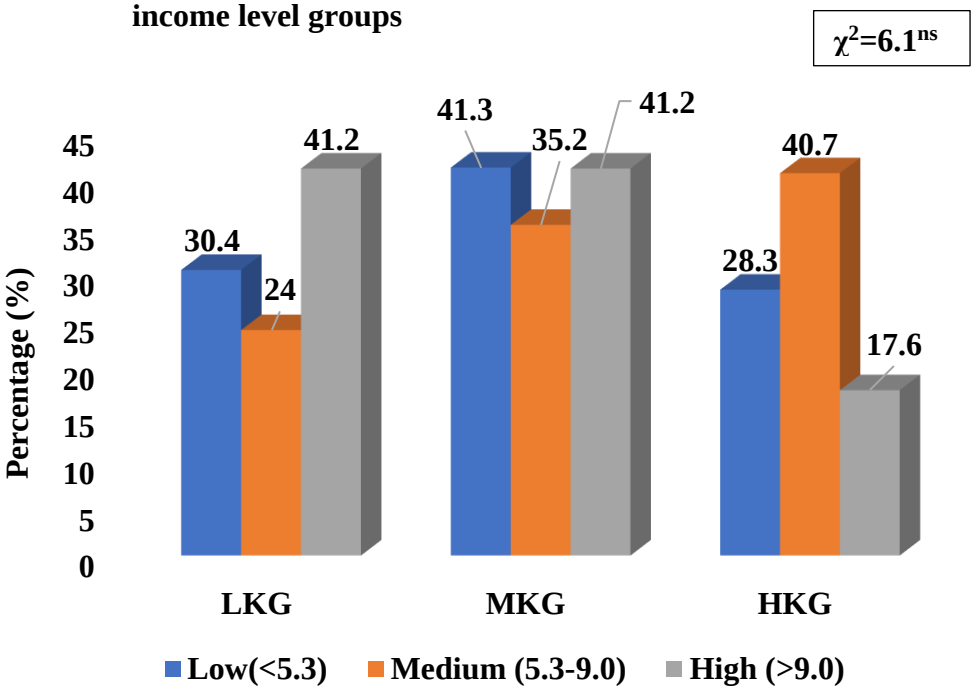


**Figure 4.6 Relationship between knowledge level on EFY VA and social participation group level**

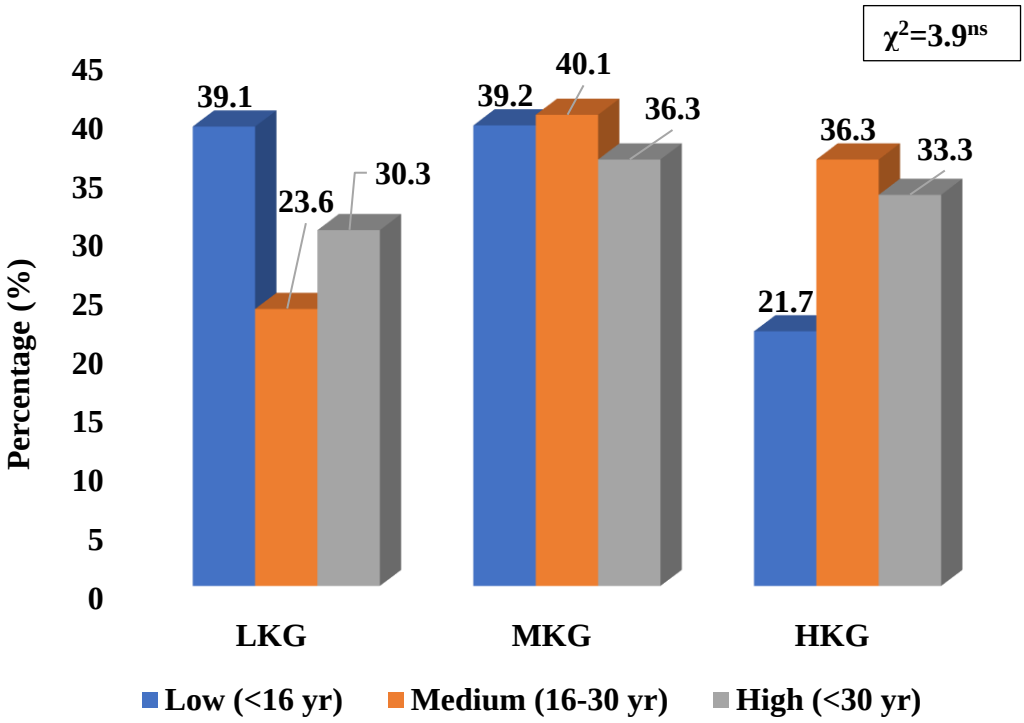


**Figure 4.7 Relationship between knowledge level on EFY VA and farming experience group level**

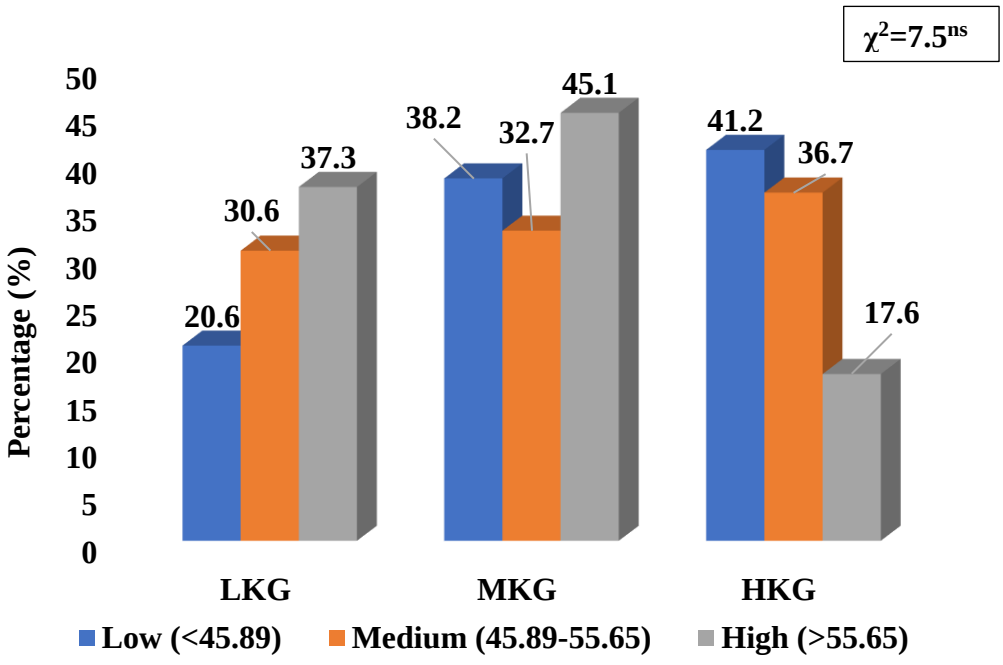


**Figure 4.8 Relationship between knowledge level on EFY VA and their level of decision-making power**

farming experience groups of the respondents and three knowledge level group were found to be not significant in chi square test.

The association between knowledge on EFY value addition and decision-making attitude categories was indicated in Figure 4.8. In low knowledge level group, high decision-making attitude level of the respondents was the highest (37.3%) among the other groups, followed by medium level of decision-making with (30.6%) and low level (20.6%) of decision-making group. In medium knowledge group, the highest (45.1%) was high level of decision-making group among the other decision-making groups, followed by (38.2%) for low level decision-making group and (32.7%) for medium level of farming decision- making group respectively. In high knowledge group level, 41.2% was the highest and it belonged to low level of decision-making group, followed by 36.7% and 17.6% for medium and high level of decision-making groups respectively. But decision-making attitude of the respondent's groups and three knowledge level group were found to be not significantly different in chi square test

The association between knowledge and attitude towards EFY value addition categories was described in Figure 4.9. In low knowledge level group, more favorable attitude level of the respondents (34.2%) was the highest percentage among the other groups, followed by less favorable attitude with (30.9%) and then 27.8% of favorable attitude group could be observed. In medium knowledge group, the highest (47.4%) was more favorable attitude among the other attitude groups, followed by (44.4%) for favorable attitude group and 23.8% for less favorable attitude group respectively. In high knowledge group level, 45.3% was the highest percentage and it belonged to less favorable attitude group, followed by 27.8% and 18.4% for favorable and more favorable attitude groups respectively. The finding of chi-square test indicated that there is a significant association between attitude towards EFY value addition groups and knowledge groups of the respondents at 10% level.

The association between knowledge on EFY value addition and risk orientation behavior of the EFY farmers was highlighted in Figure 4.10. In low knowledge level group, low risk orientation (57.2%) level of the respondents was the highest percentage among the other groups, followed by medium level risk orientation with (37.7%) and then 24.3% of high level of risk orientation group could be observed. In medium knowledge group, the highest (42.8%) was low level of risk orientation attitude, followed by 42.2% for medium level of risk orientation attitude and 23.8% for less

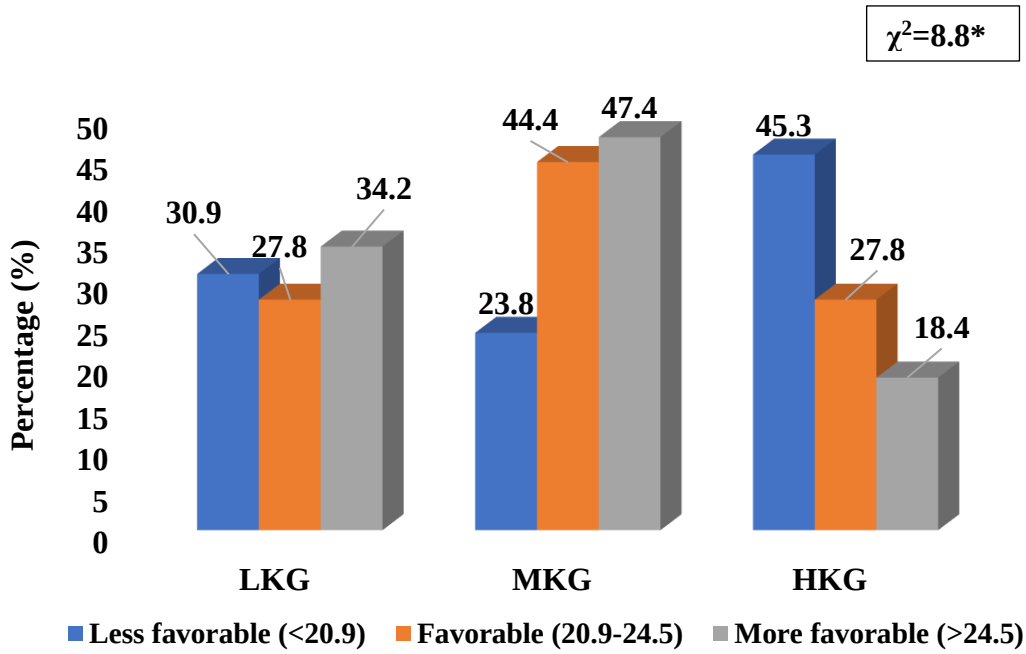


**Figure 4.9 Relationship between knowledge level on EFY VA and attitude level**

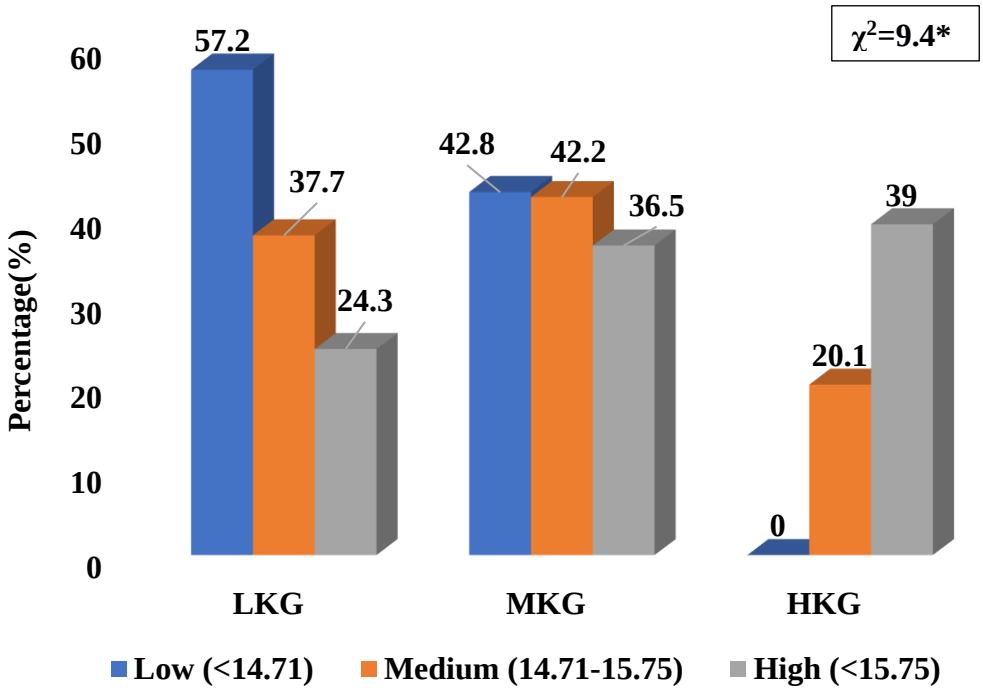


**Figure 4.10 Relationship between knowledge level on EFY VA and their risk orientation levels**

favorable attitude group respectively. In high knowledge group level, 39.0% was the highest percentage and it belonged to high level of risk orientation group, followed by 20.1% for medium level of risk orientation groups respectively. According to the result of chi-square result, risk orientation attitude of the respondent's groups was significantly association with these three knowledge groups at 10% level.

The association between knowledge on EFY value addition and market orientation behavior of EFY famers was explained in Figure 4.11. In low knowledge level group, 33% of famers had low market orientation behavior followed by 31.0 % of them had medium range of market orientation behavior and 27.5% of them with high market orientation behavior. In medium knowledge group, 45.0% of famers had high market orientation behavior followed by 38.4% of them had low range of market orientation behavior and 34.5% of them with medium market orientation behavior. In high knowledge group level, 34.5% was the highest percentage and it belonged to medium level of market orientation group, followed by 28.3% and 27.5% for low and high level of market orientation groups respectively. However, market orientation behavior difference among three knowledge level group were found to be not significant in chi square test.

The association between knowledge and innovativeness categories was revealed in Figure 4.12. In low knowledge level group, 33% of famers had low innovative behavior followed by 32.5% of them had medium range of innovative behavior and 27.8% of them with high innovative behavior. In medium knowledge group, 40.9% of famers had high innovative behavior followed by 37.2% of them had low range of innovative behavior and 36.6% of them with medium innovative behavior. In high knowledge group level, 31.1% was the highest percentage and it belonged to high level of innovativeness group of the respondents, followed by 30.3% and 30.1% for medium and low level of innovativeness groups respectively. However, innovative behavior difference among three knowledge level group were found to be not significant in chi square test.

The association between knowledge of EFY value addition and economic orientation behavior was illustrated in Figure 4.13. In low knowledge level group The association between knowledge of EFY value addition and economic orientation behavior was illustrated in Figure 4.13. In low knowledge level group, 47.6% of famers had high economic orientation behavior followed by 30.0% of them had medium range of economic orientation behavior and 26.0% of them with low economic orientation

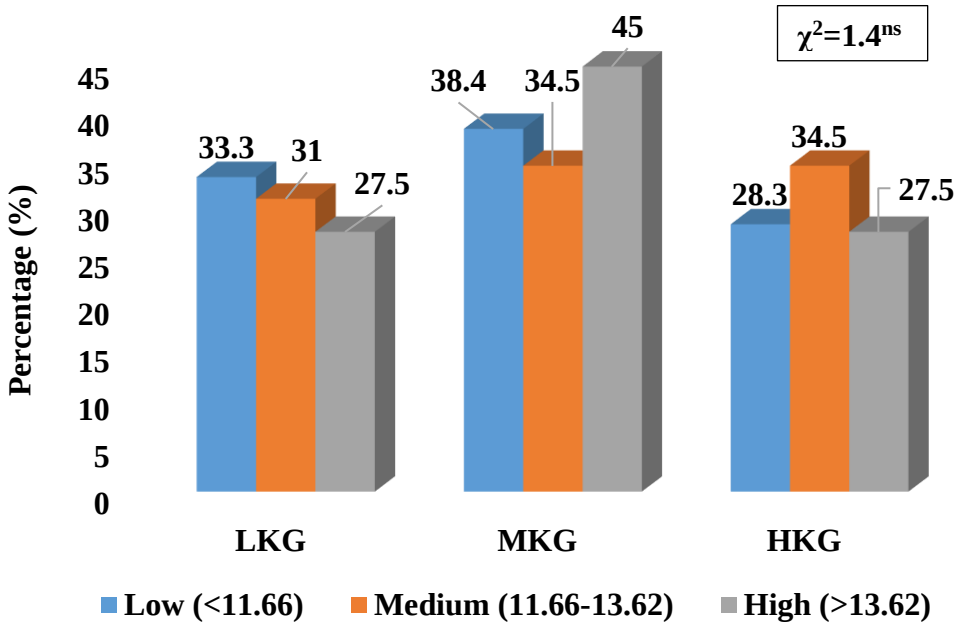


**Figure 4.11 Relationship between knowledge level of EFY VA and levels of market orientation behavior**

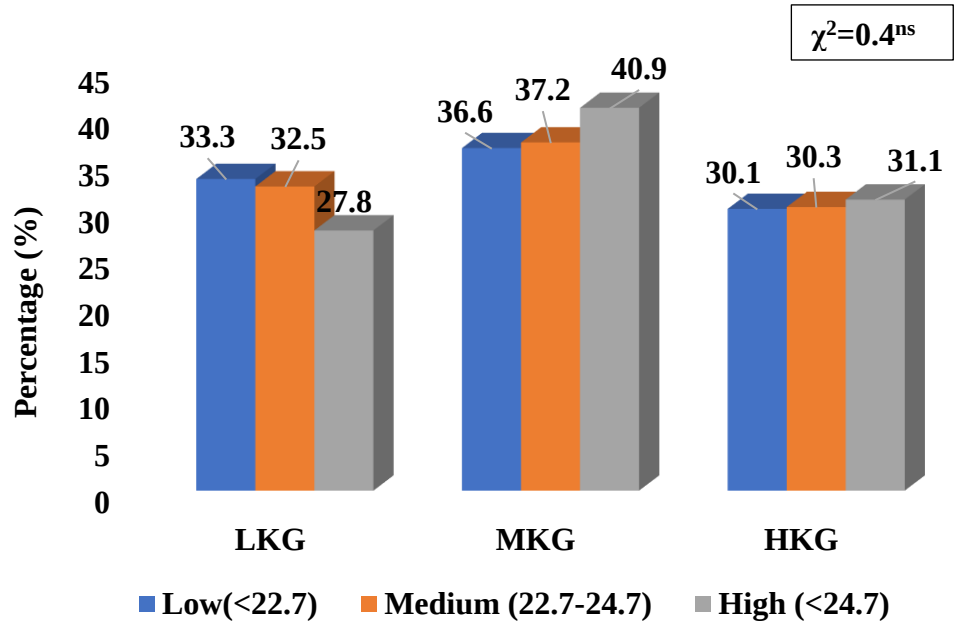


**Figure 4.12 Relationship between knowledge level of EFY VA and their level of innovativeness**

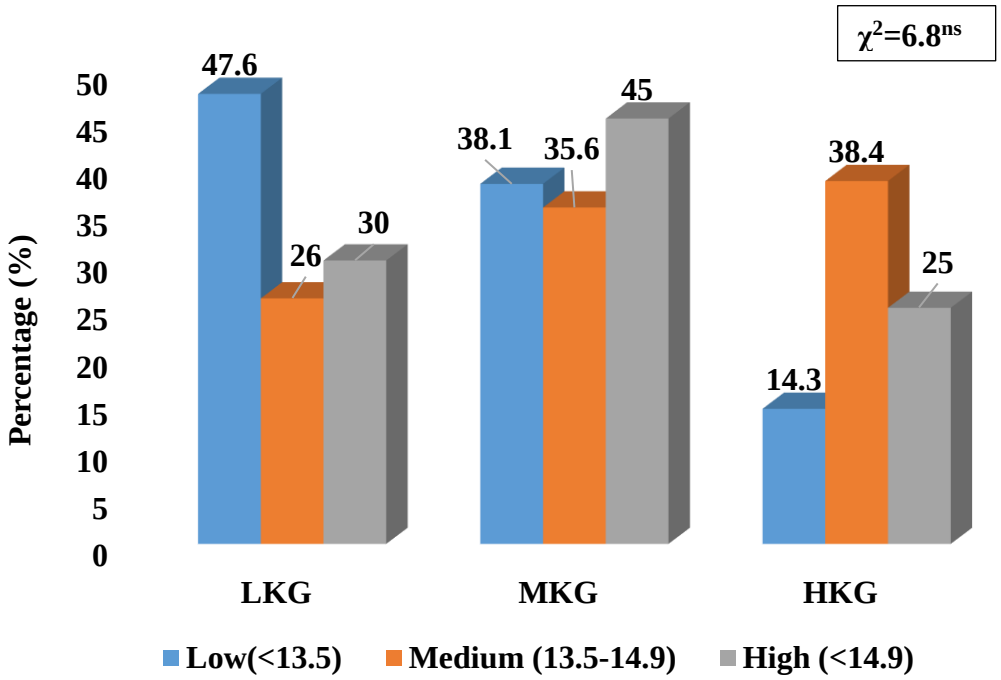


**Figure 4.13 Relationship between knowledge level of EFY VA and their level of economic orientation**

behavior. In medium knowledge group, 45.0% of famers has high economic orientation behavior followed by 38.1% of them had low range of economic orientation behavior and 35.6% of them with medium economic orientation behavior. In high knowledge group level, 38.4% was the highest percentage and it belonged to medium level of economic orientation group, followed by 25.0% and 14.3% for high and low level of economic orientation groups respectively. However, economic orientation behavior difference among three knowledge level group were found to be not significant in chi square test.

The association between knowledge and extension participation behavior was suggested in Figure 4.14. In low knowledge level group, 33.3% of famers had high extension participation behavior followed by 32.0% of them had medium range of extension participation behavior and 25.0% of them with low extension participation behavior. In medium knowledge group, 40.0% of famers had medium extension participation behavior followed by 37.5% of them had low range of extension participation behavior and 37.0% of them with high extension participation behavior. In high knowledge group level, 37.5% was the highest percentage and it belonged to low level of extension participation group, followed by 29.6% for high and 28% for medium level of extension participation groups respectively. However, extension participation behavior difference among three knowledge level group were found to be not significant in chi square test.

The association between knowledge on EFY value addition and status of extension contact categories was demonstrated in Figure 4.15. In low knowledge level group, the status of medium extension contact was the highest among the status of other groups with 35.3% respondents, followed by low extension contact with 31.7% and 25% with high level of extension contact group. In medium knowledge group, 42.5% famers had the status of medium extension contact followed by 38.2% of them had medium range of extension contact and 36.7% of them with low extension contact. In high knowledge group, 32.5% of famers had high extension contact followed by 31.6% of them had medium range of extension contact and 26.5% of them with low extension contact. However, extension participation behavior difference among three knowledge level group were found to be not significant in chi square test.

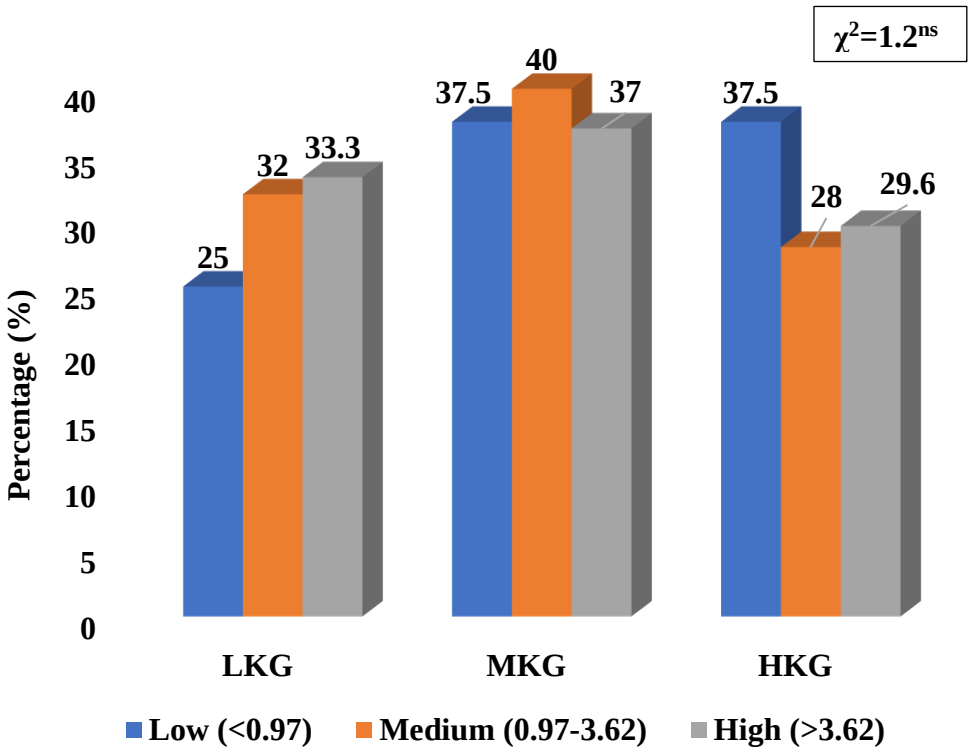


**Figure 4.14 Relationship between knowledge level of EFY VA and their level of extension participation**

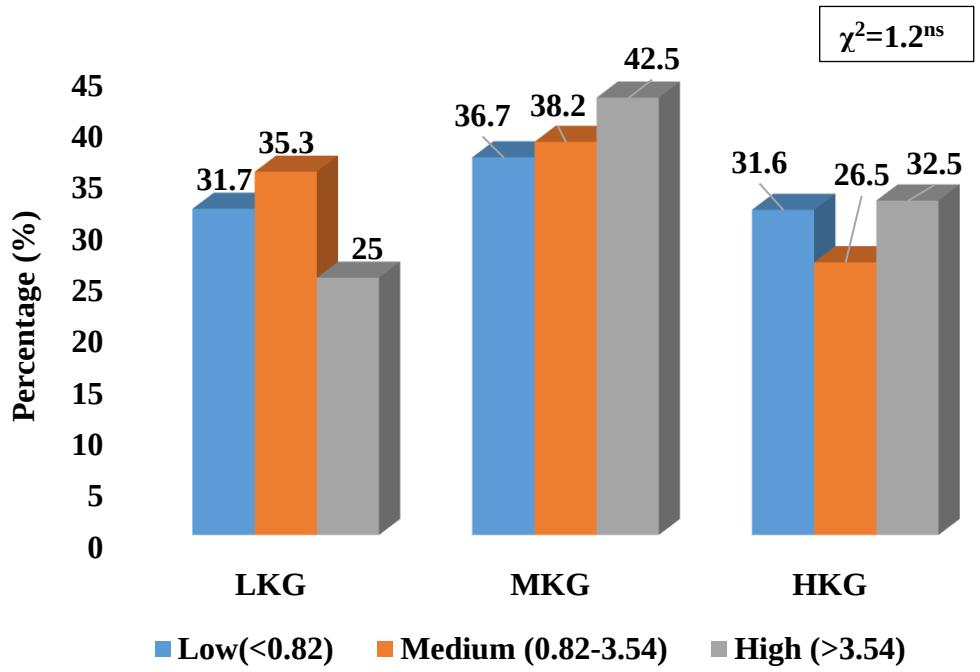


**Figure 4.15 Relationship between knowledge level of EFY VA and their level of extension contact**

The association between knowledge on EFY value addition and the level of mass media exposure was presented in Figure 4.16. In low knowledge level group, high mass media exposure level of the respondents was the highest with (46.4%) percentage among the other groups, followed by low level of mass media exposure with (26.8%) and then (26.1%) of high level of mass media exposure group could be observed. In medium knowledge group, 48.7% of famers has low level of mass media exposure followed by 40.1% of them had medium range of mass media exposure and 21.4% of them with high mass media exposure. In high knowledge group, 33.8% of famers had medium mass media exposure followed by 32.2% of them had high range of mass media exposure and 24.4% of them with low mass media exposure. However, mass media exposure behavior difference among three knowledge level group were found to be not significant in chi square test.

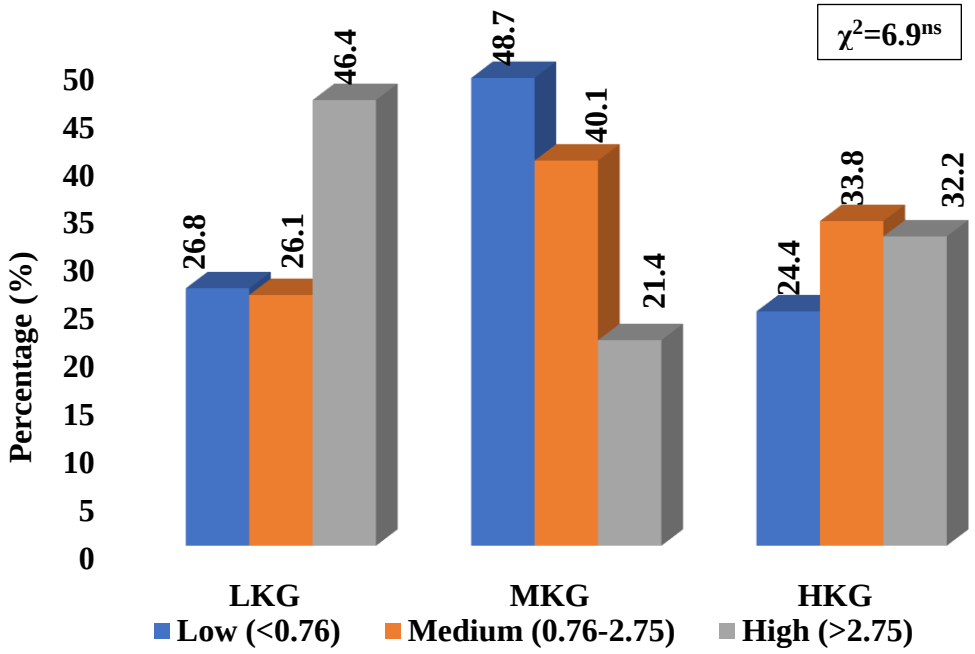


**Figure 4.16 Relationship between knowledge level of EFY VA and their level of mass media exposure**

## 4.4 Relationship between Independent Variables with Knowledge Level EFY Farmers

In order to study the nature of relationship between the selected profile characteristics and knowledge level of EFY farmers, correlation coefficients (r) were computed and the values were presented in Table 4.4. The relationship between the selected profile characteristics and the knowledge level of EFY farmers were tested by null hypothesis and alternative hypothesis.

The results in the Table 4.4 exhibited that out of sixteen independent variables studied, size of family and risk orientation showed a positive and significant association with knowledge level of EFY farmers at 1% level of significance and education presented a positive and significant with knowledge level of EFY farmers at 5% level.

The correlation values of the variables like age, social participation, innovativeness, economic orientation, decision making, attitude had showed a negative relationship with the knowledge level of the respondents.

Annual income, land holding, extension participation, extension contact, mass media exposure, market orientation had showed non-significant relationship with the knowledge level of the respondents.

Age had negative and significant relationship with knowledge level of value-added products of EFY. The traditional and old aged farmers had low knowledge and might not be much interested to know the new methods. The findings are in conformity with the finding of Ravi (2000) whereas, it is contradictory in the findings of Kumar (1997), Tarde and Thorat (2006), Hiremath (2007).

The family size was found to have significant relationship with the knowledge level. Family size is an important stimulating factor for value addition to take further action and also if the number of members in the family increased, there is a scope for division of work, sharing of ideas and information. When there is sharing of responsibility by other members in the family, head of the family can concentrate on information collection, analysis and apply the knowledge. In this way family size acts as a catalytic agent to acquire correct knowledge about value added products of EFY. The findings of the study were in agreement with that of Kumar (1997) while it is disagreement with that of Ravi (2000) and Hiremath (2007).

**Table 4.4 Matrix table for relationship between knowledge and empirical variables of the respondents**

| | Age | Edu | FM ex | Fmen | Land | HH Inc | M. Ex. I | Partic. I | Ex.C .I | Soci. P.I | MK O.I | Ec. O.I | Ris. O.I | Inno. I | Dec .I | Att.V.I | Kno. I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 1 | -.252** | .776** | -0.038 | 0.089 | 0.127 | -0.138 | 0.044 | -0.084 | -0.002 | -0.134 | -0.044 | -0.082 | 0.032 | 0.021 | -0.001 | -0.033$^{ns}$ |
| Edu | | 1 | -.337** | .175* | -0.084 | -0.001 | 0.12 | -0.027 | 0.071 | 0.058 | 0.14 | -0.045 | -0.098 | 0.146 | -0.07 | 0.032 | 0.191* |
| FM ex | | | 1 | -0.069 | 0.092 | 0.072 | -0.162 | -0.088 | -.249** | -0.066 | -.199* | 0.015 | 0.002 | -0.012 | -0.081 | -0.035 | 0.03$^{ns}$ |
| Fmen | | | | 1 | .198* | .244** | -0.097 | 0.088 | 0.079 | 0.152 | 0.109 | -0.098 | 0.114 | 0.027 | -0.004 | 0.109 | 0.272** |
| Land | | | | | 1 | .670** | -0.162 | .212* | -0.008 | .206* | -0.079 | 0.073 | .206* | 0.01 | 0.045 | 0.000 | 0.07$^{ns}$ |
| HH Inc | | | | | | 1 | -0.098 | 0.035 | -0.001 | -0.013 | 0.051 | 0.004 | 0.007 | 0.031 | -0.099 | -0.019 | 0.073$^{ns}$ |
| Media Ex. I | | | | | | | 1 | .181* | 0.166 | -0.044 | -0.002 | 0.085 | -0.11 | 0.103 | 0.08 | -0.07 | 0.033$^{ns}$ |
| Partici. I | | | | | | | | 1 | .626** | .406** | .214* | -0.066 | 0.043 | 0.162 | 0.158 | -0.023 | 0.043$^{ns}$ |
| Ex contac .I | | | | | | | | | 1 | .424** | .367** | -0.041 | -0.003 | 0.158 | 0.095 | -0.058 | 0.101$^{ns}$ |
| Social P.I | | | | | | | | | | 1 | 0.128 | 0.043 | -0.028 | .221* | 0.116 | 0.033 | -0.087$^{ns}$ |
| MKt O.I | | | | | | | | | | | 1 | -0.004 | -0.018 | 0.105 | -0.026 | 0.031 | 0.048$^{ns}$ |
| Eco. O.I | | | | | | | | | | | | 1 | 0.049 | .176* | 0.014 | -0.092 | -0.085$^{ns}$ |
| Risk O.I | | | | | | | | | | | | | 1 | -.180* | 0.058 | 0.031 | 0.242** |
| Innov I | | | | | | | | | | | | | | 1 | -0.098 | -.245** | -0.006$^{ns}$ |
| Dec .I | | | | | | | | | | | | | | | 1 | -0.062 | -0.142$^{ns}$ |
| Att.VA.I | | | | | | | | | | | | | | | | 1 | -0.042$^{ns}$ |
| Know. I | | | | | | | | | | | | | | | | | 1 |

There was a no significant relationship between the land holding and knowledge level. The knowledge depends mainly on their extent of involvement in farm activities. Greater the involvement more would be inclination to know about it. So, it was not the size of the land holding that influenced the knowledge level, but their extent of involvement in farm activities. Further, as size of the land holding increases, they would do more of supervisory work than actual farm work. The findings were in line with the findings of Kumar (1997) and Ravi (2000) who found non-significant association between land holding and knowledge level. While, it was not supported by Tarde and Thorat (2006).

The relationship between the social participation and knowledge level was found to be non-significant. The social participation level of the respondents was medium. This might be the possible reason for the non-significant association between social participation and knowledge level. The results of the study were supported by Ravi (2000), Tarde and Thorat (2006) and Hiremath (2007). Whereas, it is not confirmative with the findings of Kumar (1997).

It was evident that coefficient of correlation value (r = 0.242) between risk orientation behavior and the Knowledge level of the EFY farmers was positively and significantly related (Table 4.4). Risk taking is the ability to take the right decision during uncertainties; these uncertainties are nothing but the constraints. The farmer who is willing to take calculated risks during constraint situation will gain better results. At the same time, it was seen that many farmers were taking risks due to peer pressure or demanding situation. This finding is in agreement with results of Kumar (2004), Gopinath (2005) and Thiyagarajan (2011).

As the result shown in Table 4.4, it was obvious that coefficient of correlation value (r = - 0.085) between Economic Orientation and the knowledge level of the EFY farmers was negatively and significantly related. It might be due to the reason that low level of extension contacts of every farmer involved in the farming activity, medium and small land holding of respondents and the demand of EFY products was increasing recently.

From Table 4.4 it was evident that coefficient of correlation value (r = - 0.006) between Innovativeness and the knowledge level of the EFY farmers was negatively and significantly related. Innovativeness is associated with the individuals' earliness in the use of new practices. Innovative farmers will always be experimenters. During any constraint situation farmers with high levels of innovativeness will experiment the new

ways of doing things to change the existing situation and thereby acquiring new knowledge. It might be due to the reason medium experience farmers had low annual income and low level of extension contacts although they had high innovative level.

The variables of extension contact, extension participation and mass media exposure were found to be non-significant relationship with knowledge level of respondents. The possible reason for these results may be extension personals do not only communicate latest development in research centre but also communicate the development in another trainee's place due to language barriers, poor transportation facilities, lack of electricity and lack of enough extension personals in the study area. This result was not conformity with finding results by (Arora et al. 2006; Kumar ,2004; Gopinath, 2005 and Thiyagarajan,2011).

## 4.5 Descriptive statistics of the variables

In the study area of Hakha Townships have very steep mountains and hills forming continuous ridge with very narrow valley floors, vegetations, providing little flat land for agriculture and their mountain has altitude from 3000 to 8000 feet. Therefore, in the study area, the average sown area of EFY was 1.94 ac with a range of minimum 0.25 ac up to maximum 5 ac. Average yield for fresh EFY was 6,558 kg per acre and minimum and maximum were 4,151 kg per acre and 9,751 kg per acre while the yield per acre of minimum and the maximum for dried EFY were 910 kg, 2,350 kg and mean value was 1,261 kg. There was a wide range of price difference can be seen in two types of EFY products. In the fresh EFY the average price was 647 MMK/kg with a minimum price of 630 MMK/kg and a maximum price of 630 MMK/kg and a maximum price of 700 MMK/kg. for dried EFY, average price was5223 MMK/kg with a range from 5198 MMK/kg to 5300 MMK/kg.

**Table 4.5 Descriptive statistics of the variables**

| Items | Units | Respondents N=134 | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Mean |
| Sown area | Acre | 0.25 | 5.00 | 1.94 |
| Yield (fresh) | Kg | 4,151 | 9,751 | 6,104 |
| Yield (dry) | Kg | 910 | 2,350 | 1,261 |
| Price for fresh EFY | MMK/kg | 630 | 700 | 647 |
| Price for dried EFY | MMK/kg | 5,198 | 5,300 | 5,223 |

## 4.6 Gross Margin Analysis of EFY Production by Different Knowledge Level Groups of Respondents (HKG, MKG and LKG) in Hakha Township, 2018

The gross margin analysis for EFY (fresh) production by LKG, MKG and HKG was indicated in Table 4.6. Total cash cost for EFY production was 380,817 MMK per acre in HKG and 502,808 MMK per acre in MKG and 491,646 MMK per acre in LKG famers. The average yield of EFY in high knowledge group farmers were 8,167 kg/ac and it was higher than that of medium knowledge group (6,149 kg per acre) and low knowledge group (5,471 kg per acre), they were significant at 10% level in F test. Therefore, total gross benefit for three knowledge groups of the respondents were significantly different at 5% level in F test. Among total material cost, the cost for corms seed (cash cost) were significantly different among three groups of the respondents at 1% level in F test. Return above variable cash cost for high knowledge level group was 4,901,333 MMK per acre, that of medium knowledge level group was 3,494,531 MMK per acre and that of low knowledge level group was 3,013,877 MMK per acre and there was significant difference at 5% level in F test among them. Benefit cost ratio for three different groups were 2.5, 1.7 and 1.5 for high, medium and low knowledge groups, respectively. According to the result, they were significantly different at 1% level in F test. Among return on investment (ROI), 19 was the highest ROI in high knowledge group, 16 in medium knowledge group and 10 in low knowledge group and they were significantly different at 5% level in F test.

## 4.7 Gross Margin Analysis of EFY processing by Different Knowledge Level Groups of Respondents (HKG, MKG and LKG) in Hakha Township, 2018

The gross margin analysis for EFY (dry) production by LKG, MKG and HKG was presented in Table 4.7. Total cash cost was 522,768 MMK per acre in HKG and 570,654 MMK per acre in MKG and 607,841 MMK per acre in LKG. The average dry chip yield in high knowledge group (1,672 kg per acre) was highest than that of medium knowledge group (1,251 kg per acre) and that of low knowledge group (1,163 kg per acre) and they were significant at 10% level in F test. Therefore, total gross benefit for three knowledge group of the respondents were 8,736,600 MMK per acre, 6,550,501 MMK per acre and 6,060,592 MMK per acre for HKG, MKG, LKG, respectively and they were significantly different at 5% level in F test. Among total material cost, bought seed corm (cash cost) were significantly different among three groups of the respondents at 1% level in F test. Return above variable cash cost for high knowledge

**Table 4.6 Cost benefit analysis of Elephant foot yam production according to their knowledge level (Fresh EFY)**

| No. | Items | Units | HKG (N= 41) | MKG (N= 52) | LKG (N= 41) | Total (N= 134) | F | Sig. |
|---|---|---|---|---|---|---|---|---|
| 1 | Yield | Kg/ac | 8,167 | 6,149 | 5,471 | 6,559 | 2.884* | 0.059 |
| 2 | Price | Kg/MMK | 650 | 650 | 640 | 647 | 1.592 | 0.207 |
| 3 | Gross benefit | MMK/ac | 5,282,150 | 3,997,339 | 3,505,524 | 4,239,972 | 3.109** | 0.048 |
| | (a) bought corms (cash cost) | MMK/ac | 215,085 | 294,000 | 321,207 | 278,179 | 6.074*** | 0.003 |
| | (b) own corms (non cash cost) | MMK/ac | 1,458,476 | 1,567,500 | 1,438,549 | 1,494,687 | 0.525 | 0.593 |
| 4 | Total material cost | MMK/ac | 1,673,561 | 1,861,500 | 1,759,756 | 1,772,866 | 0.883 | 0.416 |
| | (a) Family labor cost | MMK/ac | 216,999 | 203,420 | 269,622 | 227,830 | 2.726* | 0.069 |
| | (b) Hired labor cost | MMK/ac | 165,732 | 208,808 | 170,439 | 183,888 | 0.482 | 0.619 |
| 5 | Total labor cost | MMK/ac | 382,730 | 412,228 | 440,061 | 411,719 | 0.577 | 0.563 |
| 6 | Interest of total variable cash cost (4. a+5.b) | MMK/ac | 304,654 | 402,246 | 393,317 | 369,654 | 2.125 | 0.123 |
| 7 | Total variable cash cost (4. a+5.b) | MMK/ac | 380,817 | 502,808 | 491,646 | 462,067 | 2.125 | 0.123 |
| 8 | Total variable cost (4+5+6) | MMK/ac | 2,360,945 | 2,675,974 | 2,593,134 | 2,554,238 | 1.324 | 0.27 |
| 9 | Return above variable cash cost (3-7) | MMK/ac | 4,901,333 | 3,494,531 | 3,013,877 | 3,777,905 | 3.683** | 0.028 |
| 10 | Return above variable cost (3-8) | MMK/ac | 2,921,205 | 1,321,365 | 912,390 | 1,685,734 | 4.382** | 0.014 |
| 11 | Benefit cost ratio (3/8) BCR | | 2.5 | 1.7 | 1.5 | 1.9 | 9.763*** | 0.000 |
| 12 | Return on Investment, ROI (3/7) | | 19 | 16 | 10 | 15 | 4.086** | 0.019 |

level group was 8,213,832 MMK per acre, that of medium knowledge level group was 5,979,848 MMK per acre and that of low knowledge level group was 5,452,750 MMK per acre. They were significantly different at 5% level in F test. Benefit cost ratio for three different groups were 4.1, 2.9 and 2.8 for high, medium and low knowledge groups, respectively. More, they were significantly different at 1% level in F test. Among return on investment (ROI), 28 was the highest ROI in high knowledge group, 26 in medium knowledge group and 15 in low knowledge group and they were significantly difference at 10% level in F test.

## 4.8 Comparison of BCR and ROI Ratio Between Fresh EFY and Dried Chips Depending on the Knowledge Level Group of the Respondents

Figure 4.17 described the comparison of BCR between fresh EFY and dried chips depending on the knowledge level groups of the respondents. In high knowledge group, the BCR for fresh EFY was 2.5 and that of dried chips (EFY) was 4.1 and that of value added of EFY was 1.6. In medium knowledge group, the BCR for fresh EFY 1.7 and that of dried chips (EFY) was 2.9 and that of value added of EFY was 1.2. In low knowledge group, the BCR for fresh EFY 1.5 and that of dried chips (EFY) was 2.8 and that of value added of EFY was 1.3, respectively.

Figure 4.18 described the comparison of ROI ratio between fresh EFY and dried chips depending on the knowledge level groups of the respondents. In high knowledge group, the ROI for fresh EFY was 19 and that of dried chips (EFY) was 28 and that of value added of EFY was 9. In medium knowledge group, the ROI for fresh EFY 16 and that of dried chips (EFY) was 26 and that of value added of EFY was 10. In low knowledge group, the ROI for fresh EFY 10 and that of dried chips (EFY) was 15 and that of value added of EFY was 5. According to the result, the respondents who have more knowledge about EFY production and value addition practices have more ROI than less knowledge levels of others. Therefore, there is need to be trained the respondents with experts, agriculturists and extension worker. Moreover, private sector and government should establish infrastructures to develop agribusiness like EFY value addition for rural people’s income enhancement and national economy development.

**Table 4.7 Cost benefit analysis of Elephant foot yam production according to their knowledge level (Dry chips)**

| No. | Items | Units | HKG (N= 41) | MKG (N= 52) | LKG (N= 41) | Total (N= 134) | F | Sig. |
|---|---|---|---|---|---|---|---|---|
| 1 | Dry yield | Kg/ac | 1,672 | 1,251 | 1,163 | 1,353 | 2.74* | 0.068 |
| 2 | Price | Kg/MMK | 5,228 | 5,237 | 5,213 | 5,227 | 3.302** | 0.04 |
| 3 | Gross benefit | MMK/ac | 8,736,600 | 6,550,501 | 6,060,592 | 7,069,485 | 2.771* | 0.066 |
| | (a) Bought corms (cash cost) | MMK/ac | 215,085 | 294,000 | 321,207 | 278,179 | 6.074*** | 0.003 |
| | (b) Own corms (non cash cost) | MMK/ac | 1,458,476 | 1,567,500 | 1,438,549 | 1,494,687 | 0.525 | 0.593 |
| 4 | Total material cost | MMK/ac | 1,673,561 | 1,861,500 | 1,759,756 | 1,772,866 | 0.883 | 0.416 |
| | (a) Family labor cost | MMK/ac | 362,755 | 385,497 | 413,037 | 386,965 | 0.467 | 0.628 |
| | (b) Hired labor cost | MMK/ac | 307,683 | 276,654 | 286,634 | 289,201 | 0.074 | 0.929 |
| 5 | Total labor cost | MMK/ac | 670,438 | 662,151 | 699,671 | 676,166 | 0.118 | 0.889 |
| 6 | Interest of total variable cash cost (4. A+5.b) | MMK/ac | 418,215 | 456,523 | 486,273 | 453,904 | 0.395 | 0.674 |
| 7 | Total variable cash cost (4. A+5.b) | MMK/ac | 522,768 | 570,654 | 607,841 | 567,381 | 0.395 | 0.674 |
| 8 | Total variable cost (4+5+6) | MMK/ac | 2,343,999 | 2,523,651 | 2,459,427 | 2,449,032 | 0.546 | 0.581 |
| 9 | Return above variable cash cost (3-7) | MMK/ac | 8,213,832 | 5,979,848 | 5,452,750 | 6,502,104 | 2.974* | 0.055 |
| 10 | Return above variable cost (3-8) | MMK/ac | 6,392,601 | 4,026,851 | 3,601,165 | 4,620,453 | 3.167** | 0.045 |
| 11 | Benefit cost ratio (3/8) | | 4.1 | 2.9 | 2.8 | 3.2 | 5.226*** | 0.007 |
| 12 | Return on Investment, ROI (3/7) | | 28 | 26 | 15 | 23 | 2.907* | 0.058 |

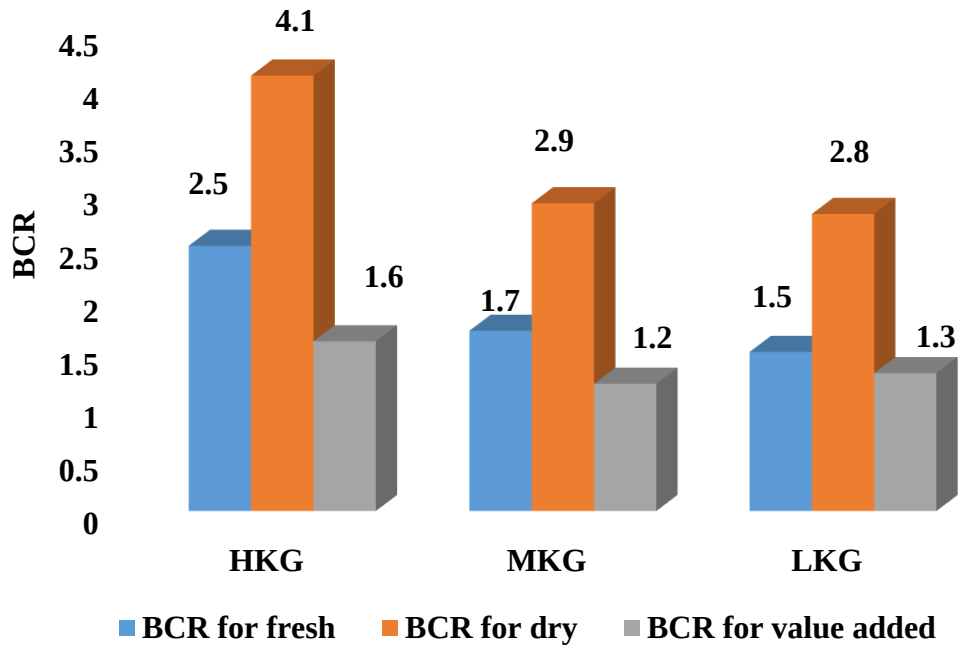


**Figure 4.17 Comparison of BCR ratio between fresh EFY and dried chips depending on the Knowledged level group of the respondents**

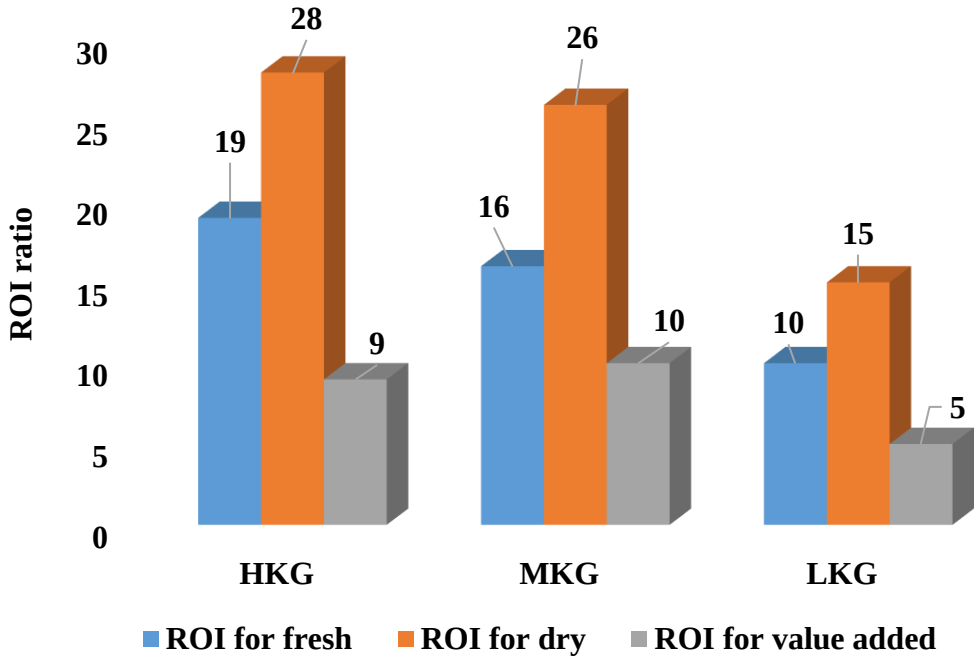


**Figure 4.18 Comparison of ROI ratio between fresh EFY and dried chips depending on the Knowledged level group of the respondents**

# CHAPTER V
# CONCLUSION AND RECOMMENDATIONS

## 5.1 Summary and Conclusion

This study was aimed to explore the knowledge level of EFY farmers in value added enterprise in Hakha Township. Hence, the study was designed to analyze the personal, socio-economic, psychological and communication factors related to farmer's participation in EFY value addition, to assess the knowledge of EFY value addition for different actors in Hakha Township, to study the relationship between knowledge with personal, socio-economic, psychological and communication characteristics of EFY farmers regarding to value addition and to measure the profitability of producing EFY. Chin State and Hakha Township were purposively selected. The population of 134 of EFY (producers and processors) respondents were selected randomly from 7 villages by using structured interview schedule.

Based on the findings of the present study, above 70% of the EFY farmers were found in medium level to high knowledge level. Over 30% of the respondents were found in low knowledge level. It is clear that majority of the respondents belonged to low education level. Most of the respondents were found in middle age group and medium farming experiences. Besides, they have medium family size and medium land holding group. And also, they were falling in medium annual income and possessed high decision-making group. Majority of the respondents possessed high level of innovativeness, risk orientation and medium level of economic orientation, favorable attitude towards EFY value addition. In spite of being in low extension contact group, they were willingness to conduct in collaboration with extension education, hence, they had medium extension participation and medium mass media groups.

As a chi square results in the association of the profile characteristics of the respondents' groups and knowledge level groups, education level groups and size of family' groups of the respondent' groups had highly and significantly difference with the knowledge groups (LKG, MKG and HKG) at 1% level. And then risk orientation behavior and attitude towards EFY value addition of the respondent's groups were significant difference with knowledge groups at 10% level.

According to the result of correlation result, out of sixteen variables, family size and risk orientation were positively and significantly related to the knowledge regarding

EFY cultivation at 1% level, although education was positively and significantly related to that of knowledge at 10% level.

Form the result of enterprise budget analysis, Benefit cost ratio among three different groups for fresh EFY producers were 2.5, 1.7 and 1.5 for high, medium and low knowledge groups, respectively. ROI 19 was the highest in high knowledge group, followed by 16 for medium knowledge group and 10 for low knowledge group. Benefit cost ratio of dry EFY processing were 4.1, 2.9 and 2.8 for high, medium and low knowledge groups, respectively. They were significantly different at 1% significance level in F test. ROI estimation for dry EFY processing, the ROI of 28 was obtained in HKG and followed by 26 in MKG and 15 in LKG and they were significantly difference at 5% significance level in F test.

## 5.2 Recommendations

On the basis of survey results, the following implications and recommendation could be made for promoting value added products as an enterprise; for low knowledge level of EFY farmers, necessary extension strategies are to be framed to bridge the knowledge gap. Moreover, there is need on the part of extension personnel to increase their knowledge levels by organizing training programmes, demonstrations and other extension activities frequently. Education is the foremost important need to bring in the progressive behavioral adoption. Hence, there is every need to intensify the efforts on non-formal education in the villages. According to the result of EFY farmers who had medium to high knowledge, the respondents were keenly interested in the new technologies. Proper motivation of such respondents will be helpful in further dissemination of EFY cultivation technology. Therefore, a greater number of training for value-added enterprise should be organized by Department of Agriculture, NGOs and other agencies for the EFY farmers improving the knowledge and developing favorable attitude of trainees towards EFY value addition. This will help the trainees into motivating to take up EFY value added products as an enterprise for earning additional income. Concerned agencies should arrange for providing loans to needy farmers for taking up value added EFY products as an enterprise. Transportation and marketing facilities needs to be supported to the EFY farmers for selling the value added EFY on time.

Value addition to agricultural products is the process of increasing the economic value and consumer appeal of an agricultural commodity and on the basis of

profitability results, EFY famers should carry out raw material (fresh) into value added products (dried chips, powders, etc.) for better livelihood improvements. Policy makers should design ways of securitizing various assets and resources.

## 5.3 Suggestion for Further Study

Being a student's research work, there is a limitation of time and resources. Moreover, this study is also concentrated on the clients of knowledge level regarding the EFY production and processing and enterprise budgets for one-acre cost. EFY production can get more profit any other RTCs in study area and its value addition can give more return on investments than fresh EFY. Therefore, the study was carried out in a specific area with a sample of 134 EFY farmers. The devices of measurement developed for the present study appear to be appropriate and convenient. However, they need to be tested for component consistency. Hence, it is suggested that there is a need for conducting a research on studying more sample size of farmers towards value addition of EFY crop in different geographical area with varying ecological, cultural and socio- economic backgrounds. This will help to make valid and wider generalization of findings.

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