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LIVELIHOODS AND DECISION MAKING ON LIVELIHOOD ASSETS OF FARMING COMMUNITY AT HOUSEHOLD LEVEL: A CASE STUDY IN TATKON, NYAUNG U AND MEIKTILA TOWNSHIPS

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LIVELIHOODS AND DECISION MAKING BEHAVIOUR OF FARMERS IN FARMING COMMUNITY: TATKON, NYAUNG U AND MEIKTILA TOWNSHIPS

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August, 2017

ABSTRACT

Rural populations are undergoing rapid changes in both their livelihoods and land uses, with associated impacts on ecosystems, global biogeochemistry, and climate change. Farmer attitudes and behaviors are influenced by a range of economic, external, internal and social factors. The overall objective of the study was to understand the impact of internal and external drivers of rural change, including seasonal climatic change, market, and credit on livelihoods at the household levels. This study was conducted at Tatkon, Nyaung U and Meiktila Townships in October 2015, April 2016 and November 2016. The objectives of this study were to identify the livelihoods of the farmers in selected townships, to identify livelihood assets available and to identify farmers' decision making behavior in response to internal and external drivers of change in selected townships. Quantitative and qualitative data were collected by using structure interview schedule questionnaire and in-depth interviewing method. Major source of income for household was agriculture in Tatkon and Nyaung U; however, major source of annual income from Meiktila was remittance from migrant family labor. Farmers in all selected townships could not cultivate their all own land due to unavailability of water and scarcity of labor. In Tatkon and Nyaung U, most of the respondents raised cattle for agricultural production purpose: however, most of the respondents in Meiktila raised village chicken followed by small ruminants. Drought and heavy rain were the serious environmental changes in the selected townships and determined the livelihoods of the rural people and their decision making behaviors. It also reflected the community level activities. Although market was the main indicator for product prices, farmers in selected townships sold out their products with the broker price and they had no chance to negotiate the price with brokers or traders. Migration was very common in Meiktila Township. In 2016, circular migration was increased because they could not grow any crops due to drought; they went to the nearby cities for jobs and income. Toddy palm production was the alternative source of income for farmers in Nyaung U Township when crops could not grow during drought. The crops especially groundnut in Nyaung U and rice in Tatkon Townships failed due to heavy rain in rainy season. The respondents sold out their small ruminants because of illness in rainy season of 2016. The Most of the respondents offered extension advice to other farmers in all selected township and most of their decision making were influenced by external drivers such as other farmers, Department of Agriculture (DoA), Department of Agricultural Research (DAR), NGOs and INGOs and private sectors, etc. Government extension services were the least pointed out by farmers as their source of agricultural information and farmer to farmer extension method was very common to disseminate agricultural information among farmers. Farmers in the selected townships were involved in formal organizations such as village administrative committee; however, there was no farmer organization in selected townships.

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LIST OF ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
ASEM	Asia-Europe Meeting
QSEM	Qualitative Social and Economic Monitoring
UNFCCC	United Nations Framework Convention on Climate Change
CB	Cooperative Bank
CDZ	Central Dry Zone
DAR	Department of Agricultural Research
DoA	Department of Agriculture
FAO	Food and Agricultural Organization
IFRI	International Forestry Resources and Institutions Program
INGOs	International Non-government organizations
OECD	Organization for Economic Co-operation and Development
LBVD	Livestock Breeding and Veterinary Department
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agricultural Development Bank
MOAI	Ministry of Agriculture and Irrigation
NGOs	Non-government Organizations
PACT	Private Agency Collaborating Together
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
YAU	YezinAgricultural University

CHAPTER 1

INTRODUCTION

The agricultural sector is a vital and historic source of livelihood in Myanmar, particularly for the poorest segments of its society. Agriculture sector is the basic one in the national economy of Myanmar, 75% of total populations residing in rural area and basically engaged in agriculture and animal husbandry for their earning. Rural people are mostly farmers. They simply earn their livelihood income by farming. The agricultural sector includes agriculture, forestry, livestock and fishery. The livestock population in Myanmar were 13.5 million cattle, 2.9 million buffaloes, 9.25 million pigs, 3.3 million sheep and goat and 153 million chickens in 2011 (LBVD 2012). Livestock provides household food security as a source of saving, cash income, draught power for cropping and as a means of transport for rural community (FAO 2006).The farming system of the Dry Zone is a complex mixture of paddy cultivation, non-rice crop (pulses, oilseeds, vegetable and others) and large and small scale livestock (MOAI 2011). Agricultural productivity is low and the farmers are heavily dependent on products from the natural forest especially fuel wood, pole, post and fodder to support their living and livestock. Many landless people are working as seasonal farm laborers, migrating to urban regions during non-planting time to find temporary employment. Most of the common livestock such as pigs, goats, sheep and poultry are traditionally raised in small numbers. Most small farm holders depend on these to fulfill household consumption or to get extra cash income. Therefore, the people in Dry Zone face the consequences of climate change as they depend on climate-dependent livelihoods.

An improved understanding of basic human psychology will assist those working in the farm advisory sector to help farm businesses to achieve their goals more effectively. Understanding the human decision making process is important to assist farmer clients in achieving goals. Through an examination of the human factors that drive decision making processes, farm advisers can gain insights that will enable them to work more effectively with their clients, and to extend their understanding of an individual farm business as a whole. Individuals within farm businesses (father and son, siblings, husband and wife teams) have different ambitions which may at times, be in conflict. Stage of life in the farming lifecycle, personality type, stress levels, entrenched values and beliefs and emotions are just some of

the fundamental human elements that influence decision making processes on-farm. Consideration of these factors is essential if farm businesses are to progress. Failure to account for these factors will most likely result in personal conflict which can lead to significant change and in some cases, business failure. Understanding these human elements will help us understand the reasons behind some of the decisions that are made that might occasionally contradict the advice given by industry support personnel. A better understanding of the decision making process will help deliver information in a more effective manner, speed adoption processes and improve communication, which will result in better outcomes for agricultural business owners (Bill 2013).

The aim of the research is to understand the impact of internal and external drivers of rural change, including seasonal climatic change, migration patterns, and macro trends and policies on livelihoods and farmer decision making at the household level. Understanding household decisions and livelihood strategies is crucial for effective targeting and adoption of newly developed technologies and management practices by the project. Households represent the interface between agricultural production and the market, and they adopt various livelihood strategies, including off- and non-farm economic activities. The research involves longitudinal study to track the change processes and outcomes over the 2015-2017 period, as well as adoption and adaptation strategies of smallholder farmers (ASEM/2011/043).

The primary objective of this study was to understand the impact of internal and external drivers of rural change, including seasonal climatic change, migration patterns, and macro trends on livelihoods and farmer decision making at the household level. For this purpose, this study was carried out with the following mentioned specific objectives:

- to identify the livelihood of the farmers in selected townships,
- to identify livelihood assets available in selected townships, and
- to identify farmers' decision making over time in response to internal and external drivers of change.

CHAPTER 2

LITERATURE REVIEW

2.1 Background of the Study

The legumes project is one of five components of a multi-sector program, funded by DFAT and managed by ACIAR, to improve food security and small-holder farmer livelihoods in the Central Dry Zone (CDZ) and Ayeyarwady Delta of Myanmar. The program is focused on rice, legume-based systems, livestock and fisheries with an overarching socio-economic/extension component. The specific objectives of the legumes project, involving personnel from the Department of Agricultural Research (DAR), Department of Agriculture (DoA) and Yezin Agricultural University (YAU) in Myanmar, from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India, and from the University of New England (UNE) and University of Adelaide (UA) in Australia are to: develop new, high-yielding varieties of pigeon pea, groundnut, chickpea, green and black gram through genetic improvement with emphasis on resistance/tolerance to biotic stresses to link with institutional and community-based seed multiplication and distribution, improve nutrient management of the legume-based farming systems, particularly phosphorus (P), nitrogen (N), boron (B), sulphur (S), potassium (K) and zinc (Zn), using both mineral and organic sources, including rhizobial inoculants, improve the agronomic management of the legume-based systems through crop benchmarking with farmers to increase efficiency of water use and effectively integrate new high-yielding varieties and pest, disease and nutrient management, and enhance capacity for RD&E in the relevant agencies in Myanmar through effective implementation of the collaborative ACIAR project model and through targeted training, extension and capacity building activities (ACIAR 2015).

The Dahat Pan project uses a participatory research approach (PRA) to explore management of livestock and to identify constrains to livestock health and production. An initial survey of each site reported data on household, land-holding and livestock ownership distribution at the village sites. Village meetings have been held in order to build relationships with village farmers, and gain an understanding of what production and health problems farmer experience. These meetings have included as many people as possible from the village sites. At the meetings, farmers created a map of their village, a seasonal calendar

of agricultural activities in their village and listed the problems they experience in livestock production. A report of PRA assessments will be forwarded to ACIAR by 30 June. Farmer interest groups have been established for cattle and small ruminants (village chickens to follow) at each village. Project staff at LBVD, UVS, the project junior scientists, township office veterinary staff and community animal health workers have received training in data collection and management, body condition scoring, animal handling, forage evaluation research and Microsoft Excel (ASEM/2011/043).

2.2 Livelihood

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers and Conway 1991). Livelihood contribute to food security, prevent dependency, reduce vulnerability, enhance self-reliance and can develop or build a set of specific skills during displacement which may have a positive impact on their well-being and future opportunities (USAID 2005). A livelihood is considered sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, both now and in the future, while not undermining the natural resource base (Carney 1998).

Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis. A household may be enable to gain sustainable livelihood security in many ways- through ownership of land, livestock or trees; rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertories of activity (WCED 1987).

2.2.1 Livelihood assets

Nikolov et al. (2011) stated that livelihood strategies are based on long-term assets and their combination of 5 forms, the so-called assets pentagon: social capital, financial capital and natural resources, physical and human capital.

Social capital (S) has reference to the connections, respective social net, accessible for the people. Social capital increases the opportunities of the population to cooperate in more-formalized groups with their systems of norms, rules and sanctions.

Financial capital (F) is related to the financial resources, used by the people for their aims achievement and includes the available money or equivalents, allowing people to adapt different livelihood strategies. Two main financial capital's resources could be identified. The first covers the available assets – available money, bank savings or liquid assets (animals, jewels). The second includes the constant cash flows, based on livings from salaries, pensions, other transfers from the state or support from emigrants.

Natural resources (N) term used for necessary resources definition, as land, water, forests, air quality, erosion, biodiversity degree etc.

Physical capital (P) includes the basic infrastructure and goods, necessary for the household livelihood, e.g. accessible transportation, water supply, health protection, buildings, electricity, access to information and technologies.

Human capital (H) is the abilities, the knowledge, and the capacity to work in good health conditions, which together allow people to form different livelihood strategies and to achieve definite tasks in the livelihood strategy.

2.2.2 Livelihood vulnerability

Vulnerability can be defined as the livelihood of the outcome of the losses of a system measured in the form of economic or human losses. Another point of view is that vulnerability is a combination of a particular state of that system with other factors such as capacity to cope and recovery; the latter introduction the concepts of resilience and resistance (Galderisi et al. 2010). The vulnerability of a society is influenced by its development path, physical exposures, distribution of resources and institutional settings (Kelly and Adger 2000; O'Brien et al. 2004; Turner et al. 2003).

The strength of a given livelihood is not only measured by its productive outcomes, but equally by its resilience to shocks, seasonal changes and trends. Shocks might include natural disasters, wars, and economic downturns. Availability of resources, income-generating opportunities, and demand for certain products and services may fluctuate seasonally. More gradual and often predictable, trends in politics and governance, technology use, economics, and availability of natural resources, can pose serious obstacles to the future of many livelihoods. These changes impact the availability of assets and the opportunities to transform those assets into a "living". Under such conditions, people must adapt existing strategies or develop new strategies in order to survive (UNDP and IRP 2015).

2.2.3 Impact of climate change on livelihoods

According to the United Nations Framework Convention on Climate Change (UNFCCC 2007), climate change referred to direct or indirect activities of humans, leading to change in global atmosphere components and create changes of natural climate variability observed over comparable time. IPCC (2007) reported that change in the state of climate that could be identified (eg. Using statistical tests) by changes in the mean and/ or the variability of its properties, and that persist for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.

The International Forestry Resources and Institutions Program (IFRI 2008) stated that climate change is likely to manifest around increased risks to rural livelihoods. These risks can be classified into four different types: across space, over time, across asset classes, and across households. Given the nature of climate change hazards- droughts, heat waves, flooding, and storm, among others- the stress they create for rural livelihoods will have two major aspects: reduction of existing livelihood options, and perhaps more importantly in the short to medium run, greater volatility and unpredictability in streams of livelihood benefits. Although agriculture has remained a prime source of livelihoods, income from different off-farm activities and remittances through migration has been increasing significantly. There is a need to consider the impact of climate change on non- agricultural activities also in rural areas.

Senbeta (2009) investigated that the increasing trend of climate change and its impact on livelihood of West-Airs zone, Ethiopia, is exacerbating the vulnerability to different socio-economic activities of the society. The gradual change was foresting crop cultivation in some highlands, the water deficit in mid and lowlands were more likely to continue to constrain livelihood activities, and consequently exacerbate societal vulnerability.

Natural climate vulnerability and its changes with warming regulate the frequency of extreme events such as drought, excessive moisture, heat waves, and these events are critical determinants of crop and livestock production. More people in the developing world are dependent on agriculture. Agriculture is very sensitive to climate variability such as change in temperature, precipitation and also climate extreme like drought, flood etc (USEPA 2011). Agriculture production was very sensitive to changes in precipitation and temperature both of

which were climate variables (Bindi et. al. 1996, Mearns et.al. 1997). Rising temperature and changes in rainfall patterns have direct effects on crop yields, as well as indirect effects through changes in irrigation water availability. Agriculture and human well-being will be negatively affected by climate change. Crop yields will decline, production will be affected, crop and meat prices will increase, and consumption of cereal will fall, leading to reduced calories intake and increased child malnutrition (IFPRI 2009).

2.2.4 Climate change impacts and vulnerability in Myanmar

Myanmar is one of the most vulnerable countries in ASEAN region to various kinds of natural disaster according to the climate changes. The year 2009 was an El Nino year with decreased annual rainfall, with heavy rains in some areas and with droughts in others". The climate change mainly affects the socio-economic sectors of Myanmar such as agriculture, forest, biodiversity, coastal zone, public health and water resources. Myanmar is an agricultural country and water and agriculture sectors are very important for Myanmar's economy. Myanmar is exposed to a number of natural hazards, some of which have caused devastating damage in the recent past. According to the UN Risk Model, Myanmar ranks as the 'most at risk' country for natural disasters. Coastal regions, particularly Rakhine State and the Ayeyarwady Delta Region, are at high risk for cyclones, storm surges and tsunamis. Much of the country is also exposed to flooding and landslides during rainy season in addition to drought and fire during dry season. As Myanmar falls on one of the two main earthquake belts in the world, much of the country is prone to earthquake. Though fires make up 73 percent of reported disaster events, storms and cyclones have caused the greatest damage and loss of life. Within the last 10 years Myanmar has been impacted by two earthquakes, three cyclones, one tsunami and other small scale hazards (Tin Yi 2011).

2.2.5 Livelihood adaptation to climate change

Climate change is expected to cause an increase in natural hazards such as floods and drought (Blanco, 2006 and Porter et al. 2014). These impacts are often found to be more severe at the local scale where lives and livelihoods are affected (Shaw, 2006). For example, climate change is likely to cause or increase food insecurity (Porter et al. 2014), livestock disease and death (Nianget al. 2014), environmental degradation through unsustainable resource use, and to negatively impact human health (Morton, 2007). Particularly,

economically poor, natural resource dependent rural households are likely to experience a disproportionate burden of these adverse impacts of climate change (Agrawal and Perrin 2008; Olsson *etal*. 2014).

Adaptation refers to the process of adjusting to actual or expected climate change and its impacts. Adaptation of natural resource dependent livelihoods is particularly critical. Generally, livelihoods depend on access to natural, human, physical, social, and financial assets (Bebbington, 1999; Dahlquistet al. 2007); and adaptation needs are highly diverse and context specific (Noble et al. 2014) . Adapting livelihoods to climate change at a small scale means households need to adjust their livelihood assets and activities to maintain the ability to make a living under the impacts of climate change (Quandt and Kimathi, 2016).

Adaptation needs are complex and context specific (Noble et al. 2014). Adaptation strategies do occur autonomously in households or communities, and can have positive impacts on poverty reduction and building resilience, particularly when supported by policy (Adgeret al. 2003; Urwin and Jordan 2008). Households undertake incremental adaptation where they extend or modify actions or behaviors that are already in place (Denton et al. 2014).

Adaptation is processes through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes. There are many options and opportunities to adapt. These ranges from technological options such as increased sea defenses or flood-proof houses on stilts, to behavior change at the individual level, such as reducing water use in times of drought and using insecticide-sprayed mosquito nets. Other strategies include early warning systems for extreme events, better water management, and improved risk management, various insurance options and biodiversity conservation (Blanco 2006; Porter et al. 2014).

Adaptation of natural resource dependent livelihoods is particularly critical (Shaw 2006). An essential characteristic of rural families in developing countries is their adaptation ability when it concerns survival, it means they are able to change their way of living due to the changes on the circumstances that they will face, especially strategic changes in their living and its features as well as their activities´ impact on the environment (Ellis 2000). The rural households' livelihood includes the ways and the means for their living. Therefore,

adapting livelihoods to climate change at a small scale means households need to adjust their livelihood assets and activities to maintain the ability to make a living under the impacts of climate change (Shaw 2006).

2.3 Coping and Adaptation Concept

Coping capacity refers to the manner in which people and organization use existing resources to achieve various beneficial ends during unusual, abnormal, and adverse condition of a disaster event or process. The strengthening of coping capacities usually builds resilience to withstand the effect of natural and other hazards (European Spatial Planning Observation Network) (OECD 2006). According to UNDP (2005), adaption is a process by which strategies to moderate, cope with and take advantage of the consequence of climatic events are enhanced, developed, and implemented.

According to UNDP (2005), adaption is a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented. Adaptive strategies to cope with change are nothing new. People have adapted their livelihoods to changing contexts in the past, are actively engaged in this presently, and will continue to adapt in the future (Matthews and Sydneysmith 2010). Livelihoods change and people adapt to disturbances and opportunities provided by many variables, climate change being one variable (Campbell and Olsson, 1991; Thomas and Twyman, 2005; Thomas et al., 2007).

Myanmar is one of the countries most vulnerable to climate change and disasters from natural hazards; it ranks second among countries most affected by extreme weather events between 1993 and 2012. Myanmar is highly vulnerable to climate change and lacking resilience, making it extremely vulnerable to destruction. Climate change and global warming will cause drought and water shortages in the central region, and the change in sea level will lead to a rise in water level in the delta region, increasing the risk of flooding. Drastic changes in weather conditions can have a huge effect on Myanmar and wipe out any humanitarian, political and economic progress. Therefore, Myanmar is in dire need of long-term international support and flexible funding to respond adequately to natural hazards (Oxfarm 2014).

2.3.1 Coping mechanisms for climate change adaption

Myanmar is one of the most hazard-prone countries in the world. Since 2000, Myanmar has been affected by more than 20 disasters triggered by natural hazards; including cyclones, flooding and earthquakes. However, there is limited understanding about how the political context of Myanmar has impacted on the strength of civil society relationships and linkages, and how this might affect communities' resilience to disasters (Kenneth and Lizz 2014). Coping strategies were common to households across the spectrum of the basket of livelihood activities and included; migration and remittance; cutting down on household expenditures, which included expenditure on both households and livelihood inputs; pawing assets; developing secondary income sources through casual labor and raising livestock; and livelihood specific strategies such as changing crops planted (QSEM-2, 2013).

A number of factors play a role in community coping capacity and resilience to disasters. Strong social networks and mutual support mechanisms can be very important for communities to prepare for, respond to, and build back after a disaster. In some cases, indigenous communities have developed specific coping strategies to extreme variations of weather, such as:

1. Crop diversification to minimize risk of harvest failures-varieties of crops with different susceptibilities to droughts, floods, pest etc. or varieties adapted to different locations such as river banks, high mountains, and close to primary forest etc.
2. Change of hunting and gathering periods to adapt to changing animal migration and fruiting periods.
3. Increasing food preservation and improving preservation methods and techniques.
4. Introduction of food banking and seed banking along with creation of exchange networks among the communities.
5. Changes in food habits-improving forest conservation and reverting to gathering food in the forests during bad harvest.
6. Introduction of multi-cropping, double cropping and relay cropping systems as appropriate by many communities.
7. Altering land use and settlement patterns.
8. Other measures such as conservation of forests and watershed, including restoration of ecosystems.
9. Awareness raising and solidarity actions to ensure or to address the concerns of indigenous peoples. It is therefore essential to recognize both the vulnerability and contributions of indigenous peoples in designing culturally appropriate adaptation and mitigation development plan as defined by the communities (Shree et al. 2012).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Selection of the Study Area

To identify the drivers of farmer decision making in response to ACIAR project intervention, ACIAR livelihood and extension project was working with livestock and legume projects. Four streams of Intervention were doing in livestock project, such as small ruminant, village chicken, cattle and feed. The intervention of legumes project was planter (seeder). After consultation with each ACIAR project, Meiktila Township was selected to identify drivers of farmer decision making in response to livestock and Tatkon and Nyaung Oo Township were selected for that of legumes project.

3.2 Data Source and Data Collection

This study was conducted at Tatkon, Nyaung U and Meiktila Townships. Tatkon Township is located at 20˚ 20'N latitude, 96˚ 30' E longitude and altitude 139m. The climate of Tatkon Township is tropical with an average temperature of 33˚ C. The region receives an average rainfall of (906.53mm) per annum. Tatkon Township has large agricultural land (40,569 ha) and contributes (22.5%) of total land. Rice growing area is nearly half of the total cultivated areas. Most of the rural people are farmers and depend on rice production. A map of the Tatkon Township is shown in Appendix 1.

Nyaung U Township is located at 21˚ 20'N latitude, 94˚ 54' E longitude and altitude 70m. Nyaung U Township has a typical tropical climate and as a rule it's relatively hot and dry throughout the year. The summer (March to May) can be seriously hot, with the temperature rising to 43˚C in the day and only falling to the mid 20s (˚C) at night. Nyaung U Township has cultivated land (88,354 ha). Farmers from Nyaung U Township are growing pulses, beans, sesame and groundnuts. A map of the Nyaung U Township is shown in Appendix 2.

Meiktila Township is located at 20˚ 20'N latitude, 95˚ 86' E longitude and altitude 244m. Meiktila has a tropical savanna climate. Temperatures are very warm throughout the year, and the months before the monsoon (March to May) are especially hot, with average maxima around 36˚ C (97˚ F). There is a winter dry season (November–April) and a summer wet season (May–October). Arable land was (61,213 ha) and crops grown within Meiktila

Township are rice, pulses and cotton. A map of the Meiktila Township is shown in Appendix 3.

3.2.1 Qualitative data

Qualitative data were collected by using in-depth interviewing method. The research involved longitudinal study to track change processes and outcomes over time, as well as adoption and adaptation strategies of smallholders engaged in livestock in Meiktila Township, pulses growing in Tatkon and Nyaung U Townships. These townships were purposely selected to identify longitudinal livelihood impacts of project activities. Data were collected two times during November 2015, April 2016 and November 2016.

The following data were collected with interview schedule.

- Significant changes of the social, economic, environmental factors at individual, household and community levels during study period
- Access of extension services and advice, source and outcomes of respondents
- Association involved in society
- Impact of migration
- Credit and market situations
- Income situations of respondents

Additional questions of perception of farmers on legumes and livestock intervention were collected from exposed farmer only from each township.

3.2.2 Quantitative data

Demographic characteristics and livelihood aspects of the respondents were collected as quantitative data first round only to understand livelihood strategies for farmers in the selected townships.

3.3 Statistical Analysis

Descriptive analysis was used to explore socio-economic and livelihoods of the farmers by using SPSS ver.17 software.

Interview qualitative data were transcript and translated from Myanmar to English language and entered into NVivo Starter 11 software to understand farmer's attitudes towards decision making of livelihood strategies and social, environmental and economic changes of individual, household and community levels as qualitative data analysis.

Table 3.1 Township, village tract, village and number of respondent of pulses and livestock projects

Townships	Village Tracts	Villages	No. of respondents		
			Intervention	Control	Total
Tatkon	KyaeChaung	Thawdar	9	8	17
Nyaung U	Taung Ba	Taung Ba	2	2	4
	TaungShae	TaungShae	2	2	4
	ShweHlaing	ShweHlaing	2	2	4
	Nyaung Pin Kan	Nyaung Pin Kan	2	2	4
Meiktila	YaeWai	KyaukAoe			
	Village Chicken				4
	Cattle				4
	Small ruminants				4
	Forage				4
Total					49

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Households in Selected Townships

This chapter firstly presents the detail socio-economic characteristics of respondent households such as demographic characteristics, housing and housing assets, livestock assets, land assets, labor migration status and livelihood diversification of the respondents in selected townships.

4.1.1 Average age of household heads and all household members in selected townships

The average age of household heads was 52.9 year, 51.6 year and 50.9 year in Tatkon, Nyaung U and Meiktila Townships, respectively. The maximum age of household heads was 72.0, 65.0 and 63.0 years and the minimum age of household heads was 35.0, 34.0 and 33.0 years in Tatkon, Nyaung U and Meiktila Townships, respectively.

The average age of all household members was 27.6, 35.9 and 37.6 year in Tatkon, Nyaung U and Meiktila Townships, respectively. The maximum age was 82.0, 87.0 and 65.0 years and the minimum age was 1.0, 1.0 and 2.0 years in Tatkon, Nyaung U and Meiktila Townships, respectively (Table 4.1).

4.1.2 Educational level of household head and all household members in of the respondents in selected townships

Education levels of the respondents varied significantly among townships. Household heads in the Tatkon Township had monastery education while that of Nyaung U Township attained middle school education and that of Meiktila Township attained primary education.

Primary education was more prominent in all household members for selected townships. Graduate education was finished by 2.4% of the household members in Tatkon Township and 7.6% in Nyaung U Township but there were no graduate respondents in Meiktila Township (Table 4.1).

Table 4.1 Age and education levels of household heads and all household members of the respondents in selected townships, 2015

	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)	
	HH Head	All HH members	HH Head	All HH members	HH Head	All HH members
Age						
Average	52.9	35.9	51.6	31.7	50.9	27.6
Maximum	72.0	82.0	65.0	87.0	63.0	65.0
Minimum	35.0	1.0	34.0	1.0	33.0	2.0
Education level						
Illiterate (%)	11.8	3.6	-	6.3	31.3	8.1
Monastery (%)	41.2	18.1	-	2.5	18.8	8.1
Primary school (%)	35.3	36.1	31.3	39.2	43.8	54.5
Middle school (%)	11.8	12.0	50.0	20.3	6.3	19.2
High school (%)	-	15.7	18.8	19.0	-	9.1
Diploma (%)	-	12.0	-	5.1	-	1.0
Graduate (%)	-	2.4	-	7.6	-	-

4.1.3 Household size of the respondents in selected townships, 2015

Table 4.2 shows basic household information among three survey townships. Tatkon Township had an average household size of 6.5 persons, as compared to 5.1 persons for both Nyaung U and Meiktila Townships. Largest household size was 10 persons in both Tatkon and Nyaung U Townships and 9 persons in Meiktila Township. The smallest household size was 4, 3 and 2 persons in Tatkon, Nyaung U and Meiktila Townships, respectively.

4.1.4 Dependency ratio (%) of the households in selected townships, 2015

The dependency ratio indicates the proportion of working aged population to dependents. The (total) dependency ratio is calculated based on the total number of dependents (people aged under 15 year, and 65 year and over) divided by the working age population (aged 15-64 year). The (child) dependency ratio is calculated based on the total number of dependents (people aged 0-14 year) divided by the working age population (aged 15-64 year). The (aged) dependency ratio is calculated based on the total number of dependents (people aged 65 year and over) divided by the working age population (aged 15-64 year).

The (total) dependency ratio was 42.62, 21.21 and 32.5 in Tatkon, Nyaung U and Meiktila Townships, respectively (Table 4.3). Child dependency ratio was 24.59, 15.5 and 30.77. Aged dependency ratio was 18.3, 6.06 and 1.28 in selected townships.

The (total) dependency ratio in Tatkon Township was the highest compared to both Nyaung U and Meiktila Townships, while Nyaung U Township had the lowest (total) dependency ratio.

Child dependency ratio in Meiktila was the highest compared to both Tatkon and Nyaung U Townships, while Nyaung U Township had the lowest child dependency ratio.

Aged dependency ratio in Tatkon Township was the highest compared to both Meiktila and Nyaung U Townships, while Meiktila Township had the lowest aged dependency ratio.

4.1.5 Migration of the respondents in selected townships, 2015

Tatkon and Nyaung U Townships had lower level of migration as compared to Meiktila Township during the survey period. Higher rate 30% of (workable age) migration was found in Meiktila Township and the villagers went to Thailand and Malaysia as migrant labors (Table 4.4). Migration was very common in Meiktila Township and 2 persons per household were migrated as migrant labors to neighboring countries (Thailand and Malaysia).

4.1.6 Housing and assets of respondents in selected townships, 2015

Household residential area includes the area used for housing as well as sheds and home gardens. Average resident areas were 0.73, 0.29 and 0.58 acre for Tatkon, Nyaung U and Meiktila townships, respectively (Table 4.5). The maximum residential areas were 1.5, 1 and1 acre and minimum areas were 0.1, 0.1 and 0.2 acre for Tatkon, Nyaung U and Meiktila townships, respectively. Households in Tatkon Township had the largest average residential area compared to Nyaung U and Meiktila Townships.

Housing material may be indicative of household wealth (ability to afford more costly/durable materials like cement) as well as locally available resources (LIFT, 2012). A majority of houses built by wood 65% in Tatkon Township and followed by brick 50% and 44% in Nyaung U and Meiktila townships receptively (Table 4.6). Households in Tatkon Township had more than half of the houses made by wood compared to Nyaung U and Meiktila Townships. The common roofing material found 100% in Tatkon and Nyaung U and 93% in Meiktila Township was corrugated iron (Table 4.7).

Table 4.2 Household size of respondents in selected townships, 2015

Townships	Household size		
	Average (No.)	Maximum (No.)	Minimum (No.)
Tatkon (n=17)	6.5	10.0	4.0
Nyaung U (n=16)	5.1	10.0	3.0
Meiktila (n=16)	5.1	9.0	2.0
Total	5.6	9.6	3.0

Table 4.3 Dependency ratio (%) of the households in selected townships, 2015

Townships	Percent of respondent		
	Total dependency ratio	Child dependency ratio	Aged dependency ratio
Tatkon (n=17)	42.62	24.59	18.03
Nyaung U (n=16)	21.21	15.15	6.06
Meiktila (n=16)	32.05	30.77	1.28
Total	31.96	23.50	8.46

Table 4.4 Migration of the respondents in selected townships, 2015

Townships	No. of household	Household members migrated
Tatkon (n=17)	5	9
Nyaung U (n=16)	3	4
Meiktila (n=16)	14	30
Total	22	43

4.1.7 Sources of primary and secondary income of household head in selected townships, 2015

The primary income sources of household heads were agriculture in Tatkon Township (100%), Nyaung U Township (94%) and Meiktila Township (80%) (Table 4.8). The secondary income sources of household heads were livestock (25%), labor (38%), remittance (12%) and trade (25%) in Tatkon Township. In Nyaung U Township, service (78%), both of trade and handicraft (11%) were the secondary income sources of household heads. The secondary income sources of Meiktila Township's household heads were livestock (70%) and service (30%). The main primary sources of income for household heads in the selected townships were agriculture and their secondary income was diverse in all selected townships.

The income sources of household members were agriculture (85%), livestock (4%), handicraft (3%) and grocery store (1%), service (8%) and remittance (1%) in Tatkon Township (Figure 4.1). The income source of households members were agriculture (39%), livestock (3%) and handicraft (3%), service (36%), grocery store (10%) and remittance (9%) in Nyaung U Township. In Meiktila Township, the income source of household members was agriculture (12%), livestock 10%, service (8%) and remittance (70%). Agriculture (85%) was their primary sources of income in Tatkon Township. Agriculture (39%) and service (36%) were the main income sources of income in Nyaung U Township's household members. However, Meiktila Township was the only township where household members identified remittances (70%) as their primary income source.

Table 4.5 Household residential areas (acres) in selected townships, 2015

Items	Tatkon (n=17)	Nyaung U (n=16)	Meiktila (n=16)
Average	0.73	0.29	0.58
Maximum	1.50	1.00	1.00
Minimum	0.10	0.10	0.20

Table 4.6 Housing materials in selected townships, 2015

Items	Percent of respondent		
	Tatkon (n=17)	Nyaung U (n=16)	Meiktila (n=16)
Wood	64	37	38
Bamboo	24	13	19
Brick	12	50	43
Total	100	100	100

Table 4.7 Roof materials of house in selected townships, 2015

Items	Percent of respondent		
	Tatkon (n=17)	Nyaung U (n=16)	Meiktila (n=16)
Corrugated iron	100	100	93.8
Others	-	-	6.3
Total	100	100	100

Table 4.8 Sources of primary and secondary income of household head of respondents in selected townships, 2015

Items	Percent of respondent					
	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Agriculture	100	-	94	-	80	-
Livestock	-	25	-	-	7	70
Labor	-	38	-	-	-	-
Service	-	-	6	78	13	30
Remittance	-	12	-	-	-	-
Trade	-	25	-	11	-	-
Handicraft	-	-	-	11	-	-

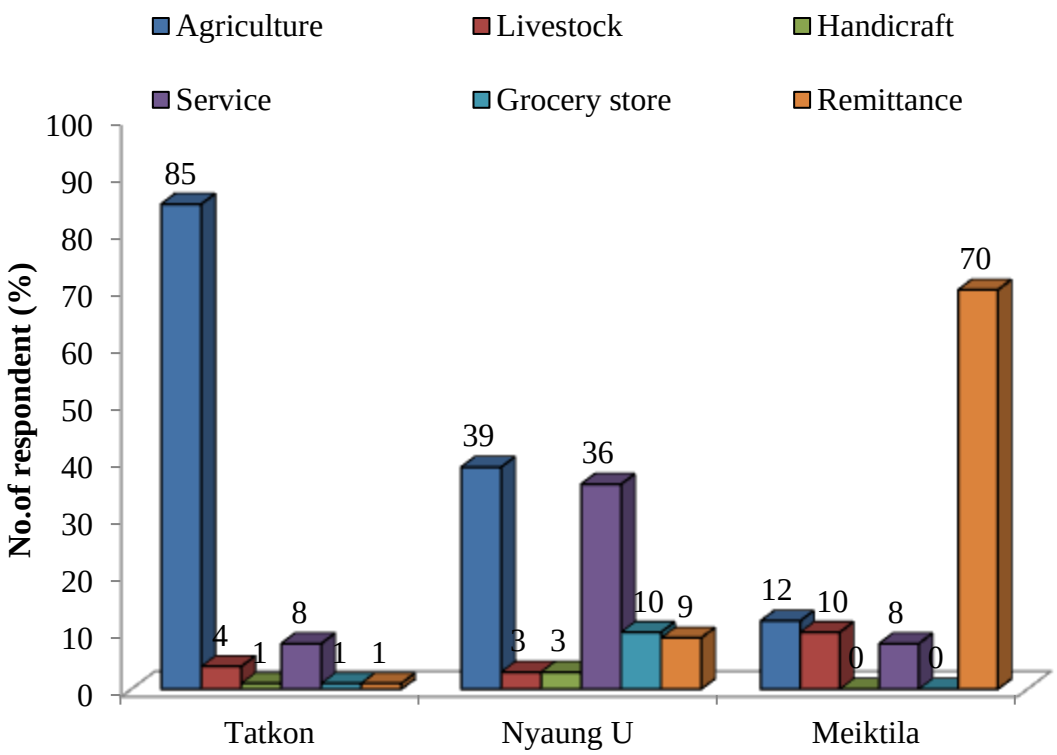

Figure 4.1 Sources of income of the household members in selected townships in 2015

4.1.8 Proportions of annual expenditure of respondents in selected townships, 2015

Household's expenditure were rice, other foods, health, education, household maintenance, purchase of vehicle and machine, water for household used, fuel for household used, social affairs and others. Figure 4.2 shows proportions of different annual expenditure for selected townships. In Tatkon Township, the main expenditure was for other foods (37%) and the lowest expenditure was for water for household used (2%). During that time, the main expenditure was for other foods (24%) and house maintenance (23%) and the lowest expenditure was water for household used (2%) in Nyaung U Township. In Meiktila Township, the main expenditure was for house maintenance (23%), rice (24%) and other foods (23%) and the lowest expenditure was for education (1%).

The expenditure for rice in Tatkon Township was the lowest among selected townships because of double rice production. The expenditure for house maintenance in Tatkon was the lowest compared to Nyaung U and Meiktila Townships. In Nyaung U Township, respondents sold out their land and built new houses and respondents built new houses with remittance money in Meiktila Township.

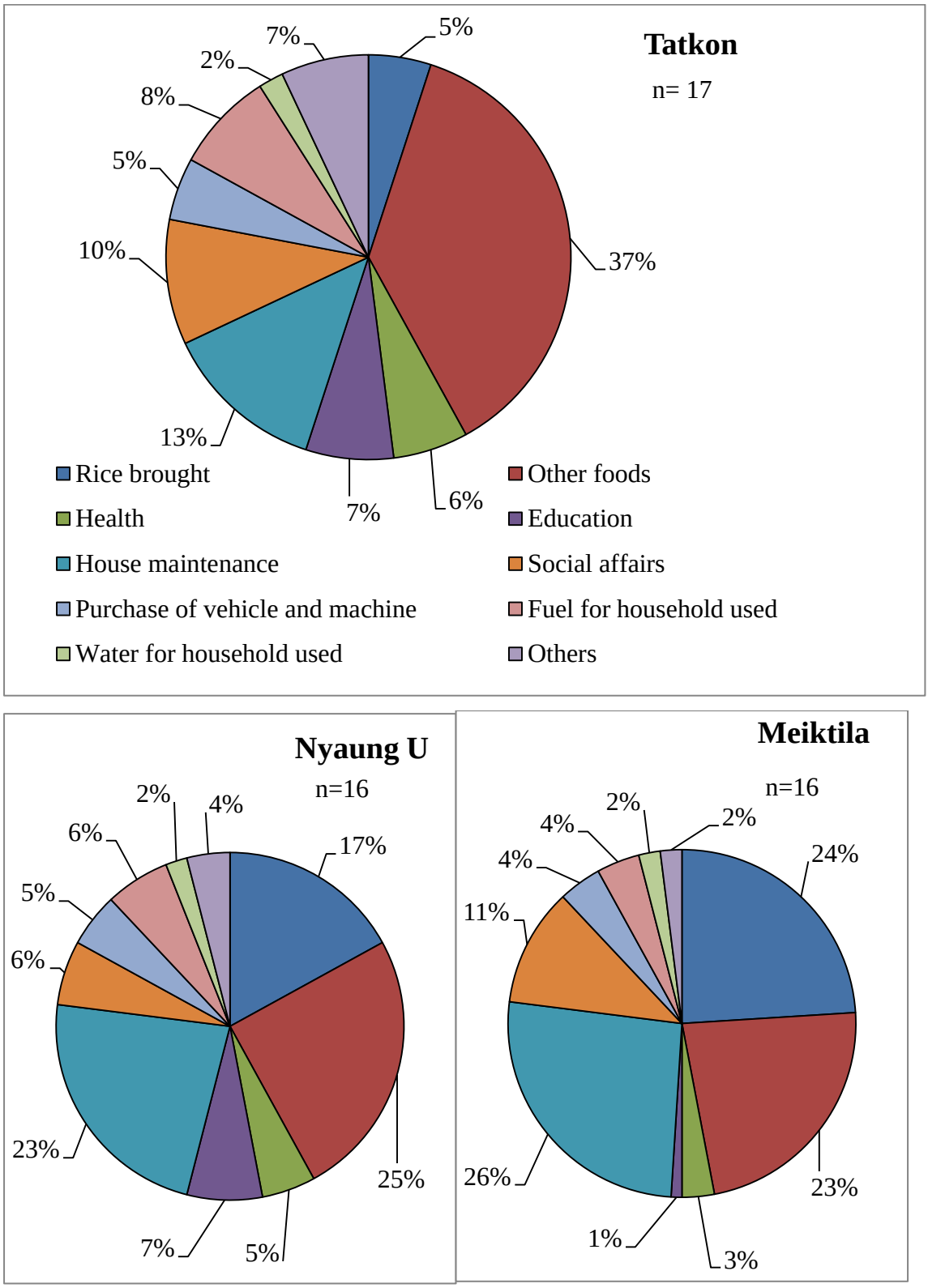

Figure 4.2 Proportions of annual expenditure of respondents in selected townships, 2015

4.1.9 Grouping of land holding size, cultivated area, rain-fed area, irrigated areas and cropping patterns of the respondents in selected townships, 2015

Figure 4.3 shows grouping of land ownership and cultivated area of the respondent's household in selected townships. More than half of the respondents in Tatkon 59% possessed 5-10acre of land and 63% cultivated the land of 5-10 acre. In Nyaung U Township, 63% of the respondents possessed and cultivated their own land of 11-20 acre. Nearly half of the respondents in Meiktila Township possessed 11-20 acre of land but 54% cultivated the same size of land 11-20 acre. However, farmers in all selected areas did not cultivate their own land due to unavailability of water and scarcity of labor.

Grouping of rain-fed and irrigated land areas of the respondents in selected townships is shown in Table 4.9. Fifty three percent of the respondent households possessed rain-fed area of less than 5 acres in Tatkon Township. In Nyaung U and Meiktila Townships, 63% and 54% of the respondents owned rain-fed land area within 11-20 acres.In Tatkon Township, 62% of the respondents possessed irrigated area between 2-5 acres. Fifty percent of the respondents owned less than 2 acres and another 50% of the households possessed 2-5 acres of rain-fed land area in Nyaung U and Meiktila Townships.

The respondents in Tatkon Township generally grew pre-monsoon, monsoon and post-monsoon crops in their field, however, respondents from Nyaung U Township did not cultivate their land in pre-monsoon and the farmers from Meiktila Township did not cultivate post-monsoon crops (Table 4.10). Rice and pulses were mostly grown in Tatkon and Nyaung U Townships. During that time, oilseed crops were mostly grown in Meiktila Township.

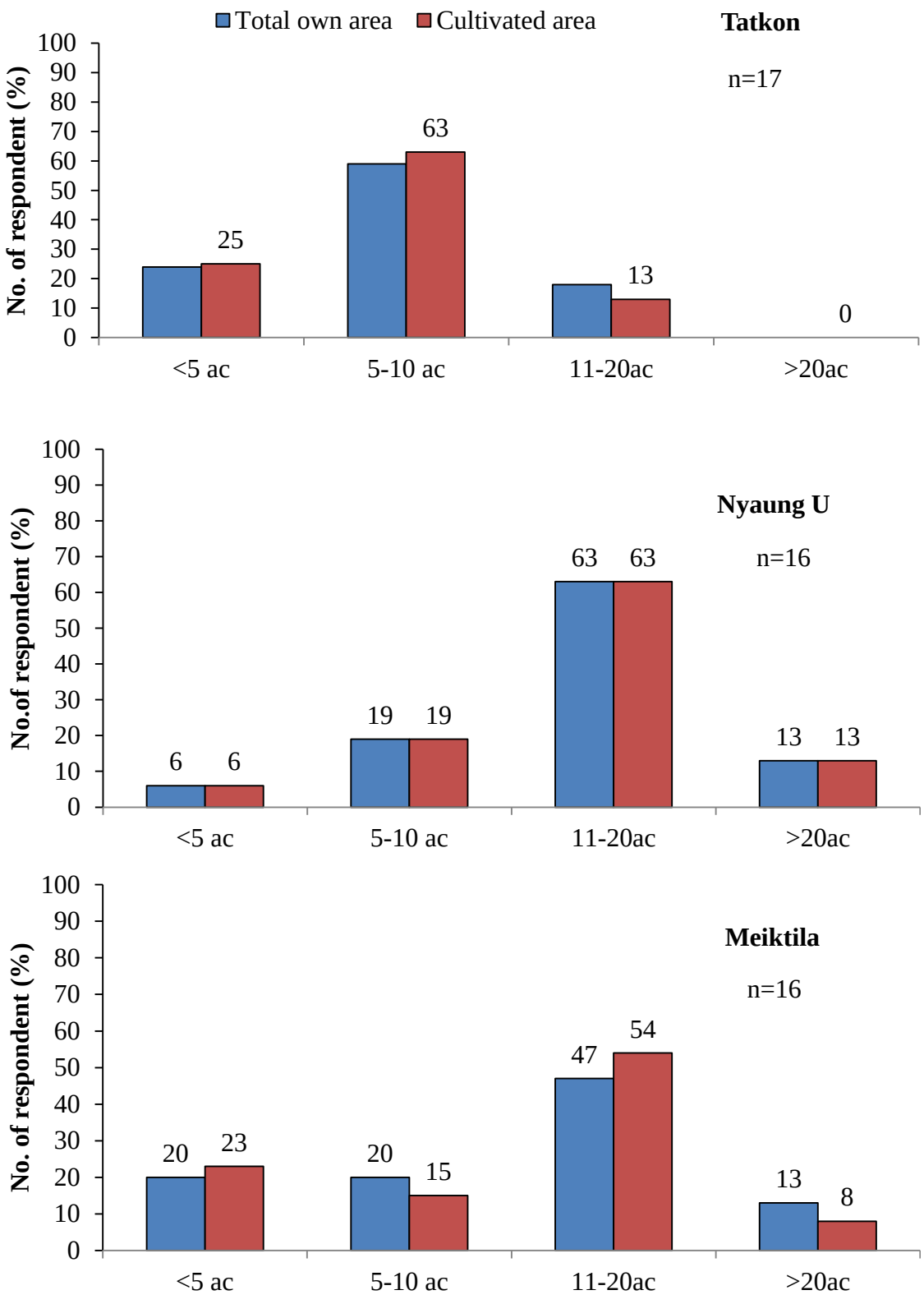

Figure 4.3 Land holding size and cultivated area in selected townships, 2015

Table 4.9 Rain-fed and irrigated areas of the respondents in selected townships, 2015

Rain-fed and irrigated areas	Percent of respondent		
	Tatkon (n=17)	Nyaung U (n=16)	Meiktila (n=16)
Rain-fed area (ac)			
<5	53	6	15
5-10	40	19	15
11-20	7	62	54
>20	-	13	16
Irrigated area (ac)			
<2	23	50	50
2-5	62	50	50
>5	15	-	-

Table 4.10 Cropping patterns and crops grown by respondents in selected townships, 2015

Township		Pre-monsoon	Monsoon	Post-monsoon
Tatkon (n=17)	Monocrop	Rice, Green gram, Lablab bean, Cotton, Maize	Rice, Green gram, Pigeon pea, Sesame, Maize, Sunflower, Black gram, Groundnut, Tomato	Sesame, Cotton, Green gram, Lablab bean, Groundnut, Chick pea, sunflower, Tomato
	Intercrop	-	Green gram + Pigeon pea Groundnut + Sesame	Groundnut + Sesame
Nyaung U (n=16)	Monocrop	-	Green gram, Pigeon pea, Sesame, Maize, Groundnut, Tomato	Green gram
	Intercrop	-	Green gram + Pigeon pea, Groundnut + Green gram, Green gram + Maize, Sesame+ Green gram, Sesame + Pigeon pea	Green gram+ Maize
Meiktila (n=16)	Monocrop	Sesame, Maize	Sesame, Maize, Chilli, Tomato, Butter pea, Pigeon pea, Sunflower, Forage	-
	Intercrop	Sesame+ Pigeon pea	Sesame + Green gram, Sesame + Pigeon pea	-

4.1.10 Livestock production of the respondents in selected townships, 2015

Respondents raised cattle, pig, chicken, goat and sheep for their farming, extra income and consumption in all selected townships. Figure 4.4 shows number of households who raised livestock in selected townships. Respondents from Tatkon Township mostly raised cattle (71%), pig (64%) and chicken (59%) whereas respondents from Nyaung U mostly raised only cattle (93%). Respondents from Meiktila Township mostly raised pig (69%), chicken (93%) and goat (75%). Among township sheep was raised in Meiktila Township only (6%). Since agriculture was the main source of income in Tatkon and Nyaung U, most of the respondents raised cattle for agricultural production purpose; however, most of the respondents in Meiktila raised local bred chicken and small ruminants.

The number of chicken per household was in Tatkon Township (125), Nyaung U Township (80) and Meiktila Township (310) in Figure 4.5. The highest number of goat per household was in Meiktila Township (397).

The raising for raising livestock were for agricultural production, household consumption, extra income, farming plus extra household income ,household consumption plus extra household income and others. The reasons for raising cattle were for farming (76.74%), extra income (9.30%), farming plus extra income (11.63%) and other purposes (2.33%) in selected townships (Table 4.11). The reasons for raising chicken were household consumption (23.33%), extra income (73.33%) and household consumption plus extra income (3.34%) in selected townships. The only reason for raising pig, goat and sheep was 100% for extra income in selected townships. The major reason for raising cattle was for agricultural purpose, getting extra income for raising pig, local bred chicken and small ruminants.

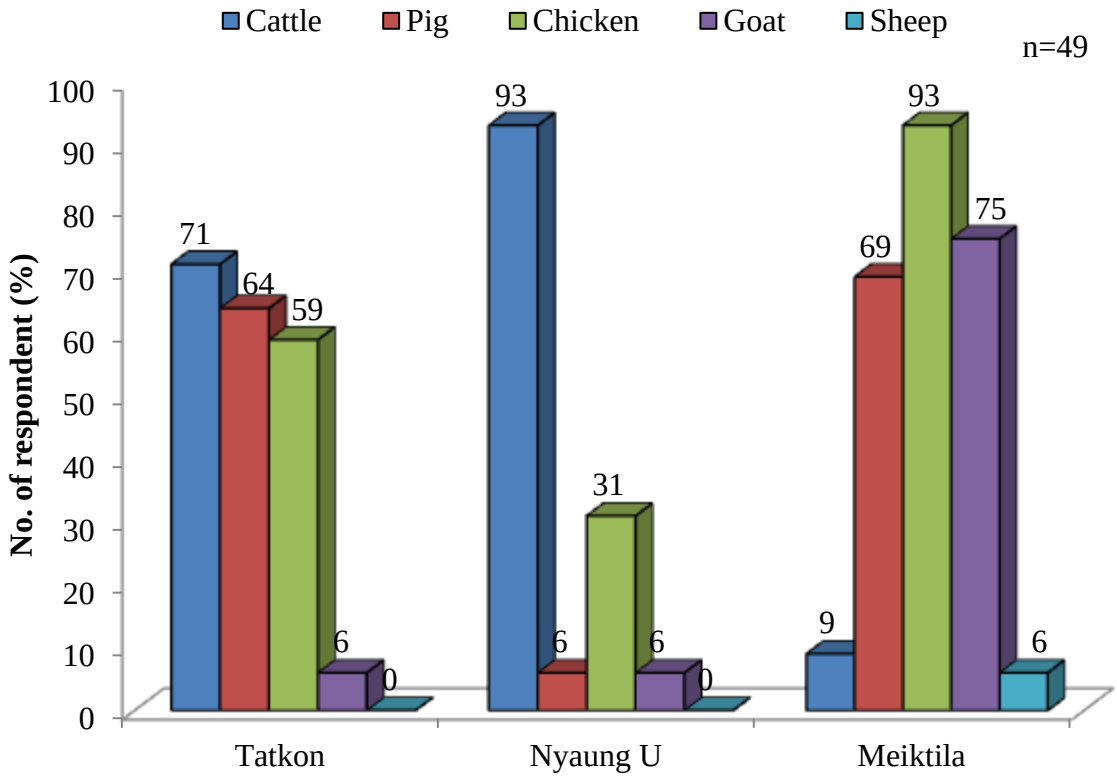

Figure 4.4 Raising livestock households in selected townships in 2015

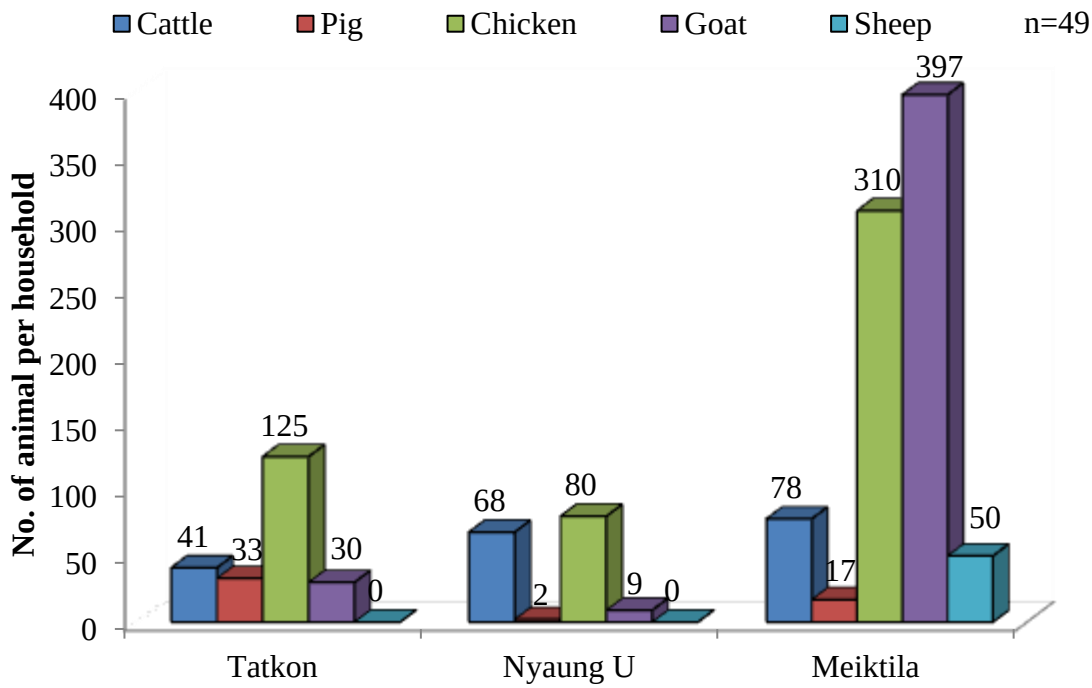

Figure 4.5 Number of animals per household in selected townships, 2015

Table 4.11 Main reasons for rearing livestock in selected townships, 2015

Reasons	Percent of respondent				
	Cattle	Pig	Chicken	Goat	Sheep
Agricultural production	76.74	-	-	-	-
Household consumption	-	-	23.33	-	-
Extra income	9.30	100	73.33	100	100
Farming +Extra household income	11.63	-	-	-	-
Household consumption + Extra household income	-	-	3.34	-	-
Others	2.33	-	-	-	-
Total	100	100	100	100	100

n=49

4.1.11 Credit situations of respondents in selected townships

Respondents were asked whether they had taken a loan in the last 12 months. In the last 12 months, 88.24%, 93.75% and 50.00% of the households from Tatkon, Nyaung U and Meiktila Townships had accessed credit from formal providers (Table 4.12).

Respondents took loan mostly from Myanmar Agricultural Development Bank (MADB) for agricultural production, followed by private and non-government organizations (NGOs) in Tatkon and Nyaung U Townships. In Meiktila Township, the respondents mainly took loan from MADB and private. Respondents took loan from MADB was 93%, 100% and 50% in Tatkon, Nyaung U and Meiktila Townships, respectively(Table 4.13). Thirteen percent of respondents from Nyaung U Township and 38% of respondents from Meiktila Township took loan from NGOs. Respondents took loan from private was 47% in Tatkon, 33% in Nyaung U and 50% in Meiktila and took loan from their relatives and gave back when respondents got remittance from the family members who are working as migrant labor in abroad. In all selected townships, MADB was the most important source of credit (61.11%). There was no NGOs loan program in Tatkon Township. The respondents from Tatkon Township got maximum loan from MADB compared to others because of providing high amount of loan rate for rice growing farmers.

The average interest rates of loan from MADB were 0.6, 0.7 and 0.5 kyats in Tatkon, Nyaung U and Meiktila Townships, respectively (Table 4.14). The average interest rates of loan from NGOs were 2.0 and 1.5 kyats in Nyaung U and Meiktila Townships. The average interest rates of loan from private were 1.4, 1.5 and 0.7 kyats in Tatkon, Nyaung U and Meiktila Townships, respectively. The average duration of loan from MADB was 6.1, 6.8 and 7.5 months in Tatkon, Nyaung U and Meiktila Townships, respectively. The average duration of loan from NGOs was 7 and 7.5 months in Nyaung U and Meiktila Townships. The average duration of loan from private was 6 months in both Tatkon and Nyaung U Townships.

The purpose of taking loan was mainly for crop production in Tatkon Township (73.69%), Nyaung U Township (77.27%) and Meiktila Township (41.67%) (Table 4.15). The purpose for taking loan was livestock in Tatkon (5.27%) and Meiktila Township (1%). The purpose for taking loan was household consumption in Tatkon (10.52%), Nyaung U (22.73%) and in Meiktila Township (16.67%). The purpose for taking loan was education in Tatkon Township (10.52%). The purpose of other reasons was in Meiktila Township (33.33%). In all selected townships, the main purpose for taking loan was to support crop production (67.93%).

Table 4.12 Respondents' accessing loans in the last 12 months in selected townships, 2015

Townships	No. of respondent			
	Took a loan		Did not take loan	
	HH	%	HH	%
Tatkon(n=17)	15	88.24	2	11.76
Nyaung U (n=16)	15	93.75	1	6.25
Meiktila (n=16)	8	50.00	8	50.00
Total	38	77.55	11	22.45

Table 4.13 Credit providers and their average loan for the respondents in selected townships, 2015

Credit sources	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)		Total	
	%	Average loan	%	Average loan	%	Average loan	%	Average loan
MADB	93	680,000	100	355,000	50	31,200	61.11	4,360,000
NGOs	-	-	13	466,666	38	68,000	9.26	830,000
Private	47	228,571	33	280,000	50	960,000	29.63	1,950,000

Table 4.14 Average interest rate and average duration of loan in selected townships, 2015

Sources of loan	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)	
	Ave. interest rate	Ave. duration of loan (month)	Ave. interest rate	Ave. duration of loan (month)	Ave. interest rate	Ave. duration of loan (month)
MADB	0.6	6.1	0.7	6.8	0.5	7.5
NGOs	-	-	2.0	7.0	1.5	7.5
Private	1.4	6.0	1.5	6.0	5.7	-

Table 4.15 Main purposes of taking loan by respondents in selected townships, 2015

Purposes	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)		All Townships	
	HH	%	HH	%	HH	%	HH	%
Crop production	14	73.69	17	77.27	5	41.67	36	67.93
Livestock	1	5.27	-	-	1	8.4	2	3.77
HH consumption	2	10.52	5	22.73	2	16.67	9	16.98
Education	2	10.52	-	-	-	-	2	3.77
Others	-	-	-	-	4	33.33	4	7.55

4.2 Livelihood Decision Making Behavior Indicators

The following data were assumed as decision making indicators for this study.

- Significant changes of the social, economic, environmental factors at individual, household and community levels during study period
- Access of extension services and advice, source and outcomes of respondents
- Associations involved in society
- Impact of migration
- Credit and market situations
- Income situations of respondents

4.2.1 Extension advice and technology obtained by respondents in selected townships during 2015, 2016 April and November

(a) Sources of extension service in selected townships in 2015, 2016 April and November

Extension advice and technology have been offered by Department of Agriculture (DoA), Department of Agricultural Research (DAR), Non-government organizations (NGOs), International Non-government organizations (INGOs), Livestock Breeding and Veterinary Department (LBVD), private sectors (input sellers) and other farmers. Respondents obtained extension advice and technology from more than one source (Table 4.16).

The respondents from two townships received extension advices and technologies from farmers to farmers (94% each of Tatkon and Nyaung U Townships) and private sector (59% in Tatkon Township and 75% in Nyaung U Township). Meiktila Township received extension advices and technologies from NGOs and INGOs (94%) and other farmers (44%), while Nyaung U respondents (69%) got extension advices and technologies from the DAR. Comparing 2015 and 2016, the utilization of extension services was generally decreased in all selected townships especially in 2016 (November).

Responses of the respondents from respective townships were cited to reflect their overall indications;

"I got extension advice from DAR, private sector (input seller) and other farmers (78 year old, male farmer, Tatkon Township)".

"I got extension advice from DOA, private sector (input seller), journal and other farmers (44 year old, male farmer, Nyaung U Township)."

"I got extension advice from Dahat Pan NGO Project (Livestock production) (42 year old, forage grower, Meiktila Township)".

Most of the respondents got extension advices and technologies from other farmers and private sectors in Tatkon and Nyaung U Townships however; most of the respondents obtained extension advices and technologies (livestock production) from NGOs and INGOs in Meiktila Township. In 2016, offering extension advice was decreased in all selected townships compare with 2015. Drought is one of the important climate phenomena in Dry Zone and 2016 is the year of EI Nino. All selected townships faced drought in summer and most of the respondents could not grow their crops. Moreover, there was heavy rain in rainy season of 2016. Most of the crops were failure and livestock especially small ruminants were died. Therefore, extension services were short of in providing any technology and technical information in 2016.

(b) Seeking extension advice and technology from other farmers or organizations in selected townships during 2015, 2016 April and November

Respondents themselves sought extension advice from DoA, DAR, NGOs and INGOs, LBVD, private sectors and other farmers. Respondents sought extension advices and technologies from more than source (Table 4.17).

The respondents from two townships sought cultivation methods, seeds and usage of fertilizers for their crops from farmers to farmers (nearly 100% each of Tatkon and Nyaung U Townships) and DoA (18% in Tatkon Township and 19% in Nyaung U Township). Meiktila Township sought cultivation methods, seeds and usage of fertilizers for their crops from other farmers (31%) and NGOs and INGOs (25%). Comparing 2015 and 2016, seeking of cultivation methods, seeds and usage of fertilizers for their crops was generally decreased in Tatkon and Nyaung U Townships, while Nyaung U Township's respondents seeking extension advices was increased in 2016 because most of the respondent's local bred

chickens were dead.

As an example of their responses were;

> *"I sought out usage of fertilizer, cultivation methods and about pure seeds for rice from DoA, DAR (Tatkon) and other farmers (78 year old, male farmer, Tatkon Township)."*
>
> *"I sought out cultivation methods and usage of pesticides for my crops from DoA and other farmers (35 year old, male farmer, Nyaung U Township)."*
>
> **"***I sought out health problem of local bred chickens from other farmers (42 year old, forage grower, Meiktila Township)".*

Most of the respondents sought out extension advices and technologies from other farmers in all selected townships. Respondents did not seek extension advice from DoA and DAR in Meiktila Township. In 2016 seeking extension advice decreased in Tatkon and Nyaung U Townships compare with 2015. But seeking extension advice increased in 2016 than 2015 in Meiktila Township because most of the respondent's village chickens were dead because of flu infection. The vaccination provided from Dahat Pan Projects was protection from Newcastle disease (personal communication with project coordinator of Dahat Pan Project). In pre monsoon season of 2016, the crops were failure due to drought. Heavy rain during rainy season also leads to crop lodging. Farmers believed that it was natural disaster and cannot control by human being and did nothing.

(c) Offering extension advices and technologies to other farmers (farmer to farmer approach) in 2015, 2016 April and November

Most of the respondents offered extension advices and technologies from farmers to farmers about technology such as cultivation methods, usage of agrochemicals and seeds (Table 4.18). Some of the respondents did not give extension advices and technologies to other farmers.

Respondents from Tatkon and Nyaung U Townships offered extension advices and technologies to other farmers (94% of each township), while, Meiktila respondents (31%) offered about cultivation methods and usage of agrochemicals to other farmers in 2015. Comparing 2015 and 2016, the offering of extension advices and technologies to other

farmers were generally increased in Nyaung U and Meiktila Townships; however, Tatkon Township respondents seeking extension advices was decreased to (65%) in 2016 because most of the respondent's could not grow summer rice due to drought and failure crop due to heavy rain.

As an example of their responses;

> *"I didn't give extension advice to other farmers because in this summer I could not grow summer rice (58 year old, male farmer, Tatkon Township)".*
>
> *"I gave extension advice to other farmers (44 year old, male farmer, Nyaung U Township)".*
>
> *"I gave cultivation method of forage to other farmers (42 year old, forage grower, Meiktila Township)".*

Most of the respondents offered extension advices and technologies to other farmers in all selected township and most of their decision making were influenced by external drivers such as other farmers, DoA, DAR, NGOs and INGOs and private sectors, etc.

Table 4.17 Seeking extension advice and technology from other farmers or organizations in selected townships during 2015, 2016 April and November

Source of service	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)
DOA	18	-	6.25	19	6	-	-	-	-
DAR	6	6	-	13	-	-	-	-	-
NGOs, INGOs	-	-	-	6	-	6.25	25	6	6.25
Private sectors	18	-	12.5	6	-	-	-	-	6.25
Other farmers	100	41	37.5	94	88	81.25	31	88	50
LBVD	-	-	-	-	-	-	6	-	-
Market	-	-	-	-	-	-	6	-	-

Table 4.17 Seeking extension advice and technology from other farmers or organizations in selected townships during 2015, 2016 April and November

Source of service	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)
DOA	18	-	6.25	19	6	-	-	-	-
DAR	6	6	-	13	-	-	-	-	-
NGOs, INGOs	-	-	-	6	-	6.25	25	6	6.25
Private sectors	18	-	12.5	6	-	-	-	-	6.25
Other farmers	100	41	37.5	94	88	81.25	31	88	50
LBVD	-	-	-	-	-	-	6	-	-
Market	-	-	-	-	-	-	6	-	-

Table 4.16 Sources of extension service in selected townships in 2015, 2016 April and November

Sources of extension service	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
DOA	47	-	31.25	38	50	43.75	47	6	
DAR	24	6	0	69	19	25	-	-	
NGOs & INGOs	-	-	12.5	31	-	25	94	94	81.25
Private sector	59	35	31.25	75	50		13	6	25
Other farmers	94	41	6.25	94	63		44	50	37.5
LBVD	6	-		-	-		6	-	
Media	-	-		-	6		-	-	

Table 4.17 Seeking extension advice and technology from other farmers or organizations in selected townships during 2015, 2016 April and November

Source of service	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)
DOA	18	-	6.25	19	6	-	-	-	-
DAR	6	6	-	13	-	-	-	-	-
NGOs, INGOs	-	-	-	6	-	6.25	25	6	6.25
Private sectors	18	-	12.5	6	-	-	-	-	6.25
Other farmers	100	41	37.5	94	88	81.25	31	88	50
LBVD	-	-	-	-	-	-	6	-	-
Market	-	-	-	-	-	-	6	-	-

Table 4.18 Offering extension advices and technologies to other farmers (farmer to farmer approach) in 2015, 2016 April and November

Advices and technologies	**Percent of respondents**								
	Tatkon (n=17)			**Nyaung U (n=16)**			**Meiktila (n=16)**		
	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)	2015	2016 (April)	2016 (Nov.)
Yes	94	65	56.25	94	100	81.25	31	88	50
No	6	35	43.75	6	-	18.75	69	12	50

4.2.2 Significant changes of the respondents in selected townships during 2015, 2016 April and November

Significant changes are individual, household, community, environmental and economic. Changes vary significantly among townships (Table 4.19). In Tatkon Township, 18%, 12% and 25% of the respondents noticed individual changes in 2015 and 2016 (April) and 2016 (November). Six percent of the respondents from Nyaung U Township noticed individual changes in 2015 and 18.75 in 2016 (November). In Meiktila Township, 19%, 13% and 12.5 % of the respondent noticed individual changes in 2015, 2016 (April) and 2016 (November).

> *"I was elected as a village administrator in 2016 election for administrative body (58 year old, male farmer, Tatkon Township)."*
>
> *"I have been treating my leg in township hospital because I could not walk (55 year old, male farmer, Nyaung U Township)".*

In Tatkon Township, household changes were 71%, 65% and 56% in 2015, 2016 (April) and 2016 (November). In Nyaung U Township, 38%, 50% and 43.75% of the respondent noticed household changes. In Meiktila Township, 63% of the respondents noticed household changes in both years.

> *"My daughter was married (61 year old, male farmer, Nyaung U Township)".*
> *"My mother had been operated her eye problem (50 year old, cattle livestock farmer, Meiktila Township)".*

Community changes were noticed by 82% and 94% of the respondents from Tatkon Township in 2015 and 2016 April and November. In Nyaung U Township, 88% and 19% of the respondents noticed community changes in 2015 and 2016. However, community changes were more in 2016 November. In Meiktila Township, 63%, 75% and 63% of the respondents noticed community changes in 2015 and 2016 April and 29016 November. Most of the community changes were road repairing, construction of school building, rural electrification and water access. In 2016, community activities regarding to water availability for home consumption was implemented in Nyaung U and Tatkon Townships under the Community Driven Program with the loan of World Bank. Thisactivity was seriously

implemented because of drought. However, this is for home consumption only and not for agriculture.

> *"The whole village faced water scarcity for drinking water, water of household used and water for cultivating (68 year old, male farmer, Tatkon Township)".*
> *"There is no work in village thus some people go to Yangon, Nay Pyi Taw and Malaysia to work(41 year old, male farmer, Tatkon Township)".*
> *"Transportation is better, torch lamp post set up and school could change from primary to middle in my village (61 year old, male farmer, Nyaung U Township)".*
> *"In village, torch lamp post set up and well dug (63year old, male farmer, Nyaung U Township)".*
> *"Houses were built and road, bridge and monastery were repaired in my village (47 year old, cattle livestock farmer, Meiktila Township)".*
> *"In village, road and bridge was repaired (56 year old, small ruminant livestock farmer, Meiktila Township)".*

In Tatkon Township, 47% and 71% of the respondents noticed environmental changes in 2015 and 2016. Nineteen percent and 6% of the respondents from Nyaung U and Meiktila Townships noticed environment changes. During the survey of 2016 November, all respondents answered the there was a serious environmental changes including drought in pre monsoon and heavy rain in late monsoon. They lost their crops mainly pre monsoon sesame and pigeon pea. Heavy rain during harvesting time of tomato caused water lodging and leads to crop failure in Meiktila Township. Moreover, heavy rain at late monsoon also destroyed groundnut in Nyaung U Township and rice fields in Tatkon Township. Regarding to small ruminants, animals were depth during rainy season in Meiktila Township. Due to these reasons, the respondents in study areas faced environmental changes which led agriculture and livestock and economic shocks in their livelihoods.

> *"Maize cultivation was destroyed by drought. (49 year old, forage grower, Meiktila Township)."*
> *"In this year, weather is too bad. (41 year old, male farmer, Tatkon Township)".*

Six percent and 13% and 6% of the respondents from Tatkon, Nyaung U and Meiktila Townships noticed economic changes in 2016.

"We have no chance to negotiate the price with brokers or traders. We have to sell out with the brokers' price (32 year old, male farmer, Tatkon Township)".
"The price of palm (jaggery) increased (63 year old, male farmer, Nyaung U Township)".

Among the changes, household and community changes are more prominent in all selected townships in 2015 and 2016 (April). The respondents also noticed environmental and economic changes in 2016 (April). The environmental change was more significant in all selected townships in 2016 (November).

4.2.3 Shocks faced by the respondents in selected township in 2015 and 2016.

Shocks faced by the respondents were drought, flood, windy, economic, and personal, labor scarcity and pest and disease and environmental shocks. Table 4.20 presents type of shocks faced by respondents in selected townships during 2015 and 2016 (April) and 2016 (November). Seventy seven percent and 25%, 38% of the respondents from Tatkon, Nyaung U and Meiktila Townships faced environmental shock (drought) in 2015. In 2016, 100% and 38% of the respondents from Tatkon and Nyaung U Townships faced water scarcity due to drought except Meiktila Township. In Tatkon Township, 29% and 6% of the respondents faced windy and flood in 2015. The respondents repaired their houses destroyed by windy.

Nearly 13% of the respondents from selected townships faced their individual shocks in 2015. In 2016, 6% of the respondents from Tatkon and Nyaung U Townships faced from personal shocks. Six percent of the respondents from all selected townships faced from economic shocks that they had no chance to negotiate the price with brokers and traders. They had to sell out their crops with the brokers' price in 2015 and 2016. In Nyaung U Township, six percent of the respondents faced from pest and diseases in their crops and labor scarcity in 2015.

In 2015, respondents from Tatkon Township more faced environmental shock than the other two townships. Drought is more serious in 2016 thus respondents faced scarcity for drinking water, water for household used and cultivating water in Tatkon Township and the respondents faced scarcity of cultivating water in Nyaung U Township. There was no shock

in Meiktila Township in 2016 because there is a stream for water for cultivating and animals.

> **"***I faced heavy rain that my tomatoes cultivation damaged but the level of shock impact is not serious (42 year old, village chicken livestock farmer, Meiktila Township)".*
>
> *"The whole village faced water shortage. (34 year old, male farmer, Tatkon Township)".*
>
> *"The whole village face drought and temperature is too high (64 year old, male farmer, Nyaung U Township)".*
>
> *"The whole village faced water scarcity. 100 farmers cannot cultivate summer rice because there is no water for cultivation (69 year old, male farmer, Tatkon Township)".*
>
> *There was drought during the pre-monsoon season and sesame crop was totally destroyed. The sesame crop was failure for more than 10 years. (44 year old, male farmer, Nyaung U Township, Nov 2016)."*
>
> *This year (2016 monsoon), there was very heavy rain during harvesting time of groundnut and groundnut crop could not harvest in time. Therefore, the groundnut yield was significantly reduced.*
>
> *Due to the heavy rain, water logging in the tomato field lead to crop failure. (49 year old, forage grower, Meiktila Township, 2016 November)*
>
> *Due to the heavy rain and cloudy for long time, my goats (2 big and 4 small) were dead. So I am worried that sold out the herd (60 year old women farmer, Meiktila Township, 2016 November)*

Tatkon Township's respondents faced major shock was 18% and 71 % and minor shock was 6% and 12% in 2015 and 2016 in Table 4.21. Nyaung U Township's respondents faced major shock was 38% in 2015 and minor shock was 13% and 44% in 2015 and 2016. In Meiktila Township, major shock was 6% and minor shock was 44% in 2015. There was no shock in Meiktila Township in 2016. Mostly minor shock was found in Nyaung U and Meiktila Townships. In 2016, Tatkon Township's respondents faced major shock than 2015 that drought is more serious in 2016. Scarcity of drinking water and water of household used were the main problems. However, because of ElNio, drought was occurred in pre monsoon and heavy rain caused flood in 2016. It was major shock in study areas.

Table 4.19 Significant changes encountered by respondents in 2015, 2016 April and November

Changes	Percent of respondents								
	Tatkon(n=17)			Nyaung U(n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
Individual	18	12	25	6	-	18.75	19	13	12.5
Household	71	65	56.25	38	50	43.75	63	63	62.5
Community	82	94	93.75	88	19	81.25	63	75	62.5
Environmental	47	71	100	-	19	100	100	6	100
Economic	-	6	12.5	-	13	31.25	-	6	25
Livestock	-	-	12.5	-	-	-	-	-	100

"The whole village faced drought, the level of shock impact was seriously. I re-cultivated other crops by borrowing money or pawning valuables things (39 year old, male farmer, Tatkon Township)".

"The whole village faced from water scarcity and did not cultivate Black gram and 150 household members did not cultivated summer rice and the shocks were seriously (78 year old, male farmer, Tatkon Township)".

"The whole village faced windy and rainy that it is not suitable time for crops and the shock is not serious (35 year old, male farmer, Nyaung U Township)".

"I was unfit. The shock is not serious (61 year old, small ruminant livestock farmer, Meiktila Township)".

Table 4.22 shows responses to shock by respondents in selected townships during 2015 and 2016. In 2015, 71%, 19% and 6% of the respondents from Tatkon, Nyaung U and Meiktila Townships responded their shocks. In Tatkon Township, 29%, 6%, 24%, 6% and 6% of the respondents responded shocks by re-cultivating next crops, selling valuables, pawning valuables things, lending bullock cart to get water and pumping water in 2015. In Nyaung U Township, 13% and 6% of the respondents responded shocks by re-cultivating

next crops and lending water pump in 2015. In Meiktila Township, 6% of the respondents responded shocks by selling cattle to re-cultivate crops.

In 2016, all selected townships did not respond their shock. The year of 2016 was EI Nino that drought was more serious than 2015. The respondents reported that they did not response to shock because it was natural disaster and just see and wait it. They sold out their small ruminant before dying with very low price in Meiktila Township. And they could not do anything groundnut loss due to delayed harvesting.

"Income was not enough for my family so I sold valuables things for our living (41 year old, male farmer, Tatkon Township)".

"The whole village face water problem so wells were repaired (53 year old, male farmer, Nyaung U Township)"

"I re-cultivated next crop by lending bullock cart to get water (64 year old, male farmer, Nyaung U Township)".

A magnitude 6.8 earthquake struck Myanmar 25 km (16 mi) west of Chaukon 24 August 2016 with a maximum Mercalli intensity of VI (*Strong*). It struck at 5:04 pm local time (10:34 UTC), and was centered in an isolated area. The estimated depth was 84.1 km.According to reports, several temples in the nearby ancient city of Bagan were damaged and four people were reported dead (https://en.wikipedia.org/wiki/August_2016_Myanmar_earthquake). Although Nyaung U area was under earthquake affected zone, there was no effect on livelihood of farmers in Nyaung U. There was no scientific evident on effect of earthquake, most of the farmers reported that the crop yield will be decreased after earthquake.

Table 4.20 Type of shocks faced by respondents in selected townships during 2015, 2016 April and November

Type of shocks	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
Drought	77	100	56.25	25	50	18.75	38	-	6.25
Economic shock	6	-	6.25	6	-	31.25	6	-	43.75
Personalshock	12	6	-	13	6	-	13	-	-
Labor scarcity	-	-	18.75	6	-	31.25	-	-	31.25
Pest and disease	-	-	6.25	6	-	-	-	-	-
Flood	6	-	-	-	-	-	-	-	-
Windy	29	-	-	-	-	-	-	-	6.25
Heavy rain	-	-	100	-	-	100	-	-	100
Earthquake	-	-	-	-	-	62.5	-	-	6.25

Table 4.21 Impacts of shocks on respondents in selected townships during 2015, 2016 April and November

Impact of shock	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
Major	18	71	12.5	38	-	62.5	6	-	56.25
Minor	6	12	-	13	44	6.25	44	-	12.5
Undecided	76	17	-	49	56		50	-	6.25

Table 4.22 Responses to shocks by respondents in selected townships during 2015

Responses to shocks	Percent of respondents		
	Tatkon (n=17)	Nyaung U (n=16)	Meiktila (n=16)
Selling cattle to re-cultivate crop	-	-	6
Re-cultivate	29	13	-
Lending water pump	-	6	-
Selling valuables	6	-	-
Pawning valuables	24	-	-
Lending bullock cart	6	-	-
Pumping water	6	-	-
Total	71	19	6

4.2.4 Association involved by respondents in selected townships during 2015 and 2016

All respondents involved in formal association and informal association. Formal associations are village administrative, United Nations Development Program (UNDP) (PACT Myanmar), Action- Aid, United States Agency for International Development (USAID) (ShaeThot), Dahat Pan Project (ACIAR), Community Driven project under the loan of World Bank, etc. Informal associations are social welfare, village electricity committee, cooking group, youth association, etc. Figure 4.6 presents types of associations involved by respondents in selected townships during 2015 and 2016 (April) and 2016 (November).

In Tatkon Township, 47% and 35% of the respondents participated in formal organizations while 47% and 24% of the respondents involved in informal organizations in 2015 and 2016 (April).

> *"I belong to social cooking group and it has 7 members. We have been meeting during social occasion of joy or grief (55 year old, male farmer, Tatkon Township)".*

In Nyaung U Township, 31% and 50% of the respondents involved in formal associations while 44% and 38% of the respondents involved in informal associations in 2015 and 2016.

> *"I belong to informal village administrative bodies that are mostly elder persons in the village, 5 members, and meet 1 time in a month. Religion committee, 10 members, meets 1 time in a week within the period of Buddhist lent (56 year old, male farmer, Nyaung U Township)".*

In Meiktila Township, 100% and 94% of the respondents involved in formal organizations while 25% and 9% of the respondents involved in informal organizations in 2015 and 2016.

> *"I belong to the Dahat Pan Project and cooperative credit society (34 year old, village chicken livestock farmer, Meiktila Township)".*

It was found that the participation in both formal and informal associations was decreasing in Tatkon and Meiktila Townships during 2015 and 2016. It is the reflection of the political situation. In Nyaung U Township the participation in formal association was increased and informal association was decreased in 2016. However, nearly 100% of the respondents from Nyaung U Township belonged to formal organizations. The formal organizations have supported infrastructures for improving their villages such as constructing connected water pipe from downtown to village for drinking water and repairing primary school.

Participation in association was decreased in all Townships in 2016 (November). Participation in formal organizations was due to re-election of village administration committee especially in Meiktila Township (25%), increasing participation of informal organization was found (43.75%). Decreased participation in both formal and informal organisations was found in Tatkon and Nuaung U Township with similar reason of re-election of village administration committee. It was also the impact of political change in 2016 (April).

4.2.5 Market access and respondents' opinion on market price of the respondent households in selected townships during 2015, 2016 April and November

Respondents sold out their crops or products within village or nearby market (Table 4.23). Nearly 100% of the respondents sold out rice within village. Other crops such as pigeon pea, black gram, tomato, maize and chicken were sold out both within village and in town.

In Tatkon Township, 65% and 6% of the respondents sold their products both in village and town in 2015 and 2016. In both years, 35% and 41% of the respondents sold out only in town in both years. In 2016, 29% of the respondents sold out their products in village. The respondents sold out their crop in village (25%) and in town (37.5%) in 2016 (November).

In Nyaung U Township, 81% and 50% of the respondents sold their products in town in 2015 and 2016. Six percent of the respondents sold out only in village in 2015 and 2016. Six percent and 13% of the respondents sold out their products in village and town. The respondents sold out their crop in village (18.75%) and in town (62.5%) in 2016 (November).

In Meiktila Township, 69% and 50% of the respondents sold out their products in town in 2015 and 2016. Twenty five percent and 6% of the respondents sold out their products in village in 2015 and 2016. Six percent and 44% of the respondents sold out their products in village and town.The respondents sold out their crop in village (25%) and in town (56.25%) in 2016 (November).

In 2015, more than 50%of the respondents from Tatkon Township sold their products in village and town. Rice was sold out in village and other crops were sold out in town. But selling their products was decreased because summer rice was not grown in 2016 because drought was more serious in this year. Most of the respondents from Nyaung U Township sold out their products in town in both years. Similar results were found in all study areas.

Respondent gave opinion of market price in selected townships during 2015 and 2016 (Table 4.24). Some respondents got satisfied price whereas some of respondents did not satisfied the price in all selected townships. Some of the respondents fair enough their crop price in all selected townships.

In Tatkon Township, satisfaction of the respondents on their crop prices was increased from 29 to 53% during 2015 and 2016.Meanwhile, the respondents' dissatisfaction were decreased from 59 to 24%.

During that time, Nyaung U respondents' satisfaction on crop price was decreasing 69 to 38% whereas Meiktila Township respondents' satisfaction on crop price was not changed (88% and 81%).

"My crops were sold to the downtown and dissatisfied prices (42 year old, male farmer, Tatkon Township)".

"Rice was sold in village and green gram, maize, black gram were sold to the downtown and dissatisfied prices (39 year old, male farmer, Tatkon Township)".

"We have no chance to negotiate the price with brokers or traders. We have to sell out with the brokers' price (32 year old, male farmer, Nyaung U Township)".

"My products were sold to the downtown and satisfied prices (47 year old, cattle livestock farmer, Meiktila Township)".

More than 80% of the respondents from Meiktila Township satisfied the price of their products. The difference from other townships was their products were livestock.It was found that the crop prices were not satified by the respondents in all study townships.

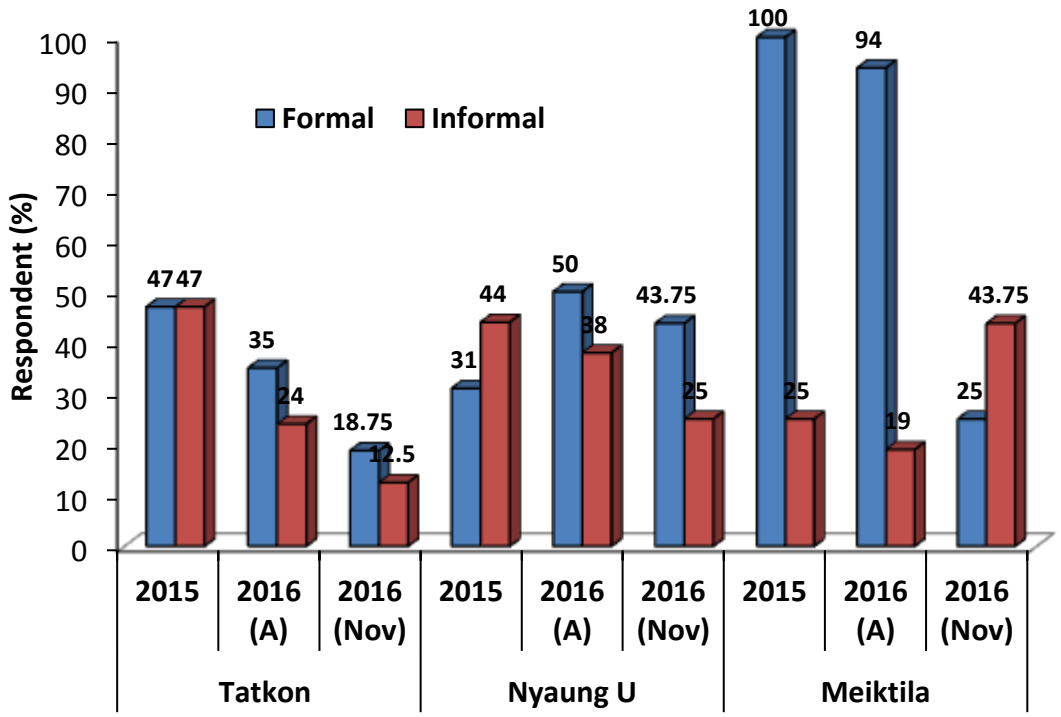

Figure 4.6 Associations involved by respondents in 2015, 2016April and November

Table 4.23 Market access in the selected townships during 2015, 2016April and November

Market (place)	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
In village	-	29	25	6	6	18.75	25	6	25
Town	35	41	37.5	81	50	62.5	69	50	56.25
Both village and town	65	6	12.5	6	13	6.25	6	44	-

Table 4.24 Respondents' opinion on market price in selected townships during 2015, 2016 April and November

Items	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
Satisfaction	29	53	6.25	69	38	12.5	88	81	6.25
Dissatisfaction	59	24	37.5	19	19	37.5	6	6	31.25
Fair enough	12	-	31.25	-	13	12.5	-	6	37.5

4.2.6 Changes of credit program in selected townships during 2015 and 2016

Changes of credit in this study were determined by changes of interest rate, loan amount and getting more opportunities for loan. Some of the respondents noticed changes of credit but some of the respondents did not know changes of credit in selected townships.

In Tatkon Township, although 24% of the respondents noticed changes in credit program in 2015, all of them did not know credit program in 2016 (Table 4.25). The respondents' awareness in Nyaung U was reduced from 69% to 94% during 2015 and 2016.

The difference condition was found in Meiktila by showing 100% unawareness to 69%.

Respondents from Tatkon Township noticed that Myanmar Agricultural Development Program, MADB's interest rate reduced in 2015. Noticing of changes decreased in 2016. There is no difference because of time limitation in 2016.

"The interest rate of MADB reduced from 1.5 kyat to 45 cent (58 year old, male farmer, Tatkon Township)".
"There was no change (34 year old, male farmer, Nyaung U Township)".
"I didn't know any changes (52 year old, small ruminant livestock farmer, Meiktila Township)".

In Tatkon Township, 6% of respondents noticed that increasing opportunities and mount of credit and 29% of the respondents noticed decreasing of interest rate in 2015.

In Nyaung U Township, 6% of the respondents noticed increasing interest rate in 2016.

In Meiktila Township, 13% and 19% of the respondents noticed that increasing amount and opportunities in 2015. Respondents knew changes of credit were 6% and 31% in Nyaung U and Meiktila Townships in 2016.

"The interest rate of MADP reduced from 1.5 kyat to 45 cent (58 year old, male farmer, Tatkon Township)".
"There was no change (34 year old, male farmer, Nyaung U Township)".
"I didn't know any changes (52 year old, small ruminant livestock farmer, Meiktila Township)".

In 2015, increasing amount and opportunities were noticed from Tatkon and Meiktila Townships. Most of the respondents from selected townships did not know changes of credit.

Table 4.25 Farmers' notices on changes of credit in selected townships during 2015, 2016 Apriland November

Opinion	Percent of respondents					
	Tatkon (n=17)		Nyaung U (n=16)		Meiktila (n=16)	
	2015	2016	2015	2016	2015	2016
Did not notice changes	76	100	69	94	100	69
Yes	24	-	31	6	-	31
-Increase amount of loan	6	-	-	-	-	13
-Increase opportunities for loan	6	-	-	-	-	19
-Increase interest rate	-	-	-	6	-	-
-Decrease interest rate	29	-	-	-	-	-

4.2.7 Migration patterns and impacts of it on respondents in selected townships during 2015, 2016 April and November

Migration was very common in Meiktila Township, 2 persons per each household migrated as cross border migration as mentioned in section 4.1. Table 4.26 presents migrations and impact of the respondents in selected township during 2015 and 2016.Twenty four percent and 53% of the respondents from Tatkon Township migrated seasonal or cross border migration. Nineteen percent and 38% of the respondents from Nyaung U Township migrated as circular migration. Eighty one percent of the respondents from Meiktila Township migrated as cross border migration.

In Tatkon Township, 69% and 38% of the respondents faced increasing and decreasing income, respectively in 2015. Fifty percent and 19% of the respondents faced increasing income and decreasing labor, respectively in 2016. In Nyaung U Township, 13% of the respondents faced increasing income and decreasing labor in 2015, but 13% of the respondents faced decreasing labor in 2016. In Meiktila Township, 6% and 12% of the respondents faced increasing income and decreasing labor, respectively in 2015. Eighteen percent, 12% and 6% of the respondents faced increasing income, decreasing labor and decreasing remittance, respectively in 2016 (April).

There were no changes in impact of migration on household in Takon and Nyaung U Townships in 2016 (November). In Meiktila Township, 37.5 and 12% of the respondents faced increasing income and decreasing labor, respectively in 2016 (November). Decreasing income was observed in Meiktila due to decreasing remittance (12%).

"There is no problem for my farm tasks but increase income due to migration. (58 year old, male farmer, Tatkon Township)".

"There is no work in village that some people go to Yangon, Nay Pyi Taw and Malaysia to work(41 year old, male farmer, Tatkon Township)".

"Income increased for my family but there is no problem for my farm tasks (34 year old, male farmer, Nyaung U Township)".

"There is no difficulty for farm tasks. But household income was increased due to remittance money (34 year old, village chicken farmer, Meiktila Township)".

Table 4.26 Migration and impacts of it on the respondent households in selected townships during 2015, 2016 April and November

Migration and its impacts	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
No. of household	24	53	6.25	19	38	6.25	81	81	62.5
-Increasing income	69	50	-	13	-	12	6	18	37.5
-Decreasing labor	38	19	-	13	13	-	12	12	12
-Decreasing remittance	-	-	12	-	-	-	-	6	12

4.2.8 Income situations of the respondent households in selected townships during 2015, 2016April and November

In Tatkon Township, 29%, 35% and 35% of the respondents faced increasing, decreasing and no changing income, respectively in 2015 in Table 4.27. In 2016 (April), 71% and 29% of the respondents faced decreasing and no changing income, respectively. The percentages of respondents reported decreasing and no changing of income were 62.5 and 25.5%, respectively in 2016 (November).

In Nyaung U Township, 56% and 31% of the respondents faced increasing and decreasing income, respectively in 2015. In 2016, 63% and 19% of the respondents faced increasing and decreasing income, respectively in 2016 (April). The percentages of respondents reported increasing, decreasing and no changing of income were 25, 43.75 and 18.25%, respectively in 2016 (November).

In Meiktila Township, 75% and 25% of the respondents faced increasing and decreasing income, respectively in 2015. In 2016, 56%, 25% and 19% of the respondents faced increasing, decreasing and no changing income in 2016. The percentages of respondents reported increasing, decreasing and no changing of income were 43.75, 31.25 and 25%, respectively in 2016 (November).

The respondents' answer of decreasing income was increased in Nyaung U and Meiktila townships and decreased in Tatkon Township in 2016 (April).

In Tatkon Township, 24%, 12%, 6%, and 6% of the respondents increased income due to agriculture, business, livestock and remittance, respectively in 2015 (Table 4.28). In Nyaung U Township, 56% and 6% of the respondents increased income due to agriculture and remittance in 2015. In 2016 (April), 50%, 6% and 6% of the respondents increased income due to agriculture, business and services, respectively. The increasing income was mainly due to agricultural production in 2016 (November).

In Meiktila Township, 44%, 31% and 31% of the respondents increased income due to remittance, agriculture and livestock, respectively in 2015. In 2016, 44% and 31% of the respondents increased income due to remittance and agriculture, respectively in 2016. Increasing income was due to increasing remittance (37.5%) in 2016 (November).

In Tatkon and Nyaung U Townships, respondents mainly increased income due to agriculture (higher crop prices) but Meiktila Township's increased due to remittance money.

"Income decrease due to agriculture that we cannot grow summer rice because there is no water for cultivation. (58 year old, male farmer, Tatkon Township)".

"Income decreased because remittance was not sent (52 year old, cattle livestock farmer, Meiktila Township)".

"Income increased due to agriculture that crop increased yield (32 year old, male farmer, Nyaung U Township)".

The respondents from Tatkon Township indicated that income was decreasing due to low price of agricultural products 29% and 6% each of low income from remittance, low wages and business, respectively in 2015 (Table 4.29) In 2016, decreasing income was mainly due to agriculture 71%. More or less 30% of the respondents had stable income in 2015 and 2016 (April). However, in 2016 (November), decreasing income was due to agriculture (50%) of respondents (Table 4.29).

In Nyaung U Township, income was decreased because of low income in livestock rising (19%) and low remittance from their migrant family member (6%) in 2015, whereas in 2016, filature in agricultural production (18%) was the main reason for low income of the respondents. Similar reason was observed in 2016 (November).

In Meiktila Township, 25% of the respondents decreased income due to agriculture in 2015. In 2016, 19% and 6% of the respondents decreased income due to remittance and livestock in 2016. Nineteen percent of the respondents were no changing income in 2016. Similar trend was found in 2016 (November).

In 2016, Tatkon and Nyaung U Townships, respondents decreased income due to agriculture (crop's price fluctuation and bad weather) but Meiktila Township decreased income due to remittance (remittance money was not sent). Most of the respondents agreed that loss of income was the major impact of climate change in their socio-economic condition in selected townships especially effect of Elnino.

Table 4.27 Income situations of the respondent households in selected townships during 2015, 2016 April and November

Income	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
-Increasing	30	-	-	56	63	25	75	56	43.75
-Decreasing	35	71	62.5	31	19	43.75	25	25	31.25
-No changing	35	29	25	-	-	18.75	-	19	25
-Undecided	-	-	12	13	18	6.25	-	-	-

Table 4.28 Reasons of income increasing in selected townships during 2015,2016April and November

Reason (Increasing income)	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
-Agriculture	24	-	12.5	56	50	43.75	31	31	18.75
-Livestock raising	6	-	0	-	-	0	31	-	
-Remittance from migrant labor	6	-	0	6	-	0	44	44	37.5
-Labor wages	-	-	6.25	-	-	12.5	-	-	
-Business	12	-		-	6		-	-	
-Service(Public and private sector)	-	-		-	6		-	-	

Table 4.29 Reasons of income decreasing in selected townships during 2015, 2016April and November

Reason (Decreasing income)	Percent of respondents								
	Tatkon (n=17)			Nyaung U (n=16)			Meiktila (n=16)		
	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)	2015	2016 (A)	2016 (N)
-Agriculture (low crop price)	29	71	50	-	13	18.75	25	-	31.25
-Livestock raising	-	-	-	6	-	-	-	6	12.5
-Remittance from migrant labor	6	-	-	19	-	-	-	19	-
-Labor wages	6	-	-	-	-	-	-	-	-
-Business income	6	-	-	-	-	-	-	-	-

4.3 Perception of Respondents on Intervention

4.3.1 Intervention of increasing productivity of legume-based farming systems in the central dry zone of Burma (Project ID SMCN/2011/047)

The project induced the planter (seeder) to the pulses growers through Department of Agricultural Research Stations (Tatkon, Nyaung U, Magway and Zaloat). Purposes of the introduction of planter in these areas were to introduce mechanized practices to reduce labour requirements and to allow improvement in productivity through longer sowing windows, better fertilizer placement and improved rhizobia survival (when it is used).

The farmers from Tatkon Township reported that using planter can save labour, seed and time and it is useful with some modification. They thought that seed containers block the view of operator, planting depth is shallow and seed drill is clogged with soil. Moreover, the tyre wheel is inconvenient during driving and lug wheel is better for driving.

The farmers from Nyaung U reported thatusing planter can save labour, seed and time and it is useful with some modification. Moreover, the tyre wheel is inconvenient during driving and lug wheel is better for driving. The farmers thought that difficult for getting spare parts, difficult for moving machine from farm to farm (no farm road, large farm size) will be the main problems in using planter at farmers' level. Farmers' perception on planter is better in Nyaung U because of large farm size, large plot size and previous contact with DAR.

4.3.2 Intervention of improving livelihoods of small-scale livestock producers in the central dry zone through research on animal production and health in Myanmar

ACIAR project AH/2011/054 were established to take responsibility for cattle, small ruminants, village poultry and forage research, the project - "Dahat Pan," which is a flower native to the central dry zone of Burma. Three village sites were selected for Dahat Pan Research activities. Township data on households, land and livestock ownership was used in a cluster analysis to identify 3 villages as project sites: KyaukAoe in Meikhtila township (cattle, small ruminants and village poultry); and YaThar (cattle and small ruminants only) and Hpet Yin (village poultry only) in Myingyan township. These sites will be used for monitoring animal health and production, testing interventions, and conducting capacity building. Informal local steering committees have been established for each of these sites. Stakeholders include the Township Supporting Committee (TSC), the Township Administration, the Myanmar Livestock Federation and any other local interest groups.

A total of 157 cattle and 223 sheep and goats have been enrolled at KyaukAoe. Animal health and body condition score is being monitored monthly, and livestock are weighed every second month. The Dahat Pan project uses a participatory research approach (PRA) to explore management of livestock and to identify constrains to livestock health and production.

There have been some significant findings from the research in 2015-16:

With chickens, coop design and feeding, as well as Newcastle disease vaccination have improved survival. The Myanmar Livestock Federation has been involved in semi-commercial coop and feed production and distribution.

With forages, a number of grasses and tree legumes have been identified as the best options for farmers to use. Grass yields are earlier after the first rain and last longer than traditional forage sorghum. Some farmers are growing forage grass to distribute. A seed production capacity is being undertaken at UVS and semi-commercially.

With small ruminants, supplementary feeding and better pen design and husbandry has improved survival and growth of kids. Strategic drenching for worms associated with records of faecal egg counts have also improved the situation.

With cattle, supplementary feeding markedly improved the growth of calves. Body condition score of cows was low and so was reproductive rate which would be improved by weaning

and better feeding (http://aciar.gov.au/project/ah/2011/054).

The farmer reference group research team finds out the farmers' perception on intervention of Dahapan Project at KyaukAoe Village. The following are the perception of respondents on the interventions.

The small ruminants

The villagers were invited to participate in Dahapan project and they interested in project to participate, however, most of the villagers don't understand the objectives of the project very clearly. Therefore, villagers don't know why animals are weighted or what the intervention is for. They said the new goat breeds are needed for their livestock farming.

Village Chickens

The villagers interested in participating in project. They said that researchers gave vaccination but chicken owners don't know why. They requested vaccination for their chicken.

Cattle

The villagers were initiated to participate and interested in project, watching peer group what they are doing. However, they don't know about the purpose of the intervention. Selling cattle increased income. The livestock farmers requested vaccination for cattle, training for livestock production and breed.

Forage

The livestock owners are interested in feed because of feed shortage during dry season, and aware in advantage of sowing forage. Therefore, they need more forage seed.

CHAPTER V

SUMMARY AND CONCLUSION

5.1 Summary of Findings and Conclusion

In the selected townships, educational level of respondents was monastery education to middle school level. Major source of household's income in Tatkon was agriculture and that of Nyaung U was services salaries and agriculture. However, source of income from Meiktila was remittance from migration. Farmers in all selected areas could not cultivate their all own land due to unavailability of water and scarcity of labor. Migration was high in Meiktila Township as cross border migration.

Government extension services were the least pointed out by farmers as their source of agricultural information in selected townships. Farmers to farmers extension method were very common to disseminate agricultural information among farmers in selected townships. The decision making behavior related to farming was largely dependent on other farmers' advice.

Internal drivers (other farmers) mainly influenced adoption of technologies and external drivers (NGOs, INGOs) mainly involved in coping climate change. Significant changes were found in community and household level in selected townships. Major impact of shock(s) was found in 2016 due to drought. Drought was the serious environmental changes in the selected areas and impacted on the livelihood of the rural people. It also changed the community level in the selected areas. Respondents from three selected townships responded shocks by re-cultivating next crops, selling valuables, pawning valuables things, lending bullock cart to get water and pumping water in 2015. Major source of income for household was agriculture in Tatkon and Nyaung U; however, major source of annual income from Meiktila was remittance from migrant family labor. Because of migration, household income was increased in selected townships. In 2016, circular migration was increasing because they could not grow any crops due to drought and went to the nearby cities for jobs. Labor scarcity problem was serious in 2015, however, not serious in 2016 because no crop was grown due to drought. The impacts of climate change on rural community were serious as the impacts were directly related to livelihoods of rural people; most importantly the impacts have been seen in agriculture and increase for migration.

Climate change is expected to cause an increase in natural hazards such as floods (heavy rain) and drought in study areas. Significant changes at individual, household and community levels of the farmers by adverse weather conditions during study period were found in selected townships. These impacts are more severe at the individual and household levels where livelihoods of the farmers in the study areas are relied on agricultural production. It leads to decrease in crop yield and livestock disease and death consequently decreased in family income. Changes on environmental factor effect on access of extension services and advice at individual level (social capital), migration pattern and income situations (financial capital**)** of respondents at household level. However, positive impact was found in social activities at community level(social and physical capitals). The farmers in study areas are adapting livelihoods to climate change at a small scale by adjusting their livelihood assets and activities to maintain the ability to make a living under the impacts of climate change.

5.2 Policy Implications

According to the results, agriculture sector was influenced by the impacts of climate change. The impacts of climate change on livelihoods of rural people in selected townships need a multiple approach to tackle issues. Therefore, climate smart or more improved technology; suitable varieties and trainings for farmers are recommended to combat the risk associated due to climate change.

Farmer field schools represent an effective mechanism for group training that can reach thousands of small-scale farmers with knowledge and technical content that each can adapt to their own unique circumstances. Beyond this, these processes empower farmers, both individually and collectively, to more effectively participate in the processes of agricultural development. Farmers Field School approach is suitable for dissemination of technology among farmers. Formal farmer organizations are needed to establish for developing empowerment of farmers for market access, bargaining power and collective activities in community development affairs.

For Meiktila Township, strengthening government extension services (both agriculture and livestock) are urgently needed to disseminate improved agricultural technologies. For Tatkon Township, government should provide infrastructures for water harvesting to overcome environmental changes especially during the dry season.

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APPENDICES

Appendix 1 Interview Schedule, 2015

Note: All questions framed for initial interview – questions about the past are framed 'in the last 12 months'; subsequent interviews will be 'in last 6 months'.

1. ***In the last 12 months what significant changes have occurred in your life?***

PROBE ... change occurring at individual, household, community levels

2. ***(a) In the last 12 months, has any extension advice [new agricultural/ livestock/fishery knowledge/ technologies] been offered to you?***

If yes PROBE ... details of the source and the outcomes - Government/ Private Sector (*Input seller/ Output Buyer/ Agri-processor*)/ Non-profit (*NGO*)/ Other farmers

(b) In the last 12 months, have you sought out extension advice?

If yes PROBE ... details of the source and the outcomes Government/ Private Sector (*Input seller/ Output Buyer/ Agri-processor*)/ Non-profit (*NGO*)/ Other farmers

(c) In the last 12 months, did you give extension advice to other farmers?

If yes, PROBE ... nature of extension advice, types of farmers involved, and outcomes

3. ***What groups/assocations do you belong to?***

PROMPT ... *Possible group types - Village committee; Red Cross Fruits flowers and vegetable association; Rice traders' association; Revolving credit; Burial society; Volunteer social affairs; External donor project groups- eg village chicken*

PROBE ... Role, How many members, How long a member, How often meet, Achievements of the group, Benefits to respondent

4. ***(a) In the last 12 months, has your household experienced any shocks (threats or constraints)?***

PROMPT ... *Different types of shocks eg environmental (flooding, drought etc); adverse health event; economic (price) shocks etc*

PROBE ... Level of shock impact – major or minor

PROBE ... Have many other households in your village faced the same shock(s)?

(b) How did your household respond to the shock(s)?

Allow a response,

PROMPT ... coping and adaptive strategies, eg.borrowing money, pawning valuables, relying

on neighbours/relatives for short term loan, seasonal work, migration/remittances

(c) If the household did not experience a shock, derive a hypothetical question. If [name of shock] happened, what would you do?

5. ***In last 12 months, what has been your experience in marketing and selling your products?***

PROBES ….What farm produce did you sell? How did you sell/market your farm produce? Were you satisfied with the market price you received for your products?

6. ***Refer to survey result to see if household uses credit. If so, ask: In last 12 months, have you experienced any changes in accessing credit?***

PROBES …. Lending organisation/ interest rate / opportunities for accessing credit / amounts

7. ***If household member(s) migrated (refer to survey result), what has been the impact on the household?***

PROBES….. Labour issue (change in gender role), income (remittance expenditure)

8. ***In the last 12 months (during 2015), has there been any changes in your household sources of income, compared with the previous 12 months (2014)?***

PROBES….. What kind of source of income? Increased or decreased? Why?

Appendix 2 Interview Schedule, 2016

Note: All questions framed for initial interview – questions about the past are framed 'in the last 6 months.

1. ***In the last 6 months what significant changes have occurred in your life?***

PROBE ... change occurring at individual, household, community levels

2. ***(a)In the last 6 months, has any extension advice [new agricultural/livestock/fishery knowledge/ technologies] been offered to you?***

If yes PROBE ... details of the source and the outcomes - Government/ Private Sector (*Input seller/ Output Buyer/ Agri-processor*)/ Non-profit (*NGO*)/ Other farmers

(b) In the last 6 months, have you sought out extension advice?

If yes PROBE ... details of the source and the outcomes Government/ Private Sector (*Input seller/ Output Buyer/ Agri-processor*)/ Non-profit (*NGO*)/ Other farmers

(c) In the last 6 months, did you give extension advice to other farmers?

If yes, PROBE ... nature of extension advice, types of farmers involved, and outcomes

3. ***What groups/assocations do you belong to?***

PROMPT ... *Possible group types - Village committee; Red Cross Fruits flowers and vegetable association; Rice traders' association; Revolving credit; Burial society; Volunteer social affairs; External donor project groups- eg village chicken*

PROBE ... Role, How many members, How long a member, How often meet, Achievements of the group, Benefits to respondent

4. ***(a) In the last 6 months, has your household experienced any shocks (threats or constraints)?***

PROMPT ... *Different types of shocks eg environmental (flooding, drought etc); adverse health event; economic (price) shocks etc*

PROBE ... Level of shock impact – major or minor

PROBE ... Have many other households in your village faced the same shock(s)?

(b) How did your household respond to the shock(s)?

Allow a response,

PROMPT .coping and adaptive strategies, eg. borrowing money, pawning valuables, relying on neighbours/relatives for short term loan, seasonal work, migration/remittances

(c) If the household did not experience a shock, derive a hypothetical question. If [name of shock] happened, what would you do?

5. ***In last 6 months, what has been your experience in marketing and selling your products?***

PROBES ….What farm produce did you sell? How did you sell/market your farm produce? Were you satisfied with the market price you received for your products?

6. ***Refer to survey result to see if household uses credit. If so, ask: In last 6 months, have you experienced any changes in accessing credit?***

PROBES …. Lending organisation/ interest rate / opportunities for accessing credit / amounts

7. ***If household member(s) migrated (refer to survey result), what has been the impact on the household?***

PROBES….. Labour issue (change in gender role), income (remittance expenditure)

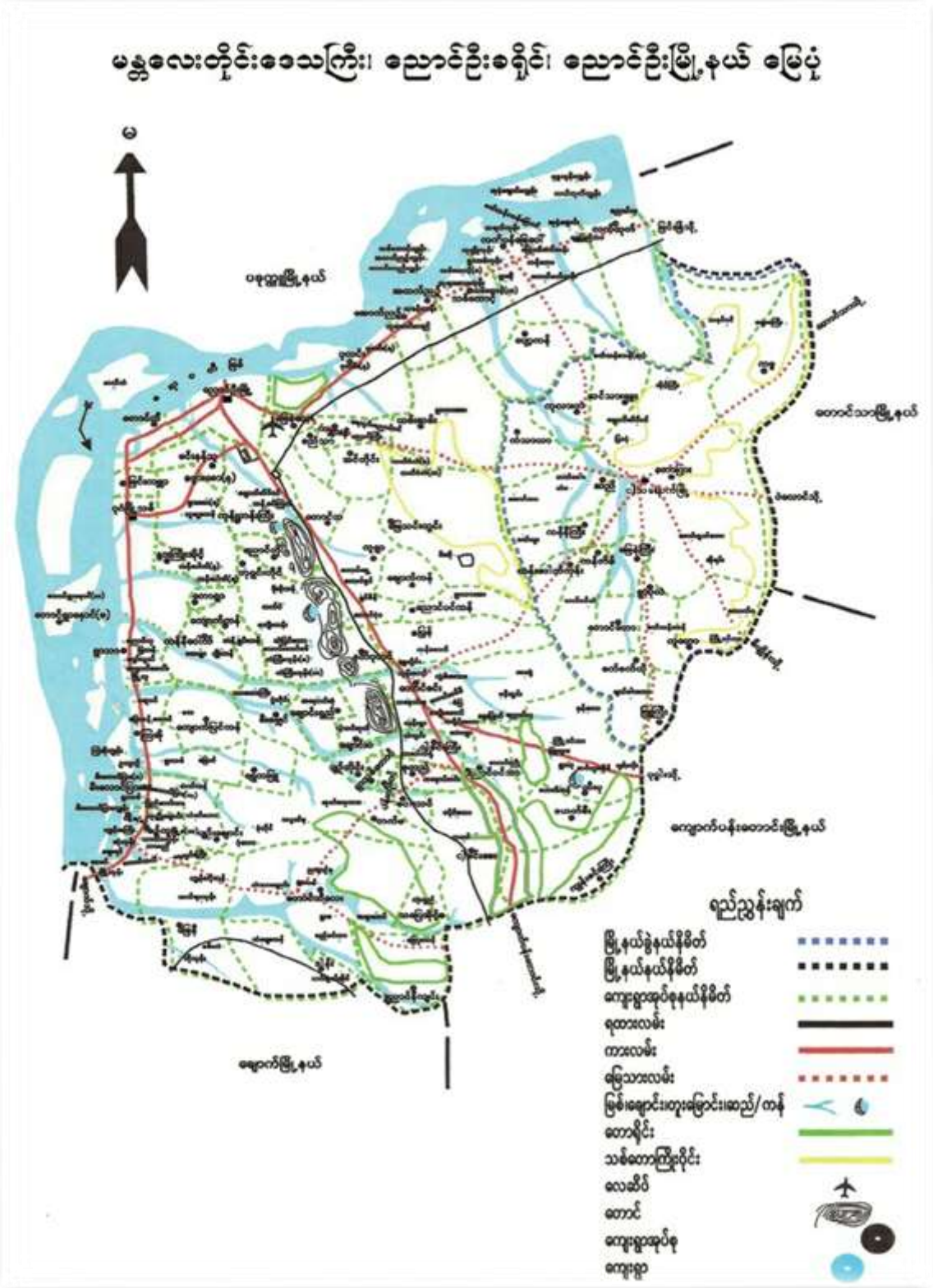
8. ***In the last 6 months (during 2015), has there been any changes in your household sources of income, compared with the previous 12 months (2014)?***

PROBES….. What kind of source of income? Increased or decreased? Why?

Appendix 3 Map of Tatkon Township

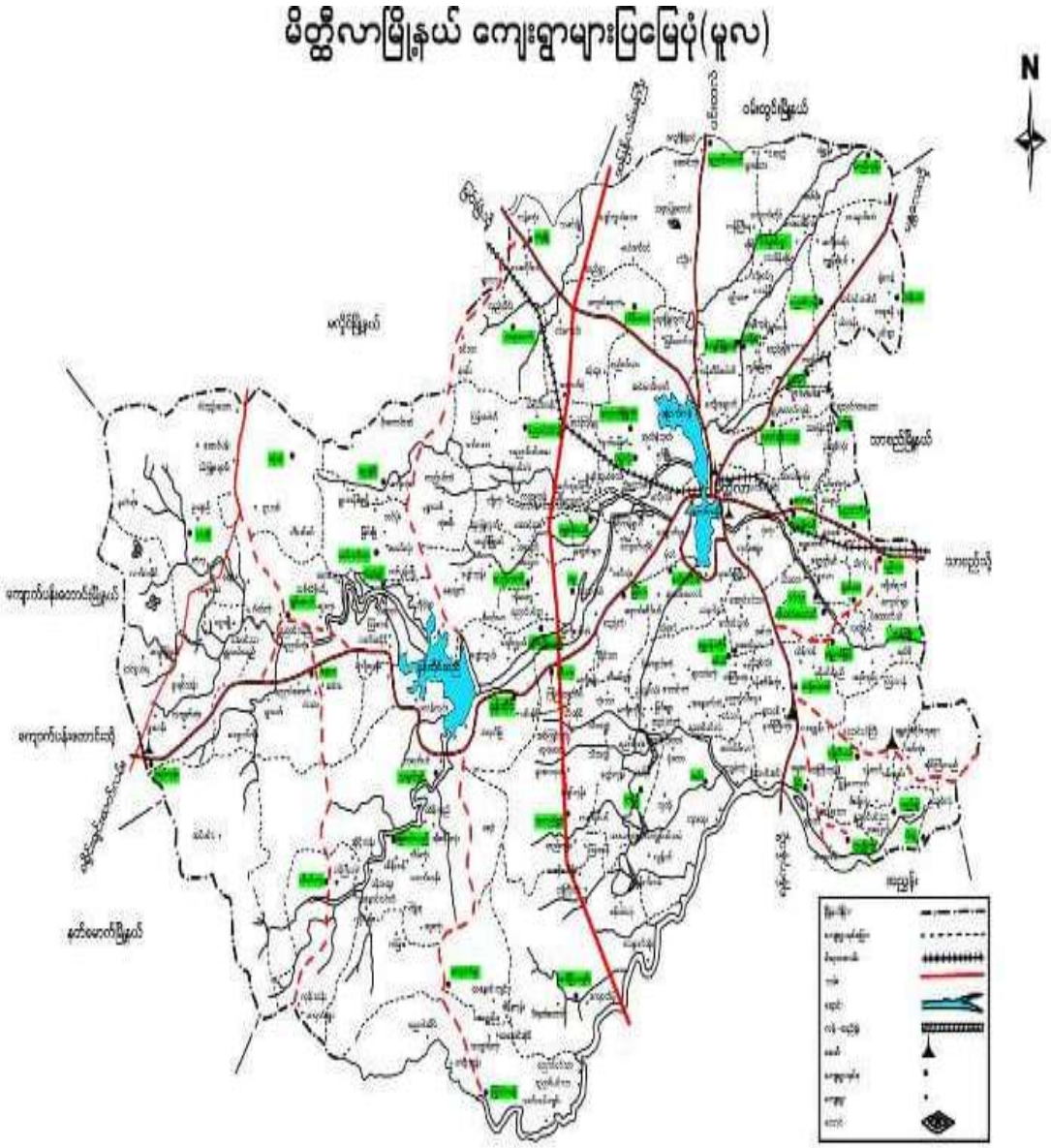
Source: DoA, 2016

Appendix 4 Map of Nyaung U Township



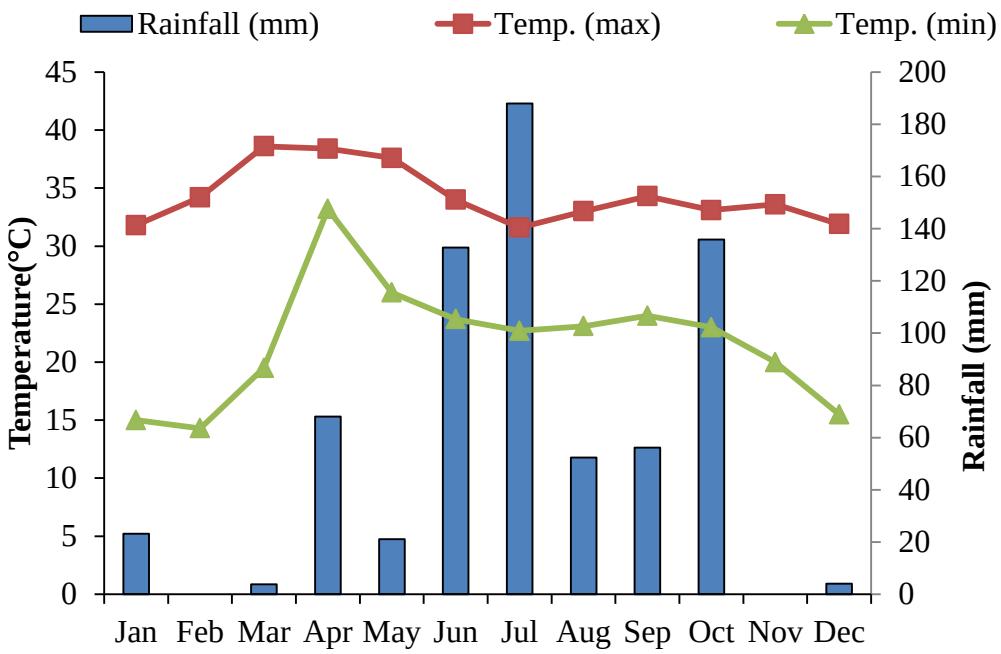
Source: DoA, 2016

Appendix 5 Map of Meiktila Township



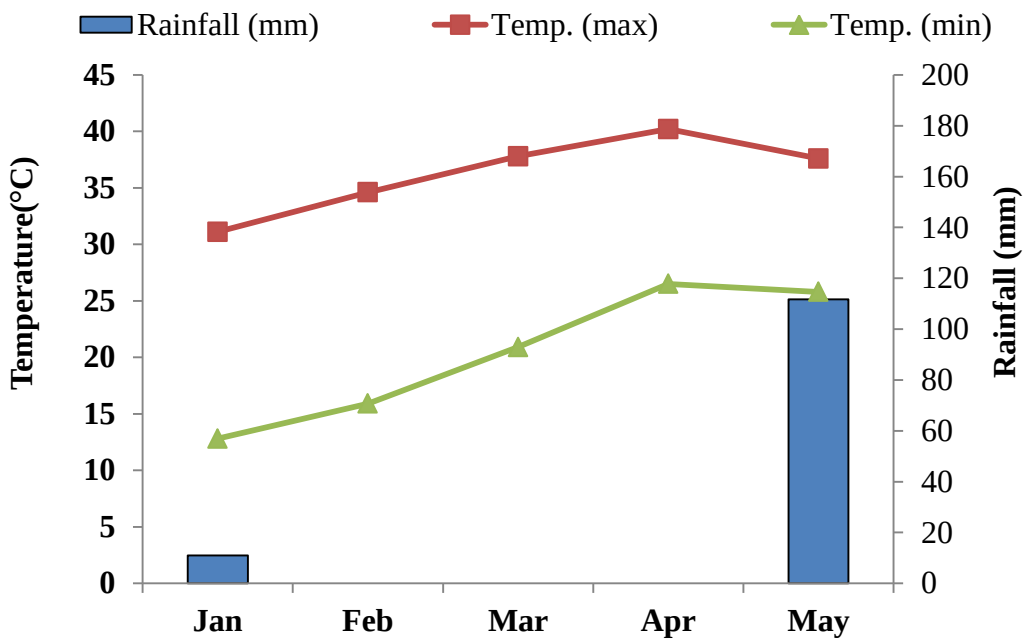
Source: DoA, 2016

Appendix 6 Monthly weather data from Tatkon Township in 2015



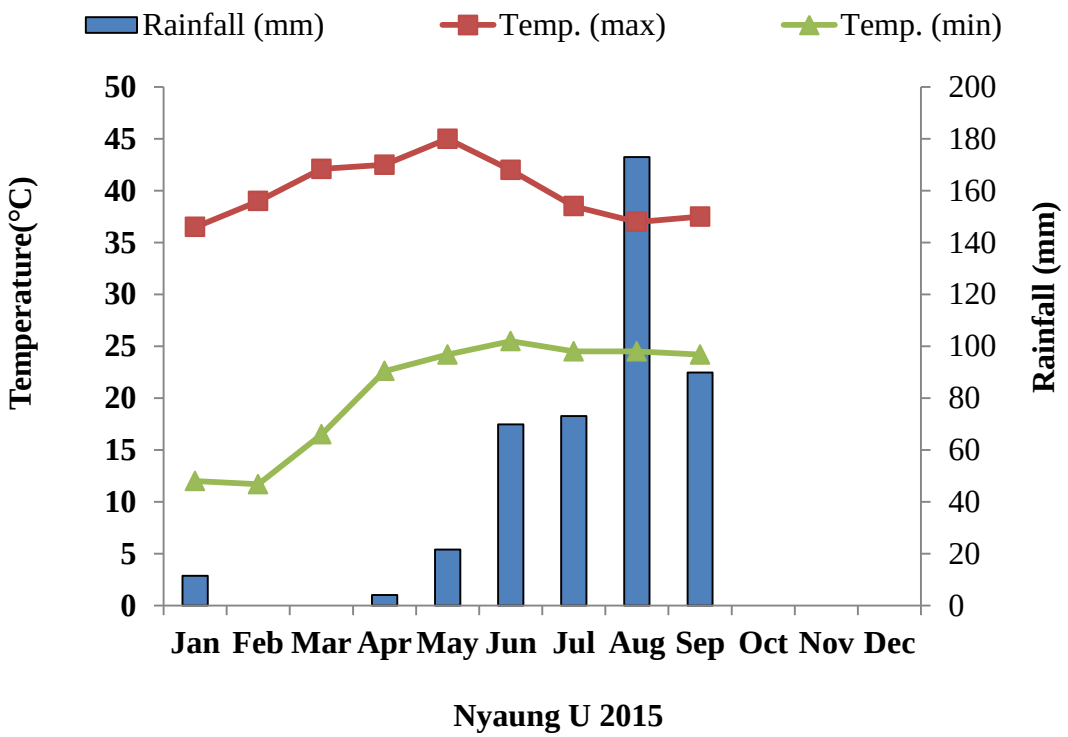
Tatkon 2015

Appendix 7 Monthly weather data from Tatkon Township in 2016

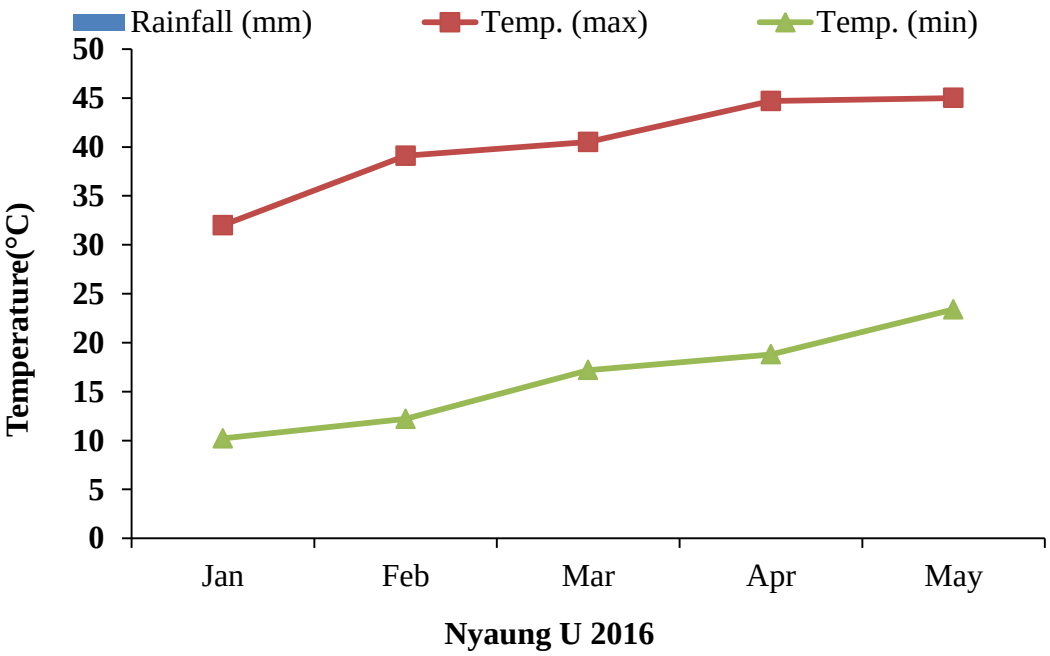


Tatkon 2016

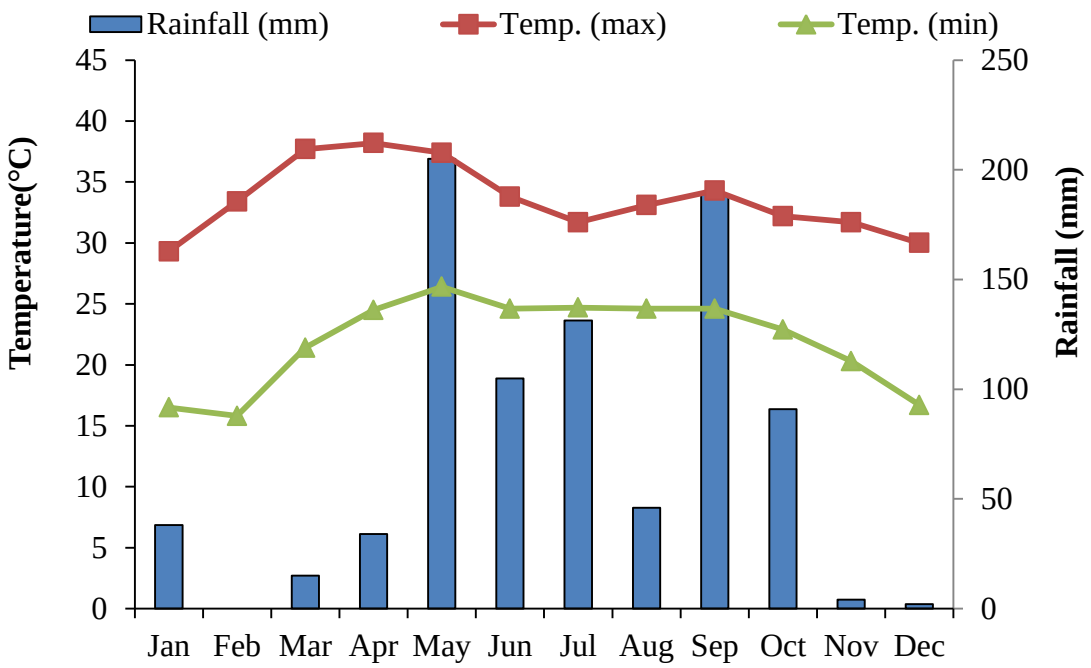
Appendix 8 Monthly weather data from Nyaung U Township in 2015



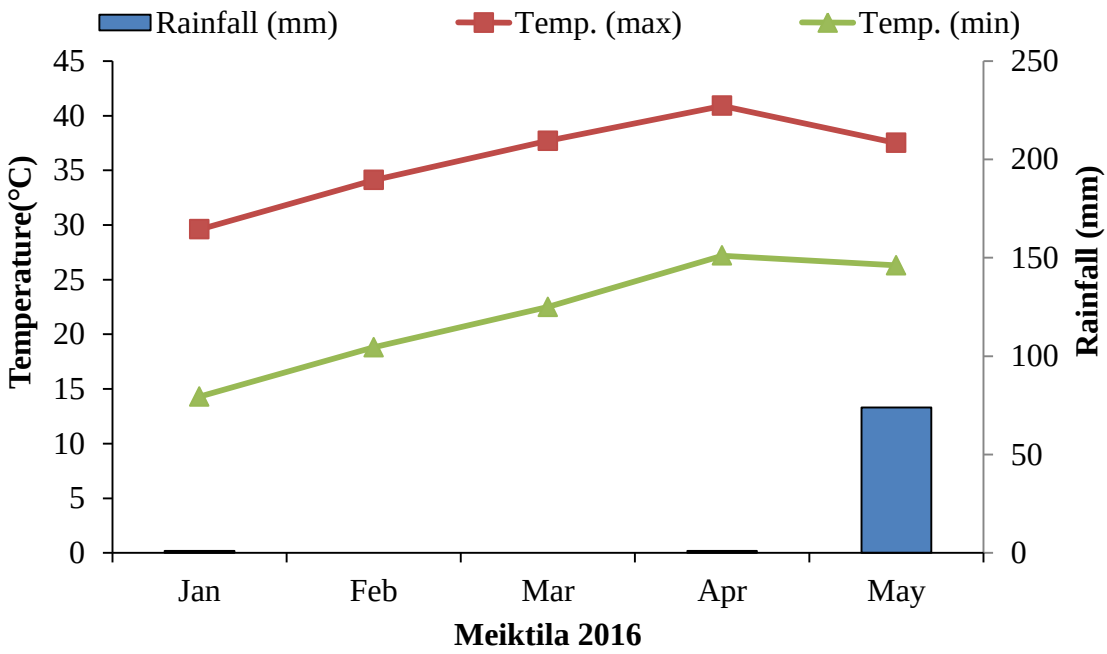
Appendix 9 Monthly weather data from Nyaung U Township in 2016



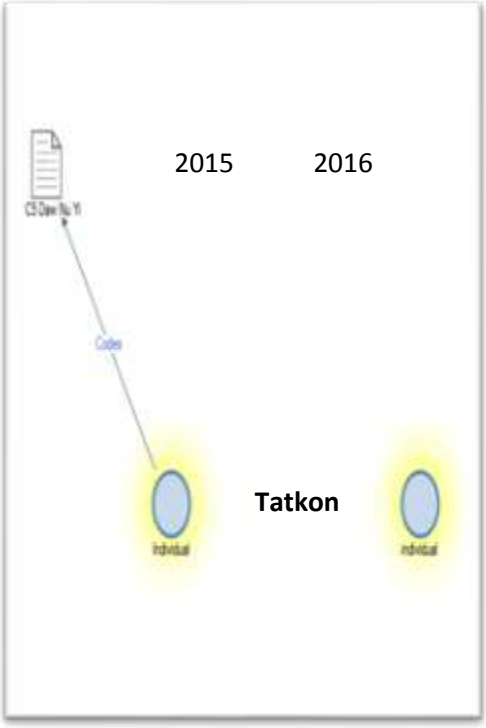
Appendix 10 Monthly weather data from Meiktila Township in 2015

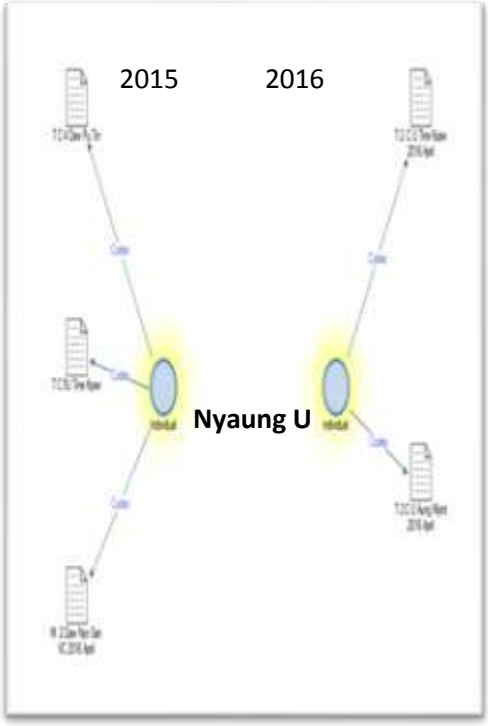


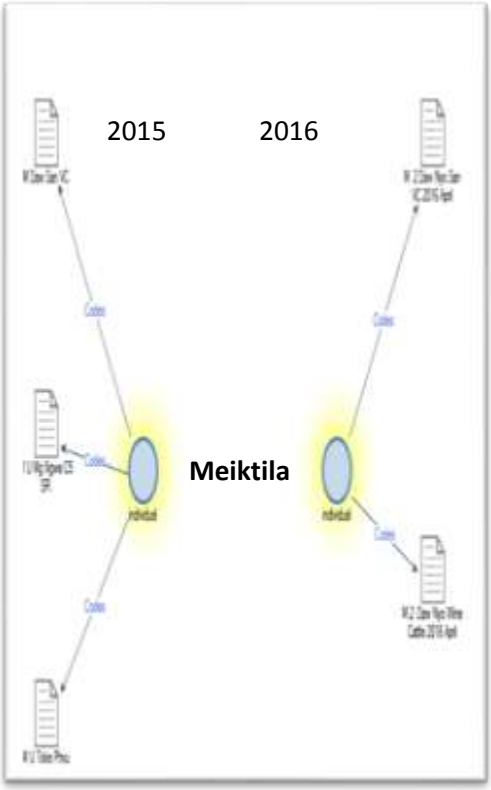
Appendix 11 Monthly weather data from Meiktila Township in 2016



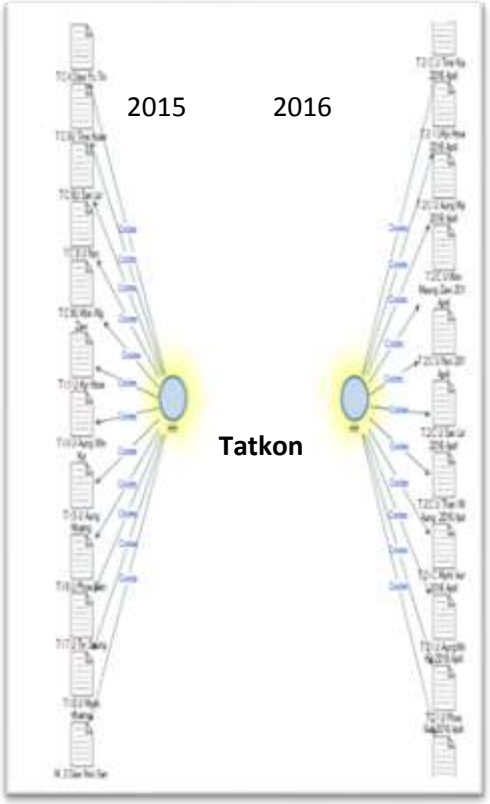
Appendix 12 Individual changes encountered by respondents in selected townships during 2015 and 2016

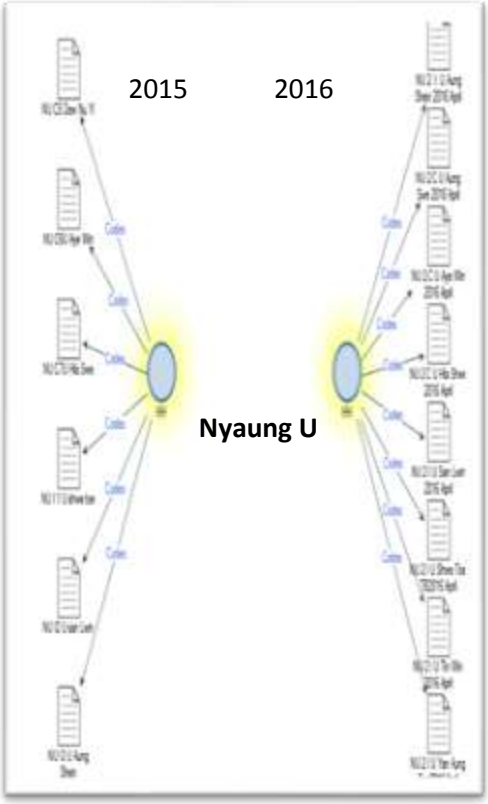


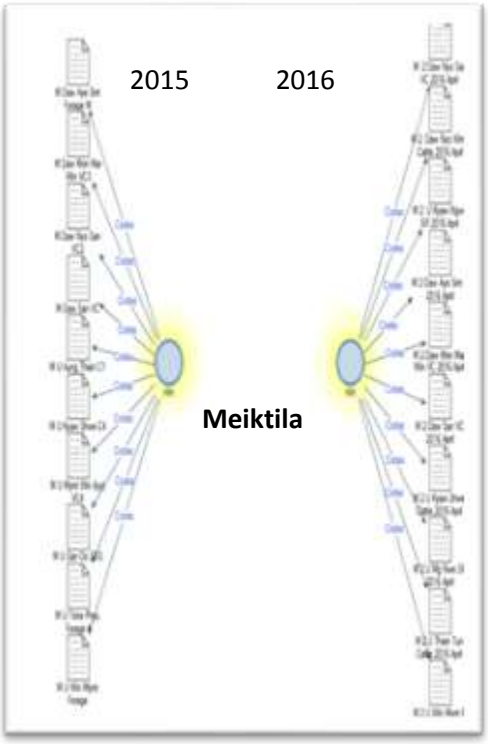




Appendix 13 Household changes encountered by respondents in selected townships during 2015 and 2016







Appendix 14 Herb ofsmall ruminant at KyaukAoe Village, Meiktila Township

Appendix 15 New houses were built with remittance at KyaukAoe, Meiktila Township

Appendix 16 Consent form for Participants

Farmer Reference Group Research Project

Participant's Name:	Please Circle
Have you read (or had the researcher read to you) the information contained in the *Information Sheetfor Participants*, and any questions you have asked have been answered to your satisfaction?	Yes No
Do you agree to participate in this activity, realizing that you may withdraw at any time?	Yes No
Do you agree that research data gathered for the study may be published using a pseudonym?	Yes No
Do you agree that you may be quoted using a pseudonym?	Yes No
Do you agree that the interview is recorded?	Yes No
Are you older than18 years of age?	Yes No

…….. …….

Participant Date

…….. …….

Researcher Date

Appendix 17 Information sheet

Dr Julian Prior, Project Leader
School of Environment and Rural Science
University of New England
Armidale NSW 2351 Australia

Phone 61 2 6773 2078

Fax 61 2 6773 2527
jprior2@une.edu.au

INFORMATION SHEET

For Farmer Reference Group

Staff involved with this research:

Dr Julian Prior (Project leader UNE), DrTheingiMyint (Project Coordinator YAU), Dr Michelle Carnegie (Research Fellow UNE), DrNyeinNyeinHtwe (Associate Professor YAU), Ms Tin May Yu (Assistant Lecturer, YAU) and MrSoePaingOo (Assistant Lecturer, YAU).

We wish to invite you to participate in our research project, described below.

Project contact: If you have any questions, you can discuss them with the Project Coordinator as per the contact details below.

Dr TheingiMyint
Yezin Agricultural University
Email: theingi.myint@gmail.com
Tel: 250 108681

Research Project	**Farmer Reference Group Research**
Aim of the research	The aim of the research is to understand how farmers make livelihood decisions in the context of rural change, for example, seasonal climatic change, migration patterns, and changing market prices.
Interview	We would like to conduct a face-to-face interview with you at a time and place convenient to you. The interview will take approximately one hour. With your permission, we will make a recording of the interview to ensure accuracy is maintained.
Confidentiality	Any information or personal details gathered in the course of the study will remain confidential. No individual will be identified by name in any publication of the results. All names will be replaced by pseudonyms; this will ensure that you are not identifiable. If you agree we would like to quote some of your responses. This will also be done in a way to ensure that you are not identifiable.
Participation is Voluntary	Your involvement in this study is voluntary and you have a right to withdraw from the study at any time. You may discontinue the interview at any time without consequence and you do not need to provide any explanation if you decide not to participate or withdraw at any time.
Questions	We will ask you a series of questions about your livelihood and how it has been changing over time. The interview questions will not be of a sensitive nature: rather they are general, aiming to enable you to enhance our knowledge about farmer livelihoods and how farmers respond to change.
Use of information	We will use information from the interview to feed back to government decision makers about how to improve extension services for farmers. The information will be compiled into a final report and may be presented at workshops, conferences or published in academic journals. At all times, we will safeguard your identity by presenting the information in a way that will not allow you to be identified. Pseudonyms will be used in instances where participants' responses are directly quoted.
Upsetting issues	It is unlikely that this research will raise any personal or upsetting issues.
Storage of information	We will keep hardcopy transcriptions and notes of the interview in a locked cabinet at Yezin Agricultural University. Any electronic data will be kept on password-protected computers in the control of the researchers

at UNE and YAU. Only the research team will have access to the data.

Disposal of information

All the data collected in this research will be kept for a minimum of five years, after which it will be disposed of by deleting relevant computer files, and destroying or shredding hardcopy materials.

Approval

This project has been approved by the:

Human Research Ethics Committee of the University of New England

Approval No Valid to:

Contact details of YAU researchers

Researcher	Dr	NyeinNyein	Htwe	htwe1971@gmail.com	95 942017847
Researcher	Ms	Tin May Yu	Aung	tinmayyuaung@gmail.com	95 942078028
Researcher	Mr	So Paing	Oo	sopaingo@gmail.com	95 979771183

Complaints

Should you have any complaints concerning the manner in which this research is conducted, please contact:

Dr Cho Cho San
Professor
Agricultural Economic Department
Yezin Agricultural University
Email: chosanyau2009@gmail.com
Tel: 4207 09067

Dr Cho Cho San will then contact:

Mrs Jo-Ann Sozou
Research Ethics Officer
Research Services, University of New England, Armidale, NSW 2351
Tel: +61 2 6773 3449 Fax: +61 2 6773 3543 Email: ethics@une.edu.au

Thank you for considering this request.

Regards,

TheingiMyint, Project Coordinator

Photos are books which have been published by YAU_ACIAR_ Strengthening Institutional Capacity, Extension Services and Rural Livelihoods in the Central Dry Zone and Ayeyarwaddy Delta Region of Myanmar (ASEM-2011-043)

Arranged by Dr. Theingi Myint, Coordinator, Professor of Agricultural Economics, Yezin Agricultural University