COMPARISON OF RURAL LIVELIHOODS AND INCOME FUNCTIONS BETWEEN LASHIO TOWNSHIP AND YAMETHIN TOWNSHIP, MYANMAR

THAZIN NWE

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A THESIS SUBMITTED TO THE POST-GRADUATE COMMITTEE OF THE YEZIN AGRICULTURAL UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF AGRICULTURAL SCIENCE (AGRICULTURAL ECONOMICS)

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DECLARATION OF ORIGINALITY

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

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DEDICATED TO MY BELOVED PARENTS

U OHN LWIN AND DAW KHIN PYONE

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ABSTRACT

The study emphasized on the hilly region (Northern Shan State) and the central dry zone of Myanmar for the analysis of rural livelihoods. Lashio and Yamethin Townships were selected as the representative study areas of Northern Shan State and the central dry zone respectively. Fifty sample respondents from two villages with equal numbers of 25 were selected from each township. The objectives of the study were to observe the existing socioeconomic conditions of sample farmers, to compare household income which can contribute rural livelihoods, and to investigate the factors affecting the household income of respondent farmers in the study areas. The analytical techniques were the descriptive analysis, the cost and return analysis and the income function analysis.

According to cost and return analysis, the sample farmers received more benefit from monsoon rice production than summer rice in Lashio Township while the farmers received more profit from betel leaf production than green gram in Yamethin.

In case of household income analysis in Lashio, farm size was the major influencing factor to get more income. Monsoon rice yield and food and non-food expenditure were also influencing factors on household income. In case of Yamethin, the material cost of betel leaf production was the most influencing factor on household income. Moreover, labor cost of betel leaf production, gross margin of betel, family labor, farm size and yield of betel leaf were also influencing factors on household income. Results of the regression analysis in both townships showed that large scale holders got higher benefit than small scale farmers.

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LIST OF ABBREVIATIONS

CSO	Central Statistical Organization
DOA	Department of Agriculture
ha	Hectare
Kg	Kilogram
Ks	Kyats
MOAI	Ministry of Agriculture and Irrigation
NB	Net benefit
N	Number of respondents
TR	Total revenue
TVC	Total variable cost
TVCC	Total variable cash cost
TLC	Total labor cost
TFLC	Total family labor cost
THLC	Total hired labor cost
TMD	Total man-day
TFMD	Total family man-day

LIST OF CONVERSION FACTORS

1 Basket of Paddy	=	20.86 kilogram
1 Basket of Green gram	=	32.65 kilogram
1Hectare	=	2.47 acres
1 ton	=	1000 kg

CHAPTER I
INTRODUCTION

1.1 Background Information of Agricultural Sector in Myanmar

As Myanmar is an agricultural country, agriculture sector is the backbones of its economy. Agriculture sector contributed 32 percent of GDP, 17.5 percent of the total export earnings and employed 61.2 percent of the labor force in 2009-2010. Growth in agricultural production is necessary to increase food availability and to raise nutrition level of population. The population of the country continues to rise at a growth rate of about 1.29 percent per annum and reached 59.13 million at the end of 2010, nearly three quarters of them are living in rural areas. As the population continues to increase, more food is required to feed them and sustainable agriculture will depend largely on land resources, inputs and the efforts to use them. Presently, there were about 11.98 million hectares of net sown area in Myanmar. Expansion of new agricultural land in remaining 0.24 million hectares of fallow land and 5.61 million hectares of cultivable land was being encouraged (MOAI 2011).

Most of the agricultural land, which is about 8.07 million hectares, was currently cultivated by small-scale farmers. The average size of holdings was 2.4 hectares. Among total net sown area of 13.8 million hectares (58 percent) were held by the farm size less than 4.05 hectares (MOAI 2011). The area classified by type of land in Myanmar in 2000-2010 was shown in Table 1.1. During the last decade (2000-2010), current fallow land was decreased by about 65 percent while 22 percent of cultivable waste land and 18 percent of other wood land were also declined. The area in reserved forests and net area sown were increased about 31 percent and 21 percent, respectively (CSO 2010).

1.2 Conditions of Rural Areas in Myanmar

In most developing countries, the majority of the poor lives in rural areas. Therefore, rural development is the priority sector for the national economy.

Table 1.1 Area classified by type of land in Myanmar in 2000-2010

(Million ha)

Year	Reserved Forests	Current Fallows	Net Area Sown	Cultivable Waste Land	Other Wood Land	Other	Total Area
2000-01	12.92	0.69	9.91	7.21	19.79	17.17	67.69
2001-02	13.98	0.62	9.99	6.67	19.33	17.09	67.69
2002-03	14.18	0.58	10.09	6.52	19.25	17.06	67.69
2003-04	15.14	0.52	10.26	6.58	18.32	16.87	67.69
2004-05	15.39	0.44	10.52	6.42	18.14	16.78	67.69
2005-06	15.71	0.37	10.93	6.28	17.84	16.56	67.69
2006-07	16.47	0.30	11.38	5.97	16.99	16.57	67.69
2007-08	16.76	0.26	11.71	5.79	16.55	16.60	67.69
2008-09	16.84	0.26	11.88	5.67	16.42	16.60	67.69
2009-10	16.90	0.24	11.98	5.61	16.26	16.69	67.69

Source: CSO 2010

Ashley and Maxwell (2001) criticized that poverty reduction is the name of the game in international development. Poverty is widespread in rural areas.

The International Fund for Agricultural Development (IFAD 2001) estimated that 75 percent of the 1.2 billion people, living on less than one dollar a day, working in rural areas. Rural development has been central to the development efforts, but rural poverty persists, and the concerted effort to rethink policy is essential by both international funding agencies and developing country governments.

In Myanmar, the rural population is still above 69 percent of the total population and the majority of rural population relies on agricultural activities for earning income and food sufficiency. And then one of the three main objectives of agricultural sector, "assistance to rural development through agricultural development" reflects the important role of rural areas. The distribution of population by urban and rural in States and Regions was described in Table 1.2. There were more rural populace than urban in almost State and Region except for Yangon Region. The urban population was 25 percent while rural population was 75 percent in 1982/83. Although urban population was increased 31 percent and rural population was decreased to 69 percent in 2009/10, rural population was still three quarters of total population (MOAI 2011).

So the development of Myanmar can be meaningful if the rural populace can achieve higher incomes and a better life. Land, labor and capital are the important resources in agricultural production and also the main factors in the income conditions of rural people. Agriculture is the main source of income for the self employment that is highly seasonal or part time. So rural development is the best way to help poor farmer and rural dwellers to become more productive and improve their living standard.

Table 1.2 Populations by urban and rural by States and Regions in Myanmar

(Percent)

State/Region	1982/83			2009/10		
	Urban	Rural	Total	Urban	Rural	Total
Kachin	22	78	100	29	71	100
Kayah	26	74	100	33	67	100
Kayin	17	83	100	15	85	100
Chin	15	85	100	22	78	100
Saging	14	86	100	19	81	100
Tanintharyi	24	76	100	30	70	100
Bago	19	81	100	25	75	100
Magway	15	85	100	19	81	100
Mandalay	27	73	100	34	66	100
Mon	28	72	100	35	65	100
Rakhine	15	85	100	20	80	100
Yangon	68	32	100	78	22	100
Shan	21	79	100	27	73	100
Ayeyarwady	15	85	100	19	81	100
Total	25	75	100	31	69	100

Source: MOAI 2011

1.3 Type of Land in Agricultural Sector in Shan State

1.3.1 Land utilization in Shan State

The land utilization in Shan State in 2000-2010 is shown in Table 1.3. There were about 1.31 million hectares of net sown area in Shan State in 2009-2010.The areas of reserved forests and current fallow lands were 3.01 million hectares and 0.09 million hectares, respectively in 2009-2010. During the last decade (2000-2010), current fallow land was decreased by about 61 percent while 16 percent of cultivable waste land and 18 percent of other wood land were also declined. The area in reserved forests and net area sown were increased about 73 percent and 70 percent respectively (CSO 2010).

1.3.2 Sown area, yield and production of major crops in Shan State

Sown area, yield and production of major crops in Shan State in 2009-2010 are shown in Table 1.4. The monsoon paddy sown area was 596,000 ha the most vast area among these major crops, and it was about 46% of total net sown area in Shan State. The yield and total production were 4.1 ton ha^{-1} and 2,444,000 ton, respectively. But its yield was less than that of summer paddy, 5.45 ton ha^{-1}. Maize is the second most sown area, 150,000 ha and it was about 12 percent of net sown area. The yield and total production were 3.74 ton ha^{-1} and 561,000 ton, respectively. There was a few sown area of green gram and it was only about 810 ha (MOAI 2011).

Table 1.3 Land utilization in Shan State in 2000-2010

(million ha)

Year	Reserved Forests	Current Fallows	Net Area Sown	Cultivable Waste Land	Other Wood Land	Others	Total Area
2000-01	1.74	0.23	0.77	2.34	5.98	4.52	15.59
2001-02	2.13	0.20	0.79	2.17	5.80	4.50	15.59
2002-03	2.15	0.19	0.82	2.16	5.78	4.50	15.59
2003-04	2.76	0.18	0.85	2.29	5.22	4.29	15.59
2004-05	2.76	0.16	0.92	2.23	5.23	4.29	15.59
2005-06	2.76	0.14	0.99	2.20	5.21	4.29	15.59
2006-07	2.92	0.12	1.11	2.11	5.04	4.28	15.59
2007-08	2.93	0.10	1.22	2.03	5.02	4.28	15.59
2008-09	2.95	0.10	1.29	1.98	4.98	4.29	15.59
2009-10	3.01	0.09	1.31	1.96	4.92	4.29	15.59

Source: CSO 2010

Table 1.4 Sown area, yield and production of major crops in Shan State in 2009-2010

Crops	Sown area ('000 ha)	Yield (ton ha^{-1})	Production ('000 ton)
Paddy (Summer)	30.8	5.45	168
Paddy (Monsoon)	596	4.1	2444
Maize (Seed)	150	3.74	561
Wheat	16	2.62	42
Groundnut	58	1.46	85
Sesame	19.03	0.62	12
Sugarcane	32.4	74.1	2401
Sunflower	17.81	1.11	20
Pigeon pea	27.53	1.04	29
Green gram	0.81	0.99	1

Source: MOAI 2011

1.4 Type of Land in Agricultural Sector in Mandalay Region

1.4.1 Land utilization in Mandalay Region

The land utilization in Mandalay Region in 2000-2010 is shown in Table 1.5. There were about 1.37 million hectares of net sown area in Mandalay Region. The areas of reserved forests and current fallow lands were 0.99 million hectares and 0.07 million hectares, respectively in 2009-2010. During the last decade (2000-2010), current fallow land was decreased by about 46 percent while 57 percent of cultivable waste land, 9 percent of other wood land and 1 percent of reserved forests were also declined. The net sown area was increased about 5 percent (CSO 2010).

1.4.2 Sown area, yield and production of major crops in Mandalay Region

Sown area, yield and production of major crops in Mandalay Region in 2009-2010 are shown in Table 1.6. The sesame sown area was 508,910 ha the most vast area among these major crops, and it was about 37 percent of total net sown area in this Region. The yield and total production were 0.32 ton $ha^{-1}$and 163,000 ton, respectively. Monsoon paddy was the second largest sown area, 302,020 ha and it was about 22 percent of net sown area. The yield and total production were 4.34 ton ha^{-1} and 1,311,000 ton, respectively. The sown area of groundnut and sunflower were 150610 ha and 144130 ha respectively. There was a few sown area of wheat, about 11,340 ha (MOAI 2011).

Table 1.5 Land utilization in Mandalay Region in 2000-2010

(Million ha)

Year	Reserved Forests	Current Fallows	Net Area Sown	Cultivable Waste Land	Other Wood Land	Others	Total Area
2000-01	1.00	0.13	1.31	0.07	0.44	0.84	3.79
2001-02	1.00	0.13	1.32	0.06	0.44	0.85	3.79
2002-03	1.00	0.12	1.33	0.06	0.44	0.85	3.79
2003-04	0.98	0.12	1.34	0.05	0.43	0.84	3.79
2004-05	1.02	0.11	1.34	0.05	0.43	0.84	3.79
2005-06	1.03	0.09	1.37	0.05	0.42	0.84	3.79
2006-07	1.04	0.07	1.38	0.04	0.41	0.86	3.79
2007-08	1.04	0.07	1.38	0.05	0.40	0.86	3.79
2008-09	1.04	0.07	1.39	0.03	0.40	0.86	3.79
2009-10	0.99	0.07	1.37	0.03	0.40	0.92	3.79

Source: CSO 2010

Table 1.6 Sown area, yield and production of major crops in Mandalay Region in 2009- 2010

Crops	Sown area ('000 ha)	Yield (ton ha^{-1})	Production ('000 ton)
Paddy (Summer)	71.26	4.89	349
Paddy (Monsoon)	302.02	4.34	1311
Maize (Seed)	19.43	3.22	63
Wheat	11.34	1.91	22
Groundnut	150.61	1.31	197
Sesame	508.91	0.32	163
Sugarcane	17.81	49.4	880
Sunflower	144.13	0.86	124
Pigeon pea	191.1	1.04	199
Green gram	142.11	1.02	145

Source: MOAI 2011

1.5 Rationale of the Study

Agriculture in developing countries including Myanmar has important characteristic with respect to sown area for majority of farmers. This characteristic is that farms are generally small size and they are threatened with the degradation of land resources and the environment. Eighty five percent of the total land areas were formed into small plots (less than 2 ha) and in various irregular forms (Tin Soe 2004).

The average land surface entitlement of small farmers has decreased, while the number of landless rural workers has increased. Farmers may inherit smallholdings, but often these are too small to be farmed economically. They then join the category of landless laborers or drift to urban area in search of a job (Rahman 1995).

For several years, rural farmers have been practicing their own farming system in the community. A greater portion of farm income is derived from this production scheme. However, average production per hectare is still low due to poor soil, inadequate water supply, improper application of fertilizers, infestation by the pests, and lack of technical know-how on crop production. Thus, farmers could not sustain a decent level of living and could hardly afford to send their children to school. To accelerate productivity, income and equity among farmers, an integrated farming system should be introduced as an effective approach to the agricultural enterprises in the area (Anselmo et al, 1982).

At national level, Myanmar accomplished surplus production of food. But due to the geographical differences, there are pockets of food deficit areas such as the Central Dry Zone and hilly regions. In those areas, rice is supplemented with maize or sorghum in order to meet their daily calorie uptake. In Myanmar, the growth in the agriculture productivity is the direct role in raising real income of the rural poor and thus reducing poverty. The major constraint of rural farmers is capital. So they faced with the limitations to provide timely field operations and the input like quality seeds, labor, chemicals and fertilizer. And then irregular rainfall patterns, limited natural resources, and increase in rural population are creating land degradation and fragile biophysical environment resulting in a decrease crop yield. The existing cropping patterns have been the same for many years and may not allocate resources at maximum economic efficiency. Diversification of cropping patterns can maximize the net return per unit area of land by allocating scarce resources efficiently. (Khin Myo Nyein 2004)

This study emphasized on the central dry zone and hilly region (Northern Shan State) for the analysis of rural livelihoods and income functions. Yamethin Township and Lashio Township were selected as the representative rural areas for the central dry zone and Northern Shan State.

Farming is a major employment in both rural areas of Lashio and Yamethin Townships. There are differences in socioeconomic conditions, employment opportunities and cropping patterns in these areas. Resulting in the different efficiency of resource use and farm household income, therefore it is needed to study the differences of rural livelihood conditions in both townships and to estimate the factors affecting the household income for conducting the improvement of rural life in those selected areas.

1.4 Objectives of the Study

(1) To observe the existing socioeconomic conditions of the selected rural areas in Lashio and Yamethin Townships;
(2) To compare household income which can contribute rural livelihoods between Lashio and Yamethin Townships; and
(3) To investigate the factors affecting the household income of respondent farmers in study areas.

CHAPTER II
LITERATURE REVIEW

2.1 Agricultural and Rural Development in Myanmar

The national government of Myanmar, in implementing the rural development theme in the national development plan, took the positive and constructive measures which could benefit the rural peasantry (Tin Hlaing et al 2004).

The implementation procedures for agriculture rural development are:

(a) Local and overseas training for the uplift of technical capacity of national scientists
(b) Transfer of appropriate technology based upon farmers' need assessment
(c) Micro-financing schemes for resources of poor farmers
(d) To formulate and implement integrated rural development programmes
(e) To enhance private public partnerships in agriculture
(f) To generate agricultural market information service for the benefit of producers, traders, farmers and consumers
(g) To establish reputable marketing centers and transport system
(h) Quality control service that shall monitor and enforce law against unlawful sale and distribution of uncertified seeds, non-registered fertilizers, pesticides and other agro-chemicals

Rural development is used to denote the actions and initiatives taken to improve the economic and social life of a group of people living in non-urban neighborhoods, countryside and remote villages. Rural development in Myanmar was traditionally associated with centralized planning and management in the past. The recent shift in rural policies represents a fundamental change in policy objectives and the policy framework towards a more holistic approach to reality (Htin Aung Shein 2011).

2.2 The Livelihood Framework

The livelihood framework attempts to conceptualize the livelihood approach. The frameworks advanced by different researchers and organizations look different, but they are composed of the same key components: assets, access,

activities/livelihood strategies, and outcomes (Carney 1998, Ellis 2000, Scoones 1998). Many of the frameworks also feature external conditions like policies, shocks and trends as part of the context that livelihoods are embedded in. The household is generally the primary level of analysis of the livelihood framework.

The livelihood framework is an effective tool for organizing and understanding complex livelihoods. It has been used in the following ways (Ellis 2000):

- To define the main factors affecting livelihoods and the relationships between them.
- To improve our understanding of the livelihoods of poor people and manage their complexity.
- To provide a basis for identifying appropriate objectives and interventions to support livelihoods

Chambers (1989) defined livelihood as ‘‘adequate stocks and flows of cash to meet basic needs’’. The problem with this definition is that it does not say how these adequate stocks and flows of cash come about. Chambers and Conway (1992) describe livelihood as the capabilities, assets and activities required for a means of living.

2.3 Assets of the Livelihood Framework

Assets form the foundation of the livelihood framework. They are the tangible (i.e. farming equipment or livestock), or intangible (i.e. social networks or political influence) means that enable participation in certain livelihood activities. Everything from education and job networks to livelihood tools and fruit trees can be considered assets.

Assets are not simply resources that people use in building livelihoods: they are assets that give them the capability to be and to act. Assets should not be understood only as things that allow survival, adaptation and poverty eradication: they are also the basis of agents' power to act and to reproduce, challenge or change the rules that govern the control, use and transformation of resources (Bebbington 1999). These five types of assets are described in more detail below.

(i) Human assets

Human assets capture the labor resources available to the households and individuals, in both qualitative and quantitative dimensions. Household size, health, education and skills are all considered to be aspects of human capital. Individual human assets have prescribed traits like gender, age, and ethnic group, as well as acquired capital like education, skills and experience. Household capital is in constant flux due to internal demographic reasons (births, deaths, marriage, migration, children growing older), and to deliberate restructuring to meet unexpected events or external pressures (Moser 1998). For example, a drought in the rural areas might motivate urban migration and greater access to urban job markets might encourage a higher investment in education. Human capital can be enhanced through education and skill training and improved health care services.

(ii) Social assets

Social capital can be seen as enhancing the capacity of individuals, households, small groups, or whole societies. At a community level the concept is useful for describing the qualities of a community that make collective action and civil society possible. This thesis is focused on the ways that individuals utilize different forms of social capital to reduce risks, access other types of capital, find jobs, acquire information, and access services. Organizations and networks give individuals access to livelihood activities and opportunities that they wouldn't be able to access on their own. The key point is that social capital has value just like a plow (physical capital) or a high school diploma (human capital).

There are a wide variety of definitions of social capital, but most have the following components in common: social networks, relationships of trust and reciprocity, and organizational membership.

(iii) Natural assets

Natural assets are the resources found in the land, water and other natural landscapes that are useful for livelihood survival or enhancement. Rural populations are especially dependent on natural assets for their livelihood activities. Natural assets are often held as common pool resources, accessible to all of the population. Land is generally considered the key asset for rural peasants. Land tenure must be considered

in relationship to natural assets, because a complicated set of access rules and rights often dictate land ownership and usage (Crowley 1991).

Livelihood activities that utilize natural assets include farming, fishing, hunting, mineral extraction, and collecting fruits, plants and firewood. Most of the natural assets relied on by rural populations are renewable resources, but in some areas nonrenewable resources, like gold or oil, are critical for livelihoods. Natural assets are not static and can be degraded or enhanced over time, depending on how they are managed.

(iv) Physical assets

Physical assets are generated by production processes to provide the means which enable people to pursue their livelihood activities. For example: tools, machines, roads, communication systems, and land improvements like terraces or irrigation canals are all considered physical assets.

Physical assets may be individually or collectively held. Blacksmithing tools are privately held and critical to the livelihood of a blacksmith, whereas roads, power lines and other infrastructure are community assets that everyone can draw benefits from. Infrastructure is especially important for facilitating livelihood diversification. Roads, for example, have multiple effects: they reduce the spatial cost of transactions in resources and outputs; facilitate the movement of people between places offering different income earning opportunities; create markets; and play an important role in transfer of information.

(v) Financial assets

Financial assets are savings, income and any other assets that are held as wealth or can easily be converted to cash. Stocks of money are often held in unusual and unpredictable ways, in rural areas where banks are not available. Financial capital could consist of loans, gold, livestock, remittances, or informal credit associations.

A livelihood strategy is an organized set of lifestyle choices, goals, values, and activities influenced by biophysical, political, economic, social, cultural and psychological components. In simple terms, livelihood strategies are the behavioral strategies and choices adopted by people to make a living (including how people access food; earn income; allocate labor, land and resources; their patterns of

expenditure; the way they manage and preserve assets; how they respond to shocks; and the coping strategies they adopt) (DFID 1999).

Livelihood strategies are based upon the assets or capital available to households, which include human, social, natural, physical and financial resources. A livelihood strategy is sustainable when "it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base."

Ellis (2000) gives particular emphasis to the widespread strategy of rural livelihood diversification, which he defines as ''the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living''.

The emerging framework came to be known as the Sustainable Livelihoods Framework. After a review of prevailing definitions of the concept, Ellis (2000) defines livelihood as follows: A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.

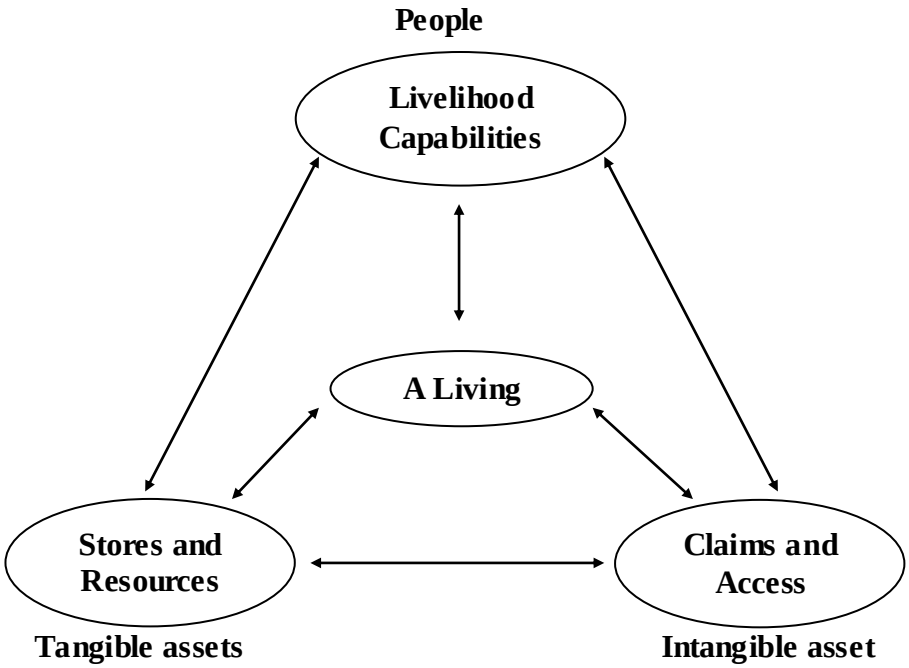

Figure 2.1 Components and flows in a livelihood

Source: Chambers, R. and Conway, G.R. 1991

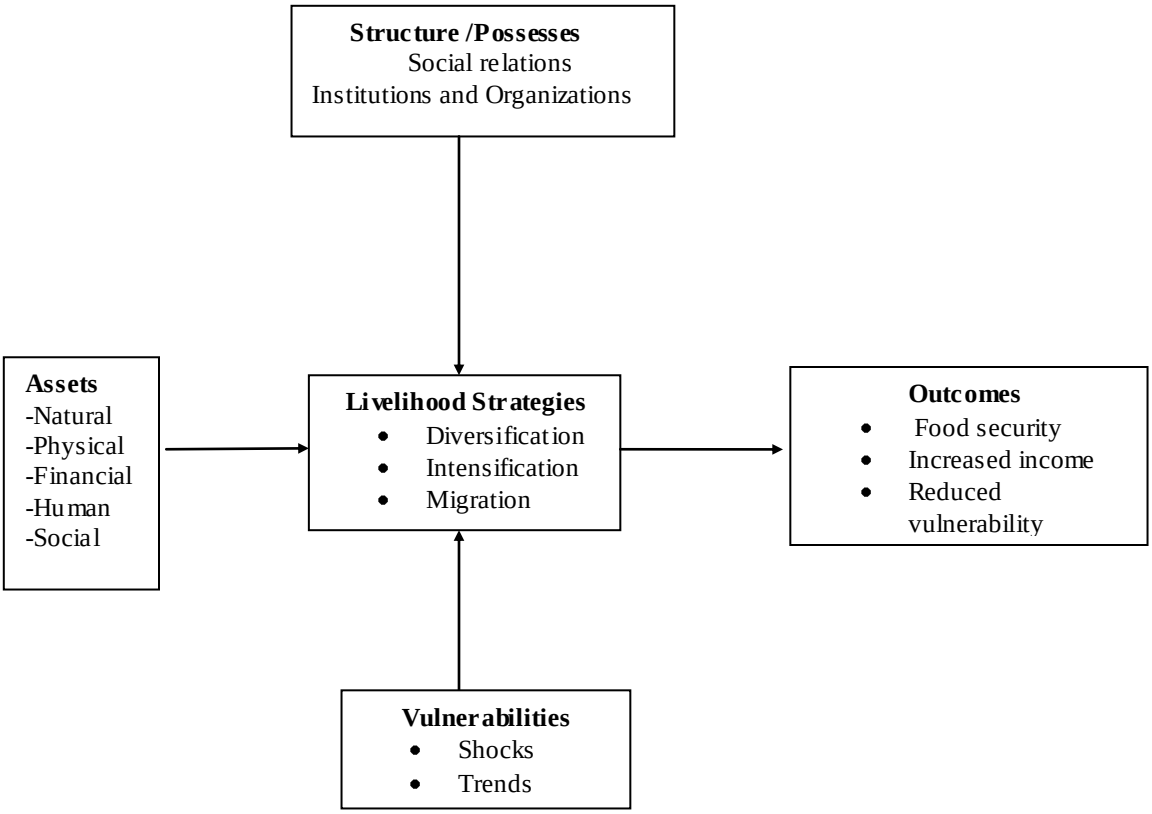

Figure 2.2 Sustainable livelihoods framework

Source: Ellis, 2000

2.4 Enterprise Budget Analysis or Decision Making Tool for Farmers

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

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

An enterprise budget is a physical and financial plan for raising and selling a particular crop or livestock commodity. It is a physical plan because it indicates the type and quantity of production inputs and the output, or yield, per unit. It is also a financial plan, because it assigns costs to all the inputs used in producing the commodity (Richard Carkner 2008).

Farmers are annually faced with critical management decisions that impact the employment of production inputs for various crop enterprises and the combination of crops that will be assembled into a cropping system. The need for reliable information is crucial if sound production decisions are to be made. Planning information played a pivotal role in the development of 2008 production plans by farmers and is important in supporting their efforts to secure the necessary resources to carry out their plans. In addition, information regarding production alternatives and costs and returns for major crop enterprises is needed by extension personnel, researchers, lending institutions, and others involved in agriculture or agribusiness (Michael E. Salassi and Michael Deliberto 2008).

Thanda Kyi et al. (1999) mentioned that the level of production efficiency was strongly affected by the management ability of individual farmer and also by the use of chemical input. In a country like Myanmar where the capital stock is small, this situation provides an opportunity for relatively inexpensive gains in production. If the farmers are operating efficiently, output from the existing inputs and technology are maximized and resource allocation are optimal then farm output can be increased only by introducing improved methods of production.

Agricultural productivity can be defined as a measure of efficiency with which an agricultural production system employs land, labor, capital and other resources. Among these land is primary and the most important one. Due to the rapid increase in population pressure in recent decade's special attention has been focused on land productivity. Productivity may be raised also by replacing the pattern of production by more intensive systems of cultivation or by cultivating higher valued crops. Shafi (1984) stated that in developing countries, while land is relatively scarce and labor abundant, yield per unit area is more important, while in countries where land is abundant and labor is scarce, yield per man-day may constitute a more suitable measure for determination of agricultural productivity.

2.5 Review of Selected Empirical Studies of Income function

An analysis of family income allows to account for the correlation of earnings among spouses or among members in the household, as well as to account for changes in the income contribution to total income by each member in the household. There are two commonly used methods to deconstruct changes in family income distribution that assess the effect of an increase in married females' earnings on family income inequality.

Byerlee and Collinson (1980) mentioned that farmers face many constraints which directly limit production and incomes, such as weeds, pests, diseases, inferior varieties and drought. So priorities must be established to make research on few problems which are most important in limiting farmers' production and incomes and for which technological components exist that promise immediate solutions to these problems.

Estudillo and Otsuka (1999) attempted to identify the major determinants of the household income using data collected from the rice-farming households in the

Philippines between 1966 to 1994, which encompassed the pre-and post-green revolution periods. They found among other things that there has been a structural shift of household income away from land to labor. The adoption of MVs made modest contribution to such a structural shift by increasing the labor demand and decreasing the return to land relative to other factors of production. The increase in labor demand, however, was largely offset by the widespread adoption of laborsaving technologies.

In the Philippines, the rice income was relatively less unequally distributed than income from non-farm sources. The inequality in the distribution of education and landholdings was a more important factor behind growing income inequality than the diffusion of MV technologies (Marciano et al. 2001).

Joshi (2003) suggested that the farmers with bigger size of landholding had more income than the smaller holders. The education level of the household head seemed to have better opportunities for skilled non-farm activities as seen from the positive and significant coefficient of education. The result also revealed that when technological progress (MVs) was associated with the development of infrastructure facilities like irrigation would contribute to household income. The numbers of working members in a household also seemed to contribute to the household income by their involvement in agricultural and non-agricultural activities.

Cho Cho San (2008) studied in Muse district to calculate the family income which depended on income from crop production, income from livestock production, income from orchard, income from agricultural off-farm activities, income from non-agricultural off-farm activities, age of household, level of education of household head and the dependency ratio of the farm family. The education and dependency ratio did not play an important role in the variation in household income. The absolute agricultural income could be increased significantly if efficiency in resource allocation was enhanced. The agricultural income contributed most of the total income even though off-farm activities had started to play an increasing role.

Thi Thi Soe Hlaing (2011) studied in Naypyitaw to calculate the total household income consisted of income from rice, non-rice crop and nonfarm sources, the factors that affect these components were considered while estimating income distribution function. Similarly the household income may be affected by size of land, education of the household head, number of household members and cropping intensity of farm and yield of rice. Rice yield was differentiated according to varieties

and compared local variety with modern varieties. In case of household income analysis, rice yield was also major influencing factor to get more income and the farmers wanted to select modern varieties that ensured high yield. Farm size and cropping intensity were also main influencing factors on household income. But the human capital and the education level of the household head did not contribute to the household income and they had no opportunity for non-farm activities. It was clearly seen that the adoption of modern rice varieties was good for better livelihood of the farmers.

Income function analysis before and after Thonze Dam irrigation project was conducted by Aye Aye Myint (2011) in Tharyarwady Township. In the study, per capita income was the dependent variable and independent variables were household head age, family size, total land size, own cattle, monsoon paddy yield, monsoon paddy production cost, summer paddy yield, and summer paddy production cost. Based on the study, the sample farm households of total income were increased after the Thonze Dam irrigation project.

Before irrigation project, per capita income of the selected farm households was positively and significantly influenced by households' head age, total land size and monsoon paddy yield at 1 percent level and influenced by own cattle at 10 percent level. Family size and monsoon paddy total production cost negatively and significantly influenced on per capital income at 1 percent level. After irrigation project, per capita income of the selected farm households was positively and significantly influenced by households' head age, total land size and monsoon paddy yield at 1 percent level. But monsoon paddy yield was not significant difference at 5 percent level. Family size, own cattle and summer paddy total production cost negatively and significantly influenced by per capital income at 1 percent level.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 General description of Lashio District

Lashio District is located in the centre of Northern Shan State. Geographically, it lies at 22˚ 16' to 23˚ 50' N latitude and 98˚ 3' to 98˚ 57' E longitude with about 2806 feet mean sea level. It is bounded by Muse district in the North, by Koonlung district in the East, by Loilin District (Southern Shan State) in the South and by Kyaukme district in the West. This Lashio district has 4 townships (Lashio, Theinni, Thantyan and Maiye), 29 blocks and1564 villages.

Lashio District has a temperate climate. Its annual temperature varies from a minimum of about 33˚F to a maximum of about 95˚F. Average annual rainfall of Lashio District is about 50.77 inches in about 90 days. The current condition of population, number of village and cultivated area of Lashio Township is shown in Table 3.1.

The soil analysis indicates that pH of soil in Northern Shan State range from 4.5 to 7.5. Rice is the main staple food and the most important crop. Its area alone stands 122274 acres (49483.6 ha) 61% of total cultivated area of Northern Shan State. Maize is the second most important cereal crop in terms of area, production and consumption, followed by rice. Pulses, oilseeds, and vegetables are the other important crops grown in this district. Cropping patterns commonly practiced in the state are rice-rice, rice-maize, maize-maize, maize-pulses, maize-oilseeds, rice-oilseeds, rice-vegetables, rice-wheat, etc. Mixed cropping is also common. Depending on the availability of water, double or triple cropping is also practiced. (DOA 2010)

The demographic conditions of Lashio Township were described in Table 3.1.

3.1.2 General description of Yamethin District

Yamethin District is located in the central part of Myanmar and is situated in the transition area of dry zone. Geographically, it lays at 19˚25'N to 20˚47'N latitude and 95˚35'E to 96˚42'E longitude. It is bounded by Meiktila District on the North, by Southern Shan State on the East, by Taungoo District on the South and by Thayet District on the South-west and Magway District on the West.

Yamethin District has a sub-tropical climate. Its mean temperature is 27.2˚C. Average annual rainfall is about 1140 mm. The population density is 120 people per square kilometer. It has a total area of 1088289 ha. It has a net cultivated area of 288326 ha and is occupying 26.5 percent of the total land area. The cultivated land is mostly found in the central portion where the land is flat. Based on the received precipitation and topographical factors, cropping systems are different in these areas. The dominant cropping pattern in this area is rice based cropping pattern. Rain fed lowland rice, cotton, sugarcane, chili, groundnut, maize, beans, tomatoes and vegetables crops are grown in Yamethin. Rice is mostly grown for local consumption. (DOA 2010)

The demographic conditions of Yamethin Township were described in Table 3.1.

Table 3.1 Demographic conditions of Lashio and Yamethin Townships

Item	Lashio	Yamethin
No. of village	71	60
Population (no.)	251368	236000
Land area (ha)	423,230	216,767
Cultivated area (ha)	60,613	74,897
Cultivated area (%)	14.32	34.5

Source: DOA 2010

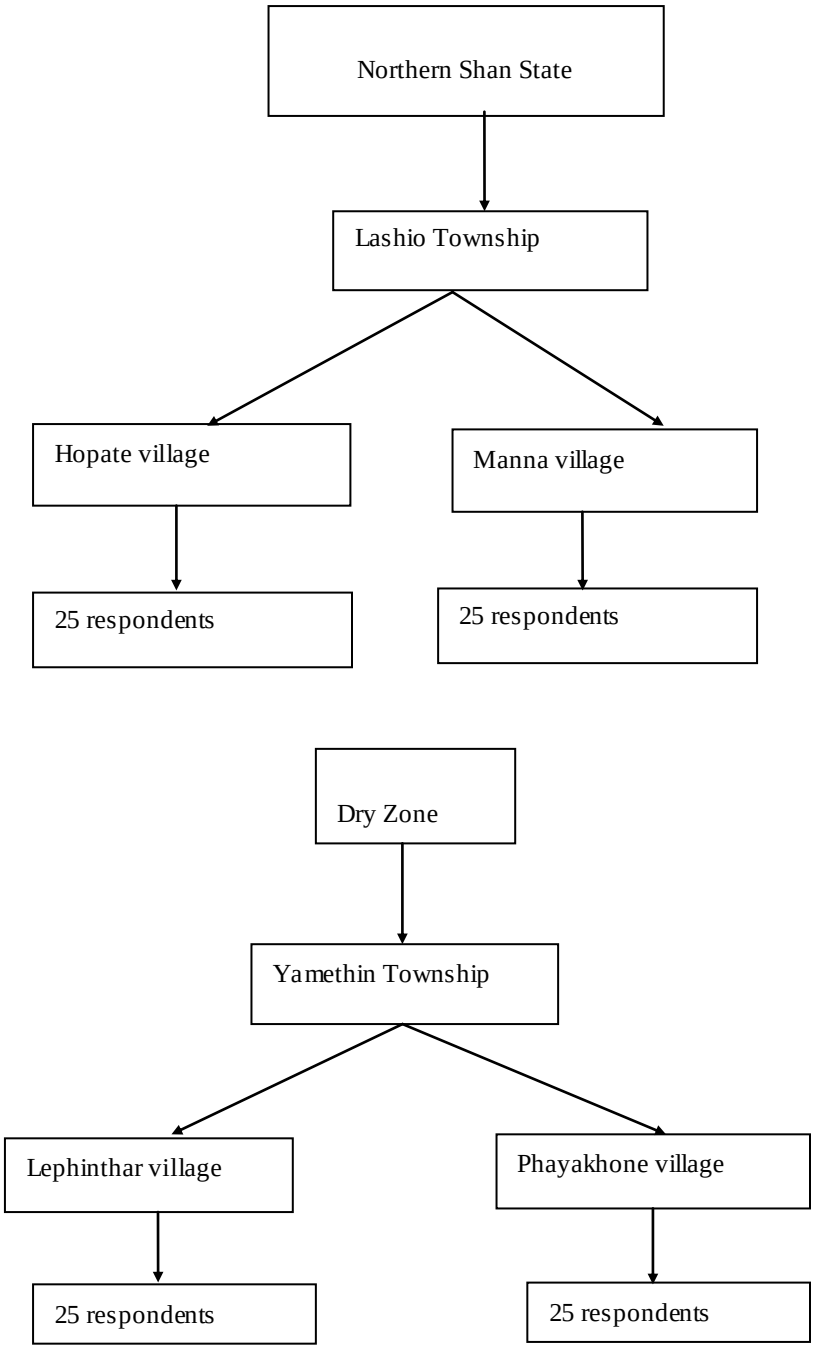

Figure 3.1 Study area and sample sizes of Lashio and Yamethin Townships

3.2 Data Collection and Sampling Procedure

Both primary and secondary data were used in this study. The primary information was collected by personal interview with a structured questionnaire. The fifty sample respondents were selected each from Lashio Township, Northern Shan State and Yamethin Township, Dry Zone area. The study area of each township consists of two villages with sample 25 respondents for each village.

All kinds of technical and socio-economic data were collected. Detail demographic data of age, education level, family size, family labor, farm size, annual household income, consumption pattern, household food and non-food expenditure, home assets and economic data such as farm implements, the quantity of labors, the quantity of chemical fertilizers used in crop production, crop yield, crop price and annual household income were collected. Relevant secondary data was taken from published and official records of Ministry of Agriculture and Irrigation (MOAI), Department of Agriculture (DOA), Central Statistical Organization (CSO), and other related documents.

3.3 Analytical Methods

Both qualitative and quantitative data were firstly entered into the Microsoft Excel program. These data was analyzed by Statistical Packages for Social Science (SPSS) version 16.0 software. The analytical techniques used in this study were the descriptive analysis, the cost and return analysis and the regression analysis for the total household income function.

3.3.1 Descriptive analysis

Descriptive analysis was applied to compare the socio-economic profile such as household structure, household assets, livestock assets, land holding, annual household food and non-food expenditure, social characteristics such as occupation, existing cropping patterns, yields, costs and benefits of crop production and income of sample farmers between Lashio and Yamethin Townships.

3.3.2 Cost and return analysis

Different budgeting techniques are available and commonly used in assessing on-farm cropping systems research trials. Among these budgeting, enterprise budget

was constructed for cost and return analysis for crop production system of sample farmers and it was used to examine the profitability of specific farm enterprise and compare the profitability of the existing crops.

Cost and return analysis was the most common method of determining and comparing the profitability of existing crops of sample farmers. In cropping system research, enterprise budgeting was used to compare the profitability of experimental cropping pattern and the most common cropping patterns and practices followed by farmers. The return above variable costs and rate of returns to scarce factors were then computed. Gross return was the level of production per hectare multiplied by the product price. Total variable cost was the total of all variable inputs into the enterprise, multiplied by their respective prices. An interest rate or cost of capital charged for material inputs was also included in total variables costs. Return above variable costs, sometimes called gross margins were gross return minus total variable costs. (Tan et al 1980)

Expressions for estimating returns to various factors were given in Table 3.2.

Table 3.2 Estimating returns to factors of production

Return to a factor A = (Net Benefit + Costs of factor A)/ Amount of factor A

Factor	Unit	How calculated
Return above variable cost	Price/ha	TR - TVC
Return above variable cash cost	Price/ha	TR - TVCC
Return per unit of total labor	Price/Man-day	(NB + TLC)/TMD
Return per unit of family labor	Price/Man-day	(NB + TFLC)/TFMD
Return per unit of hired labor	Price/Man-day	(NB + THLC)/THMD
Return per unit of cash cost	Price	TR/TVCC
Return per unit of capital	Price	TR/TVC
Break-even yield	ton/ha	TVC/Average price per ton
Break-even price	Price/ton	TVC/Average yield per ha

Source: Tan et al 1980

Where:

TR = Total revenue

TVC = Total variable cost

TVCC = Total variable cash cost

NB = Net benefit (TR – TVC)

TLC = Total labor cost

TFLC = Total family labor cost

THLC = Total hired labor cost

TMD = Total man-day

TFMD = Total family man-day

Changes in factor payments and factor share in crop production had significant impact on household income distribution, because crop production contributed large share of income for farmers in Myanmar. Crop income shared among the current variable inputs, earnings of family labor and hired labor, capital and residual (land). The current variable inputs included seeds, fertilizers, FYM, fuel and pesticides. The return of family labor was imputed by applying appropriated market wage rates for different tasks. Income from land was the residual after deducting the share of current inputs, capital and labor. Factor payments and factor shares percentage was calculated in crop production per ha (Tan et al 1980).

3.3.3 Distribution of annual household income by source

Farm income was the sum of the earnings of factors of production owned by the farm. Farm income included wages, interest, rents attributable to farm owned factors of production and returns to management. Wages included returns to family labor on the farm and wage earnings from employment outside the farm. Rents to owned land included the returns attributable to owner operated land and rentals received from tenants. Returns to capital invested on the operations farm and interest received were included in the farm-income. Farm household income consisted of the net income from farming, net income from other sources, wage and salary earnings, rentals, interest earning, and gift and subsidy received. Therefore, farm household income was the sum of returns to productive factors owned by the farm and transfer received by the farm household (Tan et al 1980).

The household income can be broadly classified into two groups namely from agricultural and non-agricultural sources. The agricultural source was further categorized by rice, livestock and non-rice source. The non-rice source consisted of the income from cereal crops other than rice, pulses, fruits, vegetables, sugarcane, etc. and income received from an agricultural labor. The non-agricultural source was further classified as government or nongovernmental employee and other source which consisted of income from trade and services. Based on the income sources, distribution of annual household income was calculated for the selected farmers.

3.3.4 Determinants of household income

The income to the household accrues from both agricultural and non-agricultural sources. The average annual total household income was affected by the level of technology, socio-economic, institutional set up of the location, and demographic factors of the farm household. The determinants could be the size of land holding, operated area, family labor in farm, the education level of the family members, ownership status of land holding, market and their infrastructures, cropping intensity, source of seed, variety adoption and so on. The income determination function was in linear form so that the value of the parameters showed the marginal returns from the factors of production (Joshi 2003).

Because the total household income consisted of income from various crops and nonfarm sources, the factors that affect these components were considered while estimating income distribution function. The contribution of income sources to total households' income were computed for each farm category. Considering these facts, the household income determination function in Lashio Township was specified as follows,

$$Y = \beta_o+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots+\mu$$

Where:

Y = Average total household income per year

X_1 = Experience year of household head

X_2 = Education level of household head

X_3 = Family labor

X_4 = Farm size

X_5 = Food expenditure

X_6 = Non-food expenditure

X_7 = Total labor cost of production for monsoon rice crop

X_8 = Total material cost of production for monsoon rice crop

X_9 = Yield of monsoon rice crop

X_{10} = Gross margin of monsoon rice crop

X_{11} = Total labor cost of production for summer rice crop

X_{12} = Total material cost of production for summer rice crop

X_{13} = Yield of summer rice crop

X_{14} = Gross margin of summer rice crop

μ = Disturbance term

Considering these facts, the household income determination function in Yamethin Township was specified as follows,

$Y = \beta_o+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots+\mu$

Where:

Y = Average total household income per year

X_1 = Experience year of household head

X_2 = Education level of household head

X_3 = Family labor

X_4 = Farm size

X_5 = Food expenditure

X_6 = Non-food expenditure

X_7 = Total labor cost of production for betel plant

X_8 = Total material cost of production for betel plant

X_9 = Yield of betel plant

X_{10} = Gross margin of betel plant

X_{11} = Total labor cost of production for green gram crop

X_{12} = Total material cost of production for green gram crop

X_{13} = Yield of green gram crop

X_{14} = Gross margin of green gram crop

μ = Disturbance term

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of Sample Farmers in Study Areas

4.1.1 Demographic characteristics of sample farmers in study areas

The demographic characteristics of sample farmers in study areas were described in Table 4.1. The eldest of the farmers in Lashio was 76 years and the youngest age was 30 years with the average age of 49.8 years old. The farmers in Yamethin had 73 years of the eldest age and 28 years of the youngest one. And the average age was 51.9 years. There were not many differences between average age of the sample farmers in study areas. Farmers' working experiences play an important role in agricultural farming activities. The farmers in Lashio had 25.08 years farm experience in average while the farmers in Yamethin had more experience showing 28.16 farming years in average. The average schooling years of sampled farmers were about 2.82 in Lashio and 4.94 in Yamethin. This finding shows that the sample farmers in Yamethin were more educated than those in Lashio.

The farmers in Lashio owned the average farm size of 1.49 ha while the farmers in Yamethin owned 1.25 ha in average. The average family members were 5.06 members in Lashio and 5.02 members in Yamethin. The average family size was not significantly different between the two townships. Most of family members in rural areas engaged in farming to reduce labor cost. The average family labors were 3.1 in Lashio and 4.1 in Yamethin respectively. There were no significant different in age, experience, farm size and family size between these townships but there were significant different in education and family labor between these townships.

4.1.2 Farm and home assets of sample farmers in study areas

The possession of the home assets like cassette, TV, DVD/EVD, radio, sewing machine, generator, well, motorcycle and bicycle was shown in Table 4.2. When comparing home assets, luxury assets such as Television, DVD player and cassette were not different in two townships. Motorbike and generator were more utilized in Lashio (82% and 36%) compared with (46% and 2%). It was due to the modernization influenced by closeness of border trade area. Sample farmers in

Table 4.1 Demographic characteristics of sample farmers in study areas

Item	Lashio N=50			Yamethin N=50		
	Ave.	Range	SD	Ave.	Range	SD
Age (year) t = 0.473, sig = .638^{ns}	49.82	30-76	11.11	51.94	28-73	10.54
Experience (year) t = 1.323, sig = .192^{ns}	25.08	5-52	10.75	28.16	4-53	10.8
Education (year) t = -3.442, sig = .001***	2.82	0-8	0.35	4.94	2-13	0.34
Farm size (ha) t = -1.149, sig = .256^{ns}	1.49	0.41- 4.05	0.113	1.25	0.1- 8.1	0.178
Family size (No.) t = -0.111, sig = .912^{ns}	5.06	2-11	1.8	5.02	2-10	1.74
Family labor (No.) t = 3.570, sig = .001***	3.1	1-6	1.07	4.14	2-9	1.65

***, **,* significant at 1%, 5% and 10% level, ns= non significant

Table 4.2 Household assets of sample farmers in study areas

Items	Lashio (%)	Yamethin (%)
Motorbike t = 3.881, sig = .000***	82	46
Well t = -2.585, sig = .013**	74	92
Television t = 1.093, sig = .280^{ns}	56	50
DVD player t = 0.207, sig = .837^{ns}	52	50
Generator t = 1.927, sig = .060*	36	2
Bicycle t = -7.080, sig = .000***	30	94
Cassette t = 0.771, sig = .444^{ns}	18	14
Radio t = -4.809, sig = .000***	12	56
Sewing machine t = -2.064, sig = .044**	2	8

***, **,* significant at 1%, 5% and 10% level, ns= non significant

Yamethin owned comparatively higher number of well (92%), bicycle (94%), radio (56%) and sewing machine (8%) than those of Lashio. These home assets were necessary for rural dry zone area, like Yamethin.

The possession of the farm assets like cart, tractor, water pump, sprayers and leveler was shown in Table 4.3. Due to the comparison of farm assets, tractor assets were not different in two townships. Sample farmers in Lashio owned comparatively higher number of leveler (86%) and sprayer (80%) than those of Yamethin. But sample farmers in Yamethin owned comparatively higher number of cart (46%) and water pump (92%) than those of Lashio. This was due to the geographical differences. As dry zone area such as Yamethin was more requirement of water than Lashio, there was more usage of water pump in Yamethin.

Table 4.4 showed that the possession of livestock which gave the other earnings of the farmers besides farming. In the study areas, buffaloes and cattle were raised to use in land preparation and it can be used not only for the own farm but also for the others. Buffalo was only used in Lashio and owned by 18% of sample farmers. In the study areas, 4% of the farmers in Lashio possessed cattle and 46% of the farmers in Yamethin owned cattle. Pigs and chickens were raised for meat production and pig was owned by 10% of the farmers in Lashio and 14% of the farmers in Yamethin respectively. The chickens were raised by 24% of the farmers in Lashio and 30% of the farmers in Yamethin. There were many significant different in poultry, buffaloes and cattle between the two townships.

4.2 Cropping Patterns of Sample Farmers in Study Areas

4.2.1 Cropping patterns practiced by sample farmers in Lashio Township

The land holding of sample farmers in Lashio Township was described in Table 4.5. In this study area, average farm sizes were 2.76 acres in irrigated land, 3.09acres in rain fed and 1.97 acres in taungya. They owned irrigated area 34%, rain fed area 49% and taungya area 17% of the total farm size. In irrigated area, there were two types of cropping patterns practiced by sample farmers; namely rice-rice and rice-rice-vegetables. About 78% of total irrigated area was practiced rice-rice cropping pattern while the rest 22% could be practiced rice-rice-vegetables. In rain fed area, about 79% of total rain fed area was grown rice mono cropping while the rest 21% was rice-vegetables. In taungya area, about 94% of the total taungya area was grown maize mono cropping while the rest 6% was maize-groundnut (Table 4.6).

Table 4.3 Farm assets of sample farmers in study areas

Items	Lashio (%)	Yamethin (%)
Leveler t = 8.941, sig = .000***	86	24
Sprayer t = 1.695, sig = .096*	80	68
Tractor t = 0.000, sig = 1.00^{ns}	32	20
Cart t = -5.755, sig = .000***	4	46
Water pump t = -23.738, sig = .000***	0	92

***, **,* significant at 1%, 5% and 10% level, ns= non significant

Table 4.4 Livestock assets of sample farmers in study areas

Items	Lashio (%)	Yamethin (%)
Poultry t= -1.637, sig = .108**	24	30
Buffaloes t = 2.433, sig = .019**	18	0
Pigs t = 1.000, sig = 0.322^{ns}	10	14
Cattle t = -5.155, sig = .000***	4	46

***, **,* significant at 1%, 5% and 10% level, ns= non significant

Table 4.5 Land holding of sample farmers in Lashio

Characters		Lashio (N=50)	
		Acre	(%)
Farm size	Total	184.69	100
	Average	3.69	
	Standard Deviation	1.96	
	Range	1-10	
Irrigated area	Total	63.44	34
	Average	2.76	
	Standard Deviation	1.47	
	Range	0.5-6	
Rainfed area	Total	89.75	49
	Average	3.09	
	Standard Deviation	2.26	
	Range	1-10	
Taungya area	Total	31.5	17
	Average	1.97	
	Standard Deviation	1.12	
	Range	0.5-5	

Table 4.6 Cropping patterns practiced by sample farmers in Lashio Township

Type of land	Cropping pattern	Lashio	
		No.	(%)
Irrigated area	Rice-rice	18	78
	Rice-rice-vegetables	5	22
	Total	23	100
Rainfed area	Rice	23	79
	Rice-vegetables	6	21
	Total	29	100
Taungya area	Maize	15	94
	Maize-groundnut	1	6
	Total	16	100

4.2.2 Cropping patterns practiced by sample farmers in Yamethin Township

The land holding of sampled farmers in Yamethin Township was described in Table 4.7. In this study area, average farm sizes were 2.36 acres in irrigated land, 1.64 acres in garden land and 2.46 acres in ya area. They owned irrigated area 17%, garden area 48% and ya area 35% of the total farm size. In irrigated area, there were three types of cropping patterns practiced by sampled famers. They were rice mono cropping 64%, rice-pulses 27% and vegetables 9%. In ya area, four types of cropping patterns practiced were green gram mono cropping 54%, green gram-pigeon pea-sunflower 23%, green gram-sunflower 14% and vegetables 9%. In garden area, there were six types of cropping patterns practiced by sampled farmers. They were only betel 49%, betel-pulses 33%, vegetables 9%, mango-betel 5%, grape 2% and pulses 2% under garden area (Table 4.8).

4.3. Household Consumption and Expenditure of Sample Farmers in Study Areas

4.3.1 Annual household food consumption in study areas

The average annual household rice consumption in Lashio and Yamethin were 566 kg and 533 kg respectively. The average annual meat and fish consumption were 66 kg in Lashio and 77 kg in Yamethin. There were no significant difference in rice, meat and fish consumption between the two townships. This was due to the same consumption pattern of rural areas. Sample farmers in Yamethin consumed comparatively higher amount of oil (70 kg) than those of Lashio. This consumption amount was more than double of that of Lashio. The average egg consumptions per year were 530 eggs in Lashio and 633 eggs in Yamethin (Table 4.9).

Table 4.7 Land holding of sample farmers in Yamethin

Characters		Yamethin (N=50)	
		Acre	%
Farm size	Total	154.2	100
	Average	3.08	
	Standard Deviation	3.1	
	Range	0.25-20	
Irrigated area	Total	26	17
	Average	2.36	
	Standard Deviation	1.16	
	Range	1-5	
Garden area	Total	73.95	48
	Average	1.64	
	Standard Deviation	1.56	
	Range	0.25-10	
Ya area	Total	54.25	35
	Average	2.46	
	Standard Deviation	2.12	
	Range	0.5-10	

Table 4.8 Cropping patterns practiced by sample farmers in Yamethin Township

Type of land	Cropping pattern	Yamethin	
		No.	(%)
Irrigated area	Rice	7	64
	Rice-pulses	3	27
	Vegetables	1	9
	Total	11	100
Ya area	Green gram	12	54
	G-Pigeon pea-Sunflower	5	23
	G-S	3	14
	Vegetables	2	9
	Total	22	100
Garden area	Betal	22	49
	Betal-pulses	15	33
	Vegetables	4	9
	Mango-Betal	2	5
	Grape	1	2
	Pulses	1	2
	Total	45	100

Table 4.9 Annual household food consumption in study areas

Items	Lashio (N=50)			Yamethin (N=50)		
	Ave.	SD	Range	Ave.	SD	Range
Rice consumption (kg) t = 0.650, sig = .519^{ns}	566	243	220-1317	533	261	210-1260
Oil consumption (kg) t = -6.233, sig = .000***	38	18	8-98	70	34	22-180
Meat & Fish consumption (kg) t = -0.761, sig = .450^{ns}	66	80	7-548	77	44	22-225
Eggs consumption (no.) t = -1.782, sig = .081*	530	262	96-1440	633	337	144-1440

***, **,* significant at 1%, 5% and 10% level, ns= non significant

4.3.2 Annual household expenditure allocation in Lashio Township

The expenditure allocation on food and non-food items of sample households in Lashio was shown in Figure 4.1. According to this figure, the sample households spent the same amount of expenditure (50% each) on food and non-food items.

Figure 4.2 showed the expenditure allocation on food items of sample households in Lashio. In this study area, the sample households spent 32% in meat and fish, 25% in rice, 15% in vegetable and fruit, 13% in other food such as salt, seasoning powder, onion, garlic, coffee, tea and pickled tea, 9% in oil and 6% in eggs of the total food expenditure.

Expenditure allocation on non-food items of sample households in Lashio was shown in Figure 4.3. The expenditure on donation and ceremonies was 22%, the large share of total non-food expenditure. The second large share was the health expenditure and it was 21% of total non-food expenditure. And then the sample households spent 16% in education, 15% in lightening, 11% in clothing, 8% in transportation and 7% in recreation and personal use of the total non-food expenditure.

4.3.3 Annual household expenditure allocation in Yamethin Township

The expenditure allocation on food and non-food items of sample households in Yamethin was shown in Figure 4.1. According to this figure, the sample households spent 62% on food items, the larger amount of the total expenditure. They spent 38% on non-food items of the total expenditure.

Figure 4.2 showed the expenditure allocation on food items of sample households in Yamethin. In this study area, the sample households spent 21% in meat and fish, 33% in rice, 7% in vegetable and fruit, 19% in other food such as salt, seasoning powder, onion, garlic, coffee, tea and pickled tea, 16% in oil and 4% in eggs of the total food expenditure.

Expenditure allocation on non-food items of sample households in Yamethin was shown in Figure 4.3. The expenditures on donation and ceremonies and on education were the same 27%, the large share of total non-food expenditure. The second large share was the clothing expenditure and it was 17% of total non-food expenditure. And then the sampled households spent 12% in health, 10% in lightening, 5% in transportation and 2% in recreation and personal use of the total non-food expenditure.

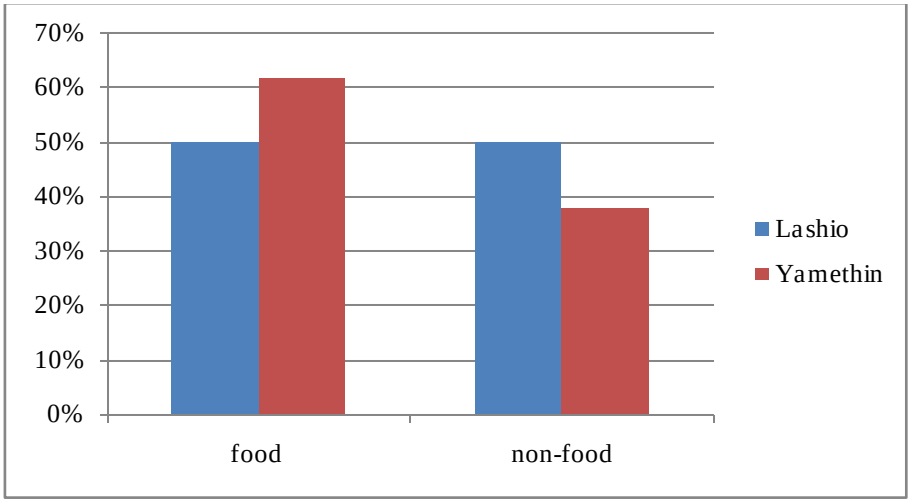

Figure 4.1 Expenditure allocations on food and non-food items of sample households in Lashio and Yamethin Townships

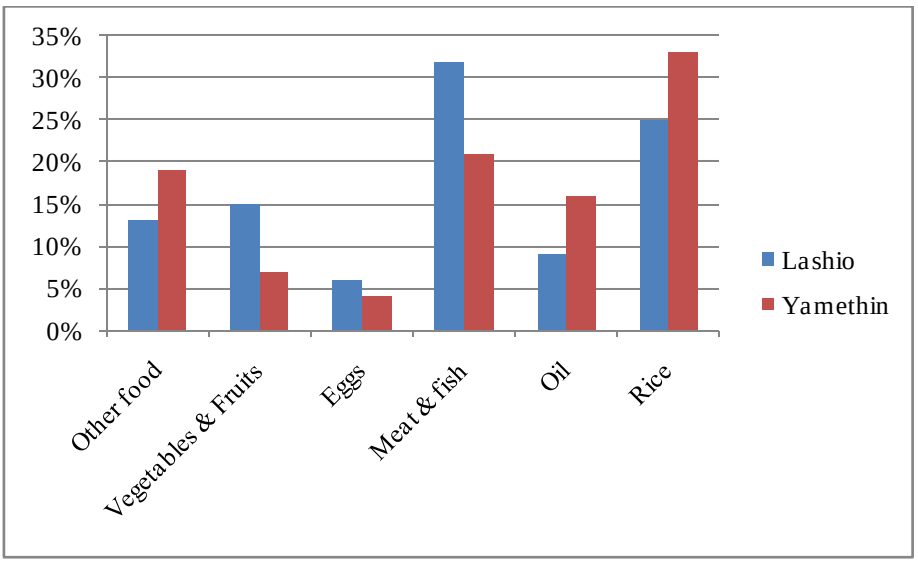

Figure 4.2 Expenditure allocations on food items of sample households in Lashio and Yamethin Townships

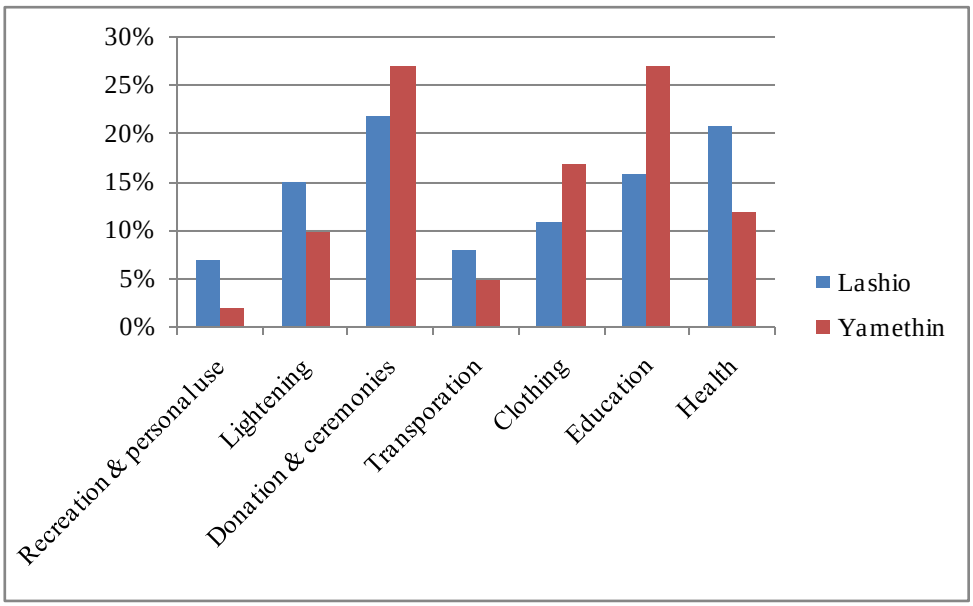

Figure 4.3 Expenditure allocations on non-food items of sample households in Lashio and Yamethin Townships

4.4 Costs and Returns of Crops of Production in Study Areas

Cost and return analysis can compare the profitability of the crops in study areas. The economic return from crop productions in study areas are discussed in this section.

4.4.1 Enterprise budget of rice production in Lashio Township

Costs and returns of the monsoon rice production were computed for 49 households in Lashio Township. The total gross benefit of the rice production was computed by multiplying the yield and the price. The variable cost included the total material cost, total family labor cost, total hired labor cost and interest of the total material cost and total hired labor cost. Considering the opportunity cost of the family labor, it was valued at market price in this analysis.

The enterprise budget of monsoon rice was shown in Appendix 1. The total gross benefit of monsoon rice was 881,033 Ks/ha. The yield of monsoon rice was 3.86 t/ha and the price of the grain was 228,247 Ks/ton. The total material cost employed in monsoon rice production was 239,281 Ks/ha. The hired labor cost applied in this production was 182514 Ks/ha and the interest on material and hired labor cost was 42,179 Ks/ha. The opportunity cost of family labor was 172,515 Ks/ha.

Costs and returns of the summer rice production were computed for 23 households in case of sample farmers in Lashio Township. The enterprise budget of summer rice was shown in Appendix 2. In summer rice production, the total gross benefit was 1,023,252 Ks/ha. The yield of summer rice was 4.24 t/ha and the price of the grain received was 241,333 Ks/ton. The total material cost used in production was 324,184 Ks/ha. The hired labor cost incurred for production process was 242,982 Ks/ha and the interest paid for material and hired labor cost was 56,716 Ks/ha. The amount of family labor cost was 215,053 Ks/ha.

4.4.2 Enterprise budget of green gram and betel leaf production in Yamethin Township

Costs and returns of the green gram production were computed for 20 households in Yamethin Township. The enterprise budget of green gram production was shown in Appendix 3.The total gross benefit received from green gram production was 297,833 Ks/ha. The yield of green gram was 0.504 ton/ha and the

price of the seed was 590,622 Ks/ton. The total material cost expensed in cultivation was 58,038 Ks/ha. The cost expensed in hired labor was 84,338 Ks/ha and the interest on cash cost was 14,238 Ks/ha. In this production, the cost (39,834 Ks/ha) was paid for the family labor.

Costs and returns of the betel leaf production were computed for 41 households in case of sample farmers in Yamethin Township. The enterprise budget of betel leaf production was shown in Appendix 4.The total gross benefit received from betel leaf production was 1,055,428 Ks/1000 plts. The yield of betel leaf was 374 viss/1000 plts and the price of the betel leaf was 2822 Ks/viss. The total material cost expensed in cultivation was 253,934 Ks/1000 plts. In this production, the cost expensed in total labor was 243,994 Ks/1000 plts and the interest on cash cost was 49,792 Ks/1000 plts.

4.4.3 Returns to factors of crop production in Lashio Township

The summary statistics of yield, cost and benefit for existing crops in Lashio Township were described in Table 4.10. According to this table, farmers can get the highest benefit from monsoon rice.

Table 4.11 shows the returns to factors from monsoon and summer rice production in the study areas. The total variable cost was the sum of the material cost and costs of the family labors and hired labors including interest on material and hired labor costs. The variable cash cost was deducted the family labor cost from the total variable cost. The gross margin or net revenue (NR) was computed by deducting the total variable cost from the total gross revenue and it was the net revenue received for farmers from the rice production. The returns above variable cost and variable cash cost were obtained by deducting total variable cost and variable cash cost from gross revenue.

The return per unit of total labor was obtained from dividing the sum of the gross margin and total labor cost by the total man-day that used in rice production. The return per unit of family labor was received from dividing the sum of the gross margin and family labor cost by the total family man-day that used in rice production. The return per unit of hired labor was calculated by dividing hired labor man-day to the sum of the gross margin and hired labor cost. The return per unit of total labor, hired labor and family labor described the return received for one unit of labor per

day. The return per unit of cash cost was divided the gross revenue by the total variable cash cost. The return per unit of capital was also divided the gross revenue by the total variable cost. The break-even yield (ton/ha) was received from dividing the total variable cost by the average price of rice (Ks/ton). The break-even price (Ks/ton) was dividing the total variable cost by the average yield of rice (ton/ha).

The gross revenues of monsoon and summer rice were 881,033 Ks/ha and 1,023,252 Ks/ha respectively. The total variable costs of monsoon and summer rice were 636,489 Ks/ha and 838,935 Ks/ha, respectively. The total variable cash costs were 463,974 Ks/ha in monsoon rice and 623,882 Ks/ha in summer rice. The gross margins of monsoon and summer rice were 417,059 Ks and 399,370 Ks respectively for one hectare land.

For monsoon rice, the returns above variable cost was 268,919 Ks/ha and the return above variable cash cost was 446,327 Ks/ha. The return above variable cost and variable cash cost of summer rice were 201,556 Ks/ha and 414,384 Ks/ha, respectively. The returns per unit of total labor, family labor and hired labor were 4,422 Ks/day, 6735 Ks/day and 6,291 Ks/day respectively in monsoon rice. The returns per unit of total labor, family labor and hired labor received from summer rice production were 3,694 Ks/day, 4,740 Ks/day and 4,900 Ks/day respectively.

The returns per unit of cash cost and capital of monsoon rice were 2.12 and 1.45 Ks, respectively. The returns per unit of cash cost and capital were 1.72 Ks and 1.25 Ks in summer rice. The break-even yields of monsoon and summer rice were 2.82 ton ha^{-1} and 3.48 ton ha^{-1}, respectively. The break-even prices were 173,176 Ks/ton in monsoon rice, and 217,891 Ks/ton in summer rice production.

Table 4.10 Summary statistics of yield, cost and benefit for existing crops in Lashio Township

Crops	Items	Unit	Ave.	BCR
Monsoon rice	Yield	ton/ha	3.86	
	Total variable cost	ks/ha	636489	
	Total revenue	ks/ha	881033	
	Net revenue	ks/ha	244544	1.38
Summer rice	Yield	ton/ha	4.24	
	Total variable cost	ks/ha	838935	
	Total revenue	ks/ha	1023252	
	Net revenue	ks/ha	184317	1.22
Maize	Yield	ton/ha	1.9	
	Total variable cost	ks/ha	349878	
	Total revenue	ks/ha	376961	
	Net revenue	ks/ha	27084	1.08
Groundnut	Yield	ton/ha	1.05	
	Total variable cost	ks/ha	279851	
	Total revenue	ks/ha	395200	
	Net revenue	ks/ha	145349	1.41

Table 4.11 Returns to factors of rice production of sample farmers in Lashio Township

Item	Unit	Monsoon rice	Summer rice
Gross revenue	ks/ha	881033	1023252
Total variable cost	ks/ha	636489	838935
Total variable cash cost	ks/ha	463974	623882
Gross margin	ks/ha	417059	399370
Return above variable cost	ks/ha	268919	201556
Return above variable cash cost	ks/ha	446327	414384
Return per unit of total labor	ks/day	4422	3694
Return per unit of family labor	ks/day	6735	4740
Return per unit of hired labor	ks/day	6291	4900
Return per unit of cash cost	ks	2.12	1.72
Return per unit of capital	ks	1.38	1.22
Break-even yield	ton/ha	2.82	3.48
Break-even price	ks/ton	173176	217891
N		49	23

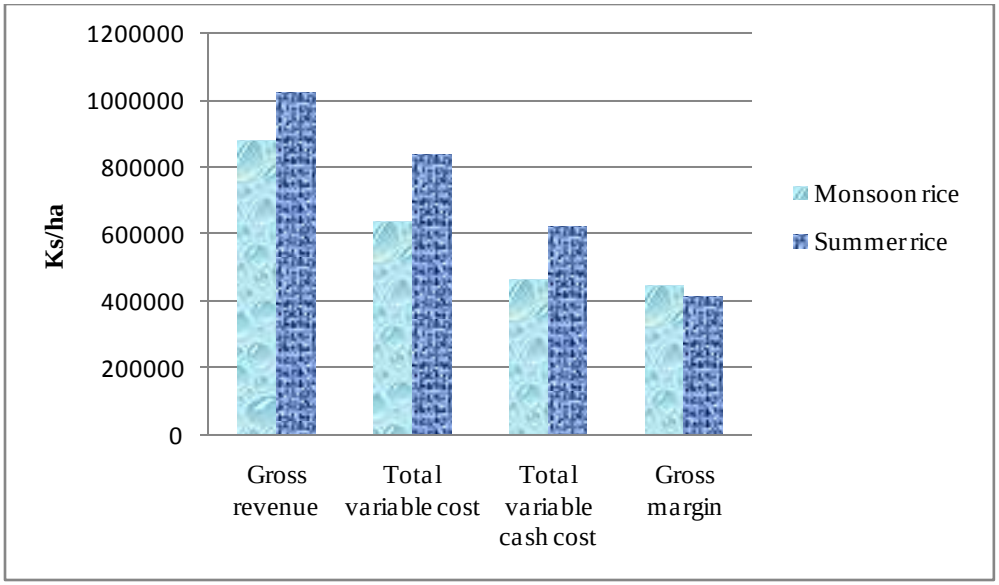

Figure 4.4 Cost and benefit of rice production of sample farmers in Lashio Township

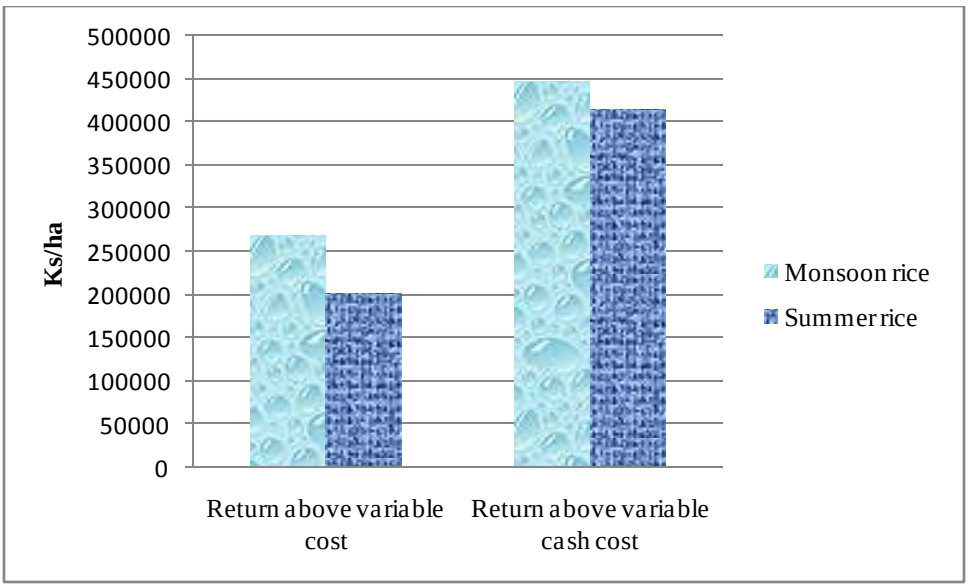

Figure 4.5 Return above TVC and TVCC of rice production of sample farmers in Lashio Township

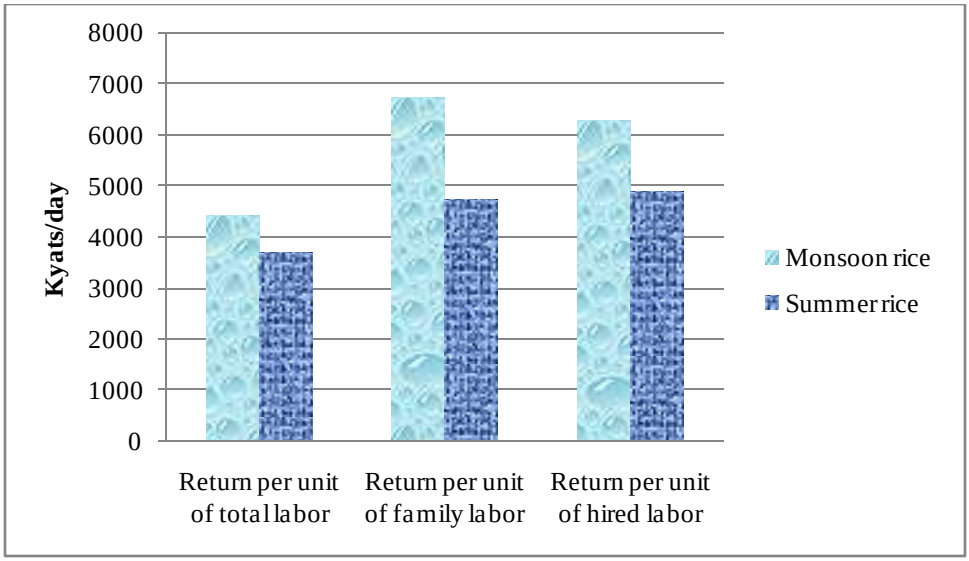

Figure 4.6 Return per unit of labor of rice production of sample farmers in Lashio Township

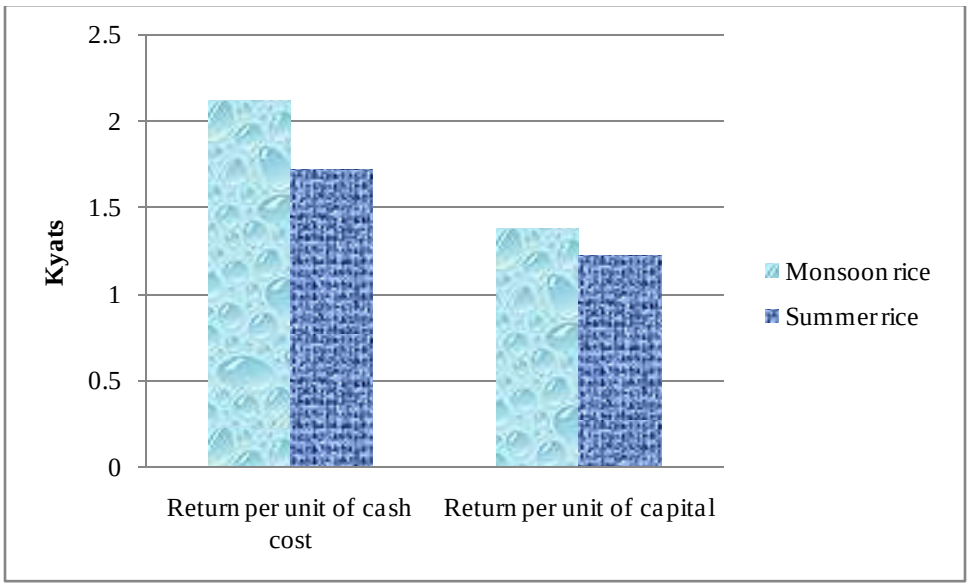

Figure 4.7 Return per unit of cash cost and capital of rice production of sample farmers in Lashio Township

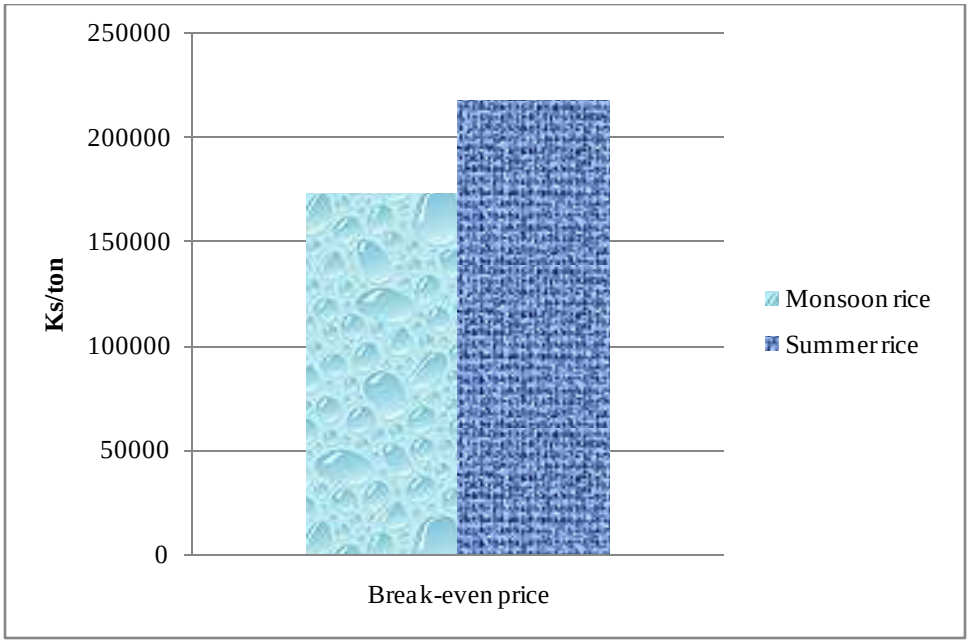

Figure 4.8 Break-even price of rice of sample farmers in Lashio Township

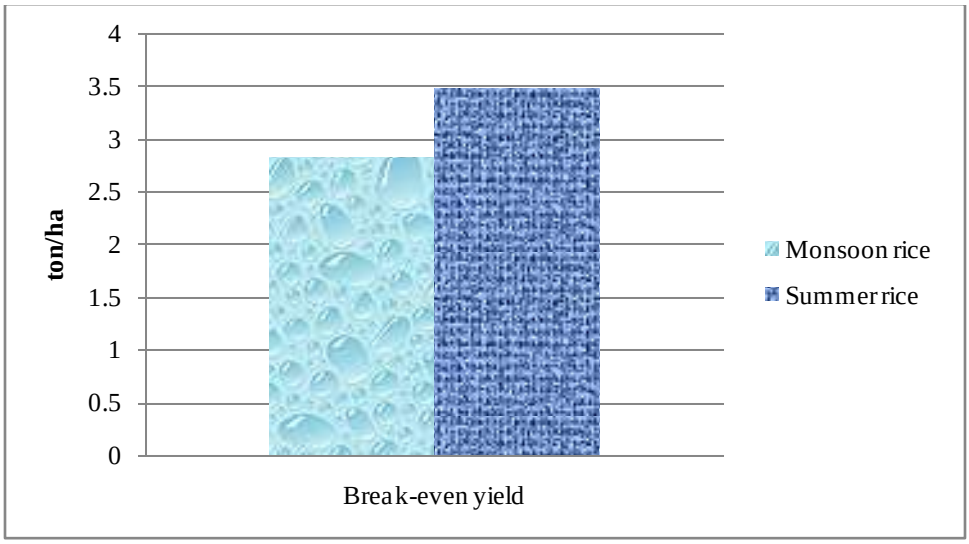

Figure 4.9 Break-even yield of rice of sample farmers in Lashio Township

4.4.4 Returns to factors of crop production in Yamethin Township

The summary statistics of yield, cost and benefit for existing crops in Yamethin Township were described in Table 4.12. According to this table, farmers can get the highest benefit from butter bean.

Table 4.13 shows the return to factors from green gram and betel vine production in the study areas. The gross revenues of green gram and betel vine leaf production were 297,833 Ks/ha and 1,055,428 Ks/1000 plts, respectively. The total variable costs of green gram and betel production were 196448 Ks/ha and 547720 Ks/1000 plts, respectively. The total variable cash cost was 156,614 Ks/ha in green gram. The gross margin of green gram was 141,219 Ks for one hectare land and 546,270 Ks for 1000 plts in betel leaf production. For green gram production, the returns above variable cost was 131,530 Ks/ha and the return above variable cash cost was 173,722 Ks/ha. The return above variable cost of betel production was 546,270 Ks/1000 plts. The returns per unit of total labor, family labor and hired labor were 13,173 Ks/day, 9,517 Ks/day and 4,268 Ks/day respectively in green gram. The return per unit of total labor in betel production was 13,213 Ks/day.

The returns per unit of cash cost and capital of green gram were 3.05 and 1.99 Ks, respectively. The return per unit of capital was 2.26 Ks in betel vine production. The break-even yields of green gram and betel vine were 0.3 ton/ha and 181 viss/1000 plts, respectively. The break-even prices were 440,407 Ks/ton in green gram, and 1,573 Ks/viss in betel production.

Table 4.12 Summary statistics of yield, cost and benefit for existing crops in Yamethin Township

Crops	Items	Unit	Ave.	BCR
Betel	Yield	viss/1000 plts	374	
	Total variable cost	ks/1000 plts	547720	
	Total revenue	ks/1000 plts	1055428	
	Net revenue	ks/1000 plts	508008	1.93
Green gram	Yield	ton/ha	0.5	
	Total variable cost	ks/ha	196448	
	Total revenue	ks/ha	297833	
	Net revenue	ks/ha	101385	1.52
Monsoon rice	Yield	ton/ha	3.25	
	Total variable cost	ks/ha	325588	
	Total revenue	ks/ha	703641	
	Net revenue	ks/ha	378051	2.16
Butter Bean	Yield	ton/ha	1.16	
	Total variable cost	ks/ha	138073	
	Total revenue	ks/ha	615030	
	Net revenue	ks/ha	476957	4.45
Sunflower	Yield	ton/ha	0.29	
	Total variable cost	ks/ha	96083	
	Total revenue	ks/ha	207480	
	Net revenue	ks/ha	111397	2.16

Table 4.13 Returns to factors of green gram and betel leaf production of sample farmers in Yamethin Township

Item	Unit	Green gram	Unit	Betel
Gross revenue	ks/ha	297833	ks/1000 plts	1055428
Total variable cost	ks/ha	196448	ks/1000 plts	547720
Total variable cash cost	ks/ha	156614		
Gross margin	ks/ha	141219	ks/1000 plts	546270
Return above variable cost	ks/ha	131530	ks/1000 plts	546270
Return above variable cash cost	ks/ha	173722		
Return per unit of total labor	ks/day	13173	ks/day	13213
Return per unit of family labor	ks/day	9517		
Return per unit of hired labor	ks/day	4268		
Return per unit of cash cost	ks	3.05		
Return per unit of capital	ks	1.52	ks/1000 plts	1.93
Break-even yield	ton/ha	0.3	viss/1000 plts	181
Break-even price	ks/ton	440407	ks/viss	1573
N		20		41

4.5 Determinants of Total Household Income of Sample Farmers in Study Areas

4.5.1 Income compositions of sample farmers in study areas

The income compositions in Lashio Township were described in Figure 4.10. According to this figure, income from crop production was the largest amount (58%) combined with animal husbandry (5%), off-farm income (26%) and non-farm income (11%) to get the total household income.

The income compositions in Yamethin Township were described in Figure 4.10. According to this figure, income from crop production was the largest amount (86%), animal husbandry (1%), off-farm income (7%) and non-farm income (6%) of the total household income.

4.5.2 Determinants of total household income of sample farmers in Lashio Township

The total household income of the sample farmers in Lashio was estimated by 14 variables; household head's experience, household head's education, family labor, farm size, food expenditure, non-food expenditure, labor cost of monsoon rice production, material cost of monsoon rice production, yield of monsoon rice, gross margin of monsoon rice, labor cost of summer rice production, material cost of summer rice production, yield of summer rice and gross margin of summer rice.

According to the regression analysis, farm size was positively and significantly influenced on the total household income at 5% level. It means that the farmers who had larger farm size can receive higher income. The food expenditure and non-food expenditure were significantly related with household income at 10% level. In addition the yield of monsoon rice was positively and significantly influenced on household income at 10% level. If the yield of monsoon rice increases by 1%, the total household income will increase by 0.587(Table 4.15).

Among the variables, household head's experience, household head's education, family labor, labor cost of monsoon rice production, material cost of monsoon rice production, gross margin of monsoon rice, labor cost of summer rice production, material cost of summer rice production, yield of summer rice and gross margin of summer rice did not contribute significantly to the household income. The F value showed that the selected model was significant at 1% level. The R^2 value 0.715 means that it can explain the variation in the total household income by 71.5%.

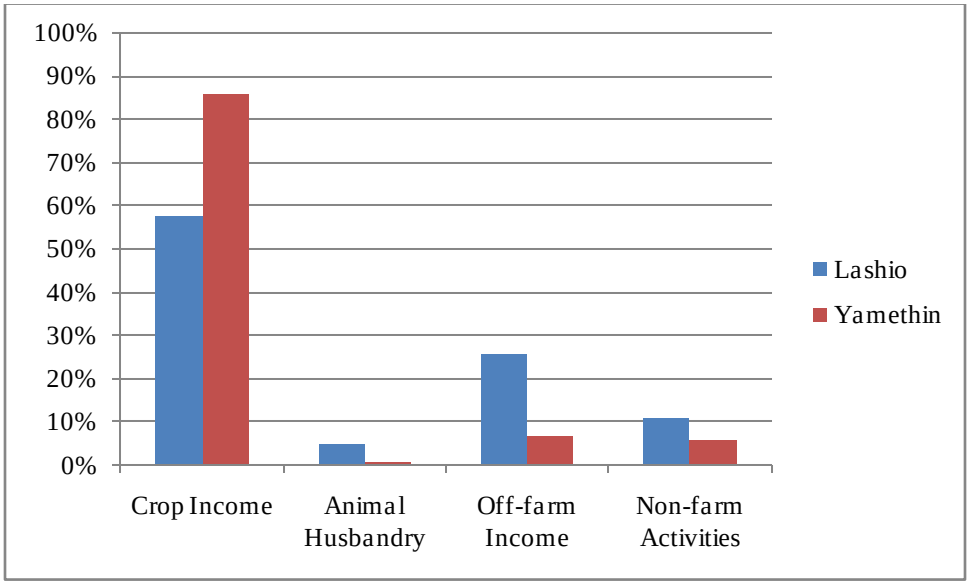

Figure 4.10 Income compositions of sample households in Lashio and Yamethin Townships

Table 4.14 Descriptive statistics of dependent and independent variables of household income function in Lashio Township

Variables	Unit	Mean	Std. Deviation
income per year	kyats	1373340.16	1032163.94
Experience year of head	year	25.08	10.75
Education level of head	year	2.82	2.50
Family labor	no.	3.10	1.07
Farm size	ha	1.5	0.79
Food expenditure	kyats	617125.28	337360.96
Non-food expenditure	kyats	580230.00	556376.57
Labor cost of monsoon rice	kyats/ha	350276.74	90017.76
Material cost of monsoon rice	kyats/ha	234551.10	86622.46
Yield of monsoon rice	ton/ha	3.78	1.26
Gross margin of monsoon rice	kyats/ha	437400.56	263694.05
Labor cost of summer rice	kyats/ha	214977.06	244604.73
Material cost of summer rice	kyats/ha	142102.14	165913.93
Yield of summer rice	ton/ha	1.95	2.46
Gross margin of summer rice	kyats/ha	190616.84	366697.18
No. of respondents	no.	50	

Table 4.15 Income function of the sample farmers in Lashio Township

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	5.246	2.275		2.306	.027**
Lnexperience	-.092	.132	-.078	-.696	.491^{ns}
Lneducation	-.082	.073	-.108	-1.120	.270^{ns}
Lnfamilylabor	-.059	.152	-.041	-.386	.702^{ns}
Lnfarmsize	.253	.120	.253	2.100	.043**
Lnfoodexp	.375	.200	.302	1.868	.070*
Lnnonfoodexp	.274	.142	.269	1.932	.062*
Lnlaborcostmonsoon	.098	.221	.332	.443	.661^{ns}
Lnmcostmonsoon	-.157	.232	-.521	-.675	.504^{ns}
Lnyieldmonsoon	.587	.313	.374	1.877	.069*
Lngmmonsoon	.019	.030	.094	.633	.531^{ns}
Lnlaborcostsummer	.090	.354	1.099	.253	.802^{ns}
Lnmcostsummer	-.120	.370	-1.416	-.323	.749^{ns}
Lnyieldsummer	.206	.263	.284	.783	.439^{ns}
Lngmsummer	.004	.022	.049	.194	.847^{ns}
R square	0.715				
Adjusted R square	0.6				
$F_{(14,35)}$	6.258				
Sig	0.000***				

Dependent variable = Ln income

***, **,* significant at 1%, 5% and 10% level, ns= non significant

4.5.3 Determinants of total household income of sample farmers in Yamethin Township

The total household income of the sampled farmers in Yamethin was estimated by 14 variables; household head's experience, household head's education, family labor, farm size, food expenditure, non-food expenditure, labor cost of betel vine production, material cost of betel vine production, yield of betel leaf, gross margin of betel leaf, labor cost of green gram production, material cost of green gram production, yield of green gram and gross margin of green gram.

According to the regression analysis, family labor played one of the major roles in determining household income. Generally, more family labor can be reduced in labor cost of farming. The farm size was positively and significantly influenced on the total household income at 10% level. It means that the farmers who had larger farm size can receive higher income. The labor cost of betel leaf production was highly influenced on total household income. And the material cost of betel leaf production was negatively and significantly related with total household income at 1% level. If material cost of betel vine production decreases by 1% level, household income will increase 0.69. In addition 1% increased in yield of betel and gross margin of betel may improve total household income by 0.429 and 0.05 (Table 4.17).

Among the variables, household head's experience, household head's education, food and non-food expenditure, labor cost of green gram production, material cost of green gram production, gross margin of green gram and yield of green gram did not contribute significantly to the household income. The F value showed that the selected model was significant at 1% level. The R^2 value 0.747 means that it can explain the variation in the total household income by 74.7%.

Table 4.16 Descriptive statistics of dependent and independent variables of household income function in Yamethin Township

Variables	Unit	Mean	Std. Deviation
income per year Ks	kyats	2022941.50	2382546.74
Experience year of head	year	28.16	10.81
Education of head	year	1.48	.65
Family labor	no.	4.14	1.65
Farm size	ha	1.25	1.26
Food expenditure	kyats	1088510.40	383361.63
Non-food expenditure	kyats	583807.20	661718.74
Labor cost of betel	kyats/1000 plts	173244.00	162798.82
Material cost of betel	kyats/1000 plts	208186.32	144758.27
Gross margin of betel	kyats/1000 plts	447941.68	529395.04
Yield of betel	viss/1000 plts	306.68	279.26
Labor cost of green gram	kyats/ha	37974.46	51385.10
Material cost of green gram	kyats/ha	23462.22	36209.58
Yield of green gram	ton/ha	.20	.29
Gross margin of green gram	kyats/ha	69488.78	138140.19
No. of respondents	no.	50	

Table 4.17 Income function of the sample farmers in Yamethin Township

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	18.156	4.483		4.050	.000***
Lnexperience	-.313	.188	-.179	-1.665	.105^{ns}
Lneducation	.284	.240	.123	1.185	.244^{ns}
Lnfamilylabor	.780	.315	.354	2.478	.018**
Lnfarmsize	.232	.118	.211	1.959	.058*
Lnfoodexp	-.200	.342	-.079	-.585	.563^{ns}
Lnnonfoodexp	-.175	.141	-.141	-1.245	.221^{ns}
Lnlaborcostbetel	.527	.184	2.773	2.863	.007**
Lnmcostbetel	-.692	.178	-3.713	-3.891	.000***
Lnyieldbetel	.429	.219	1.096	1.955	.059*
Lngmbetel	.055	.024	.380	2.254	.031**
Lnlaborcostgreengram	.034	.217	.215	.157	.876^{ns}
Lnmcostgreengram	-.063	.208	-.378	-.305	.763^{ns}
Lnyieldgreengram	.053	.277	.032	.191	.849^{ns}
Lngmgreengram	.025	.033	.162	.771	.446^{ns}
R square	0.747				
Adjusted R square	0.646				
$F_{(14,35)}$	7.393				
Sig	0.000***				

Dependent variable = Ln income

***, **,* significant at 1%, 5% and 10% level, ns= non significant

CHAPTER V
SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of Findings

Agriculture based rural development has been recognized as the key to eradication of poverty and sustainable improvement of the socio-economic well being of rural people. The employment for landless poor and other rural populace was also heavily engaged with agriculture. So the agriculture sector is the main livelihood of rural areas. And then developing agriculture means developing the economy of rural people.

In this study, socio-economic characteristics of the sample farmers in Lashio and Yamethin Townships were described. There were not many differences between average age of the sample farmers in study areas. The farmers in Lashio had 25.08 years farm experience in average while the farmers in Yamethin had more experience showing 28.16 farming years in average. The average schooling years of sampled farmers were about 2.82 in Lashio and 4.94 in Yamethin. This finding shows that the sample farmers in Yamethin were more educated than those in Lashio. There were no significant different in age, experience, farm size and family size between these townships but there were significant different in education and family labor between these townships.

When comparing home assets, luxury assets such as Television, DVD player and cassette were not different in two townships. Motorbike and generator were more utilized in Lashio compared with Yamethin. It was due to the modernization influenced by closeness of border trade area. Sample farmers in Yamethin owned comparatively higher number of well (92%), bicycle (94%), radio (56%) and sewing machine (8%) than those of Lashio. These home assets were necessary for rural dry zone area, like Yamethin.

Due to the comparison of farm assets, tractor assets were not different in two townships. Sample farmers in Yamethin owned comparatively higher number of cart (46%) and water pump (92%) than those of Lashio. This was due to the geographical differences. As dry zone area such as Yamethin was more requirement of water than Lashio, there was more usage of water pump in Yamethin. There were many significant different in poultry, buffaloes and cattle between the two townships.

In Lashio Township, the sample farmers owned irrigated area 34%, rain fed area 49% and taungya area 17% of the total farm size. The most common cropping patterns are rice-rice in irrigated area, only monsoon rice in rainfed area and only maize in taungya area respectively. Among the sample farmers the most cultivated crop in Lashio was monsoon rice and the second one was summer rice. In Yamethin Township, the sampled farmers owned irrigated area 17%, garden area 48% and ya area 35% of the total farm size. The most common crops are rice in irrigated area, only betel in garden area and only green gram in ya area respectively. And also in Yamethin among the sample farmers the most cultivated crop was betel and the second one was green gram.

The average annual household food consumption was not very much different except from oil consumption. The oil consumption in Yamethin was more than double of that in Lashio. The sample households in Lashio spent the same amount on food and non food items while those in Yamethin spent 62% on food items and 38% on non-food items. Among the expenditure on food items, the most consumption amount was on meat and fish items in Lashio and rice items in Yamethin. The sample households spent the most expenditure amounts on donation and ceremonies items in both Lashio and Yamethin. Education item was also the most expenditure in Yamethin.

In Lashio Township, summer rice received the higher total gross benefit than monsoon rice due to the highest yield and the highest price received from summer rice. However summer rice production expensed the highest variable cost and variable cash cost. The cost and return analysis clearly showed that monsoon rice was more beneficial for farmers than summer rice because the gross margin, return above variable cost, return above variable cash cost, return per unit of total labor, return per unit of family labor, and hired labor, return per unit of cash cost and capital cost of monsoon rice production were higher than summer rice. Based on the break-even yield and the break-even price, monsoon rice received the profit at lower yield and price. The farmers can receive more shares from monsoon rice production than summer rice production.

In Yamethin Township, betel leaf production received the higher total gross benefit than green gram production. Betel production expensed the highest variable cost. The cost and return analysis clearly showed that betel was more beneficial for farmers than green gram because the gross margin, return above variable cost, return

per unit of total labor, return per unit of capital cost of betel production were higher than green gram. The break-even yield and the break-even price of green gram production were 0.3 ton/ha and 440407 ks/ton respectively. For betel production, there were 181 viss/1000 plts and 1573 ks/viss respectively.

According to the household income analysis in Lashio Township, farm size was positively and significantly related to household income at 5% level. And food expenditure, non-food expenditure and yield of monsoon rice were positively and significantly related to household income at 10% level. In case of household income analysis, farm size was also major influencing factor to get more income. Monsoon rice yield and food and non-food expenditure were also main influencing factors on household income.

According to the household income analysis in Yamethin Township, material cost of betel was negatively and significantly related to household income at 1% level. And the gross margin of betel and family labor was positively and significantly related to household income at 5% level. The labor cost of betel plant production was highly influenced on household income. The farm size and betel yield were positively and significantly related to household income at 10% level.

5.2 Conclusion of the Study

The sample farmers in Yamethin were more educated than in Lashio. The household income of Yamethin was more than of that in Lashio. The oil consumption in Yamethin was more than double of that in Lashio. Monsoon rice was more beneficial for farmers than summer rice in Lashio. In Yamethin, betel was more beneficial for farmers than green gram.

Although farmers in Yamethin Township practiced diversified farming system, most of farmers in Lashio Township grew only one or two crops due to limitation of credits. In Yamethin Township, the farm households received the major income from selling their crops especially vegetables. So famers in these areas can get income in the short time by growing cash crops especially vegetables. Because of growing these crops, there were many employment opportunities for landless farmers in the whole year round. In Lashio Township, the lack of employment opportunities resulted in households being unable to access incomes leading to be unable to get sufficient food.

According to the household income analysis in Lashio Township, farm size was the major influencing factor to get more income. Monsoon rice yield, food and non-food expenditure were also influencing factors on household income. According to the household income analysis in Yamethin Township, material cost of betel was the most important influencing factor. And the gross margin of betel, family labor, labor cost of betel production, farm size and betel yield were also influencing factors on household income.

5.3 Recommendations and Implications

Households in Yamethin Township consumed large amount of oil. They spent low amount of income on vegetables and fruits. Households should be encouraged to spend their income to have vegetables and fruits instead of oil consumption. According to BCR and regression results, it would get higher benefit if farmers grow monsoon rice and groundnut in Lashio Township. According to BCR results in Yamethin Township, though the BCR for butter bean showed the highest return, the higher demand for butter bean could not be expected very large.

In Yamethin township, BCR for monsoon rice and sunflower were same as 2.16. However, to get food self sufficiency, monsoon rice should be grown extensively. According to the results of BCR and regression, betel is the highest benefit crop in Yamethin. Although betel is currently highest demand crop in the study area, the increasing health knowledge of the public would reduce consumption of betel in the long term. And increasing production of betel might reduce food production in the study area, and consequently will increase food price. Therefore the betel production in study area should be considered in the long term.

Results of the regression results in both townships showed large scale holders were getting higher benefit than small scale farmers. Therefore, non-farm activities would be highly recommended to generate higher income for these small scale farmers. If higher profitable and potentially market demanded crops could be explored, and the required inputs for these crops should be sufficiently available at affordable price, by doing so income of the farmers in both township would definitely be increased. Farmers should be encouraged not only to grow cash crops but also to grow food crops to have food self-sufficiency including rice. A variety of non farm activities should be sought including exploring of indigenous activities of respective region.

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Appendix 1 Enterprise budget of monsoon rice production of sampled farmers in Lashio Township

Item	Unit	Level	Effective Price	Total Value
1.Gross Benefit				
Rice grain	t/ha	3.86	228247	881033
Total Gross Benefit	**ks/ha**			**881033**
2. Variable Cost				
(a) Material Cost				
Seed	t/ha	0.23	211354	48611
FYM	cart/ha	2.11	11102	23425
Urea fertilizer	bag/ha	3.49	19337	67486
Other fertilizer	bag/ha	2.76	15071	41596
Pesticide	bottle/ha	2.52	1716	4324
Insecticide	bottle/ha	2.98	2665	7942
Other	ks/ha			45897
Total Material Cost (a)	**ks/ha**			**239281**
(b) Family Labor				
Land preparation	amd/ha	30.71	2541	78034
Seeding	md/ha	15.43	1978	30520
Fertilizer application	md/ha	3.53	2449	8645
Manual weeding	md/ha	1.51	2102	3174
Irrigation & drainage	md/ha	2.32	2969	6888
Harvesting	md/ha	6.05	1939	11731
Threshing & winnowing	md/ha	3.83	1990	7622
Drying	md/ha	3.08	2020	6222
Transportation	md/ha	7.56	2603	19679
Total Family Labor Cost (b)	**ks/ha**	**74.02**		**172515**
(c) Hired Labor Cost				
Land preparation	amd/ha	9.23	5163	47654
Seeding	md/ha	29.35	1913	56147
Harvesting	md/ha	21.43	2010	43074
Drying	md/ha	0.91	2980	2712
Transportation	md/ha	12.43	2649	32927
Total Hired Labor Cost (c)	**ks/ha**	**73.35**		**182514**
(d) Interest on cash cost				
Material cost	ks/ha	239281	0.10	23928
Hired labor cost	ks/ha	182514	0.10	18251
Interest on cash cost (d)	**ks/ha**			**42179**
Total variable cost (a+b+c+d)	**ks/ha**			**636489**
Total variable cash cost (a+c+d)	**ks/ha**			**463974**

N=49

Appendix 2 Enterprise budget of summer rice production of sampled farmers in Lashio Township

Item	Unit	Level	Effective Price	Total Value
1.Gross Benefit				
Rice grain	t/ha	4.24	241333	1023252
Total Gross Benefit	**ks/ha**			**1023252**
2. Variable Cost				
(a) Material Cost				
Seed	t/ha	0.24	283461	68031
FYM	cart/ha	1.88	14913	28036
Urea fertilizer	bag/ha	3.76	19413	72993
Other fertilizer	bag/ha	2.74	14609	40029
Pesticide	bottle/ha	4.46	2722	12140
Insecticide	bottle/ha	4.78	1611	7701
Other	ks/ha			95254
Total Material Cost (a)	**ks/ha**			**324184**
(b) Family Labor				
Land preparation	amd/ha	21.59	3073	66346
Seeding	md/ha	24.71	2000	49420
Fertilizer application	md/ha	3.55	2391	8488
Manual weeding	md/ha	3.33	2065	6876
Spraying insecticide	md/ha	3.33	2652	8831
Irrigation & drainage	md/ha	3.76	2652	9972
Harvesting	md/ha	7.31	2022	14781
Threshing & winnowing	md/ha	4.83	2000	9660
Drying	md/ha	5.26	2000	10520
Transportation	md/ha	10.10	2986	30159
Total Family Labor Cost (b)	**ks/ha**			**215053**
(c) Hired Labor Cost				
Land preparation	amd/ha	15.69	2879	45172
Seeding	md/ha	41.47	2005	83147
Manual weeding	md/ha	6.23	2087	13002
Harvesting	md/ha	24.92	2043	50912
Transportation	md/ha	16.76	3028	50749
Total Hired Labor Cost (c)	**ks/ha**			**242982**
(d) Interest on cash cost				
Material cost	ks/ha	324184	0.10	32418
Hired labor cost	ks/ha	242982	0.10	24298
Interest on cash cost (d)	**ks/ha**			**56716**
Total variable cost (a+b+c+d)	**ks/ha**			**838935**
Total variable cash cost (a+c+d)	**ks/ha**			**623882**

N=23

Appendix 3 Enterprise budget of green gram production of sampled farmers in Yamethin Township

Item	Unit	Level	Effective Price	Total Value
1. Gross Benefit				
Seed	ton/ha	0.504	590622	297833
Total Gross Benefit	**ks/ha**			**297833**
2. Variable Cost				
(a) Material Cost				
Seed	kg/ha	18.53	880	16306
FYM	cart/ha	4.32	3450	14904
Urea fertilizer	bag/ha	0.40	22100	8840
Insecticide	bottle/ha	4.63	3885	17988
Total Material Cost (a)	**ks/ha**			**58038**
(b) Family Labor				
Land preparation	amd/ha	9.88	1539	15205
Seeding	md/ha	2.22	1075	2386
Fertilizer application	md/ha	2.59	1650	4273
Manual weeding	md/ha	0.49	1575	772
Spraying insecticide	md/ha	2.22	1500	3330
Harvesting	md/ha	3.71	1075	3988
Transportation	md/ha	2.47	4000	9880
Total Family Labor Cost (b)	**ks/ha**			**39834**
(c) Hired Labor Cost				
Land preparation	amd/ha	9.39	5700	53523
Seeding	md/ha	2.35	1330	3125
Fertilizer application	md/ha	2.27	1646	3736
Manual weeding	md/ha	5.44	1395	7589
Harvesting	md/ha	11.61	1195	13874
Threshing	md/ha	2.35	1060	2491
Total Hired Labor Cost (c)	**ks/ha**			**84338**
(d) Interest on cash cost				
Material cost	ks/ha	58038	0.1	5804
Hired labor cost	ks/ha	84338	0.1	8434
Interest on cash cost (d)	**ks/ha**			**14238**
Total variable cost (a+b+c+d)	**ks/ha**			**196448**
Total variable cash cost (a+c+d)	**ks/ha**			**156614**

N=20

Appendix 4 Enterprise budget of betel production of sampled farmers in Yamethin Township

Item	Unit	Level	Effective Price	Total Value
1.Gross Benefit				
Betel leaf	viss/1000 plts	374	2822	1055428
Total gross benefit				**1055428**
2. Variable Cost				
(a) Material Cost				
Shelf	ks/1000 plts			46013
Seedling cost	ks/1000 plts	1000	122	122000
Fertilizer	ks/1000 plts			44985
Insecticide	ks/1000 plts			40936
Total Material Cost(a)				**253934**
(b) Labor Cost				
Fertilizer application	md/1000 plts	8.78	1500	13170
Spraying insecticide	md/1000 plts	10.90	2993	32624
Irrigation	md/1000 plts	19.95	1863	37167
Adding soil	md/1000 plts	2.76	11720	32347
Preparing plant	md/1000 plts	1.66	30476	50590
Harvesting	md/1000 plts	24	3254	78096
Total Labor cost (b)				**243994**
(c) Interest on cash cost				
Material cost		253934	0.1	25393
Total labor cost		243994	0.1	24399
Interest on cash cost (c)				**49792**
Total variable cash cost (a+b+c)				**547720**

N=41

Appendix 5 Regression results of income function of sampled farmers in Lashio Township

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.845[a]	.715	.600	.33855

a. Predictors: (Constant), Lngmsummer, Lneducation, Lnfarmsize, Lnexperience, Lnyieldmonsoon, Lnfamilylabor, Lngmmonsoon, Lnnonfoodexp, Lnlaborcostmonsoon, Lnfoodexp, Lnyieldsummer, Lnlaborcostsummer, Lnmcostmonsoon, Lnmcostsummer

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.042	14	.717	6.258	.000[a]
	Residual	4.012	35	.115		
	Total	14.054	49			

a. Predictors: (Constant), Lngmsummer, Lneducation, Lnfarmsize, Lnexperience, Lnyieldmonsoon, Lnfamilylabor, Lngmmonsoon, Lnnonfoodexp, Lnlaborcostmonsoon, Lnfoodexp, Lnyieldsummer, Lnlaborcostsummer, Lnmcostmonsoon, Lnmcostsummer

b. Dependent Variable: Lnincome

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.246	2.275		2.306	.027
Lnexperience	-.092	.132	-.078	-.696	.491
Lneducation	-.082	.073	-.108	-1.120	.270
Lnfamilylabor	-.059	.152	-.041	-.386	.702
Lnfarmsize	.253	.120	.253	2.100	.043
Lnfoodexp	.375	.200	.302	1.868	.070
Lnnonfoodexp	.274	.142	.269	1.932	.062
Lnlaborcostmonsoon	.098	.221	.332	.443	.661
Lnmcostmonsoon	-.157	.232	-.521	-.675	.504
Lnyieldmonsoon	.587	.313	.374	1.877	.069
Lngmmonsoon	.019	.030	.094	.633	.531
Lnlaborcostsummer	.090	.354	1.099	.253	.802
Lnmcostsummer	-.120	.370	-1.416	-.323	.749
Lnyieldsummer	.206	.263	.284	.783	.439
Lngmsummer	.004	.022	.049	.194	.847

a. Dependent Variable: Lnincome

Appendix 6 Regression results of income function of sampled farmers in Yamethin Township

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.864[a]	.747	.646	.53337

a. Predictors: (Constant), Lngmgreengram, Lngmbetal, Lnfamilylabor, Lneducation, Lnyieldgreengram, Lnfarmsize, Lnexperience, Lnnonfoodexp, Lnfoodexp, Lnlaborcostbetel, Lnmcostgreengram, Lnyieldbetel, Lnmcostbetel, Lnlaborcostgreengram

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.446	14	2.103	7.393	.000[a]
	Residual	9.957	35	.284		
	Total	39.403	49			

a. Predictors: (Constant), Lngmgreengram, Lngmbetel, Lnfamilylabor, Lneducation, Lnyieldgreengram, Lnfarmsize, Lnexperience, Lnnonfoodexp, Lnfoodexp, Lnlaborcostbetel, Lnmcostgreengram, Lnyieldbetel, Lnmcostbetel, Lnlaborcostgreengram

b. Dependent Variable: Lnincome

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	18.156	4.483		4.050	.000
Lnexperience	-.313	.188	-.179	-1.665	.105
Lneducation	.284	.240	.123	1.185	.244
Lnfamilylabor	.780	.315	.354	2.478	.018
Lnfarmsize	.232	.118	.211	1.959	.058
Lnfoodexp	-.200	.342	-.079	-.585	.563
Lnnonfoodexp	-.175	.141	-.141	-1.245	.221
Lnlaborcostbetal	.527	.184	2.773	2.863	.007
Lnmcostbetal	-.692	.178	-3.713	-3.891	.000
Lnyieldbetal	.429	.219	1.096	1.955	.059
Lngmbetal	.055	.024	.380	2.254	.031
Lnlaborcostgreengram	.034	.217	.215	.157	.876
Lnmcostgreengram	-.063	.208	-.378	-.305	.763
Lnyieldgreengram	.053	.277	.032	.191	.849
Lngmgreengram	.025	.033	.162	.771	.446

a. Dependent Variable: Lnincome