FOOD SECURITY STATUS OF THE RURAL HOUSEHOLDS IN MAN MAN SAI TOWNSHIP, WA SPECIAL REGION NO.2, NORTHERN SHAN STATE

ZAR NI KYAW

MAY 2012

FOOD SECURITY STATUS OF THE RURAL HOUSEHOLDS IN MAN MAN SAI TOWNSHIP, WA SPECIAL REGION NO.2, NORTHERN SHAN STATE

ZAR NI KYAW

(AEC-25)

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)

Department of Agricultural Economics

Yezin Agricultural University

MAY 2012

The thesis attached hereto, entitled "**FOOD SECURITY STATUS OF THE RURAL HOUSEHOLDS IN MAN MAN SAI TOWNSHIP, WA SPECIAL REGION NO.2, NORTHERN SHAN STATE"** was prepared and submitted by **Zar Ni Kyaw** under the direction of the chairperson of the candidate supervisory committee and has been approved by all members of that committee and board of examiners as a partial fulfillment of the requirements for the degree **OF MASTER OF AGRICULTURAL SCIENCE (AGRICULTURAL ECONOMICS).**

Dr. Dolly kyaw
Chairperson
Supervisory Committee
Professor and Head
Department of Agricultural Economics
Yezin Agricultural University

U Boon Thein
External Examiner
Advisor (Government Relation)
ActionAid Myanmar
Director (Retd), Planning Division
Department of Agricultural Planning
Ministry of Agriculture and Irrigation
Nay Pyi Taw, Myanmar

Dr. Cho Cho San
Member
Supervisory Committee
Associate Professor
Department of Agricultural Economics
Yezin Agricultural University

Dr. Mar Mar Kyu
Member
Supervisory Committee
Professor
Department of Agronomy
Yezin Agricultural University

Dr. Dolly Kyaw
Professor and Head
Department of Agricultural Economics
Yezin Agricultural University
Yezin, Nay Pyi Taw

This thesis was submitted to the Rector of the Yezin Agricultural University and was accepted as a partial fulfillment of the requirements for the degree of **MASTER OF AGRICULTURAL SCIENCE (AGRICULTURAL ECONOMICS).**

Date ---------- ----------

Dr. Tin Htut
Rector
Yezin Agricultural University
Yezin, Nay Pyi Taw

DEDICATED TO MY BELOVED PARENTS,

U SHEIN KOI OM AND DAW KHIN PHYU

DECLARATION OF ORIGINALITY

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

Date ---------- ----------

ZAR NI KYAW

ACKNOWLEDGEMENT

I would like to express my special gratitude to Dr. Tin Htut (Rector), Dr. Myo Kywe, Pro-Rector (Academic), Dr. Thein Lwin, Pro-Rector (Administration), Yezin Agricultural University (YAU), for their permission to attend the master program and their kind administrative support in the completion of my thesis.

I wish to extend my sincere thanks to my external examiner of the supervisory committee, U Boon Thein, Advisor, ActionAid Myanmar, Director (Retd.), Planning Division, Department of Agricultural Planning, Nay Pyi Taw, for his technical guidance, suggestions and invaluable comments in this manuscript.

I not only am really indebted but also would like to express my utmost gratitude to my supervisor, Dr. Dolly Kyaw, Professor, Department of Agricultural Economics, YAU for her valuable advice in data analysis, kind help, invaluable suggestions and worth guidance leading towards the successful completion of my research work. I really appreciate for her untiring assistance, love, kindness, moral support, motherly and understanding to me.

Sincere appreciation and gratitude go to supervisory committee members, Dr. Mar Mar Kyu, Professor, Department of Agronomy, YAU and Dr. Cho Cho San, Associate Professor, Department of Agricultural Economics, YAU, for their careful guidance, encouragement, moral support, generous helps, kindness, during the courses of my study, and for their critical reading, patience, suggestions and comments on this manuscript.

Special thanks go to Karin Luke, Project Manager, German Agro Action for the partial financial support for conducting my survey research work in Man Man Sai Township.

I greatly appreciate Wa authorities in Man Man Sai Township, Wein Kao District, Wa Special Region No.2 in Northern Shan State, for their permission to conduct the field survey and for their kind help in data collections. I also thank to Ko Sai Wana Thein, Field Coordinator, and my interpreters, Sai Maung Maung and Aik Htun, for their in interview to the farmers. My deepest thank goes to all village leaders and respondents who willingly answered my survey questionnaires. My great thanks also go to the teaching staff from the Department of Agricultural Economics, Yezin Agricultural

University, and all my friends and classmates for their valuable suggestions, kindness and assistance throughout my study period.

My eternal gratitude goes to Ko Win Oo, KoThein Aung Than, Ko Zaw Win Lat, Ko Bo Thein, Ko Kaung Myat, Ko Nay Myo, Ko Zayar Myint, Ko Ye Tun Min, U Win Maung, Daw Tin Tin Nyo, Ma Nem Nei Lhing, Mai Zin Zin Ni, Ma Thandar Aye, Ma Phyu Mar Cho, Ma Khin Thanda Win, Ma May Oo Khing, Ma Htwe Htwe,Thet Pai San Lwin, Naing Linn Maw, Sai Nay Kyar Tip, Kyaw San Wai and Ei Mon Thida Kyaw for their love, praying, kindness, patient, guidance and untiring assistance.

My deepest and greatest dedication is to my family; my beloved parents; U Shein Koi Om and Daw Khin Phyu, my elder brother; Ko Kyaw Zin Htun and my elder sister; Ma Khin Cho Thet for their deep encouragement, praying, kind understanding, invaluable moral and financial support not only throughout my education lifetime but also for my whole life.

ABSTRACT

The objectives of the study were to investigate the demographic and socio-economic status, and to determine the food security status of the selected rural households in Man Man Sai Township, Wa Special Region No.2. The survey was conducted during the period from January to February, 2009. Simple random sampling procedure was used to select 109 respondents from German Agro Action's project targeted 16 villages in Man Man Sai Township and the primary data were collected.

Out of the total sample households (109), 68 households were mainly small farmers, 38 households were working as a farm and rubber households, and 3 households were landless. The household's head of landless was the youngest while head of farm household was the oldest. The average family size of landless was 3 and it was about 6 in other types of households. The average dependency ratio was lower in landless than other types of households. The majority of the total sample households (85.3%) owned the houses made of bamboo and thatch roof. Rice insufficient period for both farm and landless households comprise of 7 months while farm and rubber households had 4.9 months only.

All landless households, half of farm households and farm and rubber households faced with food insecurity. The total food expenditure (195 thousand kyats per year) of food insecure households was significantly lower than food secure households (234 thousand kyats per year). More than half of food insecure households had to mix rice with maize while only 25% of food secure households mixed rice with maize. About 63% and 23% of food insecure and food secure households needed to reduce meals 4 to 10 times per month due to low income.

According to regression analysis, maize and tea were promising cash crops and therefore technology and extension services should be provided to promote maize and tea production and income. Daily causal labor income is very important for food insecure households and creation of non-farm employment and provision of credit to the poor to stabilize consumption and promote self-employment is essential. Implementation of natural resource conservation program through "food for work" is urgently needed as many households relied on collecting and selling non-timber forest products (NTFPs) especially in food shortages period. Moreover, safe drinking water and improved

sanitation should be provided especially for food insecure households to improve their food, nutrition, and hygiene status of rural households in the study area.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF APPENDICES

Page

LIST OF ABBREVIATIONS

NTFPs	Non-Timber Forest Products
WTO	World Trade Organization
CSO	Central Statistical Organization
etc.	extra
kcl/ person/ day	kilo cariole per person per day
DES	Dietary Energy Supply
g	gram
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO Statistical Database
UNFPA	United Nations Population Fund
kg	kilogram
MT	Metric Ton
MAS	Myanma Agriculture Service
UNDP	United Nations Development Programme
IFAD	International Fund for Agricultural Development
IHLCA	Integrated Household Living Conditions Assessment
MDG	Millennium Development Goal
FPL	Food Poverty Line
PL	Poverty Line
MNPED	Ministry of National Planning and Economic Development
UNOPS	United Nations Office for Project Services
UNICEF	Unite Nations International Children's Emergence Fund
SIDA	Sedwish International Development Cooperation Agency
GAA	German Agro Action
HFS	Households Food Security
H/h	Households
kyats/ year	kyats per year
ha	hectares

LIST OF CONVERSION FACTORS

1 Hectare	= 2.47 Acres
1 Acre	= 6 Muus
1 Yuan	= 170 kyats (price in 2009)

CHAPTER I
INTRODUCTION

1.1 Background

Food and nutrition security remain the fundamental challenges for human welfare and economic growth particularly in the remote upland areas of Myanmar. Government motivates its agricultural policy by fulfilling food security in all over the country. In Myanmar, food security is defined as the availability of food throughout the year for the whole country at a reasonable price such that every household can afford to consume adequate amount and quality of food. The goal of national food policy is the attainment of food security through self-sufficiency, price stabilization and the improvement of nutritional status. Actually, food security based on self-sufficiency is a recurrent theme among developing members of the World Trade Organization (WTO).

Rice is a staple food for Myanmar people and then it is followed by maize as a substitute food especially in the rice deficit production and remote hilly areas. According to the Central Statistical Organization (2001), both rural and urban households spent a high share of food expenditure (nearly 73% and 70% of the total expenditure respectively) in their budget in 2001-02, and rice occupied 22% of household's food budget. The CSO found out that average annual per capita consumption of rice in rural and urban Myanmar was 160 and 130 kg, respectively in 2001. Reflecting the importance of rice in food security and development of national economy, the objectives of agriculture sector are: (1) to achieve surplus in paddy production, (2) to achieve self-sufficiency in edible oil, and (3) to promote the production of exportable pulses and industrial crops. Therefore, the first priority of the agriculture sector was to produce sufficient amount of rice in each and every State and Division of the country.

For achieving food self-sufficiency and surplus, the supply-driven strategies such as expansion of sown area, promotion of intensive cultivation practice in irrigated area (or summer paddy program) and achievement of target yields in 10 principal crops are focused under market-oriented policy. The total crops sown area has increased from 12, 884 thousand hectares in 1995-96 to 22,117 thousand hectares in 2007-08. Paddy is the dominant crop in agriculture because it occupied 47.6 percent of total sown area in 1995-96. Its share was decreased to 36.5 percent in 2007-08. On the other hand, the share of pulses crop increased from 12 percent of total sown area to 14.8 percent during the same period. The share of oilseed crops was almost the same (about 15.2 percent).

The changes in total production and per capita production of rice, maize, groundnut, sesame, and major pulses (Black gram and Green gram etc.) during 1990-91 and 2009-2010 are presented in Table (1.1). It was obvious that percentages changed in the major pulses are highest within 15 years period as export of pulses was liberalized since 1988 when market- oriented economy was adopted.

According to FAO, "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".

Food security has 3 dimensions:

(1) Availability and stability of safe and nutritionally adequate food both at the national and household level;

(2) Need to ensure that each household has physical, social and economic access to sufficient food on a sustainable basis; and

(3) Efficient utilization of food to derive sufficient nutrition.

The FAO applied the following food deprivation and consumption indicators (Table 1.2) to present the trends of food deprivation, food needs, and food supply of Myanmar during 1990 and 2006. The proportion of undernourishment was declined from 44% of total population in 1990-92 to 17% in 2004-06. Average daily dietary energy requirement for a person was 2,310 kcal while the country's food supply in terms of dietary energy supply (DES) was 2,420 kcal in 2004-06 (Table 1.2).

Table 1.1 Changes in production of food crops in Myanmar

No.	Items	Production in 2009-10		Percentage change in total production since 1990-91	Percentage change in per capita production since 1990-91
		Total production (000, MT)	Per capita production (MT/person)		
1	Paddy	32165.8	543.9844	133.96	61.365
2	Maize(seeds)	1226	20.734	565.94	210.182
3	Groundnut (winter)	828	14.00	209.186	215.732
4	Sesamum	854	14.443	477.027	297.956
5	Matpe (Black gram)	1485	25.114	1404.559	937.645
6	Pedisein (Green gram)	1315	22.239	2024.394	1365.124

Source: CSO, Statistical Year Book (2009- 2010)

Table 1.2 Food Security Situation of Myanmar

Indicators	Unit	1990 -92	1995 -97	2000 -02	2004 -06	Annual change 1990-1995 %	Annual change 1995-2000 %	Annual change 2000-2004 %
1. Food Deprivation								
(a) Proportion of undernourishment	%	44	34	26	17	-5.4	-5.1	-10.6
(b) Number of undernourished person	millions	18.1	14.8	12.2	8.3	-4.0	-3.9	-9.7
2. Food Needs								
(a) Minimum dietary energy requirement	kcal/person /day	1750	1770	1790	1810	0.3	0.3	0.2
(b) Average dietary energy requirement	kcal/person /day	2210	2240	2280	2310	0.3	0.3	0.3
3. Food Supply for Human Consumption								
(a) Dietary energy supply (DES)	kcal/person /day	1880	2050	2200	2420	1.7	1.4	2.5
(b) Total protein consumption	g/person/ day	47.2	51.9	58.5	68.6	1.9	2.4	4.0
(c) Animal protein consumption	g/person/ day	8.4	8.7	12.1	18.3	0.8	6.6	10.4
(d) Fat consumption	g/person/ day	38.5	41.1	45.7	58.8	1.3	2.1	6.3

Source: www.faostat.org (Last update at 12/10/2009)

According to FAO, the per capita paddy production index in Myanmar was stable (around 120) during 1999 to 2004. Then it was increased to 140 and 155 in 2005 and 2006, respectively (Figure 1.1). The Ministry of Labour and UNFPA (2006) estimated that the per capita rice availability has improved gradually from 222.8 kg per year in 2000-01 to 243.2 kg per year in 2004-05.

The figure (1.2) represents that paddy sown area, yield and production in Myanmar has been improved significantly since year 2006. The paddy sown area reached to 8 million hectares (ha) and it produced about 34 million MT in year 2010.

The Myanma Agriculture Service (MAS) assumes that per capita rice consumption in rural and urban is 150 and 120 kg per year (or in terms of paddy 15 and 12 baskets in rural and urban with the conversion factor of 100 baskets of paddy equals to 1 MT of rice). MAS estimated that Chin, Mandalay, and Magway Divisions are likely to continue as rice deficit areas (Figure 1.3). Yangon Division, one of Cyclone Nargis affected areas was changed from rice surplus area in the last three years to rice deficit area in 2008- 09. The rest of the States and Divisions obtained rice self-sufficiency. At the national level, rice self-sufficiency ratio was 165 percent in 2006-07, 166 percent in 2007-08,169 percent in 2008-09, and 168 percent in 2009-10 (MAS 2011).

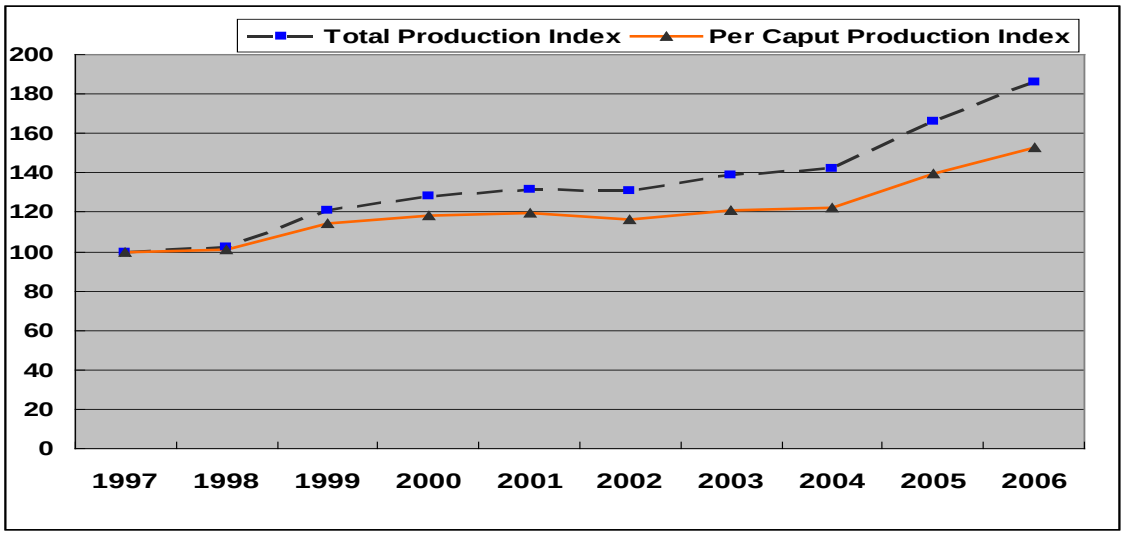


Figure 1.1 Total and per capita paddy production indexes in Myanmar
Source: FAOSTAT

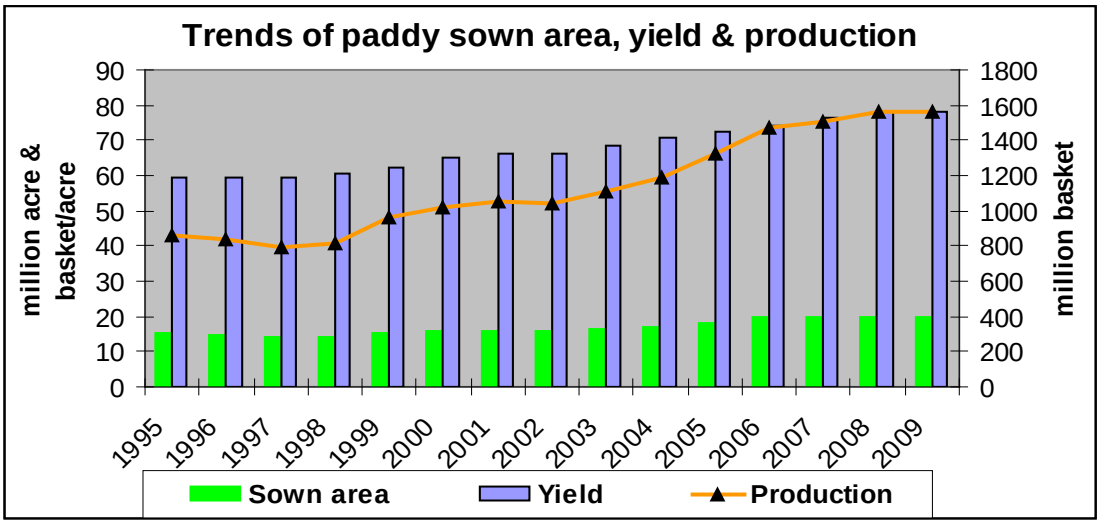


Figure 1.2 Trends of paddy sown area, yield and production
Source: MAS (Annual Report in various years)

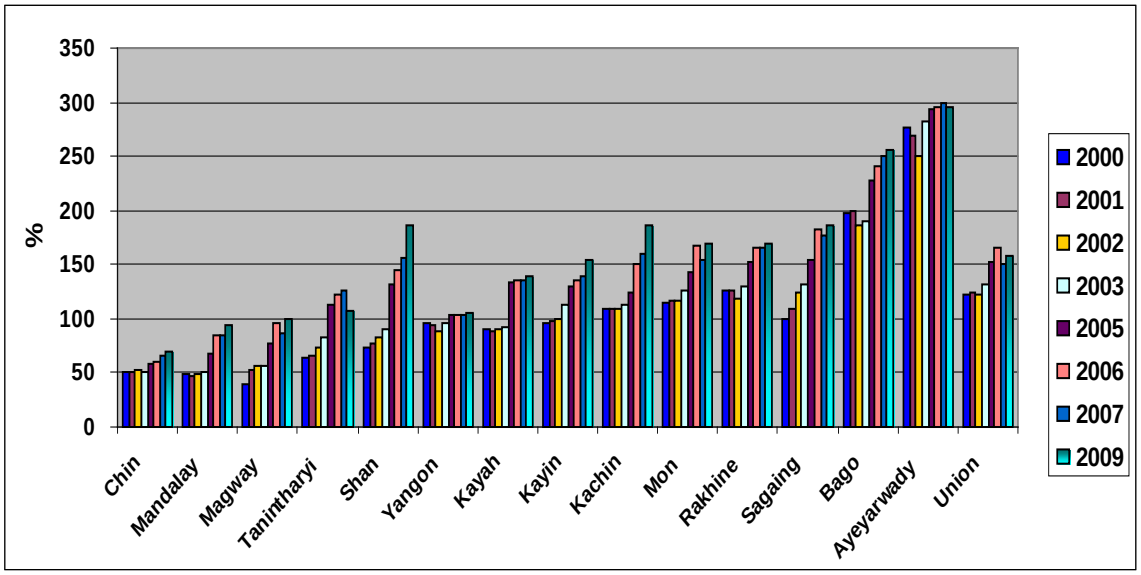


Figure 1.3 Trends of rice self-sufficiency ratio in different States and Divisions

Source: MAS (Annual Report in various years)

The vulnerable households such as landless laborers and small farmers who constitute about 30 to 50 percent of total rural households have experienced food and nutritional insecurity due to their low income. Food security is concerned with access to food. Food production and availability does not equal to food security. Although food is available in the market, households cannot afford to acquire it and they are food insecure. Food availability is a necessary but not a sufficient condition to assure food security for a household. Households must have the resources necessary to acquire the food that they need for consumption.

The UNDP and the Ministry of National Planning and Economic Development jointly conducted the Integrated Household Living Conditions Assessment (IHLCA) survey and collected data from more than 18,000 households to determine poverty levels, household living conditions and Millennium Development Goal (MDG) indicators for Myanmar in 2004-05, and in 2009-10 respectively. The food poverty line (FPL) and poverty line (PL) were set up to examine poverty levels of the households. According to the study, 9.6% of the total population fell below the FPL in 2004. There were large disparities between States and Divisions. Food poverty was highest in Chin State with a food poverty headcount index of 40%, followed by Shan North and Shan East with (51%) and (52%) respectively.

The 'poverty headcount index' is the proportion of individuals whose normalized consumption expenditure per adult equivalent is lower than the Poverty Line. The poverty headcount index of the country was 32%. Chin State was the poorest state with 73% poor, followed by Shan East (52%) and Shan North (51%) in 2004 at PL of 162,136 kyats per year (UNDP and MNPED 2007). Therefore, food and nutrition security remain the fundamental challenges for human welfare and economic growth especially in remote upland areas of Myanmar.

According to the second IHLCA survey in 2009-10, the food poverty line and poverty line were updated at 274,990 kyats and 376,151 kyats, respectively. The food poverty incidence at Union level was declined to 4.8% while the poverty incidence was declined to 26% in 2009-2010 at the updated poverty line (UNDP, MNPED, SIDA, and UNICEF 2011).

1.2 Problem Statement

The GAA (German Agro Action) has implemented the Integrated Food Security Project in Man Man Sai Township, Wein Kao District, Wa Special Region No.2 in Northern Shan State, since 2008. This Township was former poppy growing area. Project

duration was 3 years (from January 2008 to December 2010) and it was mainly financed by the European Union. The project targeted around 20 villages with an estimated number of 800 households. The project aimed at "contributing to the sustainable improvement of the food and livelihood conditions" of the targeted households.

Nearly all of the farm households in Man Man Sai Township were subsistence farmers and they produced insufficient foods for own production. Hence, they had to rely on working as causal labor, livestock raising and collecting and selling non-timber forest products (NTFPs) and barks to earn income. There was limited study and unavailable data on food security issues in that region. It was noted that during the most profitable poppy period, there was sufficient cash flow existed from selling poppy for buying rice. Due to poppy eradication, the skill and knowledge had been lost. Therefore, it is essential to assess the food security status of targeted rural households and to examine their livelihood conditions and opportunities to overcome poverty in Man Man Sai Township.

1.3 Objectives of the Study

(1) To study the demographic and socio-economic characteristics of the rural sample farm and landless households in the GAA project area of Man Man Sai Township;

(2) To estimate the food security status of the rural sample households and compare the demographic and socio-economic characteristics of food secure and insecure households in the study area; and

(3) To examine the determinant factors of per caput income of the rural sample households in the study area.

CHAPTER II
REVIEW OF LITERATURE

2.1 Concept of Household Food Security

Food security is a complex phenomenon attributable to a range of factors that vary in importance across geographic and social boundaries, as well as over time. The concept of food security is multi-dimensional and provides valuable insights into the nature and extent of a population's food situation. Additionally, food security can be looked at from many different levels: global, national, local and family or household level.

Chronic (permanent) food insecurity refers to a continuously inadequate diet resulting from lack of resources to produce or acquire food. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world. Transitory food insecurity refers to a temporary decline in the households' access to enough food. It results from instability of food prices, production or incomes. The worst form of transitory food insecurity is famine.

Household food security has three main components: availability, access and utilization. Available and stable supplies of food are a prerequisite for household food security. However, households must also have physical and economic access to food. In addition, they must have the knowledge to use such food appropriately and have a satisfactory health/sanitation environment that allows for adequate absorption of food by the body.

The focus on the lack of access to food rather than its inadequate and uncertain supply has helped to explain why famines occurred in environments of apparent food abundance (Christiaensen and Tollens 1995). Food availability is a necessary but insufficient condition for adequate household food consumption as increased reliance on off-farm activities such as petty trade, casual employment and agricultural surplus sales that has made households more dependent on purchasing food than producing it.

The utilization concept adds a qualitative notion to food security in the form of nutritional security. It is no longer enough for a family to have sufficient food to be food-secure; the food must be of adequate nutritional quality and the household must be able to use it appropriately and have a satisfactory health and sanitation environment for the body to absorb it.

The "three pillars" of household food security can be "shocked" by a variety of risk factors including natural disasters, conflicts and policy changes. In addition, there are

variables adversely affecting the farmers' food production, which in turn determines the situation of the households' food security. These are environmental crises, population pressure, poor asset base, social (cultural) issues, and poor rural infrastructure.

i) Environmental crises are comprised by two elements, i.e., climatic hazards (drought, flood, hailstorm, frost, etc.), and land degradation through soil erosion, loss of nutrients, deforestation and overgrazing.

ii) Population pressure is generated by rapid growth of human and livestock population resulting in diminishing holding size and fragmentation of farmland and absence or shortage of fallow periods.

iii) Poor asset base involves aspects such as lack of investable surplus cash, lack of farm oxen, absence of off-farm employment opportunities and inability to purchase modern farm inputs.

iv) Social or cultural issues mean low level of educational background (especially for women) and low knowledge of primary health care practices among the people in the area under study can also be the other variable.

v) Poor rural infrastructure equals to inaccessibility to roads, absence of rural credit, lack of irrigation practices, lack of agricultural extension services, poor health facilities, poor storage and unfavorable market for agricultural produce.

A household is food-secured if it has the ability to meet, either from its own production or through purchases adequate food for meeting the dietary needs of all its members (Maziya-Dixon et al. 2004).

There are approximately 200 definitions and 450 indicators of food security. One volume on household food security by Maxwell and Frankenberger (1992) lists 25 broadly defined indicators. Riely and Moock (1995) list 73 such indicators, somewhat more disaggregated than those found in Maxwell and Frankenberger. Chung et al. (1997) noted that even a simple indicator such as a dependency ratio can come with many different permutations.

Household food security was viewed as a measure to link national, regional and community level food supply to household food consumption and individual nutritional status and relate agricultural policy to issues of nutrition (Gittelsohn et al. 1998). Food insecurity is no longer seen as a failure of food production at the national level but as livelihood failure (Devereux and Maxwell 2001).

There are three types of food insecurity; (1) chronic food insecurity- affects people who consume or have regularly consumed quantities somewhat lower than the

necessary minimum for a considerable period of time**;** (2) cyclic food insecurity- occurs in seasonal lean periods; and (3) transitory food insecurity- affects people whose food intake deteriorates at times to the point that their health and well-being are affected. Food insecurity may be chronic or transitory. When it is chronic it is known as undernourishment. Vulnerability refers to the group of factors that places people in a situation where they are at risk of food insecurity, including factors that undermine people's capacity to deal with the situation.

2.2 Food and Livelihood Security

The food security of poor households is dynamic and influenced by a range of factors. The poor live in a changing world to which they must constantly adapt, and are often unprepared for the changes. There is a constant struggle to meet daily basic needs. Looking at livelihoods provides a richer and more detailed picture of how poor families cope with a variety of risks and shocks in meeting their basic needs.

Households can have several possible sources of income and other resources that constitute their livelihoods. Livelihood systems are maintained by a range of on-farm and off-farm activities, which together provide a variety of procurement strategies for food and cash. A household's total resources are based not only on its productive activities and endowments, but also on its legal, political and social position within society.

Looking at livelihoods highlights two important elements influencing a household's food security;

(1) the risk of livelihood failure determines the vulnerability of a household to income, food, health and nutritional insecurity; and

(2) the greater the share of resources devoted to the acquisition of food and health services, the higher the vulnerability of the household to food insecurity.

Livelihoods are thus secure when households have secure ownership of, or access to resources and income-earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies (Chambers and Coney 1992; Chambers 1989).

The implication for policy-making is that increased agricultural productivity is not the only solution. The answer lies in supporting the diversification of income sources and assets, as well as promoting investments and activities that help households to face shocks to their livelihoods and reduce risks (Ellis 2000).

People adopt coping strategies in response to different risks and thus shocks to their livelihoods. Coping strategies are a series of decisions and actions that result in trade-offs between current and future consumption – the accumulation of savings for

worse times. The range of coping and adaptive strategies is large and differs according to the particular conditions. Some coping strategies are positive means of overcoming food shortages, for example off-farm employment when it is available, savings that can be called upon and family networks for sharing. Examples of negative coping strategies are: severe reduction in food consumption, selling productive assets, reducing expenditures on basic services such as health and education, children are dropped out from school, etc.

2.3 Indicators for Measuring Household Food Security

Once a definition of household food security (HFS) has been adopted and the various components identified the next step in the attempt to operationalize the HFS concept calls for choosing the particular indicator to be used in characterizing the food insecure. Consensus has still not been reached on acceptable indicators and methods of measuring HFS (Haddad et al. 1994). The choice of a particular indicator must be based on the specific objectives of the research, and the trade-offs between resource constraints and information needs.

Traditional indicators have often included both supply-side indicators, such as food production, and consumption-side indicators, such as household food consumption, total expenditure and calorie adequacy (direct measures), and anthropometric measures (indirect measures). Socio-economic indicators have become increasingly important in HFS and vulnerability assessment. Simple measures such as household access to assets are often good determinants of vulnerability (Chambers 1989, Swift 1989). Also, variables that are relatively easy to collect, such as household size and composition, land use and ownership, and asset liquidity, can often be successfully used as indirect indicators to locate the most vulnerable groups in terms of food security (Haddad et al. 1994).

Table (2.1) provides the variables that will be considered in analyzing household food security.

2.4 Measuring Household Vulnerability to Food Insecurity

Household food security can be defined as "Access by all people at all times to enough food (of good quality) for an active, healthy life" (World Bank 1986). Regardless of the definition adopted, four core concepts are common to most: access, security, sufficiency and time. The primary focus will be on the first two aspects, where access is defined as the entitlement to produce, purchase, exchange or receive food, and security as the balance between vulnerability, risk, and insurance (Maxwell and Frankenberger 1992). As such, household vulnerability must be assessed in terms not only of immediate

access, but also of the stability and sustainability of those channels through which the household mediates its food access.

A household may derive its food entitlements from its own production, income (from the sale of labour or of surpluses), and disposal/use of assets. When households are able to generate a surplus above their basic food requirements, the excess resources are diverted into assets, from which the household can draw in the event of a food crisis. Assets can be either physical or human, or merely in the form of social and institutional claims. Based on this framework, the most food insecure households will be those that face the combination of shortfalls in immediately available food (through their own production or through income-generating activities), assets, and claims, all leading to a greater exposure to the risk of present or future food entitlement failure.

Poor rural households in remote areas tend to rely heavily on their own produce. Households that are unable to meet their food requirement through their own production must rely on markets, with the consequent risk of entitlement failure deriving from market shocks – the larger the share of total household resources devoted to food purchases, the greater the shock. Output shocks in food production, however, can substantially increase the vulnerability of subsistence farmers. For these households, crop and income diversification, such as seasonal off-farm agricultural labour, emerge as very important coping mechanisms to reduce the risk of entitlement failure as a result of shocks in output of staples.

In the presence of uncertainty, diversification of income sources is an important part of a household's strategy to reduce the risk of entitlement failure and, as such, must be accounted for in any attempt to measure vulnerability. At low levels of income and high levels of destitution and food insecurity, diversity in income composition may be even more important than the actual income level in securing the survival of vulnerable household members in the event of a food entitlement failure.

In circumstances where financial markets are highly imperfect or non-existent, asset ownership is a common form of precautionary savings among households in rural communities. For food security purposes, asset ownership must be further characterized on the basis of liquidity. Liquid assets, such as small animals, are often used by poor rural households for consumption smoothing, as a form of insurance against the risk of food entitlement failure.

According to International Fund for Agricultural Development (IFAD), the household must be characterized on the basis of the following features: (i) food

production/food market dependency or farm and non-farm households; (ii) income by groups (iii) asset ownership; (iv) income diversification; and (v) crop diversification.

The proxies used for each of these components are, respectively, the household's rice market dependency ratio, total household income, liquid asset stocks, the number of income sources and the number of crops grown. The first variable is included in the indicator to reflect the source of household food supply. The second variable/proxy indicates the household's ability to access food through earned revenues. The third one reflects the household's ability to cope with short-term food shortages, while the last two variables are indicative of the household's strategy in reducing the risk of entitlement failure. Each individual variable is ranked from worse off to better off, and the observations are grouped into terciles. It is assumed that belonging to the low tercile contributes nothing to the household food security measure; the medium tercile, 1 point; and the high tercile, 2 points. The partial scores are added for each individual household. Total scores of up to 3 points are presumed to reflect extreme vulnerability, while from 4 to 7 indicates medium vulnerability and from 8 to 12, low vulnerability.

In summary, the preliminary findings endorse the use of composite indicators in locating the most vulnerable groups from a food security standpoint. They also illustrate the important role played by IFAD projects in reducing household vulnerability to food insecurity across the communities surveyed. Furthermore, the univariate analysis initially hinted at the existence of a weak but positive relationship between women's income and the household food security.

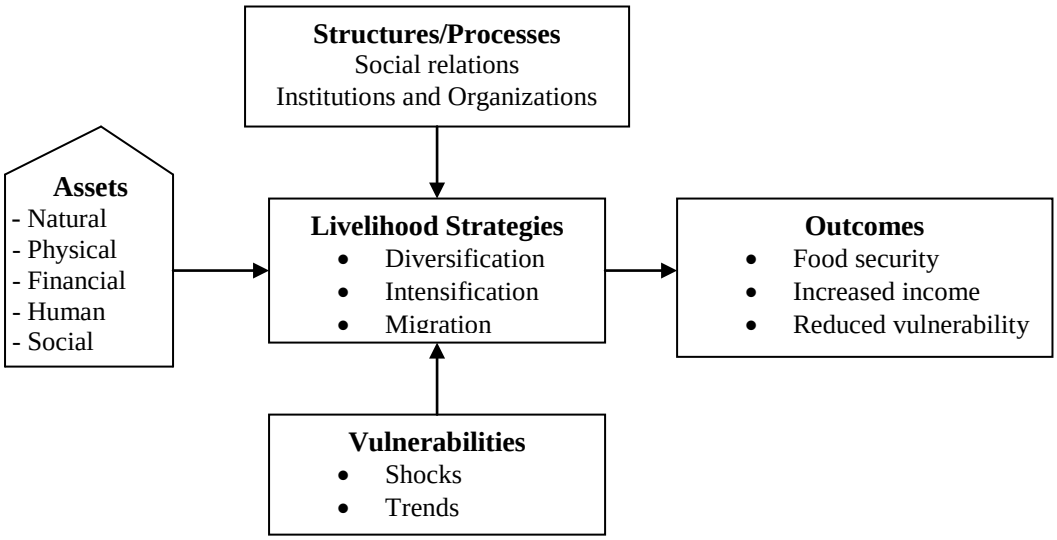


Figure 2.1 Sustainable Livelihoods Framework

Source: Ellis (2000)

Table 2.1 Factors affecting household food security

Concept	Source /component	Variables
Food access	Food supply (own)	Per capita paddy production/ cash crops production Paddy yields Duration of paddy harvest / received from relatives
	Income and Expenditure	Total income of all sources Percentage of income used for food
	Assets	Land Livestock Durable goods
	Access to credit	Amount borrowed with reasonable interest rate
	Access to natural resources	Gathering of wild fruits and plants and wood and other forest products
	Claims/social network	Transfers, remittances, subsidies, gifts Access to informal credit
Security/risk	Diversification	Income composition, integrated farming Number of crops grown by the household Income-generating activities Number of household members working off-farm job
	Food market integration	Rice market dependency ratio, Food Price Index Net rice purchases, Contribution of Transport Cost
	Migration	Male migration, Female migration, seasonal migration, permanent migration
	Assets	Asset stocks Asset liquidity Asset depletion

Source: Hadded et al. 1994

2.5 Previous Studies on Food Security in Myanmar

The UNDP and FAO (2009) reported that 52 townships in Shan, Chin State and Kachin states were deemed highly vulnerable in terms of food security. Devastatingly, one in ten people in Myanmar, that is more than 5 million, suffered from chronic hunger.

The justifications for Special Region 1 (Kokang), Special Region 2 (Wa) and Special Region 4 (Shan/Akha) were provided by the concerns that the various efforts to eradicate opium had caused many households in the regions to chronic poverty and had negatively affected their food security. A better understanding of the key factors leading the vulnerable populations to poverty and food insecurity, their coping mechanisms and capacity was expected to contribute to improved targeting, programme development and implementation, and effective and timely interventions by the Government and other national and international stakeholders concerned.

In Kokang, land availability is the main limiting factor for food availability, leading to a less frequent use of fallow practices than it has been practiced in the past. In the visited villages, fallowing is practiced 5-6 years interval. In the mean time, “slash and burn cultivations” still continue to be the current answer to basic food needs.

In some villages, the self-sufficiency lasts approximately for 5-6 months only. However, few worse-off households identified through anthropometric criteria were validated by local key informants. They declared that the food from their own production was sufficient only for 3-4 months. Post harvesting loses are relevant it reaching 20% of their produce according to some farmers (FAO 2007).

2.5.1General information for Shan State Special Region 1 and 2

As long as the economy of the Special Regions was a “poppy governed economy” the farmers’ attitude to sell opium and buy rice was rather understandable. However, in the new situation and due to the impossibility of increasing the rice production significantly, the only available possibility is to diversify the cropping system.

The diversification of the cropping system can be carried out according to different goals. These goals include the improvement of food security through a better and diversified diet composition and the identification of particular cash crops to be sold for the purchase of staple foods.

Travelling through Kokang, watching and interpreting the agricultural landscapes and interviewing the farmers, FAO experts found that crop diversification for achieving both goals has been attempted.

At present, the alternative as cash crops seems working, but is strongly dependent from the Chinese market and the vagaries of the Chinese traders. The farmers (tea planters) in a visited Kokang village confirmed that “last year tea cultivation was good, but prices were too low. This year, due to “organic tea” popularity in China, Chinese merchants offer higher prices for “organic tea”. Apparently, sugarcane production also is totally governed by Chinese demand. Further, most of the maize production is bought by Chinese merchants.

Travelling through Kokang and Wa Special Regions, one gets the impression that this area is a remote rural outskirt of Yunan. The primary evidence is that only Chinese currency (Yuan) is used and Kyat is not recognized.

The second alternative is to diversify the cropping system for improving food security through modifications of the intakes, is rather important but is facing difficulties too (FAO 2007).

Special Region No. 2 lies along the Chinese border in northern Myanmar. It commences just south of where the Salween River enters China and extends approximately 180 km further south. The Salween River forms much of the western border of Special Region No. 2. This region is very hilly with altitudes varying from about 350m altitude along the lower Salween River to about 2,600m in the north and there are few large flat areas in the Special Region. Soils are generally derived from sedimentary rocks (and some granite) and are usually infertile and acid: but some areas of high-fertility limestone soils occur and these have been favoured for opium poppy cultivation.

The total area of Special Region No. 2 is about 10,000km^2 with a total population of about 450,000 persons. Special Region No. 2 can be divided into two main areas, the northern part and the southern part. Wa ethnic peoples comprise over 90% of the northern part of the Region. The remainder are of several ethnic groups mostly being Shan, Chinese (in towns mainly), Lahu and Akha. In the southern part, about 50% of the population are Lahu and the remainder mostly Shan, Chinese, Wa and Akha (http://www.adkn.org/en/agriculture/article.asp?a=57).

CHAPTER III
RESEARCH METHODOLOGY

3.1 Study Area Profile

The Area of Man Man Sai Township in Wein Kao District is about 625 km^2 (937.500 mu/156.250 acres) and it has 50 villages including about 1400-1680 total households and the population are about 7000-8500 people. It has five village tracts which are Man Man Sai village tract, Bala village tract, Marn Patt village tract, Marn Khar village tract and Marn Phant village tract. Man Man Sai village tract is about 63 km^2 wide and it has 7 villages which possess 370 households. Bala village tract is about 144 km^2 wide and it includes 10 villages that have 250 households. Marn Patt village tract is about 137 km^2 and it has 6 villages that include 180 households. Marn Khar village tract is about 125 km^2 wide and it has 9 villages including 220 households. Marn Phant village tract is about 156 km^2 wide and it has 18 villages that include 380 households. In the study area, Wa nationality mainly live and some are Shan and Lahu nationalities. Languages spoken in the area are predominantly Wa and Shan.

3.2 Market Access and Mode of Transportation

There are three markets in Man Man Sai Township. They are Man Man Sai market, Marn Khar market and Marn Phant market. Mode of transportation to market is mainly on foot. The villagers in Man Man Sai village tract, in Bala village tract and in Marn Patt village tract go to the Man Man Sai Market. The markets are opened on every five days. Young Oo Village is about 4 miles (takes 2 hours on foot) far from the market along the tarmac road. Kone Sar Village is about 1 mile (30 minute walk) far from the market along with tarmac road. Nar Loi Village is about 3 miles (1.5 hour walk) far from Kone Sar Village along the earth road and then 1.5 miles (45 minute walk) along the tarmac road to get in Man Man Sai Market. Nam Noot Village in Bala village tract is about 6 miles (3 hour walk) along the earth road far from the Kone Sar Village and about 1 mile (30 minute walk) along the tarmac road to the Man Man Sai Market. And the Yaung Line village is about 5 miles (2.5 hour walk) along the earth to the Kone Sar Village and about 1 mile (30 minute walk) along the tarmac road to the market. Pan Kaw Village in Marn Patt village tract is about 2 miles (1hour walk) along the pave to reach the tarmac road and from the tarmac road to the market is 1 furlong (10 minute walk) far from the market. Marn Patt Village is about 1 mile (30 minute walk) along the tarmac road to the Man Man Sai market. Sai Kan Village in Marn Patt village tract is about 7 miles (3.5 hours) along the pave and then 1 mile (30 minute walk) along the tarmac road to the market. Marn Khar Village is 1.5 furlongs along the earth road to the Marn Khar market. Yaung Ka Lay Village is about 1 furlong (10 minute walk) along the earth road to the market. Kaung Loon Village is about 1 mile (30 minute walk) along the earth road to the Marn Khar market and about 4 miles (2 hour walk) to the Marn Phant market. The Marn Khar market is located in Marn Kee Nuu Village. So it is nearest to the market. Hart Sheng Village is about 4 miles (2 hour walk) along the earth road to the Marn Phant market. Onn Noon Village is about 1 mile (30 minute walk) along the earth road to the market. Marn Wein Village is about 1.5 furlong walk along the earth road to the market. Marn Phant market is located in Kat Kao Village and so it is nearest to the market in Marn Phant village tract.

The buying things are rice, maize, edible oil, dried chili, candles, battery, and fuel oil, alcohol, tea leaves, barks and honshanship.

3.3 Selection of the Study Villages

The sample villages in Man Man Sai Township under GAA project were purposively selected and the households were randomly selected. The study was

conducted in a total of 16 villages in all village tracts in Man Man Sai Township; three villages from Man Man Sai village tract, two villages from Bala village tract, three villages from Marn Patt village tract, four villages from Marn Khar village tract and four villages from Marn Phant village tract, respectively.

3.4 Data Collection

The survey was conducted during the period from January to February 2009. Both primary and secondary sources of data were used in this study. The primary data was collected by household interview using a set of structured questionnaires. Number of selected sample households cover 20% of the total households in 5 village tracts.

All kinds of demographic and socio-economic data were collected. Information on status of food security, their livelihood and living standards, sources of income and other relevant information have been collected. Detailed data on farmers' age, education level, family members, family labor, farm size, annual household income (from food and non-food items) and expenditure, food and non-food consumption, household’s assets, loan availability, own production and yield of crops, sources of labor, village access road conditions to market, mode of transportation, sources of water, condition of sanitation, food for education and farming practices such as land preparation, use of seed rate, and time of sowing and harvesting were collected.

3.3.1 Sample Villages, Households and Sample size

Table 3.1 Sample villages, households and sample size

No.	Sample villages	Total households	No. of sample households	Village tracts
1	Yaung Oo	80	16 (14.7%)	Man Man Sai
2	Kone Sar	35	7 (6.4%)	
3	Nar Loi	45	9 (8.3%)	
4	Nam Noot	35	7 (6.4%)	Bala
5	Yaung Line	25	5 (4.6%)	
6	Pan Kaw	30	6 (5.5%)	Marn Patt
7	Marn Patt	70	14 (12.8%)	
8	Sai Kan	15	3 (2.8%)	
9	Marn Khar	30	6 (5.5%)	Marn Khar
10	YaungKaLay	25	5 (4.6%)	
11	Kaung Loon	25	5 (4.6%)	
12	MarnKeeNuu	25	5 (4.6%)	
13	Hart Sheng	30	6 (5.5%)	Marn Phant
14	Onn Noon	25	5 (4.6%)	
15	Marn Wein	25	5 (4.6%)	
16	Kat Kao	25	5 (4.6%)	
	16 villages	545 households	109 households	5 village tracts

3.5 Method of Analysis

Both qualitative and quantitative data were recorded into the Microsoft Excel program. Sample households were discriminated by their income levels .Then, the data were re-entered into the Statistical Packages for Social Science (SPSS) software. Pearson Chi-Square test, the Analysis Of Variance (ANOVA), regression analysis were used to compare the demographic and socio- economic characteristics and food security status of different rural households.

3.5.1 Regression Model

The following model was used to examine the determinant factors of per-capita income.

$Y = \beta_0 + \beta_1 F + \beta_2 A + \beta_3 U + \beta_4 L + \ldots + \beta_i \ldots + \mu$

Where,

Y is per capita income (kyats per year) and also a dependent variable.

Independent variables:

H is age of household's head (years).

F is family size of household (no.).

U is upland rice sown area (acre).

L is lowland rice sown area (acre).

M is maize sown area (acre).

R is rubber planting area (acre).

P is rice sufficiency percentage (%).

A is income from alcohol (kyats per year).

B is income from bark (kyats per year).

E is income from tea (kyats per year).

W is income from wage (kyats per year).

"μ" is the residual term.

β_0 is the intercept and β_i are the coefficients of the independent variables.

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Sample Households

The livelihoods of the sample households (total 109) in the villages were shown in Table (4.1)**.** Among the sample households, 68 households were farm households, 38 households were farm and rubber households, and 3 households were landless households. It was obvious that sample rural households only rely on agriculture for their likelihoods.

4.1.1 Family Size, Age of Household's Head and Dependency Ratio of the Sample Households

The family size, age of household's head and dependency ratio of the sample households were shown in Table (4.2)**.** For overall, the average family size was 6.03, ranging from 2 to 12 members. Farm households and farm and rubber households possessed the higher family size of 6.10 and 6.13, respectively. The landless households possessed the lowest family size of 3. The F-test shows that family size was not significantly different among different types of households.

The average age of the total household's head was 43.42 years with minimum 20 and maximum 70 years. Among the households, farm households were the oldest (average 44.51 years old) and the landless households were the youngest (average 32.67 years old). The F-test shows that the average age of household's head was not significantly different among different types of households.

The average dependency ratio for overall households was 53.99%. Among the households, farm and rubber households had the greatest dependency ratio (average 55.47%) and the landless households had the smallest dependency ratio (average 44.44 %). The F-test shows that the dependency ratio was not significantly different among different types of households.

4.1.2 Literacy Status of Household's Head

Majority of the total sample households (90.8%) was illiterate and 9.2% of total sample households was literate as shown in Table (4.3). All farm households about 88.2% of the total households were illiterate. Only 8 persons (11.8%) from farm households, one person (33.3%) from landless households, and one person (2.6%) from farm and rubber households were literate. Illiterate percentage of farm and rubber households was more than that of landless, (97.4% and 66.7% respectively). The Pearson

Chi-Square test illustrates that the literacy status of household's head was not significantly different among different types of households.

4.2 Assets and Types of Houses of the Sample Households

Household's productive assets, luxury assets, and types of houses for different types of households were shown in Table (4.4). It was obvious that majority of the total sample households (85.3%) owned the houses of bamboo wall and thatch roof. Only 16 households lived in wooden wall and corrugated roof. The Pearson Chi-Square test shows that there was a significant difference between types of houses and the different types of households. For example, more percentage of household's heads who was working as farm and rubber households possessed wooden wall and corrugated roof about 26% of sample households.

Table (4.5) and Table (4.6) show that the Pearson Chi-Square test shows that numbers of buffalo were significantly different at 5% level among the different types of households and numbers of poultry and own granary at 1% level. More members of farm households and farm and rubber households owned numbers of buffalo and granary than landless households. But owning numbers of cattle, pig and own motorbike were not significantly different among different types of households.

Table 4.1 Livelihoods of sample households in sample villages

no.	Sample villages	Sample H/h (no.)	Farm H/h (no.)	Farm and rubber H/h (no.)	Landless H/h (no.)
1	Yaung Oo	16	8	6	2
2	Kone Sar	7	7	0	0
3	Nar Loi	9	0	9	0
4	Nam Noot	7	5	2	0
5	Yaung Line	5	1	4	0
6	Pan Kaw	6	2	4	0
7	Marn Patt	14	13	0	1
8	Sai Kan	3	1	2	0
9	Marn Khar	6	6	0	0
10	YaungKaLay	5	5	0	0
11	Kaung Loon	5	5	0	0
12	MarnKeeNuu	5	5	0	0
13	Hart Sheng	6	3	3	0
14	Onn Noon	5	1	4	0
15	Marn Wein	5	2	3	0
16	Kat Kao	5	4	1	0
	16 villages	109 households	68	38	3

Table 4.2 Family size, age of household's head and dependency ratio of the sample households

	Farm H/h	Farm and rubber H/h	Landless H/h	Total H/h
Family size (no.)				
Mean	6.10	6.13	3.00	6.03
Minimum	2	2	2	2
Maximum	12	10	4	12
F-test	F = 2.286, Sig= 0.064 ns			
Household Head's age (years)				
Mean	44.51	42.32	32.67	43.42
Minimum	20	23	28	20
Maximum	70	60	35	70
F-test	F= 1.811, Sig= 0.168 ns			
Dependency ratio (%)				
Mean	53.59	55.47	44.44	53.99
Minimum	0.00	0.00	33.33	0.00
Maximum	77.8	80.00	50.00	80.00
F-test	F= 1.811, Sig= 0.640 ns			

Source: Field survey (2009), ns = not significant

Table 4.3 Literacy status of the household's head

Literacy status of household's head	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Illiterate	60 (88.2%)	37 (97.4%)	2 (66.7%)	99(90.8%)
Literate	8(11.8%)	1(2.6%)	1 (33.3%)	10 (9.2%)
Total households	68(100.0%)	38(100.0%)	3 (100.0%)	109(100.0%)
Chi-Square	P= 0.100 ns, df= 2			

Source: Field survey (2009), ns = not significant

Table 4.4 Types of houses of the sample households

Types of houses	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Wooden wall and corrugated roof	6 (8.8%)	10 (26.3%)	0 (0.0%)	16 (14.7%)
Bamboo wall and thatch roof	62 (91.2%)	28 (73.7%)	3 (100.0%)	93 (85.3%)
Total households	68 (100.0%)	38 (100.0%)	3 (100.0%)	109 (100.0%)
Chi-Square	P= 0.039 **, df= 2			

Source: Field survey (2009), ** significant at 0.05% level, ns = not significant

Table 4.5 Assets possessed by the sample households

Assets	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Not own motorbike	63	33	3	99
	92.6%	86.8%	100.0%	90.8%
Own motorbike	5	5	0	10
	7.4%	13.2%	0.0%	9.2%
Chi-Square	P= 0.523ns, df=2			
Not own granary	40	10	3	53
	58.8%	26.3%	100.0%	48.6%
Own granary	28	28	0	56
	41.2%	73.7%	0.0%	51.4%
Total households	68	38	3	109
	100.0%	100.0%	100.0%	100.0%
Chi-Square	P= 0.001 ***, df= 2			

Source: Field survey (2009), *** significant at 0.01% level, ns = not significant

Table 4.6 Average livestock and poultry numbers owned by the sample households

	Farm H/h	Farm and rubber H/h	Landless H/h	Total households
Buffalo (no.)				
Mean	0.38	0.87	0.00	0.54
Minimum	0	0	0	0
Maximum	4	5	5	5
F-test	F = 3.034, Sig= 0.0525 **			
Cattle (no.)				
Mean	0.34	0.50	0.00	0.39
Minimum	0	0	0	0
Maximum	6	3	0	6
F-test	F = 0.525, Sig= 0.593 ns			
Pig (no.)				
Mean	1.04	1.45	0.33	1.17
Minimum	0	0	0	0
Maximum	4	4	1	4
F-test	F = 2.812, Sig= 0.065 ns			
Poultry (no.)				
Mean	1.22	2.50	0.67	1.65
Minimum	0	0	0	0
Maximum	4	10	2	10
F-test	F = 6.851, Sig= 0.002 ***			

Source: Field survey (2009), ** significant at 0.05% level, *** significant at 0.01% level, ns = not significant

4.3 Land assets, Crop Sown Area, and Annual Income of the Sample Households

Table (4.7) demonstrates that the average upland sown area of the sample households was 0.3912 ac ranging from 0.17 to 1.00 ac. The F-test shows that the average upland sown area was significantly different among the different types of sample households. The average lowland sown area of the sample households was 0.2620 ac ranging from 0.17 to 0.50 ac. The F-test shows that the average lowland sown area was significantly different among the different types of sample households. The average maize sown area of the sample households was 0.1250 ac ranging from 0.06 to 0.5000 ac. The F-test shows that the average maize sown area was not significantly different among the different types of sample households. The average tea sown area of the sample households was 0.7577 ac and it was not significantly different among the different types of sample households. The average rubber planting area of farm and rubber households was 4.7538 ac ranging from 0.60 to 25.46 ac. The F-test shows that the average rubber planting area was not significantly different among the different types of sample households.

Table 4.7 Crop sown areas of the sample households

Crop sown areas (ac)	Farm H/h	Farm and rubber H/h	Total H/h
Upland rice sown area (ac)			
Mean	0.4274	0.3233	0.3912
Minimum	0.17	0.17	0.17
Maximum	1.00	0.67	1.00
F-test	F= 6.146, Sig= 0.015 **		
Lowland rice sown area (ac)			
Mean	0.2437	0.50	0.2620
Minimum	0.17	0.50	0.17
Maximum	0.1670	0.50	0.50
F-test	F= 5.061, Sig= 0.044 **		
Maize sown area (ac)			
Mean	0.0266	0.1066	0.1250
Minimum	0.06	0.06	0.06
Maximum	0.50	0.31	0.50
F-test	F= 0.671, Sig= 0.418 ns		
Tea sown area (ac)			
Mean	0.7077	0.8220	0.7577
Minimum	0.06	0.06	0.06
Maximum	0.50	2.78	2.78
F-test	F= 0.1154, Sig= 0.737 ns		
Rubber planting area (ac)			
Mean	0.3826	4.7538	4.3290
Minimum	0.06	0.60	0.60
Maximum	2.78	25.4600	25.46
F-test	F= 0.370, Sig= 0.547 ns		

Source: Field survey (2009), ** significant at 0.05% level, ns = not significant

4.4 Number of Sources of Farm and Non-Farm Income of the Sample Households

Among the farm households, 43 households had one source of farm and non-farm income, 23 households had 2 and two households had only three sources of income. All the landless households had 2 sources of income. The majority of households, working as farm households had only one source of income. The same pattern can be found in farm and rubber households in Table (4.8).

4.5 Annual Income of the Sample Households

Table 4.9 demonstrates that only farm and rubber households had income from selling alcohol on average (143.15 kyats per year). The F-test presents that average income from selling alcohol was not significantly different among the different types of sample households. Among the households except landless households, farm households had the higher average income from selling tea (1,880 kyats per year). The F-test presents that average income from selling tea was not significantly different among the different types of sample households. Among the households except land less households, farm households had the higher average income from selling bark (1,817 kyats per year). The F-test presents that average income from selling bark was significantly different among the different types of sample households. Farm households and farm and rubber households had the higher average income from selling hosanship of (29,466 kyats per year) and (29,302 kyats per year) respectively. The F-test presents that average income from selling hosanship was not significantly different among the different types of sample households. Among the households, farm and rubber households had the highest average income from getting average income from daily causal labor (765,000 kyats per year). Landless households had the lowest average income from getting average income from daily causal labor (510,000 kyats per year) because of low family size. The F-test gives the information that average income from daily causal labor was significantly different among the different types of sample households.

Table 4.8 Number of sources of income for different types of households

Items	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
One source of income	43	25	0	68
Two sources of income	23	9	3	35
Three sources of income	2	4	0	6
Chi-Square	P= 0.043 **, df= 4			

Source: Field survey (2009), ** significant at 0.05% level,

Table 4.9 Annual income (kyats/year) from different income sources of the sample households

	Farm H/h	Farm and rubber H/h	Landless H/h
Income from selling alcohol (kyats/year)			
Mean	0	143.15	0
Minimum	0	0.00	0
Maximum	0	5440.00	0
F- test	F= 0.933, Sig = 0.397 ns		
Income from selling tea (kyats/year)			
Mean	1880	536.84	0
Minimum	0.00	0.00	0
Maximum	61200	20400.00	0
F- test	F= 0.305, Sig = 0.738 ns		
Income from selling bark (kyats/year)			
Mean	1817	893	0
Minimum	1275	765	0
Maximum	2550	1275	0
F- test	F= 12.571, Sig= 0.005 **		
Income from selling hosanship (kyats/year)			
Mean	29466	29302	28560
Minimum	16320	16320	16320
Maximum	40800	40800	36720
F-test	F= 0.010, Sig = 0.051 ns		
Income from daily causal labour (kyats/year)			
Mean	733500	765000	510000
Minimum	306000	612000	306000
Maximum	918000	918000	612000
F- test	F = 3.682, Sig= 0.028 **		

Source: Field survey (2009), ** significant at 0.05% level, ns = not significant

4.6 Rice and Other Food Consumption of the Sample Households

Rice and other food consumption of the sample households were shown in Table (4.10). The expenditure for rice of the sample households was 91,987 kyats per year ranging from 24,480 to 195,840 kyats per year. The F- test illustrates that expenditure for rice was not significantly different among the different types of sample households. The average expenditure for other food of the sample households was 122,213 kyats per year ranging from 0.00 to 314,160 kyats per year. The F-test reveals that the average expenditure for other food was not significantly different among the different types of sample households. The average total food expenditure of the sample households was 214,200 kyats per year ranging from 32,640 to 416,160 kyats per year. The F-test gives the information that the average total food expenditure was not significantly different among the different types of sample households.

4.7 Non-Food Expenditure of the Different Types of Sample Households

Non-food expenditure of the sample households was depicted in Table (4.11). The expenditure for education program of the sample households was 11,323 kyats per year ranging from 0.00 to 40,800 kyats per year. The F-test illustrates that the expenditure for education program was significantly different among the different types of sample households. The average expenditure for their health of the sample households was 362,741 kyats per year ranging from 0.00 to 51,000 kyats per year. The F-test reveals that the average expenditure for their health was not significantly different among the different types of sample households.

.

Table 4.10 Food expenditure (kyats/year) of the different types of sample households

Items	Farm H/h	Farm and rubber H/h	Landless H/h	Total H/h
Rice expenditure (kyats / year)				
Mean	93570	89975	81600	91987
Minimum	24480	24480	48960	24480
Maximum	171360	195840	122400	195840
F- test	F= 0.244, Sig= 0.784 ns			
Other food expenditure (kyats / year)				
Mean	121770	127929	59840	122213
Minimum	0.00	0.00	20400	0.00
Maximum	314160	301920	118320	314160
F- test	F= 1.231, Sig= 0.296 ns			
Total food expenditure (kyats / year)				
Mean	215340	217904	141440	214200
Minimum	32640	69360	89760	32640
Maximum	416160	350880	240720	416160
F- test	F= 1.327, Sig= 0.270 ns			

Source: Field survey (2009), ns = not significant

Note: Other food expenditure includes oil, meat and vegetables etc.

Table 4.11 Non- food expenditure (kyats/year) of the different types of households

Non-food expenditure (kyats/ year)	Farm H/h	Farm and rubber H/h	Landless H/h	Total H/h
Education (kyats/year)				
Mean	13680.00	7998.94	0.00	11322.93
Minimum	0.00	0.00	0.00	0.00
Maximum	40800.00	40800.00	0.00	40800.00
F- test	F = 3.034, Sig= 0.052 **			
Medicine (kyats/year)				
Mean	33900.00	41122.00	28560.00	36271.00
Minimum	0.00	0.00	16320.00	0.00
Maximum	51000.00	51000.00	34680.00	51000.00
F- test	F = 2.253, Sig= 0.110 ns			

Source: Field survey (2009), ** significant at 0.05% level, ns = not significant

4.8 Rice Insufficient Months and Situation of the Sample Households

The highest rice insufficient months per year was 7 and it was found in both farm households and landless households. The farm and rubber households had lower rice insufficient months than other types of households. The F-test shows that total average rice insufficient months of the sample households were highly significantly different at 1 % level among the different types of sample households in Table (4.12).

Table (4.13) explained that only 9.2% (10 H/h) of the sample households had rice sufficiency for the whole year and was the same as the lowest level of rice insufficiency for 1 to 3 months. About 29.4 % (32 H/h) of the sample households was the low level of rice insufficiency for 4 to 6 months. About 41.3% (45 H/h) of the sample households was medium level of rice insufficiency for 7 to 9 months. About 11.0% (12 H/h) of the sample households was the high level of rice insufficiency for the whole year.

4.9 Coping Strategies for Food Security

The condition of rice mixing with maize of the sample households was shown in Table (4.14). About 30.3% (33 H/h) of the sample households did not mix rice with maize. About 1.8% (2 H/h) of the sample households mixed rice with maize between 1 and 3 times per month. About 38.5% (42 H/h) of the sample households mixed rice with maize between 4 and 10 times per month. About 29.4% (32 H/h) of the sample households mixed rice with maize above 10 times per month. The Pearson Chi-Square test shows that the condition of rice mixing with maize was not significantly different among different types of households.

The condition of reducing meals of the sample households was revealed in Table (4.15). Only 41.3% (45 H/h) of the sample households did not need to reduce meals. About 43.1% (47 H/h) of the sample households reduced meals between 4 and 10 times per month. About 15.6% (17 H/h) of the sample households reduced meals above 10 times per month. The Pearson Chi-Square test shows that the condition of reducing meals was not significantly different types of sample households.

Table 4.12 Rice insufficient months per year of the sample households

	Mean (months)	Std. deviation	Minimum	Maximum
Farm H/h	7	3.10	0	11
Farm and rubber H/h	4.89	2.80	0	9
Landless H/h	7	0.00	7	7
Total households	6.27	3.11	0	11
F-test	F= 6.201, Sig= 0.003 ***			

Source: Field survey (2009), ***significant at 0.01% level,

Table 4.13 Rice insufficient situation of the sample households

Level	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Sufficient	5	5	0	10
	4.6%	4.6%	0.0%	9.2%
Lowest level of insufficient	4	6	0	10
	3.7%	5.5%	0.0%	9.2%
Low level of insufficient	15	17	0	32
	13.8%	15.6%	0.0%	29.4%
Medium level of insufficient	32	10	3	45
	29.4%	9.2%	2.8%	41.3%
High level of insufficient	12	0	0	12
	11.0%	0.0%	0.0%	11.0%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.006 **, df= 8			

Source: Field survey (2009), ** significant at 0.05% level,

Note; Sufficient = rice sufficiency for the whole year

Lowest level of insufficient = Rice insufficient for 1 to 3 months

Low level of insufficient = Rice insufficient for 4 to 6 months

Medium level of insufficient = Rice insufficient for 7 to 9 months

High level of insufficient = Rice insufficient for 10 to 12 months

Table 4.14 Types of rice consumption

	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Rice alone	18	15	0	33
	16.5%	13.8%	0.0%	30.3%
Mix and eat 1-3 times/month	1	1	0	2
	0.9%	0.9%	0.0%	1.8%
Mix and eat 4-10 times/month	27	14	1	42
	24.8%	12.8%	0.9%	38.5%
Mix and eat more than 10 times/month	22	8	2	32
	20.2%	7.3%	1.8%	29.4%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.528 ns, df= 6			

Source: Field survey (2009), ns = not significant

Table 4.15 Reduce meals

	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Not reduce meals	25	20	0	45
	22.9%	18.3%	0.0%	41.3%
Reduced meals 4-10 times per month	32	13	2	47
	29.4%	11.9%	1.8%	43.1%
Reduced meals more than 10 times per month	11	5	1	17
	10.1%	4.6%	0.9%	15.6%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.303 ns, df= 4			

Source: Field survey (2009), ns = not significant

4.10 Coping Strategies for Health/Hygiene Status

The condition of going to clinic of the sample households was shown in Table (4.16). Only 53.2% (58 H/h) of the sample households did not go to clinic. The Pearson Chi-Square test shows that the condition of going to clinic was not significantly different among different types of sample households.

The condition of sanitation of the sample households was presented in Table (4.17). Only 36.7% (40 H/h) of the sample households had latrines. About 63.3% (69 H/h) of the sample households did not have latrines. The Pearson Chi-Square test shows that the condition of sanitation was not significantly different among different types of sample households.

The condition of getting drinking water in summer season of the sample households was revealed in Table (4.18). Only 22.0% (24 H/h) of the sample households did not get drinking water in summer season. The Pearson Chi-Square test shows that the condition of getting drinking water in summer season was not significantly different among different types of sample households.

Table 4.16 Taken health treatment

	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Not go to clinic	41	16	1	58
	37.6%	14.7%	0.9%	53.2%
Go to clinic	27	22	2	51
	24.8%	20.2%	1.8%	46.8%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.155 ns, df= 2			

Source: Field survey (2009), ns = not significant

Table 4.17 Sanitation

Sanitation	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Not own latrine	47	20	2	69
	43.1%	18.3%	1.8%	63.3%
Own latrine	21	18	1	40
	19.3%	16.5%	0.9%	36.7%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.238 ns, df= 2			

Source: Field survey (2009), ns = not significant

Table 4.18 Drinking water in summer season

	Farm H/h	Farm and rubber H/h	Landless H/h	Overall
Insufficient drinking water	12	10	2	24
	11.0%	9.2%	1.8%	22.0%
Sufficient drinking water	56	28	1	85
	51.4%	25.7%	0.9%	78.0%
Total households	68	38	3	109
	62.4%	34.9%	2.8%	100.0%
Chi-Square	P= 0.098 ns, df= 2			

Source: Field survey (2009), ns = not significant

4.11 The Food Security Status of the Sample Households

Based on interviews with the respondents, about 48.6% (53 H/h) of the sample households was food secure households and about 51.4% (56 H/h) of the sample households was food insecure households. The food secure households had enough food and/or income for the whole year. The food insecure households faced with shortage of food and income for the whole year.

The numbers of food secure and insecure households were the same about 50% of total households in farm households and also in farm and rubber households. There were three landless households in the condition of food insecure in Table (4.19). The Pearson Chi-Square test shows that the livelihood condition was not significantly different among the different types of households.

4.11.1 Family Size, Age of Household's Head and Dependency Ratio of the Food Insecure and Secure Households

The family size, age of household's head and dependency ratio of food insecure and secure households were shown in Table (4.20). For overall, the average family size of food insecure households was 5.89 and 6.17 for food secure households. The t-test shows that family size was not significantly different between these two groups.

The average age of the household's head of food insecure households was 43.86 years and 42.9 years for food secure households. The t-test shows that the average age of household's head was not significantly different between these two groups.

The average dependency ratio of food insecure was 51.58% and 56.55% for food secure households. The t-test shows that dependency ratio was not significantly different between these two groups.

Table 4.19 Food security status of the sample households

	Farm H/h	Farm and rubber H/h	Landless H/h
(1) Food secure households	34 (50%)	19 (50%)	0 (0.0%)
(2) Food insecure households	34 (50%)	19 (50%)	3 (100.0%)
Total households	68(100.0%)	38 (100.0%)	3 (100.0%)
Chi-Square	P= 0.232 ns, df= 2		

Source: Field survey (2009), ns = not significant

Table 4.20 Family size, age of household's head and dependency ratio of the food secure and insecure households

	Food secure=1, Food insecure=0	N	Mean	t- value	Std. Error Mean
Family size (no.)	Food insecure	56	5.89	- 0.63	0.31
	Food secure	53	6.17	- 0.63	0.29
Age of household's head (years)	Food insecure	56	43.86	0.40	1.45
	Food secure	53	42.96	0.40	1.68
Dependency ratio (%)	Food insecure	56	51.57	- 1.29	3.04
	Food secure	53	56.55	- 1.30	2.30

Source: Field survey (2009)

4.12 Assets and Types of Houses of the Food Insecure and Secure Households

Household's productive assets, luxury assets, and types of houses for food insecure and secure households were shown in Table (4.21). It was obvious that majority of the food insecure households (89.3%) owned the houses of bamboo wall and thatch roof. Only 10 food secure households lived in wooden wall and corrugated roof. The Pearson Chi-Square test shows that it was not significantly different between these two groups. For example, more percentage of food secure households possessed wooden wall and corrugated roof than food insecure households.

The Pearson Chi-Square test shows that own motorbike, own granary, numbers of buffalo and cattle apart from numbers of pig and poultry were significantly different between these two groups as shown in Table (4.22) and in Table (4.23).

4.13 Land Assets and Crop Sown Area of Food Insecure and Secure Households

Table (4.24) shows that the average upland rice sown area was 0.313 ac for food insecure households and 0.372 ac for food secure households. The t-test shows that the average upland sown area was not significantly different between these two groups. The average lowland rice sown area was 0.027 ac for food insecure households and 0.041 ac for food secure households. The t-test shows that the average lowland rice sown area was not significantly different between these two groups. The average maize sown area was 0.039 ac for food insecure households and 0.042 ac for food secure households. The t-test shows that the average maize sown area was not significantly different between these two groups. The average tea sown area was 0.157 ac for food insecure households and 0.359 ac for food secure households and t-test shows that it was not significantly different between these two groups. The average rubber planting area was 1.787 ac for food insecure households and 1.571 ac for food secure households. The t-test shows that the average rubber sown area was significantly different between these two groups.

Table 4.21 Types of houses possessed by food insecure and secure households

Types of houses	Food insecure households	Food secure households
Wooden wall and corrugated roof	6 (10.7%)	10 (18.9%)
Bamboo wall and thatch roof	50 (89.3%)	43 (81.1%)
Total households	56 (100.0%)	53 (100.0%)
Chi-Square	P= 0.229 ns, df= 1	

Source: Field survey (2009), ns = not significant

Table 4.22 Assets possessed by food insecure and secure households

	Food insecure households (n= 56)	Food secure households (n= 53)
Not own motorbike	54 (96.4%)	45 (84.9%)
Own motorbike	2 (3.6%)	8 (15.1%)
Chi-Square	P= 0.037**, df= 1	
Not own granary	33 (58.9%)	20 (37.7%)
Own granary	23 (41.1%)	33 (62.3%)
Chi-Square	P= 0.027 **, df= 1	

Source: Field survey (2009), ** significant at 0.05% level,

Table 4.23 Average livestock and poultry numbers of food insecure and secure households

	Food secure=1, Food insecure=0	**N**	**Mean**	**t- value**	**Std. Error Mean**
Buffalo (no.)	Food insecure	56	0.29	-2.63	0.08
	Food secure	53	0.81	-2.59	0.18
Cattle (no.)	Food insecure	56	0.12	-2.83	0.07
	Food secure	53	0.66	-2.78	0.17
Pig (no.)	Food insecure	56	1.07	-0.95	0.13
	Food secure	53	1.26	-0.94	0.15
Poultry (no.)	Food insecure	56	1.46	-1.07	0.23
	Food secure	53	1.85	-1.07	.274

Source: Field survey (2009)

Table 4.24 Crop sown areas of the food insecure and secure households

Crops sown areas (ac)	Food secure=1, Food insecure=0	N	Mean	t- value
Upland rice sown area (ac)	Food insecure	56	0.3125	- 1.359
	Food secure	53	0.3719	- 1.349
Lowland rice sown area (ac)	Food insecure	56	0.0268	- 0.746
	Food secure	53	0.0408	- 0.742
Maize sown area (ac)	Food insecure	56	0.0390	- 0.189
	Food secure	53	0.0424	- 0.187
Tea sown area (ac)	Food insecure	56	0.1568	- 1.718
	Food secure	53	0.3593	- 1.696
Rubber sown area (ac)	Food insecure	56	1.7871	0.361
	Food secure	53	1.5706	0.361

Source: Field survey (2009)

4.14 Annual Income of the Food Insecure and Secure Households

Table (4.25) explains that the average income source was 1.41 for food insecure households and 1.45 for food secure households. The t-test illustrates that income source was significantly different between these two groups. The average income from selling alcohol was nil for food insecure households and 102.64 kyats per year for food secure households. The t-test reveals that average income from selling alcohol was not significantly different between these two groups. The average income from selling tea was 218.57 kyats per year for food insecure households and 384.91 kyats per year for food secure households. The t-test shows that average income from selling tea was not significantly different between these two groups. The average income from selling bark was 59.19 kyats per year for food insecure households and 279.06 kyats per year for food secure households. The t-test shows that average income from selling bark was significantly different between these two groups.

The average income from selling hosanship was 7,795.7 kyats per year for food insecure households and 9,468.7 kyats per year for food secure households. The t-test shows that average income from selling hosanship was not significantly different between these two groups. The average income from daily causal labor was 743,140 kyats per year for food insecure households and 733,250 kyats per year for food secure households. The t-test gives the information that average income from daily causal labor was not significantly different between these two groups. The average per caput income was 150,370 kyats per year for food insecure households and 134,600 kyats per year for food secure households. The t-test gives the information that average per caput income was not significantly different between these two groups.

Table 4.25 Annual income (kyats/year) from different income sources of food insecure and secure households

	Food secure=1, Food insecure=0	N	Mean	Std. Deviation	t- value
Income sources (no.)	Food insecure	56	1.41	0.59	-0.36
	Food secure	53	1.45	0.60	-0.36
Income from alcohol (kyats/year)	Food insecure	56	0.00	0.00	-1.02
	Food secure	53	102.64	747.24	-1.00
Income from tea (kyats/year)	Food insecure	56	218.57	11460.08	1.11
	Food secure	53	384.91	2802.15	1.14
Income from bark (kyats/year)	Food insecure	56	59.19	275.03	-2.28
	Food secure	53	279.06	663.95	-2.23
Income from hosanship (kyats/year)	Food insecure	56	7795.7	12455.13	-0.60
	Food secure	53	9468.7	16432.86	-0.59
Income from daily causal labour (kyats/year)	Food insecure	56	743140	173661	0.31
	Food secure	53	733250	151101	0.31
per caput income (kyats/year)	Food insecure	56	150370	71037.47	1.32
	Food secure	53	134600	51218.85	1.33

Source: Field survey (2009)

4.15 Rice and Other Food Consumption of the Food Insecure and Secure Households

Rice and other food consumption of the food insecure and secure households were demonstrated in Table (4.26). The expenditure for rice was 84,300 kyats per year for food insecure households and 100,000 kyats per year for food secure households. The t-test illustrates that expenditure for rice was significantly different between these two groups. The average expenditure for other food items such as oil, meat and vegetables was 111,000 kyats per year for food insecure households and 134,000 kyats per year for food secure households. The t-test reveals that the average expenditure for other food was not significantly different between these two groups. The average total food expenditure was 195,000 kyats per year for food insecure households and 234,000 kyats per year for food secure households. The t-test reveals that average total food expenditure was significantly different between these two groups.

4.16 Non-Food Expenditure of the Food Insecure and Secure Households

Non-food expenditure of the food insecure and secure households was illustrated in Table (4.27). The average expenditure for education program was 12,349 kyats per year for food insecure households and 10,238 kyats per year for food secure households. The t-test reveals that average expenditure for education program was not significantly different between these two groups. The average expenditure for their health was 37,376 kyats per year for food insecure households and 35,103 kyats per year for food secure households. The t-test reveals that average expenditure for their health was not significantly different between these two groups.

Table 4.26 Food expenditure (kyats/year) of food insecure and secure households

Food expenditure (kyats / year)	Food secure=1, Food insecure=0	N	Mean	Std. Deviation	t- value
Rice (kyats/year)	Food insecure	56	84300	28845.43	-2.32
	Food secure	53	100000	41334.77	-2.29
Oil, meat, vegetables (kyats/year)	Food insecure	56	111000	72829.87	-1.69
	Food secure	53	134000	71121.88	-1.69
Total food expenditure (kyats/year)	Food insecure	56	195000	85971.02	-2.65
	Food secure	53	234000	66108.87	-2.67

Source: Field survey (2009)

Table 4.27 Non-food expenditure (kyats/year) of the food insecure and secure households

Non-food expenditure (kyats/year)	Food secure=1, Food insecure=0	N	Mean	Std. Deviation	t- value
Education expenditure (kyats/year)	Food insecure	56	12349	16275.52	0.68
	Food secure	53	10238	16080.35	0.68
Medicine expenditure (kyats/year)	Food insecure	56	37376	16274.06	0.65
	Food secure	53	35103	20081.14	0.64

Source: Field survey (2009)

4.17 Coping Strategies for Food Security Status

The condition of rice mixing with maize of food insecure and secure households was presented in Table (4.28). Only 7.1% of food insecure households and about 54.7% of the food secure households did not need to mix rice with maize. About 51.8% of the food insecure households had to mix and eat rice with maize about 4-10 times per month. The Pearson Chi-Square test shows that the condition of rice mixing with maize was significantly different at 1% level between these two groups.

The condition of reducing meals of food insecure and secure households was shown in Table (4.29). About 69.8% of food secure households did not need to reduce meals. About 62.5% of the food insecure households had to reduce meals about 4-10 times per month. The Pearson Chi-Square test shows that the condition of reducing meals was significantly different at 1% level between these two groups.

4.18 Coping Strategies for Health/ Hygiene Status

The condition of going to clinic of food insecure and secure households was revealed in Table (4.30). Only 53.6% (58 H/h) of food insecure households did not go to clinic. The Pearson Chi-Square test shows that the condition of going to clinic was not significantly different between these two groups.

The condition of sanitation of food insecure and secure households was shown in Table (4.31). About 71.4% of food insecure households and 54.7% of food secure households had no latrines. The Pearson Chi-Square test shows that the condition of sanitation was significantly different at 10% level between these two groups.

The condition of getting drinking water in summer season of food insecure and food secure households was presented in Table (4.32). About 30.4% of the food insecure households and 13.2% of food secure households did not get sufficient drinking water in summer period. The Pearson Chi-Square test shows that the condition of getting drinking water in summer season was significantly different at 5% level between these two groups.

Table 4.28 Types of rice consumption

	Food insecure households	Food secure households
Rice alone	4 (7.1%)	29 (54.7%)
Mix and eat 1-3 times/month	1 (1.8%)	1 (1.9%)
Mix and eat 4-10 times/month	29 (51.8%)	13 (24.5%)
Mix and eat more than 10 times/month	22 (39.3%)	10 (18.9%)
Total households	56 (100.0%)	53 (100.0%)
Chi-Square	P= 0.000 ***, df = 3	

Source: Field survey (2009), *** significant at 0.01% level,

Table 4.29 Reduced meals

	Food insecure households	Food secure households
Not reduce meals	8 (14.3%)	37 (69.8%)
Reduced meals 4-10 times per month	35 (62.5%)	12 (22.6%)
Reduced meals more than 10 times per month	13 (23.2%)	4 (7.5%)
Total households	56 (100.0%)	53 (100.0%)
Chi-Square	P= 0.000 ***, df= 2	

Source: Field survey (2009), *** significant at 0.01% level,

Table 4.30 Taken health treatment

	Food insecure households	Food secure households
Can go to clinic	30(53.6%)	28(52.8%)
Cannot go to clinic	26(46.4%)	25(47.2%)
Total households	56(100.0%)	53(100.0%)
Chi-Square	P= 0.938 ns, df= 1	

Source: Field survey (2009), ns = not significant

Table 4.31 Sanitation

	Food insecure households	Food secure households
Not own latrine	40 (71.4%)	29 (54.7%)
Own latrine	16 (28.6%)	24 (45.3%)
Total households	56 (100.0%)	53 (100.0%)
Chi-Square	P= 0.070*, df= 1	

Source: Field survey (2009), * significant at 0.10% level,

Table 4.32 Insufficient drinking water in summer season

	Food insecure households	Food secure households
Insufficient drinking water	17 (30.4%)	7 (13.2%)
Sufficient drinking water	39 (69.6.6%)	46 (86.8%)
Total households	56 (100.0%)	53 (100.0%)
Chi-Square	P= 0.031**, df=1	

Source: Field survey (2009), ** significant at 0.05% level,

4.19 Factors Influencing Per Caput Income (kyats per year) of the Food Insecure and Secure Households

Regression analysis of the food insecure and secure households was presented in Table (4.33)**.** The result of per caput income (kyats per year) as a dependent variable was also determined by using 11 independent variables; age of household's head (years), family size of households (no.), upland rice sown area (acre), lowland rice sown area (acre), maize sown area (acre), rubber planting area (acre), rice sufficiency percentage (%), income from selling alcohol (kyats per year), income from selling bark (kyats per year), income from selling tea (kyats per year), and income from daily causal labor (kyats per year).

According to the regression analysis, income from selling tea (kyats per year), and income from daily causal labor (kyat per year) of the food insecure and secure households were positively and significantly influenced on per caput income (kyats per year) at 5 and 1 percent level, respectively.

The number of family size of the food insecure and secure households was negatively and significantly related to per caput income (kyats per year) of the food insecure and secure households. If one member of family size of households increases, per caput income (28, 013 kyats per year) will be decreased at 1 percent level.

The F value shows that the selected model is significant at 1 percent level. The adjusted R squared points out that the model is significant and it can explain on the variation in food insecure and secure households by 79.8 percent.

:

Table 4.33 Results from the stochastic model for food insecure and secure households

	Explanatory variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	179592.1	15126.08		11.87	0.00
2	Age of household's head (yrs)	236.18	262.30	0.04	0.90	0.37
3	Family size of households (no.)	-28013.0	1513.20	-1.02	-18.51	0.00
4	Upland rice sown area (acre)	9718.03	15344.21	0.03	0.63	0.52
5	Lowland rice sown area (acre)	7871.42	40417.48	0.01	0.19	0.84
6	Maize sown area (acre)	74120.34	34207.94	0.11	2.16	0.03
7	Rubber planting area (acre)	-1589.81	965.44	-0.07	-1.64	0.10
8	Rice sufficiency (%)	89.34	112.43	0.03	0.75	0.42
9	Income from alcohol (kyats/year)	-6.89	5.81	-0.05	-1.18	.23
10	Income from bark (kyats/year)	-2.90	5.43	-0.02	-0.53	0.59
11	Income from tea (kyats/year)	0.92	0.33	0.12	2.75	0.01
12	Income from daily causal labor (kyats /year)	0.15	0.02	0.39	7.28	0.00
	R^2= 79.8% , $F_{11,97}$= 39.767, Sig= 0.000 ***					

Dependent Variable: Per caput income (kyats/year), *** significant at 0.01% level,

CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion of the Study

This study was an attempt to study the demographic characteristics and to examine the food security status of the selected rural households in Man Man Sai Township. The survey was done during the period from January to February, 2009. The data were collected by interviewing total 109 respondents from 16 villages in Man Man Sai Township and Statistical Packages for Social Science (SPSS version 16.0) software was used to analyze the data.

In the view of livelihoods of the sample households, 68 households were farm households, 38 households were farm and rubber households, and 3 households were landless households. It is obvious that sample rural households only rely on agriculture for their livelihoods.

For overall, the average family size was 6.03, ranging from 2 to 12 members. The farm households and farm and rubber households possessed the higher family size of 6.10 and 6.13, respectively. The landless households possessed the lowest family size of 3.

The average age of the total household's head was 43.42 with minimum 20 years and maximum 70 years. Among the households, farm households were the oldest (average 44.51 years old) and the landless households were the youngest (average 32.67 years old).

The average dependency ratio for overall households is 53.99 %. Among the households, farm and rubber households had the greatest dependency ratio (average 55.47%). Therefore, they have better livelihoods of more children. The landless households had the smallest dependency ratio (average 44.44 %). That means households with more farming activities have better livelihoods in this area. Therefore, all household members except children are working to earn food and income.

Majority of the total sample households (90.8%) was illiterate and 9.2% of total sample households was literate. All farm households about 88.2% of the farm households were illiterate. That means livelihoods of all sample households are more important than education in this study area.

The majority of the total sample households (85.3%) owned the houses of bamboo wall and thatch roof. Only 16 households lived in wooden wall and corrugated roof. The Pearson Chi-Square test shows that there was a significant difference between types of house and the different types of households. For example, more percentage of

household's heads who were farm and rubber households possessed wooden wall and corrugated roof than other types of households. The Pearson Chi-Square test shows that own motorbike, own buffalo, and own granary were significantly different among the different types of households. More members of farm households and farm and rubber households owned motorbike, buffalo and granary than landless households. It was obvious that perennial crops can contribute highest income than seasonal crops for sample households in the study area.

The average upland rice sown area of the sample households was 0.3921ac ranging from 0.17 to 1.00 ac. The F-test shows that the average upland rice sown area was significantly different among the different types of sample households. The average lowland rice sown area of the sample households was 0.2620 ac ranging from 0.17 to 0.50 ac. The F-test shows that the average lowland rice sown area was highly significantly different among the different types of sample households. The average maize sown area of the sample households was 0.1250 ac ranging from 0.06 to 0.5000 ac. The F-test shows that the average maize sown area was not significantly different among the different types of sample households. The average tea sown area of the sample households was 0.7577 ac and it was not significantly different among the different types of sample households. The average rubber sown area of the sample households was 4.3290 ac ranging from 0.60 to 25.46 ac. The F-test shows that the average rubber sown area was significantly different among the different types of sample households.

Among the farm households, 43 households had one source of income, 23 households had 2 and two households had only three sources of income. All the landless households had 2 sources of income.

Average annual income was 743,313 kyats per year for farm households and 774,256 kyats per year for farm and rubber households and 538,560 kyats per year for landless households.

The t-test shows that average total food expenditure was highly significantly different among the different types of sample households.

The highest rice insufficient months per year was 7 and it was found in both farm households and landless households. The farm and rubber households had lower rice insufficient months than other types of households. The F-test shows that an average total rice insufficient month was significantly different among the different types of sample households.

Only 9.2% (10 H/h) of the sample households had rice sufficiency for the whole year and was the same as the lowest level of rice insufficiency for 1 to 3 months. About 29.4 % (32 H/h) of the sample households was the low level of rice insufficiency for 4 to 6 months. About 41.3% (45 H/h) of the sample households was medium level of rice insufficiency for 7 to 9 months. About 11.0% (12 H/h) of the sample households was the high level of rice insufficiency for the whole year.

About 48.6% (53 H/h) of the sample households had enough food for the whole year. About 35.8% (39 H/h) of the sample households had not enough food about 4 to 10 times per month. About 15.6% (17 H/h) of the sample households had not enough food more than 10 times per month.

About 30.3% (33 H/h) of the sample households did not mix rice with maize. About 1.8% (2 H/h) of the sample households mixed rice with maize about 1 to 3 times per month. About 38.5% (42 H/h) of the sample households mixed rice with maize about 4 to 10 times per month. About 29.4% (32 H/h) of the sample households mixed rice with maize more than 10 times per month.

Only 41.3% (45 H/h) of the sample households did not need to reduce meals. The 43.1% (47 H/h) of the sample households reduced meals about 4 to 10 times per month. About 15.6% (17 H/h) of the sample households reduced meals more than10 times per month.

Only 36.7% (40 H/h) of the sample households had latrines. The 63.3% (69 H/h) of the sample households did not have latrines. Only 53.2% (58 H/h) of the sample households did not go to clinic. Only 22.0% (24 H/h) of the sample households did not get drinking water in summer season.

Average income of farm households, farm and rubber households and landless households were 743, 313, 774, 256 and 538, 560 kyats per year, respectively.

Based on interviews with the respondent, about 48.6% (53 H/h) of the sample households was food secure households and about 51.4% (56 H/h) was food insecure households. The food secure households had enough food and/or income for the whole year. The food insecure households faced with shortage of food and inadequate income for the whole year.

It was obvious that majority of the food insecure households (89.3%) owned the houses of bamboo wall and thatch roof. Only 10 food secure households lived in wooden wall and corrugated roof. The Pearson Chi-Square test shows that it was significantly

different between these two groups. For example, more percentage of food secure households possessed wooden wall and corrugated roof than food insecure households.

The Pearson Chi-Square test shows that own motorbike, own granary, own buffalo, and own cattle were significantly different between these two groups.

The average tea sown area was 0.157 ac for food insecure households and 0.359 ac for food secure households and t-test shows that it was significantly different between these two groups.

The average income from selling bark was 59.19 kyats per year for food insecure households and 279.06 kyats per year for food secure households. The t-test shows that average income from selling bark was significantly different between these two groups.

The average per caput income was 150, 370 kyats per year for food insecure households and 134,600 kyats per year for food secure households. The t-test gives the information that average per caput income was highly significantly different between these two groups.

The expenditure for rice was 84,300 kyats per year for food insecure households and 100,000 kyats per year for food secure households. The t-test illustrates that expenditure for rice was not significantly different between these two groups. The average expenditure for other food such as oil, meat and vegetables was 111,000 kyats per year for food insecure households and 134,000 kyats per year for food secure households. The t-test reveals that the average expenditure of other food was not significantly different between these two groups. The average total expenditure was 195,000 kyats per year for food insecure households and 234,000 kyats per year for food secure households. The t-test reveals that average total expenditure was significantly different between these two groups.

Only 7.1% of food insecure households and about 54.7% of the food secure households did not need to mix rice with maize. The Pearson Chi-Square test shows that the condition of rice mixing with maize was not significantly different between these two groups.

About 69.8% of food secure households did not need to reduce meals. About 62.5% of the food insecure households had to reduce meals about 4-10 times per month. The Pearson Chi-Square test shows that the condition of reducing meals was significantly different between these two groups.

About 46.4% of food insecure households and 47.2% of food secure households could not go to clinic for their health. The Pearson Chi-Square test shows that the

condition of going to clinic for their health was not significantly different between these two groups.

About 71.4% of food insecure households and 54.7% of food secure households had no latrines. The Pearson Chi-Square test shows that the condition of sanitation was not significantly different between these two groups.

About 30.4% of the food insecure households and 54.7% of food secure households did not get sufficient drinking water in summer season. The Pearson Chi-Square test shows that the condition of getting drinking water in summer season was not significantly different between these two groups.

5.2 Recommendation of the Study

5.2.1 Promote agricultural activities

Intercropping and mix-cropping should be encouraged with adequate assistance and horticultural businesses should be promoted where ever possible.

Deforestation caused by intensive “slash and burn” cultivations should be controlled to improve cropping conditions in study areas. In the meantime, more frequent fallowing should be assisted to avoid soil exhaustion.

Production of maize should be strengthened. Farmers should be aware of its nutritional value and palatal constraints must be removed. In the meantime, adequate solutions should be explored for better food security and improvement of nutrition status of sample households to promote home gardening.

The production of “organic tea” should be encouraged due to international demand. However, the farmers should clearly understand the meaning of “organic” and receive training on making organic fertilizers.

The conversion to rubber offers a good example on the tangled play between different components of food security issues and policies in the region. The new rubber plantations, sometimes consisting of a true remodeling of the hilly landscape must be considered as an interesting alternative to poppy cultivation. Rubber, being a cash crop seems to partially compensate for income losses due to poppy eradication policy. However, due to the rubber tree characteristics (the trees become productive only after seven years) this alternative cropping strategy can only be adopted by better-off. Poor people cannot wait that long without an income. For them, in a short time, there is only a marginal advantage offered as causal laborers due to compelling need to find a survival for tomorrow.

Rubber and rubber plantation are developed under the expectation that at least during the next 20 years. The Chinese economy will express considerable rubber demand that it will necessarily continue to request an imports. However, there are many open questions: how long the Chinese economy will last to express this demand and if the Chinese economy finds cheaper inputs elsewhere and consequently will reduce the expected import from this border area.

The relevance of these concerns should not be under evaluated. In the meantime, it is not easily foreseeable that due to internal (Myanmar) persisting political difficulties, these remote border areas will have the possibility of a significant improvement of their economic integration into the Myanmar market. Nevertheless, only trans-border strategies will facilitate the development of these areas; but the risks of creating new dependency (from China) could arise.

Rubber processing technologies and diversification of crops such as tang oil, macadamia, and upland hybrid rice varieties, high income horticultural crops such as dragon fruits, maderine oranges, pears, plums, apples, kaki fruits etc. should be introduced with better cold storage facilities.

Public- private partnership in implement of food security programs and pillars of rural development and poverty alleviation programs should be strengthened to get better food secure situation in study area.

5.2.2 Promote non-agricultural activities

Daily wage labor income is very important for food insecure households. They engaged in various non-farm activities as their survival strategy. Moreover, labor migration to nearby border townships becomes their survival strategy.

Hence, creation of non-farm employment and provision of credit to the poor to stabilize consumption by creating better income from farming business and to promote job opportunities are essential to improve food security.

5.2.3 Promoting conservation of natural resources

Implementation of conservation program through “food for work” is essential as many households rely on collecting and selling non-timber forest products (NTFPs) especially in food shortage period.

5.2.4 Improvement of literacy, safe drinking water and sanitation

It is required to implement better programs to reduce high illiteracy rate in the study area. Concerning health and nutrition of food insecure households, safe drinking water and improved sanitation should be provided in the study area.

REFERENCES

Central Statistical Organization. (2001) "Statistical Year Book", Ministry of National Planning Economic Development, Yangon, 2001.

Chambers, R. (1989), "Vulnerability, coping and policy", IDS Bulletin 20: 1-7.

Chambers, R. and Coney, G., 1992. Sustainable Rural Livelihoods: Practical Concepts for the . IDS Discussion Paper No. 296. Institute of Development Studies, Brighton, UK.

Chambers, R., 1988. Sustainable Rural Livelihoods: A key for People, Environment and Development. In Conroy, C. and Litvinoff, M. (eds.), The Greening of Aid,. Earthscan, London.

Christiaense, L., and Tollens, E., 1995. Food Security: From Concept to Action. Research the framework of policy preparing research in the field of cooperation in development. gium

Chung, k., L. Haddad, J. Ramakrishna, and F. Riely. 1997. Identifying the food-insure: The application of mixed method approaches in India. IFPRI, Washington, D.C.

CSO. 2009. Statistical YEAR Book. Central Statistical Organization.Myanmar.

CSO. 2009-10 Myanmar Agricultural Statistics (1997-98 to 2009-10). Central Statistical Organization.Myanmar.

DAP. 2010. Myanmar Agriculture in Brief, Ministry of Agriculture and Irrigation. Myanmar.

Devereux, S. & Maxwell, S. 2001. "Introduction" in Devereux, S. & Maxwell, S. ed, Food security in sub-Saharan Africa. Pietermaritzburg: University of Natal press, pp. 1-12.

E.C and FAO (2007), "Indentification and Assetment of the Poor, Food Insecure and Vulnerable in the Union of Myanmar", FAO, January, 2007.

Ellis f. (2000) Rural livelihoods and diversity in developing countries. Oxford: Oxford University Press.

FAO online database, FAOSTAT. 2010. Food and Agriculture Organization of the United Nations. Source: http://faostat.fao.org/site/406/default.aspx.

FAO. 2007. Food and Agriculture Organization of the United Nations. Identification and Assessment of the Poor, Food Insecure and Vulnerable in the Union of Myanmar

FAO. 2007. Food and Agriculture Organization of the United Nations. Identification and Assessment of the Poor, Food Insecure and Vulnerable in the Union of Myanmar

FAO. 2007. Food and Agriculture Organization of the United Nations. Identification and Assessment of the Poor, Food Insecure and Vulnerable in the Union of Myanmar

Gittelsohn, J., Mookherji, S. and Pelto, G. 1998. "Operationalizing household food security in Nepal", http://www.unu.edu/unpress/food/V193e/ch04.htm.

Hadded. L., E.Kennedy and J. Sullivan (1994), "Choice of indicators for food security and monitoring", Food Policy 19:329:-343.

http://www.adkn.org/en/agriculture/article.asp?a=57

Maxwell, S. and T. Frankenberger. (1992). Household food security: Concepts, indicators, measurements. International Fund for Agricultural Development (IFAD) and UNICEF, Rome.

Maziya- Dixon, B., I. O. Akinyele, E. B. Oguntona, S. Nokoe, R. A. Sanusi, and Harris (eds).2004. Nigerian Food Consumption and Nutrition Survey 2001-2003, Summary. Ibadan Nigeria: International Institute of Tropical Agriculture (IITA).

Ministry of Labour and UNFPA (2006), Handbook on human resources Development Indicators" (Special Edition), Development of Labour , Ministry of Labour, 2006.

Riely, F., and N. Moock. 1995. Inventory of food security impact indicators. In Food Security Indicators and Framework: A Handbook for Monitoring and Evaluation of Food Aid Programs. IMPACT, Arlington, Va., U.S.A. Draft.

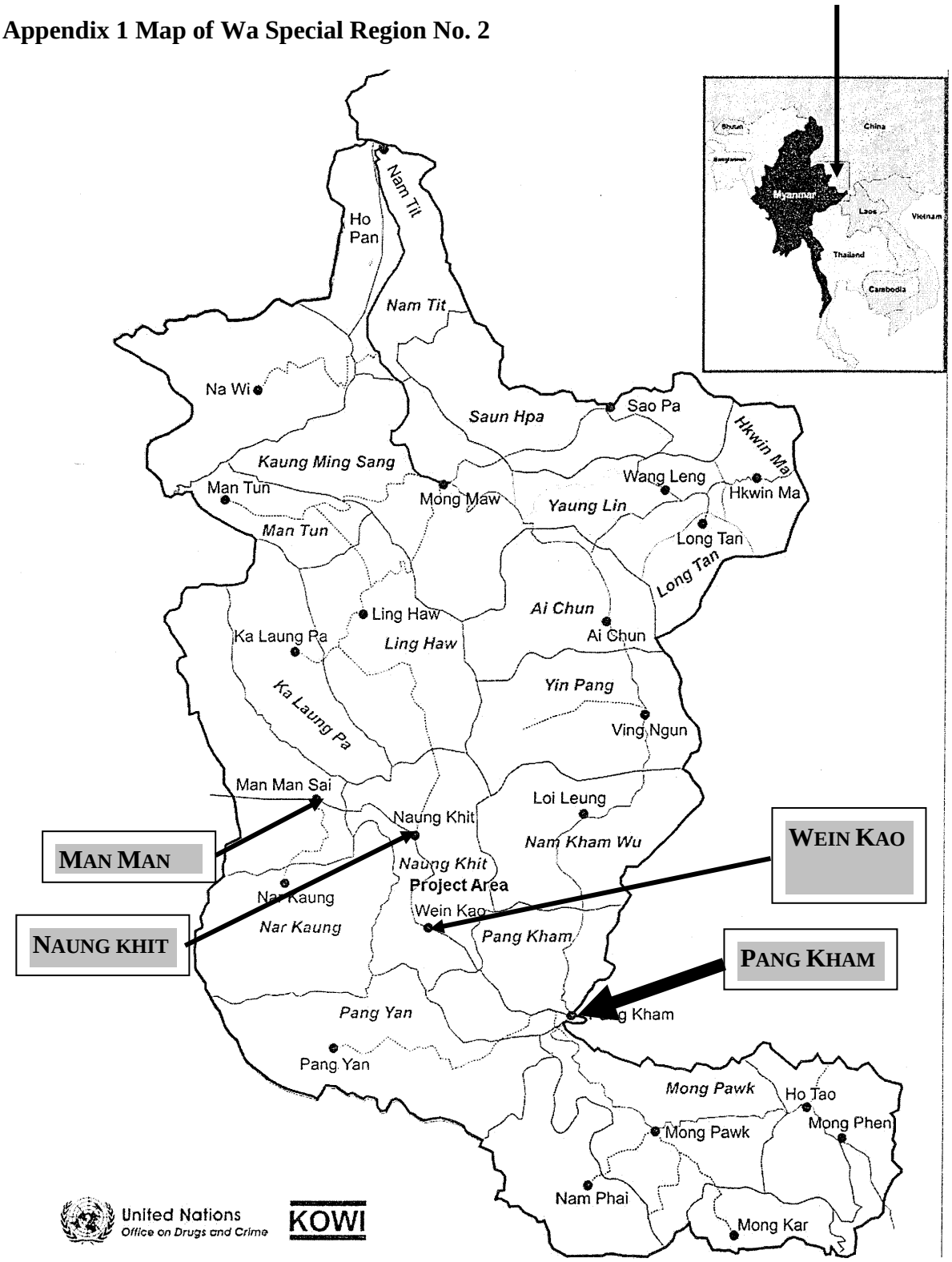
Swift, J.R., 1989. Why are rural people vulnerable to famine? IDS Bulletin, Vol. 20 No.2, IDS, University of Sussex, Brighton, UK.

United Nations Development Programme and Ministry of National Planning and Economic Development (2007) "Integrated Household Living Conditions Survey in Myanmar: Poverty Profile" , United Nations Development Programme, Yangon, 2007.

World Bank (1986), Poverty and Hunger: Issues and Options for food security in Developing Countries, World Bank, Washington, D.C.

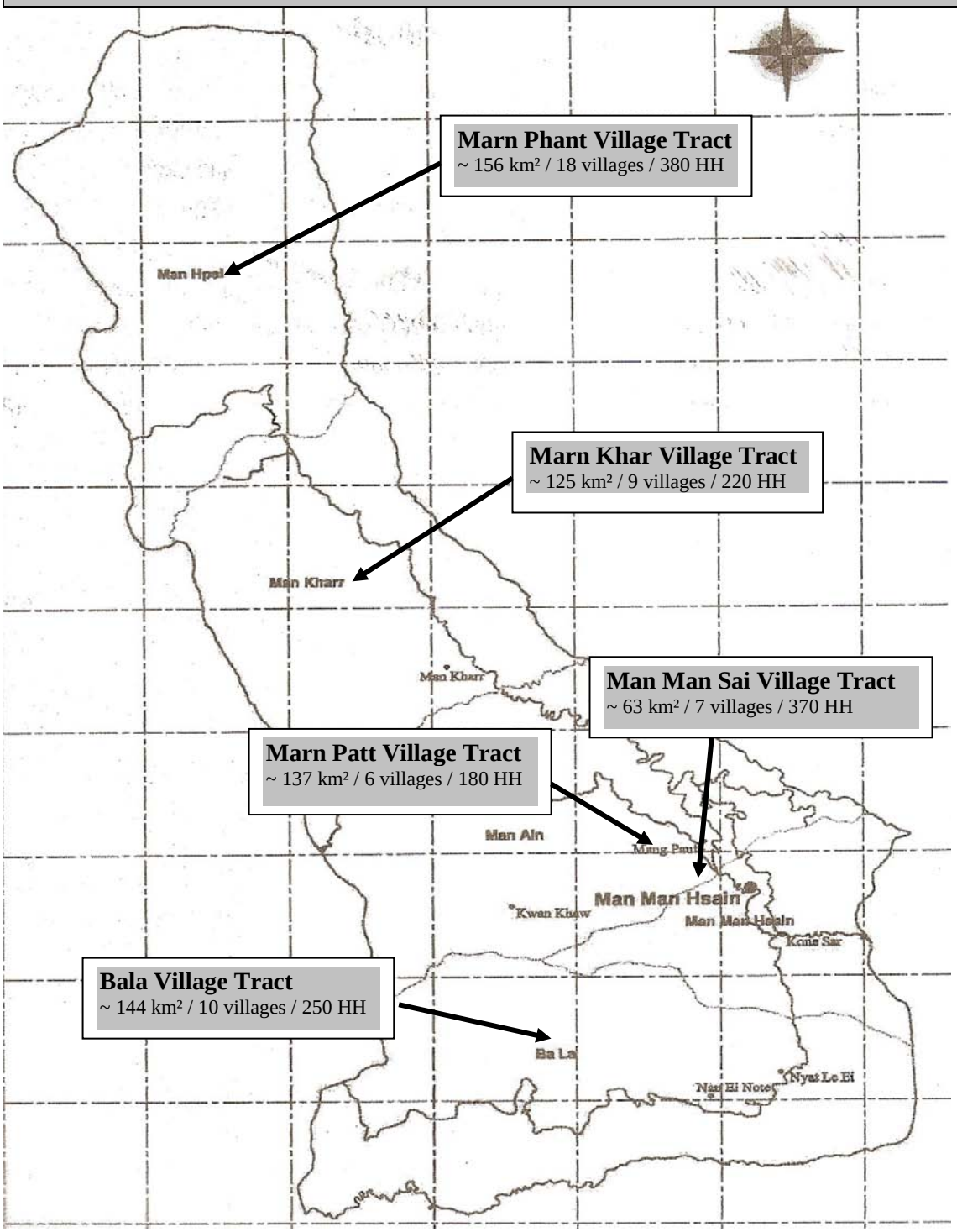
APPENDICS

Appendix 1 Map of Wa Special Region No. 2



Appendix 2 Map of Man Man Sai Township

MAN MAN SAI TOWNSHIP / WEIN KAO DISTRICT
(Area: ~ 625 km² = 937.500 mu / 156.250 acres)
(No. villages ~50 / No. HH ~ 1400 - 1680 / population ~ 7000 – 8500)



Appendix 3 Regression Results for Food Secure and Insecure Households

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.905	.819	.798	28058.1587	1.723

a Predictors: (Constant), low land rice (ac), age of head, inc bark (k/yr), inc tea (k/yr), rice adequate (%), family size, income alcohol (k/yr), rubber (ac), maize (ac), inc wage (k/yr), upland rice (ac)

b Dependent Variable: per caput income/yr

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	344376315187.857	11	31306937744.351	39.767	.000
	Residual	76364245973.822	97	787260267.771		
	Total	420740561161.679	108			

a Predictors: (Constant), low land rice (ac), age of head, inc bark (k/yr), inc tea (k/yr), rice adequate (%), family size, income alcohol (k/yr), rubber (ac), maize (ac), inc wage (k/yr), upland rice (ac)

b Dependent Variable: per caput income/yr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	179592.1	15126.083		11.873	.000
	age of head	236.188	262.300	.044	.900	.370
	rice adequate (%)	89.343	112.434	.037	.795	.429
	income alcohol (k/yr)	-6.891	5.811	-.058	-1.186	.239
	inc tea (k/yr)	.928	.337	.126	2.756	.007
	inc bark (k/yr)	-2.904	5.438	-.024	-.534	.594
	inc wage (k/yr)	.153	.021	.398	7.289	.000
	family size	-28013.0	1513.209	-1.021	-18.512	.000
	maize (ac)	74120.346	34207.948	.111	2.167	.033
	rubber (ac)	-1589.813	965.445	-.079	-1.647	.103
	upland rice (ac)	9718.036	15344.215	.036	.633	.528
	low land rice (ac)	7871.422	40417.489	.012	.195	.846

a. Dependent Variable: per caput income/yr

$R^2 = 79.8\%$, $F_{11, 97} = 39.767$, Sig = 0.000***