Rural Households' Food Security Status and Coping Strategies to Food Insecurity in Myanmar

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ACKNOWLEDGEMENTS

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CHAPTER I
INTRODUCTION

1.1 Background

Promoting the people basic needs and well-being or making the world free from hunger, malnutrition and poverty is the greatest challenge especially for the LDCs. The difficulty of food security has been faced and given as the first priority in achieving the most fundamental human right[1] in all developing countries. Although there was reducing undernourished people in some of the developing countries, the current global food crisis emerging from soaring prices of staples and depletion of food stocks affects on access to food by poor people in many developing countries. Poor food buyers in urban areas and net food buyers and non-food producers in rural areas who spend a large share of their incomes on food are the most adversely affected by the rising food prices.

The FAO identified as over 37 developing countries are in urgent food needs in May 2008. It is undeniable fact that all countries have to respond to promote food security, in line with the definition of the 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"*. In this connection, food security has three dimensions: (1) availability and stability of safe and nutritionally adequate food both at the national and household level; (2) the 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 during a given period from its food supply. The reaction to this issue especially in the developing countries is to give a higher priority for the development of the agriculture sector in enhancing higher food production, securing sufficient food supplies domestically, and minimizing on the dependence of food import.

In 2001-03, there were still 854 million undernourished people worldwide: 820 million in the developing countries, 25 million in the transition countries and 9 million in the industrialized countries (FAO 2006). In terms of the regions, the prevalence of undernourished people were 162 million in Asia and Pacific, 212 million in India, 150 million in China, 52 million in Latin America/Caribbean, 38 million in Near East & North America, 206 million in Sub-Saharan Africa, 25 million in Transition Countries and 9 million in Industrialized Countries. Only Asia and the Pacific and Latin America and the Caribbean have reduced in both number and prevalence of undernourished people. In Asia,

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[1] The Human Right to Adequate Food is part of Article 25 of the General Declaration of Human Rights of 1948 and Article 11 of the International Covenant on Economic, Social and Cultural Rights of the United Nations. This Covenant became effective in 1976.

Myanmar and Viet Nam have reduced the number of undernourished people by more than 25 percent. China, Thailand and Indonesia have made the significant progress in reducing hunger since the WFS baseline period 1996 (FAO 2006). However, mainly due to increases in food prices after 2006, the global number of undernourished people in 2007 is estimated to increase at 923 million (FAO 2008).

The developing country food situation is currently redefined by the new driving forces such as climate change, income growth, globalization and urbanization, etc. (Joachim von Braun 2007). Not only the quantity and quality of food but also consumption pattern is changed to consume less cereal and more meats, fishes and fruits. Analyzing the recent trends and challenges in food availability covering food production, consumption, consumption pattern, rising food prices and self-sufficiency at the country level is essential in order to provide information to response appropriate actions for attaining food security. As the issues of food security also relate with nutrition security, the nutritional status and health related environment of food insecure people must be considered in mobilizing resources for promoting the livelihoods of those people. Keeping up the momentum in reducing hunger and reaching WFS target[2] in the developing countries presents a formidable challenge for all and Myanmar.

1.2 Research Focus

Myanmar is the second largest among ASEAN countries in terms of size and fifth largest in terms of population. Myanmar has a predominantly agrarian economy based on rice production. Rice is the staple food crop occupying the largest share of multiple crop-sown areas (about 39 percent in 2006-2007) followed by pulses and oil seeds. In country with per capita income of US$ 217 in 2005, rice accounts for 43 percent of the agriculture value-added and provides employment for 61 percent of the total labor force. The government of the Union of Myanmar has always given the first priority to produce sufficient amount of rice and to provide rice at an affordable price. Reflecting the importance of rice in social and political stability, the major objective of the agricultural sector is 'to ensure national food security and generate surplus in rice (staple food) and pulses productions'.

Rice is the major source of the energy for Myanmar people because it contributes about 73 and 80 percent of the total daily dietary energy supply in urban and rural households, respectively (CSO 2001). Even though annual per capita consumption of rice has declined gradually since 1998, Myanmar consumes the highest amount of rice (196 kg per year in 2003) among the Asian countries (FAO STAT). Consumption of rice per capita in

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[2] The World Food Summit in 1996 established the target of halving the number of undernourished people by no later than 2015.

rural area is greater than urban area. The vulnerable household such as landless laborers and small farmers would continue to experience food and nutritional insecurity due to low income, low rice wage rate, increasing rice price and low land productivity.

According to the statistical data, Myanmar is self-sufficient in food and rice production at the national level (FAO Statistical Year Book 2005/06 Vol.2 and Myanma Agriculture Service May 2008). The sown area of paddy (*unmilled rice*) has increased from 4.78 million hectare in 1988-1989 to 8.03 million hectare in 2006-2007. The paddy production also increased from 13.14 million metric ton in 1988-1989 to 30.77 million metric ton in 2006-2007. Actually, the paddy sown area and production has been increased significantly after introducing summer paddy program in 1992-93 with emphasize on irrigation development. The official data present that paddy yield growth was improved by average 2.7 percent per year during the period of 1997-98 to 2006-07 while the United States Department of Agriculture (USDA) has different figures; there was a negative growth rate of paddy yield (- 0.3 percent per year) for the same period.

In order to maintain the stability of the major food prices in the country, the government has adopted restrictive trade policies especially on rice and oil seeds. The government has monopolized in rice export since 1962. To earn foreign exchange, the government procured paddy at a fixed and low price from the farmers. The fertilizer subsidy program was abolished in 1993-94. The procurement of paddy and rice distribution for civil servants, prisoners, hospital, etc. were finally abolished in 2003 when facing with declining rice export quantity, poor quality of rice and huge losses in rice distribution system.

The reforms in 1988 allowed the free trade flow of all crops within the country. After attempting to trade liberalization in April 2003, rice export will be allowed if there is a surplus of rice in the country and the private exporter must follow the guidelines set by the Myanma Rice Trading Leading Committee. The export tax is 10 percent and the exporter must share the net export earnings after taxes on 50-50 basis with the government. But rice and rice products, yellow corn, sesame, oil crops and oil cakes, onion and sugar were banned to export in January 2004 due to anxiety of rising prices and food insecurity.

Under the restrictive trade policy, the net return per unit of land from rice production is much lower than other crops especially pulses. The pulses crop is allowed to export since 1988. Because of high cost of fertilizer, the application rate of fertilizers (urea, potash and T. super) declined from 75 kg per hectare in the peak year (1985-1986) to about 30 kg per hectare in the early 2000s. It is obvious that fertilizer application rate is low in Myanmar in comparison with other Asian countries. As is the case with fertilizer, most of Myanmar's diesel oil is imported and the domestic price has risen quite rapidly. Although increased irrigation facilities are beneficial to rice yield, the farmers' low level of access to the external inputs has contributed largely to the low land productivity. As a result, most of the rice farmers have to enjoy in subsistence economy.

The prices of both low and high quality rice have been substantially increased during

2001 to 2008. The wholesale price of high quality milled rice (Pawsan Hmwe) reached about Ks 590,250 per ton in June 2008, nearly 13-folds increase compared to the price level in January 2001 (Market Information Service 2008). The price of low quality milled rice (Ngasein) was also increased by 13.5 times within the same period. After landing Nargis cyclone especially in Pawsan producing areas (Ayeyarwady and Yangon Divisions) on May 2008, the price of Pawsan rice reached to 1.4 times of the price before cyclone. The rice wage (the amount of rice which can be purchased by daily wages) of agricultural laborers was declined from 4 or 5 kg (Fujita 2005) in the early 2000s to 2.6 kg with minimum daily farm wage of 1000 Kyats and low quality of rice 800 Kyats/pyi or 376.5 Kyats/kg in 2008.

The food security of the vulnerable households (small holders, landless laborers) who constitute about 35 to 53 percent of the rural population (Agriculture Census 2003) became more serious. The EC and FAO (2007) find that there is a deteriorating pattern of the consumption of the Myanmar people during the period of 1997 to 2001 in terms of both quantity and quality by using the CSO data. Unfortunately, there is a lack of time-series data on household's consumption and further analysis is restricted in the context of Myanmar to determine to what extent the population is in food insecurity.

This study will examine the food (rice) availability at the national level using the official and FAO data. Second, a case study in the rice deficit region (Dry Zone) will present the characteristics and food security status of the farm and non-farm rural households (landless) and the determinants of food security. The Dry Zone was chosen to study because the EC & FAO (2007) classified this region as the most vulnerable area of the country. Furthermore, the FAO projected that the Net Primary Production would be decreased significantly in the Dry Zone in the next two decades. It is essential to collect the primary and secondary data on food availability, access, stability and utilization for understanding the current reality of food security at both macro and micro level.

1.3 Objectives of the Study

- ➢ To assess the food (rice) availability at the national level by using indicators of trend of production index, growth rate of sown area, production and yield, average availability of rice, average per capita rice consumption, rice surplus, dietary energy supply of rice, share of food expenditure in total budget, self-sufficiency ratio, trends in domestic prices of rice and the estimated effects of the Nargis cyclone on rice self-sufficiency.
- ➢ To investigate the rural household's access to food in terms of human capital, food production, household income, asset ownership, and income diversification of farm and non-farm (landless) households.
- ➢ To examine the farm and non-farm household's food security status by applying the national food poverty line and the index of coping strategies method along with

some indicators such as food share in the household budget, percentage of food expenditure in the total household income, and nutrition security indicators of access to safe drinking water, sanitation, diseases, and number of children death.

CHAPTER   II
MYANMAR'S ECONOMIC DEVELOPMENT, NUTRITIONAL STATUS AND POVERTY

2.1   Economic Performance of Myanmar

The economic performance of the country should be reviewed to understand the changes of the economic growth rate, economic structure, consumer price indexes, export and import, and per capita consumption and income.

Myanmar has possessed double-digit GDP growth rates since 1999-2000 (ADB). There is a controversial in GDP growth rate as UNESCAP (2005) pointed out that GDP growth rates of Myanmar has declined to zero in 2003-2004 (due to banking crisis) and 3.6 percent in 2004-2005. In addition, the growth rate of agriculture sector has declined from 8.7 percent in 2001-2002 to 4 percent in 2004-2005. The ADB's growth rate of agriculture has increased to 11.7 percent in 2003-2004 and it was stagnant in 2004-05 and 2005-06. Both institutions pointed out that the growth rates of industry and services have significantly declined since 2003-2004 and it reached negative in ESCAP data in 2003-2004 (Table 2.1). Within the last 16 years (1990-2006), the share of agriculture sector to the country GDP has declined by about 9 percent while the shares of industry and services sectors have increased by around 6 percent and 3 percent, respectively. The estimated GDP per capita was USD 219 and 232 in 2005-06 and 2006-07, respectively (IMF, World Economic Outlook Database, April 2008). The IMF (2007) estimated that per capita GDP is likely to increase to USD 238 in 2007-08 and USD 290 in 2008-09 due to the high growth rate of export (particularly natural gas) and high growth rate of the whole agriculture sector.

The Consumer Price Indices of rice and meats/fish/eggs have significantly risen since 2001-2002. Because of increasing demand of both domestic and export markets, especially the prices of meats and fishes have continuously increased over time. The government has monopolized in rice exporting[3] since 1962. It seems that the informal trade of rice through border areas was likely to emerge gradually because of rising cost of production (subsidy program of fertilizer and pesticide to the farmers was eliminated in 1993-94) and to enjoy comparative advantage of rice production of Myanmar. It is noted that the new rice policy in 2003 unofficially imposed a ban on export of rice by the private sector with an anxiety of soaring domestic price of rice. On the other hand, the emergence of informal trade will create distortion in the country's economy as the state will receive no tax revenue and foreign currency.

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[3] Rice export was fluctuated and declined; 1 million in 1994/95, 0.028 million in 1997/98, 0.79 million in 2002/03, 0.014 million MT in 2006/07 (MOAI 2008).

Table 2.1   Economic Performance of Myanmar

Indicators	1999 -00	2000 -01	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07
Growth rate of GDP (%)								
- ADB	10.9	13.7	11.3	12.0	13.8	13.6	13.2	12.7*
- UNESCAP	4.6	6.2	11.3	10.0	0.0	3.6		
Growth rate of agriculture (%)								
- ADB	11.5	11.0	8.7	6.0	11.7	11.0	11.8	
- UNESCAP			8.7	4.2	3.0	4.0		
Growth rate of industry (%)								
- ADB	13.8	21.3	21.8	35.0	20.8	21.5	19.1	
- UNESCAP			21.8	32.8	-3.4	3.0		
Growth rate of services (%)								
- ADB	9.2	13.4	12.9	14.8	14.6	14.5	12.8	
- UNESCAP			12.9	12.5	-3.4	3.0		
Shares of major sectors in GDP	1990							
- Agriculture (%)	57.3			52.9	51.9	50.8	50.6	48.4
- Industry (%)	10.5			12.8	13.6	14.5	14.3	16.2
- Services (%)	32.2			34.3	34.5	34.7	35.1	35.4
CPI (1997=100)*								
- Overall (Food CPI)			204.1	322.6	403.1	418.3	463.2	588.3
- Rice			167.1	370.3	452.8	371.8	440.6	
- Edible oils			191.7	377.0	346.3	343.6	382.1	
- Meats/Fish/Eggs			220.0	358.6	449.9	494.3	545.9	
Inflation (%)	21.3	- 0.2	21.2	57.0	36.6	4.5	9.4	
Growth rate of export (%)		42.3	34.5	16.5	1.9	4.4	21.7	46.2
Growth rate of import (%)		-7.3	21.9	-18.9	-2.6	-11.9	0.6	48.0

Source: ADB Key Indicators 2007: Inequality in Asia, UNESCAP Statistical Indicators for Asia & the Pacific Vol. XXXV, 2005, *CSO 2006

Inflation is an easy-to-see-indicator of economic malperformance of the country. The ADB presented that inflation has been decreasing significantly since 1999-2000, from 21.3 percent to (-) 0.2 percent in 2000-2001. The inflation rate increased again in 2001-2002 and it reached a peak level of 57 percent in 2002-2003. The rate of inflation then declined to 4.5 percent in 2004-2005 and it rose again to 9.4 percent in 2005-2006. Actually, it has increased at an average rate of 22 percent per year during 1999 to 2005. The estimated purchasing power was declined in 2006-07 because of continuously increasing annual growth rate of CPI at 25.7 percent in 2006-07 (IMF 2008).

The inflation is expected to increase further because of destroyed or damaged stock and enterprises of basic food items such as rice, fishery, livestock, etc. in the Nargis cyclone affected areas in May 2008. The joint assessment of Nargis cyclone impact on Myanmar economy (2008) projected that inflation would increase further to 40 percent in 2008 and 30 percent in 2009 as increases in government spending were largely financed through credit from the central bank.

Myanmar has enjoyed high growth rate of export in 2000-2001 because of significantly increased production and growth rate in industry and agriculture sectors. However, the growth rate of export significantly declined in 2003-2004 and it recovered again in 2006-2007. The negative growth rate of import has been received since 2000-2001. But the growth rate of import increased sharply in 2006-2007 accompanied by high growth rate of export. The economic reforms during the last 20 years encouraged the private sector investment and allowed some crops to export. Although the economic structure has been slowly changed and agriculture sector still dominants in the country's economy, the source of GDP from private sector has significantly risen from 75 percent in 2000-01 to 91 percent in 2005-06 (IMF 2006).

2.2   Nutritional Status and Health Situation of Myanmar

According to the National Nutrition Center, the proportion of population below minimum level of dietary energy consumption in 1997 was 30.84 percent (CSO, Household Income Expenditure Survey 1997). It is noted that average consumption of calorie in 1997 was 92.5 percent of the recommended daily allowances (RDA) and 30.4 percent of the households consumed less than 80 percent of the RDA. With increasing per capita food production index, the FAO estimated that the proportion of undernourishment has declined from 10 percent of the population in 1990-92 to 5 percent in 2001-03 (Table 2.2). Myanmar has relatively lower proportion of undernourished in total population among some Asian countries such as Cambodia (33%), Lao PDR (21%), Thailand (21%) and Viet Nam (17%) in 2001-03.

The available outcome indictors of the food security at the country level are the prevalence of underweight and stunting children under five years of age. The Multiple Indicators Cluster Survey found that proportion of underweight children under five years of age was reduced from 38.6 percent in 1997 to 31.8 percent in 2003. About 32 percent of children under five were stunting in 2003. Moreover, the health indicators such as under-five mortality rate and infant mortality rate are improved as these rates were reduced by 20 and 18.6 percent, respectively during 1990 and 2006. The National Nutrition Centre has implemented the nutrition promotion and intervention programs in order to for reducing protein energy malnutrition (PEM) especially among children. The fatality rate due to PEM has declined to 7.9 percent in 2003 from 15.9 percent in 2000.

The impact of hunger and poverty is particularly severe on women and children, who are especially vulnerable to suffer more from malnutrition and disease. The country possessed the high children mortality rate and maternal mortality rate. The estimates of maternal mortality rates were ranging from 1.78 per 1,000 live births in urban area and 2.81 per 1,000 live births in rural area. The maternal mortality rate of rural area is higher than urban area because of unlikely to get health services on time, and more likely to deliver

Table 2.2   Indicators of Nutritional & Health Status in Myanmar

Indicators	1990-1992	1995-1997	2001-2003
Food Deprivation			
-Proportion of undernourishment (%)	10	7	5
-Number of undernourished (million)	4	3.1	2.4
Food & Population Growth			
-Food (ave. annual rate of change %)	3.0	2.2	2.1
-Population (%)	2.8	1.7	1.4
Child Nutritional Status*	**1997**	**2000**	**2003**
-Under-5 malnutrition prevalence (% of underweight)	38.6	35.3	30
-Under-5 malnutrition prevalence (% of stunting)			32.2
Health Indicators	**1990**	**2003**	**2006**
-Life expectancy at birth (years)	55	57	62
-Under-five mortality rate (per 1000 live births) 20	130	107	104
-Infant mortality rate (per 1000 live births) 18.6	91	76	74
Health Related Indicators	**1990**	**2000**	**2004**
-Access to safe drinking water (% of total population)	57	71	78
-Access to improved sanitation (% of total population)	24	58	77

Source: FAO (http://www.fao.org/es/ess/faostat/foodsecurity/index_en.htm), World Bank: HNP stats, *Ministry of Health and UNICEF 2003.

children at home under less than ideal sanitary conditions. About 78 and 77 percent of the total population in the country have access to safe drinking water and improved sanitation in 2004.

The country was ranked at 132 out of 177 countries as per of the human development index[4] (HDI), and 52 among 108 countries as per of the human poverty index[5] (HPI) (UNDP, 2007). The HDI of China, India, Indonesia, Philippines, Sri Lanka, Thailand, Vietnam, Lao and Cambodia are greater than Myanmar while Bangladesh, Nepal, and Pakistan are lower than Myanmar. It is noted that Myanmar's GDP per capita is the lowest (1,027 USD in 2005) among those countries. According to Human Poverty Index (HPI-1), China, Indonesia, Philippines, Sri Lanka, Thailand and Vietnam have a lower HPI than Myanmar while Bangladesh, Cambodia, India, Lao, Nepal and Pakistan have a higher HPI

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[4] The human development index is a summary composite index that measures a country's average achievements in three basic aspects of human development: longevity, knowledge, and a decent standard of living.

[5] For HPI (developing countries), deprivation in longevity is measured by the probability at birth of not surviving to age 40; deprivation in knowledge is measured by the percentage of adults who are illiterate; deprivations in decent standard of living is measured by two variables: the percentage of people not having sustainable access to an improved water source and the percentage of children below the age five who are underweight (UNDP, 2004).

than Myanmar. Because of better educational achievement and less proportion of underweight children, Myanmar has likely to have lower HPI.

Because of hunger has many faces, IFPRI constructed the Global Hunger Index (GHI) based on three equally weighted indicators[6] to capture the multi-dimensional aspects of food security. The GHI score varies between zero and 100. Higher scores indicate greater hunger; the lower the score, the better the country's situation. The GHI scores ranging from 10 to 19.9 are considered as serious, from 20 to 29.9 are considered as alarming and scores above 30 are extremely alarming in food security issue. The 2007 GHI illustrates that 36 countries are at alarming scale: twenty-five of these countries are in Sub-Saharan Africa, nine in Asia, one in the Middle East and Latin America respectively (IFPRI 2007).

According to IFPRI, the GHI in 2007 has slightly improved in 115 developing countries in comparison with the previous year. Because of improvement in health care and education achievement since 1990s, the positive trends can be found in the indexes of some Asian countries. Among them, Malaysia and China have reached at low level of hunger while Laos, India and Cambodia have reached at alarming hunger level in 2007. The rest of the Asian countries including Myanmar[7] (Figure 2.1) are at serious level of hunger according to the GHI. The IFPRI's report points out that some countries such as Bangladesh, Pakistan, India, Nepal, Laos and Cambodia failed to achieve their midpoint Global Hunger Index targets.

Figure 2.1 Global hunger indexes of some Asian countries
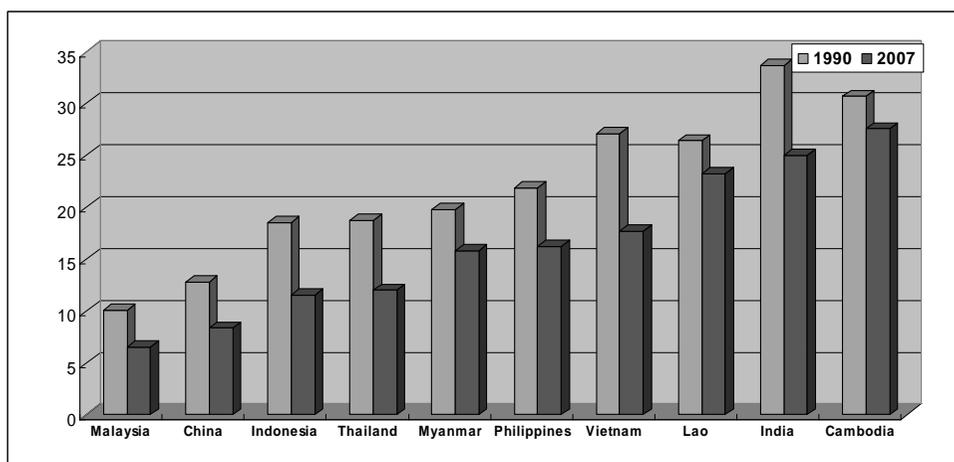
Source: IFPRI 2007

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[6] (1) the proportion of undernourishment as a percentage of the population, (2) the prevalence of under weight in children under the age of five and (3) the under-five mortality rate

[7] Myanmar was ranked as 66 among 115 countries according to the GHI scores of 15.8 in 2007

2.3   Income/consumption Poverty Situation

The socio-economic development of a country and increased per capita income especially for the vulnerable group is essential to reduce hunger and malnutrition and to improve standard of living and social situation. The following figure presents that per capita income of Myanmar (US$ 217 in 2005) is the lowest among the neighboring countries (China, India, Thailand, Bangladesh and Lao) and Indonesia and Viet Nam as well. Thailand has obtained the highest per capita income that was more than 10 times of the income of Myanmar.

The country primarily faces income/consumption poverty issue and the poor are distributed in different regions (hilly, dry zone, delta, and border areas of the country) of the whole country with a wide degree of poverty. The Household Income and Expenditure Survey (HIES) was conducted by the Central Statistical Organization (CSO) in 1997, covering 14,860 rural households and 10,610 urban households in 45 sample townships of States and Divisions. The percentage of monthly household expenditure on food and beverages is 68 percent of total expenditure for the urban household and 72 percent for the rural household. Based on the survey, the 'poverty estimates' for urban was 23.9 percent, for rural was 22.4 percent and for total was 22.9 percent in Myanmar. The highest rural poverty rate was found in Chin State followed by Kayah, Magway, Bago and Sagaing. The lowest poverty rate was found in Tanintharyi Division, Kachin and Kayin States.

In 2001, the CSO and Ministry of National Planning and Economic Development (MNPED) had conducted the Household Income and Expenditure Survey (HIES) with the sample size of 30,000 households from 75 sample townships in order to measure poverty

Figure 2.2   Per capita income of some Asian countries
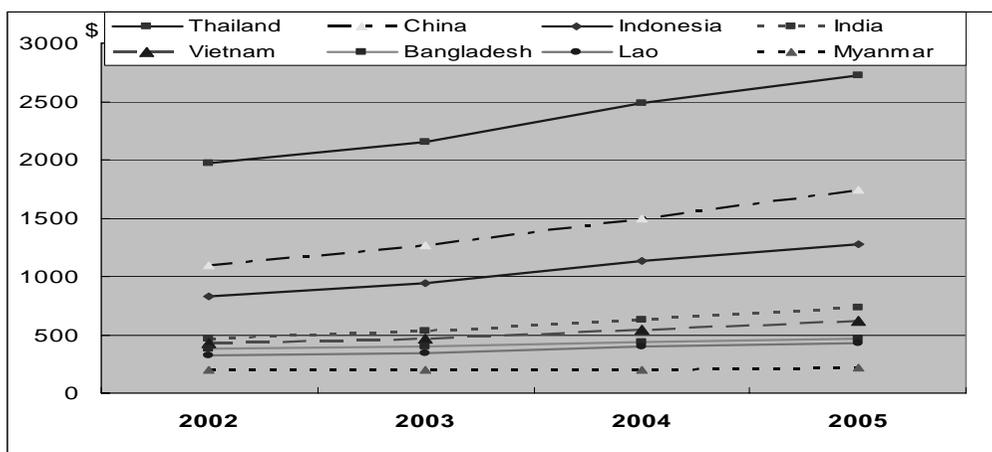
Source: ADB 2007

incidence in the country. The estimated poverty incidence for urban was 20.7 percent, for rural was 28.4 percent and for overall was 26.6 percent in 2001 (Millennium Development Goal Report 2006). It seems that poverty incidence in rural has increased but urban poverty has decreased when compared with the estimated poverty incidence in 1997.

Based on the integrated household living standard survey, which was jointly undertaken by the UNDP and MNPED in 2004, the team estimated that about 32 percent of the total population was in poverty at the national poverty line 162,136 Kyats per adult equivalent per year in 2004 (UNDP & MNPED 2007). The poverty incidence in rural was 36 percent while urban was 22 percent. It seems that the income/consumption poverty incidence was worsen during the period of 1997 to 2004 because of lower growth in per capita income and higher increasing rate of CPI especially the prices of basic food items.

The Department of Agricultural Planning (2003) studied farm poverty situation in the eight selected townships in different regions. The DAP applied the poverty line which is based on the relative poverty concept. They found that poor households spend about 50 percent or more of their income on rice consumption. The price adjusted poverty incidence was ranged from 26 percent to 75 percent and found to be highest for small farmers. The small farmers are under pressure to generate extra income for providing basic food by means of working as low wage laborer. Although DAP did not include landless rural households in the study, it is obvious that the incidence of food security and poverty tend to be more severe in landless rural poor. The hunger and poverty situation of the rural landless should be emphasized because they represent 35 to 53 percent of the total rural population (Agriculture Census 2003).

The measurement of poverty is deeply associated with the definition of poverty. Although the concepts are different and poverty incidences are not comparable, it is useful to gather information on different poverty measurement criteria. The Japanese researchers conducted a household survey, covering more than 500 households in eight villages with diverse agro-ecological environments of delta, dry zone, hilly, and coastal areas in 2001. They applied the food poverty line corresponding to the value of 200 kg rice per person per year, and the poverty line corresponding to the value of 400 kg rice per person per year. With this poverty line, Kurosaki et al. (2004) found out that the highest poverty incidence of 68 and 54 percent in the two villages of the dry zone.

D. Kyaw and Routray (2006) applied the Cost of Basic Needs method in constructing the regional food poverty line for the dry zone in accordance with the recommended daily energy intake of *2100 calorie per capita per day*. And the food poverty took into account not only rice consumption of 176 kg per person per year but also other food items (cooking oil, meats, fish, egg, vegetables, etc.). With household size adjustment, the poverty incidence of female-headed and male-headed households was 46 and 22 percent, respectively applying the poverty line of $ 0.3 per person per day at the market exchange rate in 2003.

This study will apply the national food poverty line of UNDP and MNPED (2007) to obtain the recommended calorie intake of about 2300 kilocalories per adult equivalent per day. The index of food-coping strategies of the rural households will be calculated for comparison of the results from the food poverty line method.

Table 2.3   Estimated Food, Non-food and Poverty Lines in Myanmar

	Kurosaki et al. (2004)*	Kyaw and Routray (2006)**	UNDP & MNPED (2007)***
Food poverty line	Value of 200 kg rice/year	215 Ks/person/day	324.39 Ks/person/day ($ 0.34 at 950Ks/$)
Non-food poverty	Value of 200 kg rice/year	37 Ks/person/day	119.82 Ks/person/day
Poverty line	Value of 400 kg rice/year	252 Ks/person/day ($ 0.3 at 850 Ks/$)	444.21 Ks/person/day ($ 0.47 at 950 Ks/$)

Source: Kurosaki et al. (2004), D. Kyaw and Routray (2006), UNDP & MNPED (2007)

Note: *Based on survey in 4 different regions, ** Based on survey at the dry zone in 2003 to obtain 2100 kcal/person/day, *** Based on integrated household living conditions survey in all States & Divisions to obtain 2304 calories for first round in 2004 & 2295 calories for second round in 2005.

CHAPTER III
NATIONAL FOOD AVAILABILITY AND SELF-SUFFICIENCY

3.1 Monitoring Physical Access to Food at National Level

Nationally, adequacy of food can be monitored on the basis of total supply relative to total requirements. The trends of per caput food availability, per caput food production, self-sufficiency ratio and per caput milled rice consumption provide good indicators of adequacy and stability.

Apart from requiring adequacy, household consumption pattern, changes in diet share in daily consumption, and food expenditure share in household total expenditure are the good proxy indicators in ensuring access to food at the household level. Although the changes in food stock indicator[8] are an impressive, data are not available to measure this indicator. It should be noted that *food security* of the country is synonymous to *rice security* depend upon its importance in the diet as a major source of energy for Myanmar. Moreover, the role of rice especially in rural households and the country economy in terms of revenue and employment is equally important.

3.1.1. Total and Per Capita Paddy Production Index

Among some major rice exporting and importing Asian countries, the per capita food production index of Myanmar has continuously increased through. The similar pattern is found in China, Vietnam and Indonesia. These countries reached the highest level of food production in 2005. However, the per caput food production index has not changed much in India, Bangladesh, Cambodia and Thailand (Figure 3.1).

The analysis is focused on rice because of its importance not only as a source of energy but also as a source of income especially for the majority of rural population. It primarily provides daily energy intake of 1915 kcal per person in 2001-03 (FAOSTAT). Because of the government emphasizes in rice self-sufficiency in each State and Division, the production strategies such as area expansion, double rice crop production in irrigation areas[9], and increased land productivity are mainly applied. The major task of the extension staff is to drive the rice farmers to reach the target yield of paddy (100 baskets per acre or 5.18 ton/hectare) and to expand sown area according to the national target plan. In addition to expansion of sown area, the increased production originated from using MVs widely and

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[8] Under the guidance of the head of State, the State Peace and Development Council reserves 50,000 tons of rice per year (source: Ministry of Commerce 2003)

[9] To increase rice production ensuring self-sufficiency for growing population at 2 percent per year, the summer paddy program was introduced in 1992/93.

Figure 3.1   Per capita food production indexes of some Asian countries
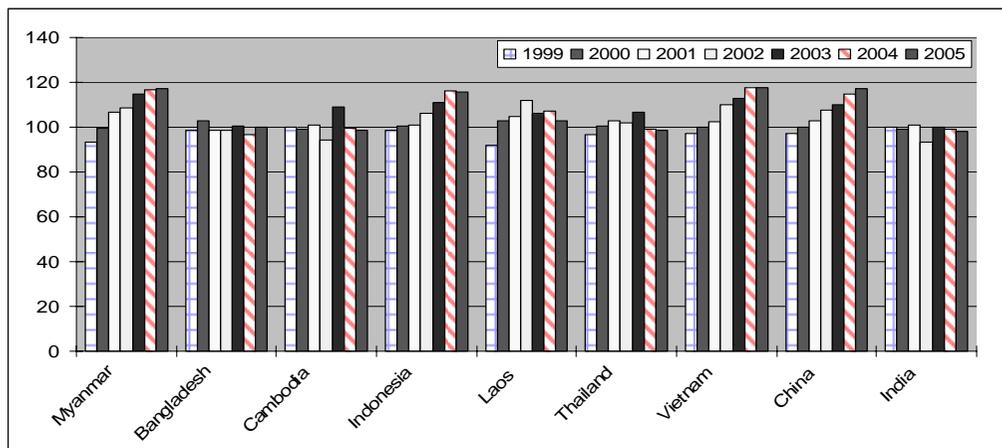
Figure 3.2   Total and per capita paddy production indexes in Myanmar
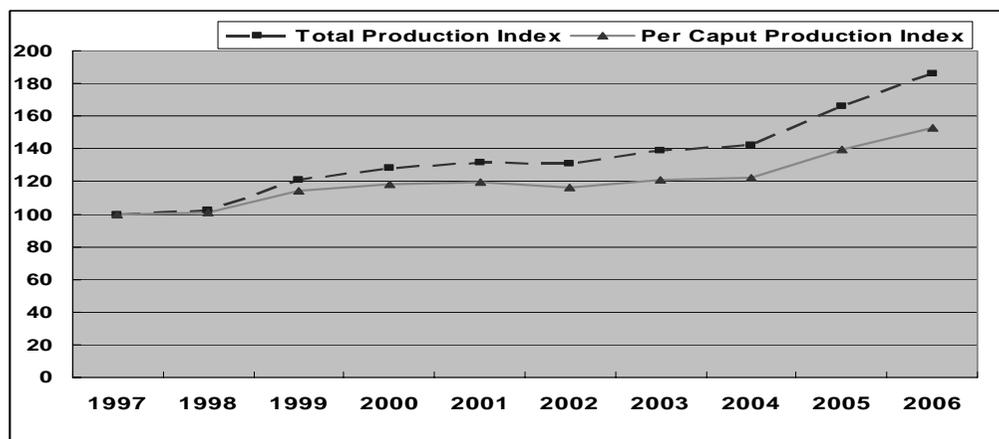
the favorable rain-fed rice producing ecosystem (Ayeyarwady and Bago[10]) in Myanmar.

The FAO estimated that there was a stable per capita paddy production index (around 120) during 1999 to 2004 (Figure 3.2). It has increased significantly to 140 in 2005 and to 155 in 2006. It can be concluded that paddy production has experienced a medium and stable growth rate of around 5.5 percent within the last 9 years. As the agricultural policy in Myanmar has been synonymous with rice policy (Okamoto 2007), increased rice production

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[10] Around 18 and 22 percent of the total rain-fed rice is grown in Bago and Ayeyarwady Divisions, respectively in 2007-08.

is the first priority to provide rice with a stable price to consumers and to gain political stability. The Ministry of Labour and UNFPA (2006) also present that the per capital rice availability has improved gradually from 222.8 kg per year in 2000-01 to 243.2 kg per year in 2004-05.

3.1.2. Resources for Paddy Production

Under the reforms, the subsidization of fertilizer to the farmers was abolished along with paddy procurement system. Although the government has provided production credit to farmers through Myanmar Agricultural Development Bank (MADB), the amount of credit per unit of land covers less than 5 percent of the total cost of rice production. Most of the farmers therefore rely on informal financial sources at high interest rate of 10 to 20 percent per month. Manures (that are collected from own draught cattle and poultry) are used as a major source of fertilizer and the farmers can use one third to one fourth of the recommended level of expensive chemical fertilizers. Therefore average annual growth rate of rice production solely rely on area expansion. The potential for net sown area expansion depends on land development of the fallow land and cultivable waste land (totally 9.2% of the total land 67659 thousand hectares) in Myanmar.

In order to increase the cropping intensity and multiple cropping areas, the irrigation development work was emphasized to construct dams and reservoirs in different regions of the country. As a result, coverage of irrigated area increased from 12.5% of the sown area in 1987-88 to 18% in 2006-07 and per capita cultivated area has increased from 0.21 hectare in 1989-90 to 0.36 hectare in 2006-07 (Table 3.1).

Figure 3.3   Land utilization in Myanmar (2006-07)
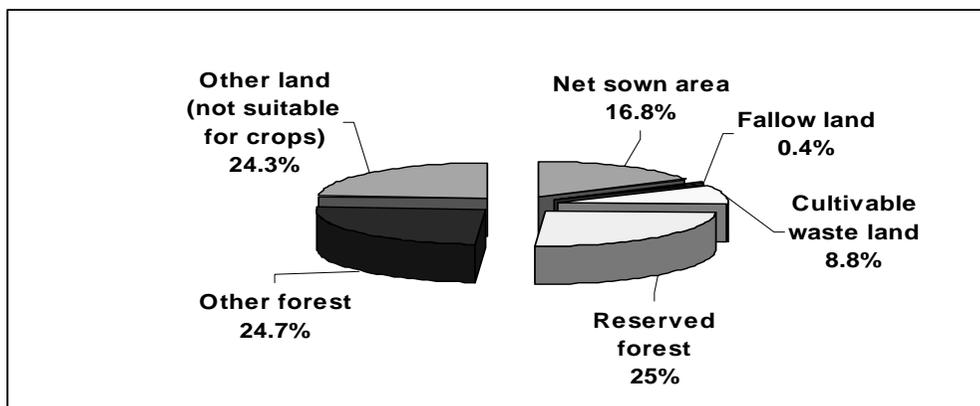
Source: MOAI, Settlement and Land Record Department (2007)

Table 3.1   Per capita cultivated land in Myanmar

	1989-90	1999-00	2003-04	2005-06	2006-07
Net sown area (000 Ha)	8209	10135	11043	11938	12576
Mixed & multiple cropping area	1643	4669	5678	6816	7710
Total cultivated area (000 Ha)	9852	14804	16721	18754	20286
Population (million)	47.40	49.13	53.23	55.4	56.51
Per capita cultivated land (Ha)	0.21	0.30	0.31	0.34	0.36

Source: Author's estimation based on data from Settlement and Land Record Department, MOAI, various issues.

It seams that increased paddy area is accompanied by a steadily decline in average chemical fertilizer consumption, and large dropped in the application rate of fertilizer. According to the CSO data, availability of chemical fertilizer (urea, T. super and potash) per unit of land was reduced from 6.54 kg/acre in 1999/2000 to 0.17 kg/acre in 2005/2006. After the government has abolished the fertilizer subsidy in 1990s, the price of fertilizer has increased gradually due to insufficient domestic production and import. For example, the urea fertilizer price was increased significantly from 2,200 Kyats/bag (a bag contains 50 kg) in 2000-01 to 26,000 Kyats/bag in 2007-2008. Actually, the expansion of irrigated paddy land increased with lower rate when compared with other commercial crops[11]. Therefore whereas other Asian countries are estimated to achieve more of their increased paddy production from yield increases, in Myanmar increased paddy production appears to be from area expansion. The average paddy yield was 3.38, 3.42, 3.42, 3.54, 3.63, 3.74 and 3.8 ton per hectare in 2000-01, 2001-02, 2002-03, 2003-04, 2004-05, 2005-06 and 2006-07, respectively (MOAI 2008).

Figure 3.4 Growth rates of paddy sown area, production and yield
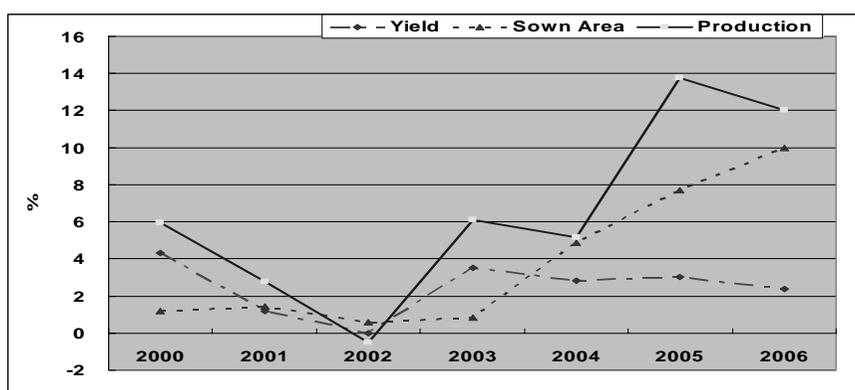
Source: Author's estimation based on data from CSO and MAS

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[11] During 1996-97 to 2005-06, average annual growth rate of irrigated area for rice, maize, pulses and groundnut were about 4, 71, 32 and 31 percent, respectively (CSO 2006).

According to the official data, the growth rate of rice sown area is estimated at average 4.8, 7.7 and 10 percent, respectively in 2004, 2005 and 2006 (Figure 3.4). The achievement of paddy yield was at an average rate of 2.47 percent per year during 2000 to 2006. In contrast, the USDA estimated that Myanmar has experienced negative growth rate (-0.3%) in paddy yield during 1997 to 2007. It is the time to consider for creating enabling policy environment for promoting land productivity and food security in the future. The increased land productivity will provide the benefits to both producers and consumers as rice producers will gain in terms of high income (or decreasing per unit cost of output) and consumers will enjoy in consuming staple food at a reasonable price.

Farmers receive the cultivated right on land and the land policy does not allow mortgaging the land for their working capital. As mentioned earlier, the MADB's loans are mostly seasonal and the amount is too small to cover even fertilizer cost alone. The medium term loans (that is payable in 2 to 3 years) are also provided to the farmers by the MADB for the purchase of cattle, bullock carts, pump sets, power tillers and farm implements. The total amount disbursed for these activities has increased yearly but it is a small amount for a unit of land[12]. The rice farmers are more utilizing small-scale agricultural machineries such as hand tractor, thresher, water pump, etc. to promote their production by means of land intensification. The farmers have to rely on informal financial sources (private lenders, traders, etc.) to meet their working capital requirement. Therefore the recommended rate of chemical fertilizer, mechanization and proven technology that will enhance land productivity cannot be realized with inefficient land policy, rural credit and banking system.

3.1.3. Situation of Paddy Production, Utilization and Surplus

The official data presents that paddy (*unmiilled rice)* utilization (which includes for foods, seeds and waste) has decreased from around 83.7% of the total production in 1999-2000 to 63.9% in 2006-07. The paddy production has increased from 20.26 million metric ton in 1999-2000 to 30.77 million metric ton in 2006-07. Thus the production and surplus of paddy has significantly increased since 2003-04.

After the state abolished the rice procurement system (buying rice by advance payment and cash down systems from the farmers) in 2003-04, the rice production and surplus has significantly increased in the last four years. The percentage of milled rice consumption in terms of total rice production has significantly declined from 75.7 percent in 1999-2000 to 57.2 percent in 2006-07. The proportion of seed and waste is average 7.4 percent of the total production as the MAS used a fixed rate of seed and waste per unit of land. The highest percentage of export (7.27 percent of the total rice production) was found in 2001-02 and it was sharply declined to 0.08 percent of the total production in 2006-07

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[12] According to CSO, loan for paddy was increased from 563 Ks/acre in 1999/2000 to 1604 Ks/acre in 2005/2006.

Figure 3.5   Paddy production, utilization and surplus in Myanmar
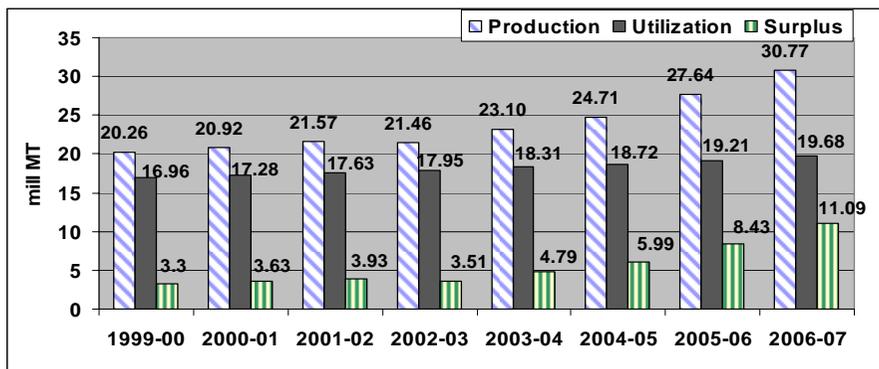
Source: Ministry of Commerce 2003 and 2008

providing the surplus gap of more than 30 percent (Figure 3.6). This surplus gap could be explained in terms of informal export, stock in private hands and inefficient database on rice sown area, yield and production. The other factor is a high competitive of quality and price on international market which caused declining export demand on Myanmar rice.

Much of Myanmar possesses fertile productive land where food production is unlikely to be limiting. But the impacts of high cost of crop production, low income/wage, declining purchasing power and limited social welfare management depress on non-food producer's access to and utilization of food in the country.

Figure 3.6   Trends of rice consumption, seed & waste, surplus and export (% of total production)
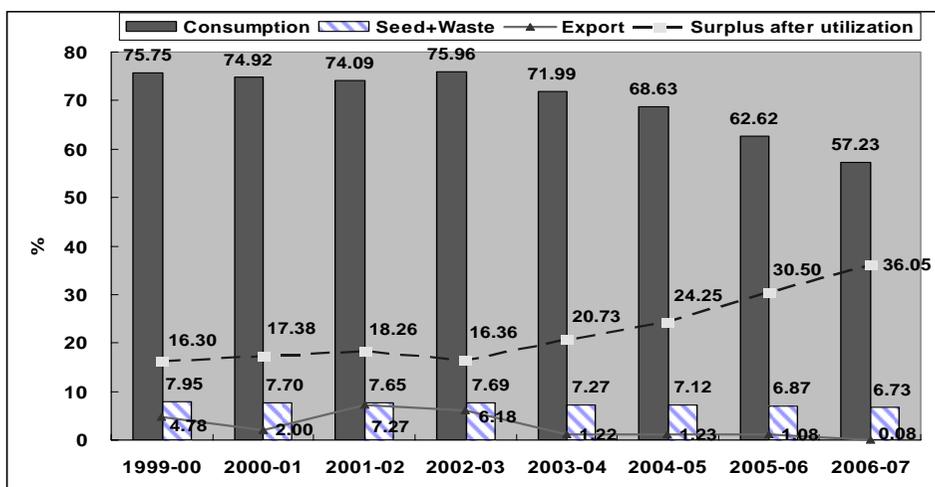
Source: Author's estimation based on data from Ministry of Commerce (2003 and 2008)

3.2 Analysis on Rice Consumption and Self-sufficiency

By using the official data on rice production, estimated population, consumption, seeds for planting and waste, the trends of rice self-sufficiency ratios in Myanmar can be estimated and compared with the estimated ratios of Myanma Agriculture Service (MAS) and the United States Department of Agriculture (USDA). Because of limited data on households' income and expenditures[13], this study compares the rural and urban households' food expenditure ratio to the total expenditure, rice, meats/fish, and oils expenditure ratios to the total food expenditure, the consumption pattern in 2001 or quantity of consumption on rice, meats/fish, oils, etc., and received daily per caput calorie, protein and fat from rice (staple food) consumption. Although the annual changes in consumption pattern cannot be compared due to unavailable data, the shares of dietary consumption in some Asian countries will be compared to identify the differences in food consumption pattern.

3.2.1. Changes in Rice Consumption & Diet Share in Daily Consumption

The per caput milled rice consumptions in some Asian countries present that Myanmar has the highest rice consumption level of 196 kg/year in 2003 (Figure 3.7). The per caput rice consumption in Japan, India, China, Indonesia, Thailand and Myanmar have declined gradually since 1997 while Bangladesh and Cambodia have opposite pattern. The per capita rice consumption in Vietnam was stable at around 170 kg/year.

The FAO STAT (updated in November 2008) presents that Myanmar people has consumed less rice over time as the per caput rice consumption was 212, 215, 208, 206, 205, 202, and 196 kg in 1997, 1998, 1999, 2000, 2001, 2002 and 2003, respectively. This indicator points out the deterioration of food security and malnutrition of the country because per capita rice consumption should be raised especially in low income countries with increasing population like Myanmar, Bangladesh, Philippines and Viet Nam. Sombilla and Hossain (2000) criticized that it will take many years before these countries will start substituting rice for other commodities even at the highest rate of economic growth.

According to FAO, the per capita rice consumption data show a declining trend in rice consumption and thus decreased in calorie intake from rice. The calorie intake from rice in Myanmar was 2063 kcal/person/day in 1997 and it reduced to 1915 kcal/person/day in 2003. There was no improvement in terms of the intake of protein and fat from rice between 1997 and 2003 (Figure 3.8). Traditionally, Myanmar diet consists of mainly rice and a few dishes derived from vegetables, pulses, meats and fish products. The dietary pattern can change over time and consumption of rice will be reduced gradually with a high economic growth and rapid urbanization. Myanmar has still experienced low per capita income and

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[13] The Central Statistical Organization (CSO) conducted the national wide Household Income & Expenditure Survey in 1997 & 2001.

Figure 3.7   Per caput rice consumption in some Asian countries
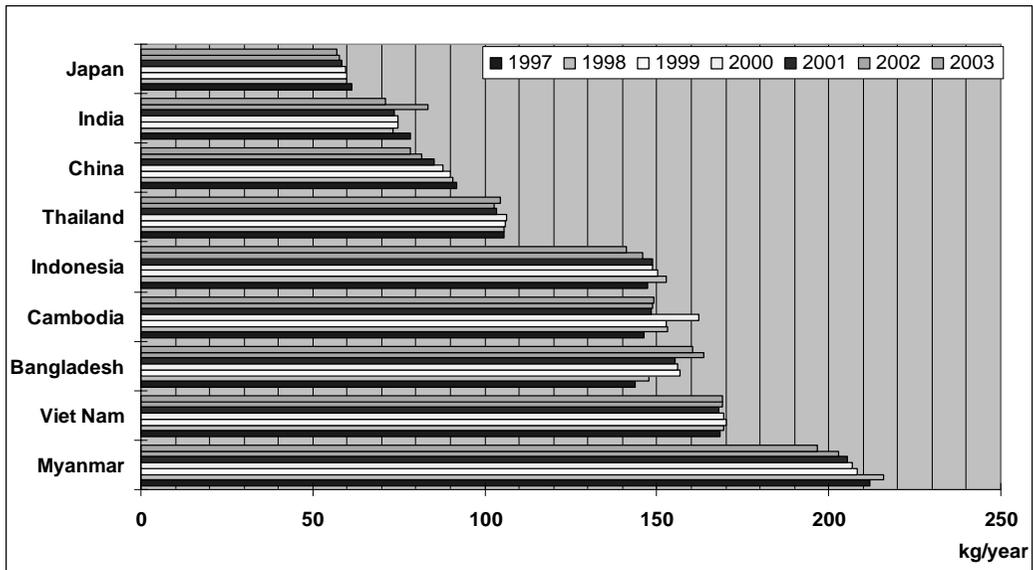
Figure 3.8   Per caput energy, protein & fat received from rice consumption
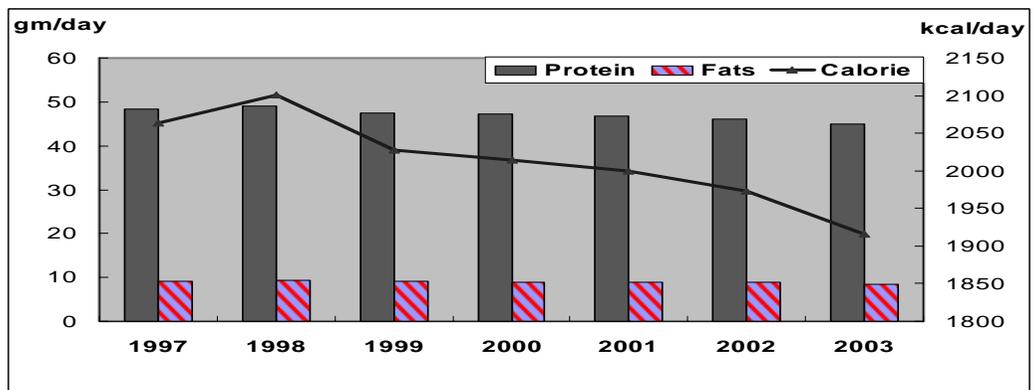
Source: FAO STAT

there is no substitute food for rice (Myanmar people prefer only rice). As a result, there is a growing concern on food security and nutritional issues along with declining rice intake.

In comparison with other Asian countries, rice is the highest diet share in total consumption in Bangladesh (82%), Cambodia (75%), Lao PDR (73%), Myanmar (70%) and Viet Nam (70%). Among the Asian countries, Myanmar has the highest diet share in pulses consumption (6%) while China (14.8%) and Viet Nam (9.3%) have the highest share in meat consumption in their total food consumption.

Figure 3.9   Share (%) of dietary consumption in total consumption (2001-03)
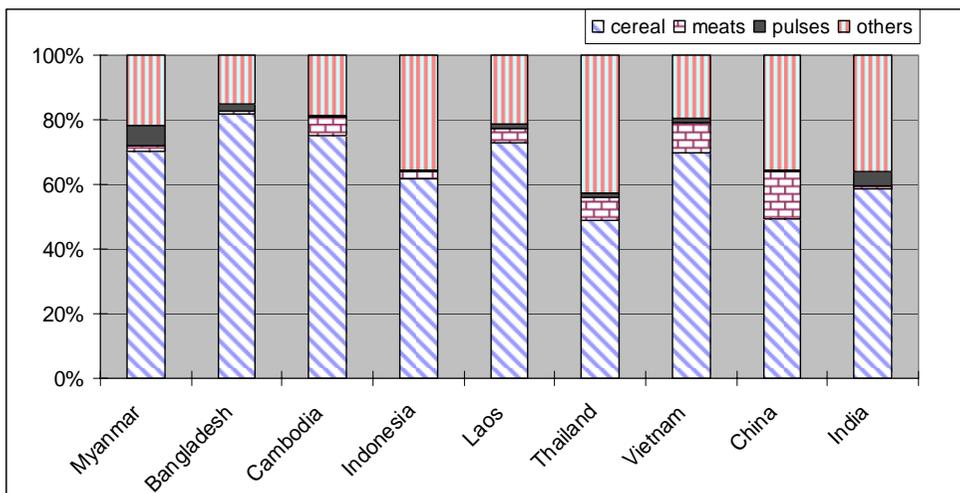
Source: FAO STAT

Based on CSO consumption data, the FAO and EC (2007) estimated that the per capita daily calorie and protein intakes for rural and urban were 2221 kcal and 62 gm, and 2041 kcal and 54 gm, respectively in 1997. Because of people in both rural and urban areas have reduced rice consumption between 1997 and 2001, the per capita daily calorie and protein intakes were declined to 1921 kcal and 56 gm in rural and 1712 kcal and 51 gm in urban in 2001. After analyzing changes in calorie and protein intakes in each State/Division by rural and urban areas, the joint study (FAO & EC, 2007) concluded that there was a decline in food intake both in terms of quantity and quality during the period of 1997 to 2001, and food security in Myanmar is not always simply affecting rural remote areas but also affects very urban and central areas significantly.

Figure 3.10   Diet share (%) in daily consumption in Myanmar
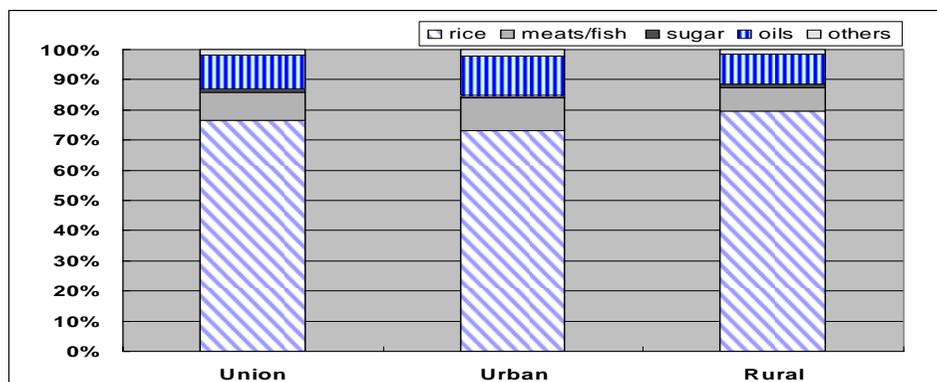
Source: CSO 2001

The monthly per capita consumption of rice in urban and rural households in 2001 was 10.6 and 13.2 kg, respectively (CSO, 2001). For the whole year, the per capita consumption of rice accounted for 128 kg in urban and 158 kg in rural households. Myanmar people also consume various rice processing products such as rice vermicelli, rice noodle, rice cake, etc. If the real price index of rice will rise, the low-income consumers would shift to consume low quality of rice and unbalanced food diet.

The monthly per capita consumption of meats in urban (1127 gm) was higher than rural consumption (751 gm) but rural consumed more fish and fish products (1323 gm) than urban people (1240 gm) in 2001. The per capita consumption of edible oil was 9.9 kg per year in urban households while it was 8.5 kg per year in rural households. Therefore the rural households received more energy intake from rice while the urban households have more diet shares from meats and edible oil than rural households. As CSO collects food and non-food expenditures in every year but not on food consumption quantity, the rural and urban households' annual rice consumption quantity changes can not be analyzed.

3.2.2. Share of Food Expenditure in Household Total Expenditure

The share of food expenditure to the household's total expenditure of 1997 and 2001 are compared separately for rural and urban households. The percentage of share has reduced more in urban area of Myanmar (in terms of rice, spices, milk and others) than rural area. It is obvious that urban households use their budgets more on non-food expenditure and the share of food expenditure declined at an average rate of 0.56 percent annually (Table 3.4). For overall, the share of food expenditure has decreased at an average rate of 0.34 percent per year during 1997-98 to 2001-02 (Table 3.2).

Nevertheless, the consumption pattern has changed from rice and oil to more meats/fish/eggs, pulses and vegetables in urban and to more meats/fish/eggs, milk, pulses and vegetables in rural. For the whole country, there were increased shares in meats/fish/eggs, pulses, milk and vegetables expenditures by average 9.3, 5.7, 4.2 and 0.6 percent per year, respectively. In the rural Myanmar, shares of meats/fish/eggs, milk, pulses and vegetable expenditures increased by average rate of 11, 12.8, 3.5 and 0.13 percent per year, respectively. In urban households, the shares of meats/fish/eggs, pulses and vegetables have increased at an average rate of 8.2, 9.7 and 1.2 percent per year. The increase in expenditure of meats/fish/eggs in rural areas is even greater than in urban areas. The urban households have increased more in consumption on pulses and vegetables than rural.

The share of food expenditure to the total expenditure has reduced a little in both rural and urban areas. Both rural and urban households are still spending higher share of food expenditure (nearly 73% and 70% of the total expenditure) in their budget in 2001-02. Based on the integrated household survey, the UNDP (2006) pointed out that average household in Myanmar spends more than two-third of their income on food that is the highest in the region. Kudo (2007) criticized that there was no significant improvement in

household income as Engel's coefficient recorded 71 percent in 1997 and 72 percent in 2001. Because of both food and non-food prices were significantly increased in the last two years, the food consumption survey should be conducted to collect food expenditures, quantities and quality aspects for examining whether the overall households improve their income and consumption or not. The household income and the ratio of food cost to the household income should be examined by different income groups to assess the food security status and to recommend the food policy of the country.

Table 3.2   Changes in Food Expenditures of Overall Households

Items	1997-98	2001-02	Average annual changes (%)
Share of food & beverage in total expenditure %	70.95	71.91	- 0.34
Share of rice expenditure to food expenditure %	27.56	21.99	- 5.05
Share of cooking oil to food exp. %	12.77	11.54	- 2.41
Share of meats/fish/eggs to food exp. %	23.07	31.72	9.37
Share of pulses to food exp. %	2.34	2.88	5.77
Share of vegetables to food exp. %	9.77	10.01	0.61
Share of spices to food exp. %	5.76	5.31	- 1.95
Share of beverages to food exp. %	2.22	2.18	- 0.45
Share of sugar expenditure to food exp. %	2.83	2.01	- 7.24
Share of milk to food exp. %	0.59	0.69	4.24
Share of others expenditure to food exp. %	13.08	11.67	- 2.69

Source: Author's estimation based on CSO data

Table 3.3   Changes in Food Expenditures of Rural Households

Items	1997-98	2001-02	Average annual changes (%)
Share of food in total expenditure %	72.41	72.96	- 0.19
Share of rice expenditure to food expenditure %	30.27	23.92	- 5.24
Share of cooking oil to food exp. %	13.08	11.81	- 2.43
Share of meats/fish/eggs to food exp. %	20.76	30.02	11.15
Share of pulses to food exp. %	2.41	2.75	3.53
Share of vegetables to food exp. %	9.90	9.95	0.13
Share of spices to food exp. %	5.93	5.71	- 0.93
Share of beverages to food exp. %	2.26	2.14	- 1.33
Share of sugar expenditure to food exp. %	3.82	2.27	- 10.14
Share of milk to food exp. %	0.39	0.59	12.82
Share of others expenditure to food exp. %	11.18	10.85	- 0.74

Source: Author's estimation based on CSO data

Table 3.4   Changes in Food Expenditures of Urban Households

Items	1997-98	2001-02	Average annual changes (%)
Share of food in total expenditure %	68.25	69.78	- 0.56
Share of rice expenditure to food expenditure %	22.79	17.84	- 5.43
Share of cooking oil to food exp. %	12.00	10.97	- 2.15
Share of meats/fish/eggs to food exp. %	26.60	35.38	8.25
Share of pulses to food exp. %	2.29	3.18	9.72
Share of vegetables to food exp. %	9.67	10.15	1.24
Share of spices to food exp. %	5.26	4.45	- 3.85
Share of beverages to food exp. %	2.31	2.26	- 0.54
Share of sugar expenditure to food exp. %	1.96	1.43	- 6.76
Share of milk to food exp. %	1.02	0.90	- 2.94
Share of others expenditure to food exp. %	16.10	13.44	- 4.13

Source: Author's estimation based on CSO data

The CSO collected the food consumption quantity of rural and urban households in 2001-02. The comparison of the composition of food consumption between rural and urban households presented that rural households consume more on rice only than the urban households. Both rural and urban households rely on rice to get the daily requirement of calories. The meats and fish account for 13.5% and 11%, and vegetables for 8.4% and 5.8%, respectively in urban and rural households' food composition.

Figure 3.11   Composition of urban and rural food consumption
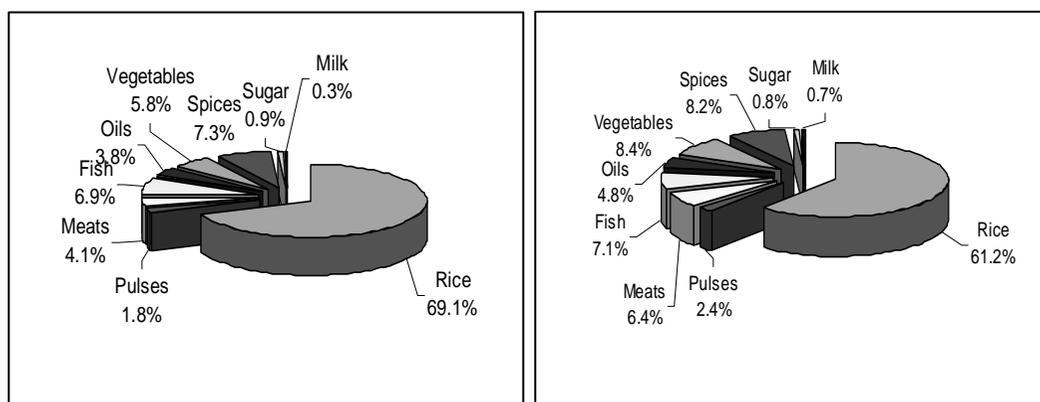
Source: CSO 2001

3.2.3. Estimation of Rice Self-sufficiency Ratio in Myanmar

The food security issues are generally analyzed at the country level. The emphasis is on national food supplies, measured through food balance sheets, to determine a country's food security status. Hence the study analyzed the nutritional quo of food requirements and food surplus condition of the country by using the official data. Because of estimates and data on domestic rice production, number of population and consumption are different among different organizations, the official data is used in this study to present food security situation of the country over time and to compare with the official and USDA estimates of rice self-sufficiency in Myanmar.

It is needed to understand the nature and status of food security or rice sufficiency at both country and disaggregate levels. In this study, the issues surrounding food security at the national level are investigated, before analyzing on household food security. The question of food security in intra-household relationships will not be pursued here.

- Nutritional quo of food requirement, surplus and self-sufficiency

According to FAO (2001), the self-sufficiency ratio (SSR) expresses magnitudes of production in relation to domestic utilization. The SSR is defined as;

$$SSR = Production/(Production + Imports - Exports)*100$$

Based on the official data on rice production, population, and the MAS's assumption of seed use for planting and waste at harvesting time (2 baskets and 3 baskets of paddy per acre, respectively) or average 7.4% of the total production are applied in estimation of rice self-sufficiency ratio. The FAO's country fact sheet presented that 91 percent of the calorie was received from rice consumption in Myanmar for 3 years average (2001-2003)[14]. According to HIES in 2001, the average monthly per capita milled rice consumption of the country was 5.62 *pyi* or 11.94 kg (or 143.3 kg per year). Applying the WHO recommended daily energy requirement (2250 kcal/person/day) with 91% of the daily energy intake coming from rice and using a conversion factor 3.6 kcal/gm, the *rice consumption requirement* can be calculated as:

$$(91\%*2250 \text{ kcal})/3.6 = 568.7 \text{ gm/day or } 208 \text{ kg/year}$$

This nutritional quo requirement of rice 208 kg/year is closed to the food poverty line (200 kg/year) of Kurosaki et.al. (2004). By using *actual rice consumption 143.3 kg/year* in

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[14] FAO statistical year book: country profiles presents that per caput daily calorie intake from rice in Myanmar was 1963 in average total 2149 kcal/day in 2001-03.

the based year 2001 and rice *208 kg/year* for reaching recommended calorie level, the rice requirements for consumption, rice surplus, per capita availability of rice and self-sufficiency ratio of rice are estimated in the following table.

The rice surplus ranged from 2.2 to 4.26 million tons has been realized with per capita rice consumption of 143.3 kg/person/year. But negative rice surplus was resulted at nutritional quo rice requirement of 208 kg/person/year during 2000-01 to 2004-05. Then the positive surplus amount of rice 0.68 and 0.17 million MT were received in 2005-06 and 2006-07, respectively due to increased in rice sown area[15]. The increased per capita rice availability in the last 3 years points out that the country has potential to reduce malnutrition.

Following the FAO concept in estimation of self-sufficiency ratio, the ratio has decreased from *110.7* in 2001-02 to *100.1* in 2006-07. Despite the amount of rice export has reduced since 2003-04, Myanmar continuously received just sufficient in rice from 2003 to2006. If informal export of rice or border export to neighboring countries is taken into account, the self-sufficiency ratio would be more than *100.1* in 2006/07. It is noted that the

Table 3.5   Estimates of rice consumption, surplus and self-sufficiency ratio in Myanmar (2000-01 to 2006-07)

Item	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Total rice production (million MT)	10.22	10.5	10.45	11.09	11.86	13.18	12.87
Seed+waste (million MT) (7.4% of TP)	0.76	0.78	0.77	0.82	0.88	0.98	0.95
Net Production	9.46	9.72	9.68	10.27	10.98	12.2	11.92
Population (million)	50.13	51.14	52.18	53.23	54.30	55.39	56.50
Requirement for consumption[1]	7.18	7.33	7.48	7.63	7.78	7.94	8.10
Surplus[1] (Net Prod. – Consumption[1])	2.28	2.39	2.2	2.64	3.2	4.26	3.82
Requirement for consumption[2]	10.43	10.64	10.85	11.07	11.29	11.52	11.75
Surplus[2] (Net Prod. – Consumption[2])	-0.97	-0.92	-1.17	-0.8	-0.31	0.68	0.17
Rice export (million MT)	0.251	0.939	0.793	0.168	0.182	0.18	0.0145
Net rice availability (Net production – Export)	9.209	8.781	8.887	10.102	10.798	12.02	11.91
Per caput rice availability (kg/year)	*184*	*172*	*170*	*190*	*199*	*217*	*211*
Rice self-sufficiency ratio (%)	*102.7*	*110.7*	*108.9*	*101.7*	*101.7*	*101.5*	*100.1*

Source: Author's estimation based on CSO and MAS

[1]actual per caput rice consumption is 143.3 kg/year in the based year 2001-2002

[2]per caput rice consumption 208 kg/year is needed to get the recommended level of calorie 2250 kcal/person/day

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[15] Rice sown area has increased significantly from 15.94 million acre in 2001-02 to 18.26 and 20.08 million acre in 2005-06 and 2006-07, respectively (MAS 2008).

State Peace and Development Council announced on 23 April 2003 that the direct purchase of paddy from farmers by the state is ended and the new rice marketing policy allowing free marketing of rice will be adopted. The amount of formal rice export was declined significantly since 2003-04.

The *official calculation* (Myanma Agriculture Service) assumes that per capita rice consumption in rural and urban is 15 and 12 baskets of paddy per year (or rice 150 and 120 kg/person/year in rural and urban or average 135 kg/year with MAS's conversion factor of 100 basket of paddy equals to 1 ton of rice), fixed rate of seed use for planting is 2 baskets and waste at harvesting time is 3 baskets of paddy per acre. The rice self-sufficiency ratio (SSR) is calculated as;

$$SSR = Production/Total\ Utilization$$

The MAS's estimates of rice self-sufficiency situation in different States and Divisions are presented in the following table (Table 3.6). In 2000-2001, Chin, Mandalay, Magway, Tanintharyi and Shan States were in rice self-insufficiency. Yangon, Kayah and Kayin were nearly rice self-sufficient and the rest of the states and divisions were reached at rice self-sufficiency. Because of the government policy to attain rice self-sufficiency in all states and divisions, the rice sown area and production have increased and it can cover the requirements for consumption, seed for planting and waste. Only Chin, Mandalay and Magway have experienced rice insufficiency in 2005 and 2006. For overall, the rice self-sufficiency ratio was gradually increased from 123% in 2000-01 to 165% in 2006-07.

In calculating rice self-sufficiency, MAS assumed that per capita paddy consumption in urban and rural are 12 and 15 baskets per year, respectively. It is noted that their average figure (135 kg/year) is lower than the actual rice consumption level (union consumption of 143.3 kg in HIES 2001). The MAS estimated rice self-sufficiency ratio is significantly increased through time while this study's estimate of rice self-sufficiency ratio is slightly declined in 2006-07 by using the *same data*. It is obvious that official estimates for the country rice self-sufficiency ratio is straightforward, and not taking into account the export figure.

The inefficient data collection on yield in different ecosystems and changes in rice sown areas due to urbanization in every States and Divisions should be corrected to get a real picture of food security situation in Myanmar. Actually, the paddy sown area and production figures are widely quoted, following the annual target plans on sown acre and yield. In most of the developing countries, harvest and postharvest losses of cereal commonly surpass 10 percent. However, MAS's estimates on waste losses are lower than the actual level and it was assumed constant, not considering the changes over time.

Table 3.6 MAS Estimated Rice Self-sufficiency in States & Divisions

(percent)

States/Divisions	2000-01	2001-02	2002-03	2003-04	2005-06	2006-07
Chin	50	51	52	51	58	61
Mandalay	49	48	50	51	68	84
Magway	39	52	56	57	78	96
Tanintharyi	63	66	72	82	113	123
Shan	73	77	82	90	131	145
Yangon	96	93	88	95	103	104
Kayah	90	89	91	92	133	135
Kayin	96	98	100	112	130	136
Kachin	108	109	109	114	125	150
Mon	115	117	116	126	143	167
Rakhine	126	127	119	130	152	166
Sagaing	101	110	125	131	155	183
Bago	197	199	186	190	227	240
Ayeyarwady	276	270	251	282	293	295
Union	*123*	*124*	*122*	*132*	*152*	*165*

Source: MAS

The comparison of the trends of rice self-sufficiency ratios by USDA, MAS and own estimation point out that Myanmar has experienced rice self-sufficiency over time. The country's domestic production can provide nutritional quo requirement of rice 208 kg/person/year because the positive surplus[2] is received in 2005-06 and 2006-07. Although the different data sets were used by USDA, their estimated rice self-sufficiency ratio is more or less similar with this study's estimation. Myanmar's food security issue is therefore mainly concerned with access to nutritional requirement of food rather than food availability. Moreover, consumption shortfalls, compared to nutritional norm should be the focus of the national food policy along with self-sufficiency.

Figure 3.12 Rice self-sufficiency ratio in Myanmar
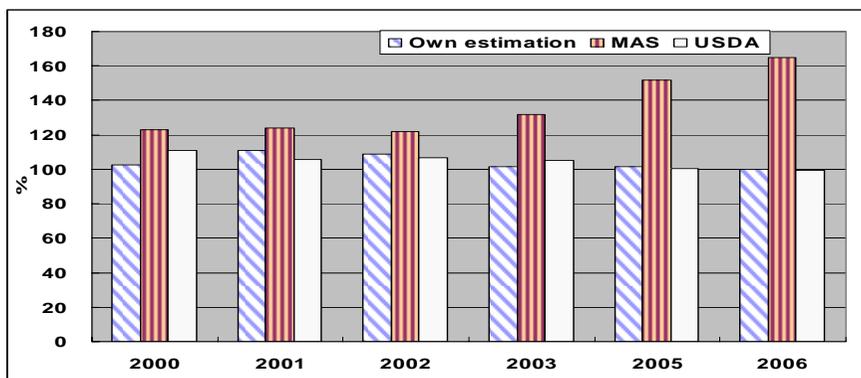
Source: Author's estimation, MAS and USDA

3.3   Effects of the Cyclone on the Country's Rice Production and Consumption

The Cyclone Nargis struck Myanmar on 2 and 3 May 2008, affecting more than 50 townships, mainly in Yangon and Ayeyarwady Divisions. The eleven most affected townships are Bogale, Dedaye, Kyaikiat, Labutta, Mawlamyinegyun, Ngapudaw and Pyapone of Ayeyarwady Division and Khawhmu, Kungyangong, Kyauktan and Twantay Townships of Yangon Division. As of June 24, the official death toll stood at 84,537 with 53,836 people still missing and 19,359 injured. The majority of the rural population affected by Nargis has suffered gravely and many of them become vulnerable. The devastation caused by the cyclone has impacted heavily on not only the availability of food stocks but also seeds, draught cattle and tools which are required especially for monsoon rice production. The Joint Assessment Team (2008) estimates that the total value of damages and losses for the agriculture sector ranged from Kyats 570,000 to 700,000 million. Damage was officially reported to about 16,200 hectares (40014 acres) of the summer paddy crop, equivalent to 80,000 MT of paddy production (rice about 38000 MT), and to milled rice in farmers' storage, estimated at 251,000 MT. The MAS's estimation on total rice production of the country in 2007-08 is about 15 million MT (MAS April 2008) before cyclone, and rice damaged by the cyclone is about 2 percent of the total production. The Joint Assessment Team estimated that the total economic losses are about 2.7 percent of the officially projected national GDP in 2008. Due to destruction of communication networks, and severely damage in food supplies, the prices of food commodities have significantly increased by average rate of 50 percent in the cyclone affected areas and the whole country. The market prices of salt and edible oil increased up to 300 and 17 percent, respectively in the country immediately after the cyclone. Then the prices dropped to the normal level gradually.

According to the Joint Assessment Team, the consumption pattern was changed in the cyclone affected area because consumption of fish and eggs were dropped by 25 percent and of vegetables and fruits by 9 percent after the cyclone. These food items are the major source of protein, minerals and vitamins in the people daily consumption. Therefore the impact of cyclone on food security and malnourishment of the households in cyclone affected areas and the country should not be neglected as those areas are the 'rice bowl[16]' of Myanmar.

- Changes in rice sown area, production and self-sufficiency ratio

Within the worst-affected townships of Latputta, Mawlamyaingkyaun and Bogalay, a

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[16] Ayeyarwady & Yangon Division produce approximately 7.5 million MT of monsoon paddy (29 percent of the national total) and 2.7 million MT of summer paddy annually (48 percent of the national total).

Table 3.7   Estimated reductions of monsoon paddy cultivated area and production

District & Township	Total paddy sown area (acre)	Cultivated area of rain-fed rice by farmer's management	Estimated uncultivated area (acre)	Yield in 2007-08 (basket /acre)	Estimated reduction in monsoon paddy 2008 (basket)
Myaungmya district	564,319	181,177	383,142	73.76	28,259,285
Latputta township	366,212	38,198	328,014	73.42	24,082,788
Mawlamyaingkyaun	198,107	142,979	55,128	75.56	4,176,497
Pyarpon district	307,829	147,929	159,900	74.12	11,851,788
Bogalay township	307,829	147,929	159,900	74.12	11,851,788
Total	872,148 (353096 ha)	329,106 (133241 ha)	543,042 (219855 ha)	73.84 (3.83 t/ha)	40,111,073 (842,333 MT)

Source: MOAI May 2008

reduction in paddy area was estimated as 219,855 hectares by the government. Therefore the estimated reduction in paddy production in 3 townships is about 0.84 million MT. The government, national and international assistance is required in provision of seeds, inputs, fuel, draught cattle, tractor, etc. for timely cultivation of monsoon paddy on *219,855 hectares* in 2008 (Table 3.7).

Based on the last year performance and assuming the normal weather condition, it is expected that the harvested monsoon and summer cultivated areas would be 99.6 and 99.1 percent of the sown area, respectively. Assuming a constant yield, the estimated monsoon rice production in 2008-09 using official data on actual rice sown area is 11.9 million MT and summer rice production is 2.7 million MT in the projection 1. The estimated total rice production is therefore 14.6 million MT in 2008-09. The rice production in 2008-09 would be reduced by about 3.3 percent, comparing the provisional estimate of rice production of 15 million MT in 2007-08. The projection 2 assumed that paddy yield in the cyclone affected area will be reduced by 5 baskets and 3 baskets in monsoon and summer season reflecting increased salinity in some areas. With this assumption, the rice production is expected to reduce by 5.3 percent of the last year production or 14.39 million MT.

Table 3.8   Projection of Paddy Sown Area & Production in 2008-09

	Monsoon sown area (acre)	Monsoon yield (bkt/acre)	Production (basket)	Summer Sown area (acre)	Summer yield (bkt/acre)	Production (basket)	Total Production (basket)
Based data							
Yangon	1205753	66.9	80303572	193221	81.14	15677767	95981339
Ayeyarwady	3700025	76.24	280120801	1256030	94.89	119184687	399305488
The rest	11947808	70.56	875887884	1685006	83.66	139613243	1015501127
Total	16853586	73.66	1236312257	3134257	88.30	274475697	1510787954
Projection1*							
Yangon	1200341	66.9	79981599	189051	81.14	15201541	95183140
Ayeyarwady	3647168	76.24	276947845	1200890	94.89	112926880	389874725
The rest	11993022	70.56	842842720	1685006	83.66	139698893	982541613
Total	16840531	73.66	1199772164	3074947	88.30	267827314	1467599478
Projection2*							
Yangon	1200341	61.9	74003902	189051	78.14	14639493	88643395
Ayeyarwady	3647168	71.24	258784949	1200890	91.89	109356634	368141583
The rest	11993022	70.56	842842720	1685006	83.66	139698893	982541613
Total	16840531	67.90	1175631571	3074947	84.56	263695020	1439326591

Source: Author's estimation based on the official report on 7 November 2008

1* Actual cultivated monsoon rice area in 7 November 2008, assuming constant yield of last year, harvested areas are 99.6% for monsoon and 99.1% for summer, summer rice sown area would be declined by 2% & 4% in Yangon & Ayeyarwady. 2* The same paddy sown area in Projection 1 but assume that paddy yield will be reduced by 5 baskets in Yangon & Ayeyarwady for monsoon and by 3 baskets in Yangon & Ayeyarwady for summer season.

The FAO's estimation on reduction in rice production is approximately 10 percent of the provisional paddy production 1.5 million MT in 2007-08 and thus the adjusted rice production (monsoon plus summer) is 13.5 million MT (15 – 1.5 million MT). The USDA estimates that approximately 1.0 million MT of rice (milled rice equivalent) from the 2007/08 harvest was lost or destroyed by the storm surge and subsequent flooding. For 2008-09, the USDA currently expects that approximately 700,000 hectares will go unsown in the main monsoon season in 2008, thereby reducing overall rice production by 12 percent from last year.

After the cyclone, the estimated per caput rice available for consumption in 2007-08 is 231 kg per person per year based on the official data while it is 210 kg per person per year using FAO estimation on amount of damaged rice by the cyclone. The country's rice self-sufficiency ratio is estimated 103 percent in both official and FAO estimates for 2007-08 after adjustment of the cyclone effects on rice production. The rice self-sufficiency ratio was

Table 3.9 Estimates on rice self-sufficiency ratio in 2007-08 and 2008-09

Item	2007-08[1]	2007-08[2]	2008-09[C]	2008-09[R]	2008-09[U]
Total rice production (million MT)	14.71	13.50	14.6	14.3	13.2
Seed & waste (5 baskets/acre)	1.0	1.0	1.0	1.0	1.0
Net Production (million MT)	13.71	12.5	13.6	13.3	12.2
Population (million)	57.65	57.65	58.81	58.81	58.81
Requirement for consumption*	8.26	8.26	8.43	8.43	8.43
Surplus* (Net Prod–Consumption*)	5.45	4.24	5.17	4.87	3.77
Requirement for consumption**	11.99	11.99	12.23	12.23	12.23
Surplus**(Net Prod–Consumption**)	1.72	0.51	1.37	1.07	- 0.03
Rice export (million MT)	0.4	0.4	0	0	0
Net rice availability (million MT) (Net production – Export + Import)	13.31	12.1	13.6	13.3	12.23
Per caput rice availability (kg/year)	*231*	*210*	*231*	*226*	*208*
Rice self-sufficiency ratio (%)	*103*	*103.3*	*100*	*100*	*99*

[1]Provisional rice production (before cyclone) in 2007-08 is 15 million MT – government's estimation on damaged rice by cyclone 0.29 million MT = 14.71 million MT
[2]Provisional rice production (before cyclone) in 2007-08 is 15 million MT – FAO's estimation on damaged paddy 1.5 million MT = 13.5 million MT
[C] Projection 1, actual sown area & constant yield, [R] Projection 2, reduced yield, [U] USDA assumed that rice production in 2008-09 will be reduced by 12 percent of the last year production.
*actual per caput rice consumption is 143.3 kg/year in based year 2001-2002 & ** per caput rice consumption 208 kg/year is needed to get the recommended level of calorie 2250 kcal/person/day

increased from 100 in 2006-07 to 103 percent in 2007-08 because of increased production and export (0.0145 million MT in 2006-07 to 0.4 million MT in 2007-08).

Both projection 1 and 2 for paddy production in 2008-09 points out that Myanmar would be able to recover its economy and availability of food eventually with the strong point of the Myanmareconomy as agricultural based one. The Projection 2 assumes that paddy yield will be reduced by 5 baskets and 3 baskets per acre in the cyclone affected areas for monsoon and summer season, respectively. It is also assumed that there are no changes in yield in other regions. The per capita rice availability is estimated 231 kg in the projection 1 and 226 kg in the Projection 2. If the USDA's estimation on reduction of rice production by 12 percent was used, per capita rice availability will be 208 kg/year and import of rice about 30,000 MT will be required.

3.4　Changes of Rice Prices in Myanmar

3.4.1.　Seasonal Movement of Rice Prices in Myanmar

The following figures present the seasonal movements of the prices of low quality rice (Nga Sein) and high quality rice (Paw San) from January 2001 to June 2008. It is noted that both low and high quality rice average monthly prices from 2001 to 2005 are significantly lower than the prices of 2006, 2007 and 2008. Generally, the monsoon rice (contributes around 82% of the total rice production) is grown in June and harvested in October - November. The summer rice is usually grown in December-January and harvested in May. Generally, the poor households are in food insecurity in the lean period of July to October-November. The prices of rice are rising during the lean period and then decline at the harvesting time of October-November. It seems that summer rice production has no significant influence on seasonal movement of rice prices because rice prices are started to increase in May (after harvesting time of summer rice).

In 2006, the prices of both low and high quality rice were started to increase significantly in April and there were no decreasing trend after the harvesting time in November. Both prices have moved upward continuously to the harvesting time in next year 2007. The low quality rice price started to increase in April 2008 but it was stayed at lower level than the last year price level. The reason is supply of partially damaged rice at a low price from Ayeyarwady and Yangon Divisions. On the other hand, the high quality rice prices in May and June 2008 were higher than the prices in the last year. As partially damaged rice in cyclone affected areas is continuously sold out at a low price[17], low quality rice price is expected to stable during rice growing season in June, July and August 2008.

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[17] Low-income consumers eat partially damaged rice (they called "dan pauk rice" or yellow color rice) at a low cost (average price is 610 Kyats/kg).

Figure 3.13   Seasonal movement of wholesale price of Pawsan rice
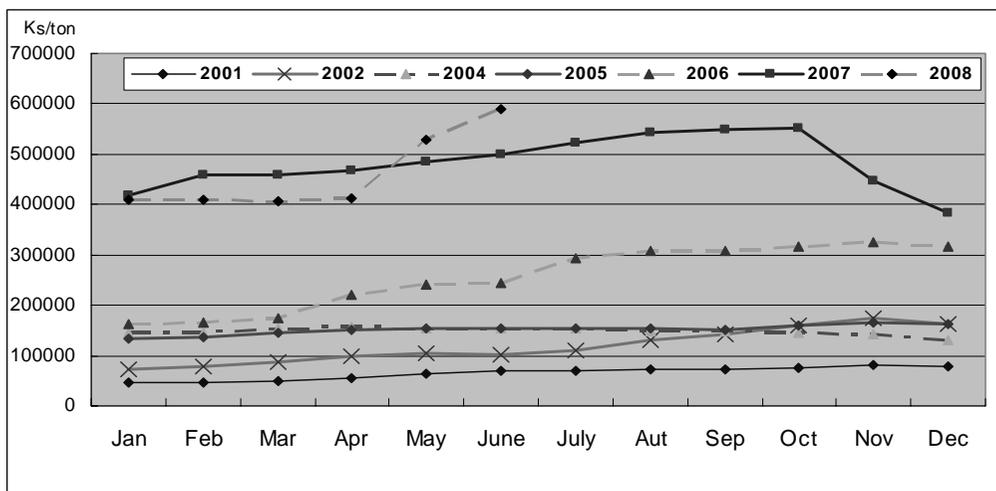
Figure 3.14   Seasonal movement of wholesale price of Ngasein rice
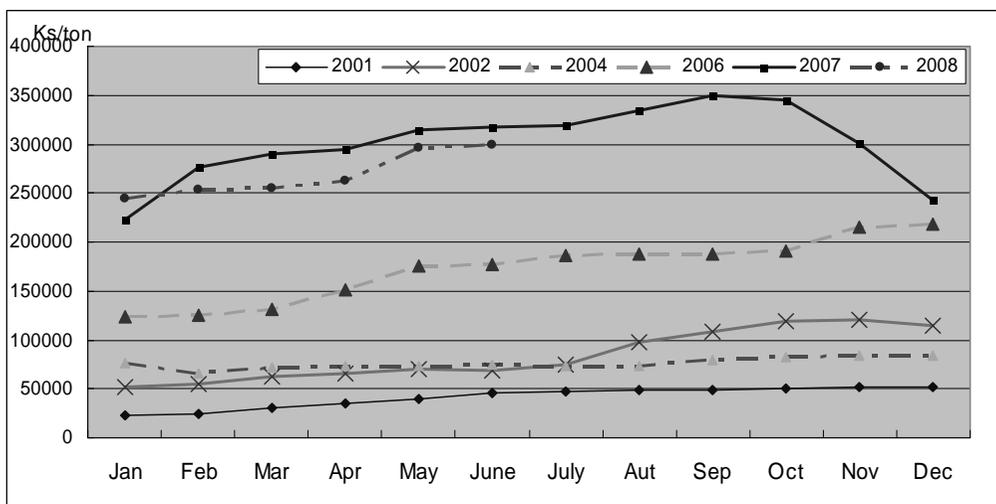
3.4.2.   Trends of World and Domestic Nominal Prices of Rice

During 2000 to 2006, world demand for cereals increased by 8 percent while cereal prices more than doubled (Joachim von Braun 2007). The prices of basic food commodities on the world have increased rapidly over the past three years. In only the first quarter of 2008, wheat and maize prices increased by 130 percent and 30 percent respectively over 2007 figures. Rice prices, while rising moderately in 2006 and more so in 2007, rose 10 percent in February 2008 and a further 10 percent in March 2008 (Rice Market Monitor 2008). Unsurprisingly, the threat to food security in developing countries increases in stride. The export price of rice (Thai white 100% B second grade) has increased at an average rate

of 16.6 percent per month from January 2008 to July 2008. It was reached at the peak level of 963 $/ton in May 2008 (FAO Rice Price Update September 2008).

Based on Myanma Information Service (MIS) data, the low quality of rice (Nga Sein) price is about 47% of the world rice export price (Thai 100% white rice) and the high quality of rice (Pawsan) price is about 74% of the world rice price, on average in nominal term. Because of increasing demand on quality rice and limited supply (Pawsan rice can be produced only in delta area), the price of Pawsan rice was higher than the world rice price (Thai white 100% B second grade) particularly in January 2007 to October 2007. Other factors for changes in the domestic rice price are primarily internal such as inflation, cost of production, transportation cost[18], etc. and there was less effects of world price on domestic rice price due to restricted export by private traders in Myanmar up to 2006. Having large surplus gap in rice production, the government allowed rice 573966 MT for the private sector's export in 2007-08 and around 421137 MT was already exported before cyclone on May 2008 (Report on 14 May 2008, Ministry of Commerce).

During the period of 2001-03 to 2006-07, paddy production in Myanmar has increased by average annual growth rate of 6.5% while real prices of Ngasein and Pawsan rice have increased at an average annual growth rate of 13% and 6%, respectively. Higher percentage increased in low quality rice price especially depressed the rice wage ratio and it

Figure 3.15   Movement of world and domestic nominal prices of rice
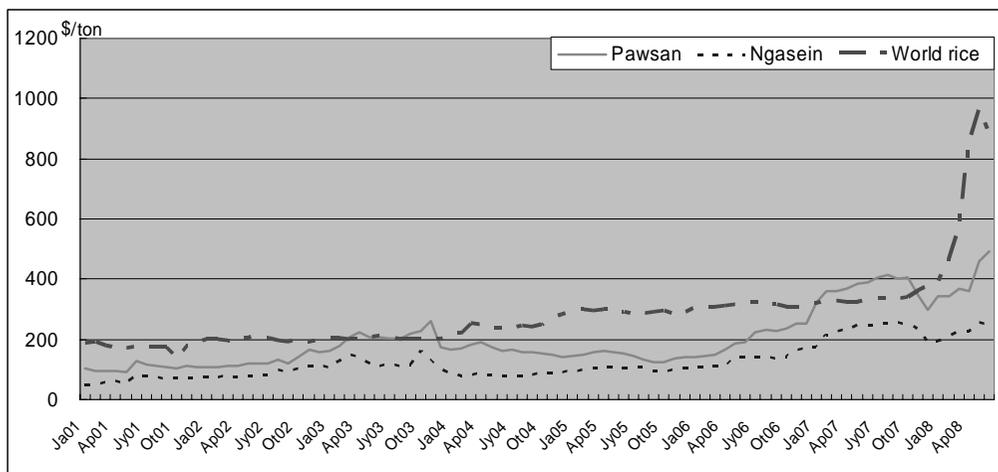
Source: Author's estimation with parallel monthly market exchange rate and MIS data, FAO Rice Price Update

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[18] The price of diesel oil was doubled in August 2007 from K 1,500 to K 3,000 per gallon, gasoline price increased from K 1,500 to K 2,500 per gallon, and the price of natural gas was increased by 500 percent (Joint Assessment, 2008)

Figure 3.16   Growth rate of rice production and real prices of rice
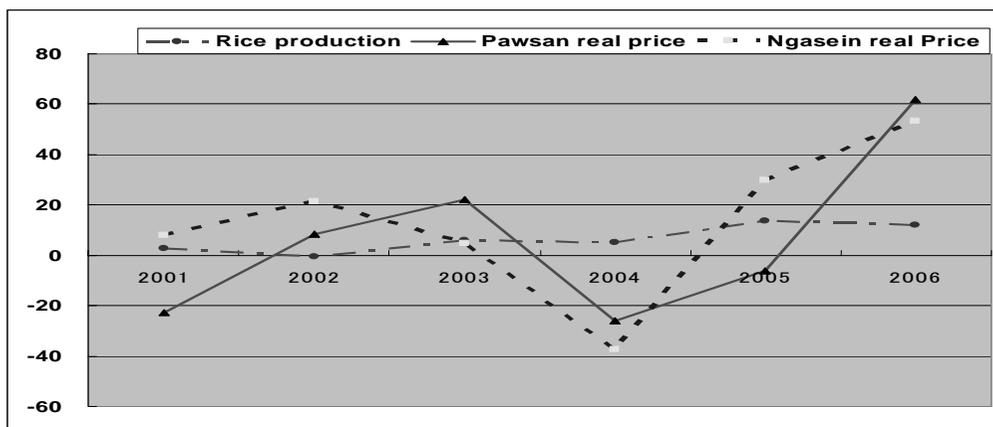
makes landless rural households more vulnerable in access to food. When the fuel price was increased by double in August 2007, the transportation charges went up twice and the food prices were increased further resulting a demonstration and riot in September 2007.

Because of the government has emphasized in achievement of rice self-sufficiency with restricted trade policy, changes in the price of world rice do not automatically translate into changes in domestic price of rice. However, there is a considerable extent the international prices are in fact transmitted to consumers and producers if some informal border trades of rice to neighboring countries were taken into account. In 2007-08, the private sector was allowed to export rice.

Figure 3.17 Trends of world and domestic rice price indexes

In order to clarify in the rice price movements, the price in January 2004 was used as a base for constructing the rice price indexes. In June 2008, both high and low quality of domestic rice price indexes have increased by about 2.9 and 2.8 times of the base year, respectively (data source: MIS). It is obvious that the monthly increased in low quality of rice price index was greater than the price index of high quality rice for the whole period except in June 2008. The increased of the salary by 5.5 times to 12.5 times in April 2006 push the rice prices up especially low quality of rice. On the other hand, the changes in index of world price (Thai white rice 100%) were around 1.7 times at the end of 2007. The world price has sharply increased during 2008 and reached the peak level of 4.4 times in May. The domestic price indexes declined sharply at the monsoon rice harvesting time (November 2007 to January 2008). Trends of price indexes of both low and high quality of domestic rice followed the pattern of world rice price in the first half of 2008, at the lower level than the world price.

3.4.3. Rice Wage Ratio

The previous studies on rice wage ratio in Asian countries consistently showed that Myanmar has relatively lower wage rate and thus high return from rice production when compared with other Asian countries. Rice (1997) presented that the irrigated farmers in Myanmar received relatively higher paddy income of $ 600 per hectare in 1995 reflecting favorable farm gate price of rice and input/output price structure especially in labor cost[19]. The comparison of farm wage paddy price ratio in some Asian countries showed that Myanmar has the highest ratio (26.4 in 1997) because rice farmers received lower price of paddy from the government procurement system (Hossain et.al 2002).

After abolishing the procurement system in 2003/04, the daily farm wage was increasing but at a lower rate than the increased in rice price. Under the market mechanism, rice price increased sharply because it was highly associated with inflation rate[20] and high cost of production (mainly due to imported fertilizers and diesel oil). Even with annually increasing rice production by the force of government food policy, the increased in price of rice was faster than the farm wage. In 2008, daily wage for laborers in agriculture is from 1000 Kyats to 2000 Kyats a day depends on workload, while annual wages are less in proportion accounting for seasonal unemployment period of 3 to 4 months per year. With a minimum daily farm wage of 1000 Kyats and minimum price of low quality rice 800 Kyats per pyi (376.5 Kyats per kg), the rice wage ratio is deteriorated significantly from 4-5 kg in the early 2000s (Fujita 2005) to 2.6 kg in 2008. Kurosaki (2005) argued that farmers and landless rural households in Myanmar face food insecurity in spite of increased production

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[19] The daily farm labor cost were US$ 3.75, 1.2 and 0.5 in the selected study areas of Thailand, Vietnam and Myanmar (Rice, 1997).

[20] Cointegration analysis among rice price series and consumer price index showed that both low and high quality of rice prices were significantly integrated with the CPI at 1% and 5% level (Theingi Myint 2007).

of rice.

In the previous, most of the farmers provided meals to both daily hired laborers (especially at the time of planting and harvesting) and permanent laborers who receive the fixed amount of salary per month for one cropping season. Nowadays, no meal is provided to the daily hired laborers. Some permanent laborers receive the fixed amount of paddy and cash. In order to cope with rising food prices, the daily farm laborers form a group and they work efficiently. As a result, more works are finished and more incomes can be earned at the time of peak season such as transplanting and harvesting of rice. Moreover, both farmers and laborers gain in terms of more finished work and income by using the fixed payments in cash per unit of a farm work such as land preparation, weeding, fertilizer application, etc. Covering the different farm wage rates and earned income, it is of interest to examine the rural households' food security status and their coping strategies to food insecurity and suggest appropriate mechanism for promoting the well-being of the vulnerable rural households in Myanmar.

Sustained growth in production and farm income cannot be expected without reform of the enabling policy environment under which farmers are operating their farming/marketing activities and landless are engaging in both farm and non-farm activities. The research findings from a case study in the dry zone will point out the major factors which depress the rural household consumption resulting uncertainty in access to food.

CHAPTER IV
STUDY ON THE RURAL HOUSEHOLDS' FOOD SECURITY:
A CASE STUDY IN MAGWAY DIVISION

4.1 Background

Initially, 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 & Maxwell, 2001). The interests are shifted away from emphasis on national food production and the increasing awareness that sustainable livelihoods are crucial elements in food self-sufficiency of the households. A household perspective gives a very different picture of the food situation of a population than a macro-level approach.

The case study of the rural households' food security status in the Dry Zone attempts to fill this gap because the previous studies on food security by the official, EC/FAO (2007), and FIVIMS emphasized food security situation at regional and national level and they did not specify the levels of food security accrued to different categories of people. Moreover, the study tries to pinpoint the factors influencing the food expenditure of the rural households. The study applied food consumption survey approach and the farm and non-farm (landless) households are categorized into food secure and insecure households by using the national food poverty line (UNDP and MNPED 2007) method and the Coping Strategy Index (CSI) method.

The study area of Magway division, one of the poverty-stricken and food insecurity areas in Myanmar, is situated in the dry zone of central Myanmar. Based on the integrated household living conditions survey, the UNDP and MNPED (2007) rank this division as 11th among 17 states and divisions in terms of food poverty and poverty incidences. They find that 14 and 44 percent of the total population in Magway division living below the national food poverty and poverty line[21]. The study area has higher food poverty and overall poverty incidence than the national average level of 11 and 36 percent, respectively in 2004.

The total land area is 44,821 square km and it occupies approximately 6.6 per cent of the country's total land area with 10 percent of its population. The characteristics of the study area are low rainfall, frequent drought, low land productivity, high level of land degradation, and low soil fertility. Most of the land in the study area has been converted to

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[21] According to the UNDP and MNPED, the food poverty line and overall poverty line were 118,402 Ks/year (324 Ks/day) and 162,136 Ks/year (444 Ks/day) per adult equivalent in November 2004.

agriculture. It usually suffers from drought twice in every three-year cycle due to low rainfall associated with crop failure. On average, it is situated 300 meter above sea level, and received relatively low rainfall (about 380 to 760 mm) falling in a bi-modal monsoon pattern with early monsoon from late May to early July, and late monsoon from late August to October. The average monthly temperature ranges from a minimum of 9° C (in December) to a maximum of 42° C (in March).

This division produces mainly mineral oil, fertilizer, cement, tractors, cigarette, edible oil, pulses, maize, etc. It is the supplier of edible oils or 'oil pot' of Myanmar because sesame and groundnut are produced mainly in this area. Farm land occupies 1.6 million acres of about 2.5 million acres of total arable land in the Division. Multiple cropping is practiced in both *Le* (wet) land and *Yar* (dry) land. In Magway Division 944 thousand acres is put under paddy in 2007-08. The major crop is sesame occupying more than one million acres of the cultivated land.

4.2 Data Collection

The Magway division is made up of the districts of Magway, Minbu, Thayet, Pakokku and Gangaw comprising 25 townships and 1,696 village-tracts. Because of time constraint, the field survey was conducted in Minbu and Pwintphyu township in Minbu district and Nautmauk township in Magway district. The two sampled villages were selected purposively in each township; similar distance from the respective town.

The two villages in Minbu township have easy access to road and both are 5 miles away from the Minbu town center. The first sampled village or village A has one state middle school and no electricity. The village B has one primary school and received electricity. Some farmers in the village A receive the irrigation water from a dam (Aiema) but village B has no access to irrigation. The two villages in Pwintphyu township have also easy access to road. These villages are situated 4 and 5 miles away from the Pwintphyu town center, respectively. Both villages have received the irrigation water from a dam (Mezarle) for summer paddy production. The landless households in these villages engage as permanent workers in the cotton ginning factory of the military. Both villages have the primary school and no access to electricity. The sampled villages in Nautmauk township are 4 miles away from the town center. Although the villages are not situated in a remote area, it is difficult to go there with poor road (thus horse carts are mainly used) and no bridge to across a big stream. The village B and A in Nautmauk possess the primary and secondary school, respectively and both have no access to electricity. Livestock are raised in all villages. Some farmers in village A receive irrigation water from the Nautmauk reservoir. It is noted that not all farmers receive irrigation water even in an irrigated village/area.

Table 4.1 Sampled Households in the Villages in Minbu, Pwintphyu and Nautmauk Townships

	Minbu township		Pwintphyu		Nautmauk	
	THHs	**SHHs**	**THHs**	**SHHs**	**THHs**	**SHHs**
Sampled village A	284 (112,172)	19 (7,12)	345 (125,220)	24 (8, 16)	290 (110, 180)	16 (5,11)
Sampled village B	293 (116,177)	21 (7,14)	417 (150,267)	25 (8,17)	220 (90, 130)	15 (5,10)
Total Sampled HHs		NF 14, F 26		NF 16, F 33		NF 10, F 21

Note: THHs = total households, SHHs = sampled households, NF = non-farm household, F = farm household

As far as the type of soil and water is concerned, the villages are totally different. The villages in Minbu township have poor soil fertility and a little salty drinking water. The mineral oil is being extracted in large quantities in Minbu township. However, the soil fertility and quality of drinking water is better in the villages in Pwintphyu township. Some of the farmers who own *Le* land in the sampled villages of Nautmauk township mainly face the problem of water logging.

As the field survey focused on not only land holding households but also landless households, the randomly sampled landless households constitute about 33 percent of the total sampled households reflecting the landless households' contribution in the study area. The survey collected information from 40 non-farm (landless) households and 80 farm households. The survey tried to collect more non-farm (landless) households but both man and wife in non-farm households are working and they are unavailable. In order to identify and compare the various characteristics (such as demographic, social, economic and institutional characteristics) and food security status of farm and non-farm households, this study focuses on household level analysis and it is not based on village level.

A team consisting of 2 graduates of Yezin Agricultural University who stay in Magway, 2 staff of MAS (Magway and Minbu), 3 final year students of Yezin Agricultural University and 4 teaching staff of the Department of Agricultural Economics interviewed the household's head and spouse. The household food consumption in the last 24 hour was recalled but consumption of some of the major food items such as rice and oil were checked by their weekly consumption data. The survey was conducted at the late summer (last week of May 2008) or lean season.

According to the official data, Pwintphyu and Minbu township produce surplus of rice while Nautmauk township has deficit of rice production. In order to reach rice self-sufficiency in this division, *Yar* land or dry land has been transformed to *Le* or wet land. Not only the availability of rice but also access to rice is important especially for vulnerable households in this poverty-stricken region.

4.3   Characteristics of the Sampled Rural Households

4.3.1   Household Structure, Household Size and Dependency Ratio

The household structure, family size and its composition are related to productive assets (especially land) and income. Nucleus household structure dominates in both landless and farm households. It is followed by widow/widower households (20% of total landless) in landless households and extended household structure (29% of total farm household) in farm households. The extended household structure occupies about 33 percent of small and large farm households and 29 percent of medium farm households. The widow/widower farm household can be found only in small and medium farm households.

The average household size of landless and farm households are 4.25 and 5.18, respectively. The t-test shows that there is a significant difference between the household size of landless and farm households. Half of the landless household has family size of 3 to 4 persons while the majority of farm household (about 39% of total farm household) has the family size of 5-6 persons. The reason for smaller household size in landless is the seasonal migration for working in other places. Actually, seasonal migration is the major coping strategy for food security in landless household. The average family size of small, medium and large farm household are 5.13, 5.23 and 5.14, respectively and there is no significant difference in household size among the farm households. The average family size of the overall household is (4.87) lower than the national average family size (5.04) because the survey emphasizes on collecting food consumption and accounts the number of family members who are currently staying in the household.

Table 4.2   Household Structure of the Sampled Households in Magway Division

Structure	Landless Household	Farm Household	Overall
Widow/widower	8 (20%)	2 (2.5%)	10 (8.3%)
Nucleus	28 (70%)	54 (67.5%)	82 (68.3%)
Extended	3 (7.5%)	23 (28.7%)	26 (21.7%)
Single	1 (2.5%)	1 (1.3%)	2 (1.7%)
Total	40 (100%)	80 (100%)	120 (100%)
Structure	**Small Farm**	**Medium**	**Large**	**Farm HH**
Widow/ widower	1 (4.2%)	1 (2.9%)	0	2 (2.5%)
Nucleus	14 (58.3%)	26 (74.2%)	14 (66.7%)	54 (67.5%)
Extended	8 (33.3%)	8 (22.9%)	7 (33.3%)	23 (28.7%)
Single	1 (4.2%)	0	0 (0%)	1 (1.3%)
Total	24 (100%)	35 (100%)	21 (100%)	80 (100%)

Source: Field Survey (2008)

Note: HH = Household, small farm household = owning less than 5 acres of land, medium farm = 5.1-10 acres and large farm = above 10 acres, Sample size n = 40 for landless, n = 80 for farm households, n = 24 for small farm households, n = 35 for medium farm households & n = 21 for large farm households

Table 4.3 Household Size & Distribution of the Sampled Rural Households

Household Size	Landless Household	Farm Household		Overall
1 - 2	6 (15%)	4 (5%)		10 (8.3%)
3 – 4	20 (50%)	26 (32.5%)		46 (38.3%)
5 – 6	11 (27.5%)	31 (38.7%)		42 (35%)
7 – 8	3 (7.5%)	17 (21.3%)		20 (16.7%)
9 - 10	0 (100%)	2 (2.5%)		2 (1.7%)
Average size	4.25	5.18		4.87
t test	t = 2.88, sig = .005**, df = 118			
Household Size	Small Farmer	Medium	Large	Farm HH
1 - 2	2 (8.3%)	0	2 (9.5%)	4 (5%)
3 – 4	6 (25%)	14 (40%)	6 (28.6%)	26 (32.5%)
5 – 6	10 (41.7%)	13 (37.1%)	8 (38.1%)	31 (38.8%)
7 – 8	6 (25%)	7 (20%)	4 (19%)	17 (21.2%)
9 - 10	0	1 (2.9%)	1 (4.8%)	2 (2.5%)
Average size	5.13	5.23	5.14	5.18
F test	F = 0.03, sig = .970ns, df = 79			

Source: Field survey (2008) **Significant at 99% confidence interval. ns = not significant

The economic dependency ratio is measured by dividing the number of non-working members (children under 5 years of age, children who are studying at school and university, house-wife who are not working, and elder persons who cannot work) by the total family size. The majority of both landless and farm households have a dependency ratio of 40 to 59 percent (about half of the total family members is dependent). High dependency ratios (60 -79% and above 80%)

Table 4.4 Dependency Ratio of the Sampled Rural Households

Dependency ratio	Landless Household	Farm Household		Overall
0 - 19%	7 (17.5%)	6 (7.5%)		13 (10.8%)
20 – 39%	12 (30%)	9 (11.3%)		21 (17.5%)
40 – 59%	14 (35%)	33 (41.2%)		47 (39.2%)
60 – 79%	5 (12.5%)	26 (32.5%)		31 (25.8%)
80% & above	2 (5%)	6 (7.5%)		8 (6.7)
Average ratio	37.4	50.8		46.3
t test	t = 3.20, sig = .002**, df = 118			
Dependency ratio	Small Farmer	Medium	Large	Farm HH
0 - 19%	1 (4.2%)	2 (5.7%)	3 (14.3%)	6 (7.5%)
20 – 39%	2 (8.3%)	5 (14.3%)	2 (9.5%)	9 (11.2%)
40 – 59%	8 (33.3%)	14 (40%)	11 (52.4%)	33 (41.3%)
60 – 79%	10 (41.7%)	11 (31.4%)	5 (23.8%)	26 (32.5%)
80% & above	3 (12.5%)	3 (8.6%)	0	6 (7.5%)
Average ratio	55.8	51.4	44.0	50.8
F test	F = 1.89, sig = .157ns, df = 79			

Source: Field survey (2008) **Significant at 99% confidence interval. ns = not significant

are found in 40 percent of the farm household and about 17 percent of landless households. The t-test shows that average dependency ratio is significantly different between landless and farm households because more members of landless household must work to survive. At the survey time, around 28 percent of landless households have at least one member is working as seasonal worker in other places while 10 percent of farm households have seasonal migration workers.

Among the farm households, the small farm household has more dependent numbers (children) than medium and large farm household. But F test shows that the dependency ratio among the farm households is not significantly different.

4.3.2 Socio-economic Characteristics of the Households

First, the socio-demographic characteristics and major occupation of the rural households' heads are presented for landless and farm households. There are total 11 female-headed households and most of the female-headed households (about 73%) are landless. On the other hand, about 29 percent of the male-headed households are landless. As the land is the most important asset of the rural household, the female-headed households in the study area are more vulnerable. The Pearson Chi-square test shows that there is a significant different in gender of household head between landless and farm households.

Table 4.5 Socio-demographic Characteristics and Principal Occupation

(Number of household)

Socio-demographic & Employment of Head	Landless N = 40	Farm HH N = 80	Small FH N = 24	Medium N = 35	Large N = 21
Gender of head					
- Female	8 (20%)	3 (3.7%)	1 (4.2%)	2 (5.7%)	0
- Male	32 (80%)	77 (96.3%)	23 (95.8%)	33 (94.3%)	21 (100%)
Pearson Chi-square	P=.004**			P=.548ns	
Average age of head (yrs)	49.4	54.9	51.3	56.4	56.8
t-test bet: landless & farm	t = 2.33			F = 1.77	
F test among farm HHs	sig=.021*			Sig=.176ns	
Education level of head					
- Illiterates	8	9	1	5	3
- Monastery	6	15	4	6	5
- Primary	11	22	10	10	2
- Secondary	10	17	6	5	6
- High school & above	5	17	3	9	5
Average schooling years	4.1	4.7	4.7	4.5	5.0
of head	t = 0.935			F = 0.137	
t & F test	sig=.352ns			sig=.872ns	
Employment of head					
- Farmer	0	80	24	35	21
- Laborer	17	0	0	0	0
- Self employed	10	0	0	0	0
- Govt/company worker	13	0	0	0	0

Source: Field survey (2008) * significant at 95% and ** significant at 99% level, respectively. ns = not significant.

The average age of the landless and farm household is about 49 and 55 years old, respectively. Thus the head of landless household is significantly younger than the head of farm households. Among the farm households, the head of large and medium farm households is older than the head of small farm household but it is not significant.

There are total 17 illiterate persons; 8 in landless and 9 in farm households. About 27 percent of the head of landless households attended at both primary and secondary level. And about 41 percent of the head of small farm households reached at the primary level. Around 25 percent of the head of medium and large farm households and 12.5 percent of the head of landless household reached at the high school and above level. The average schooling years of the head of landless and farm households are not significant different.

The majority of the heads of landless (about 42 percent) engage as causal laborer in both farm and non-farm sectors. Then working as permanent worker with a fixed salary in the government and company dominates in the landless households. Some of the landless households engage in own employment such as grocery shop, street vendors, petty traders, bicycle repair service, transporting service with a horse cart, etc.

The income diversification of the landless and farm households is presented in the following table. It is obvious that landless have to diversify their income generating activities as they have lack of or less productive assets except own labor. Only 3 landless are working as a permanent farm worker (*thuyinnga*) and only 5 landless engage as a non-farm worker in oil mills and market. The rest of landless households have 2 or 3 sources of income. Among the farm households, small farm household has more income diversification than other farm households. About 45%, 65% and 62% of the small, medium and large farm have only one source of income (from crop production).

Table 4.6   Income Diversification of Landless and Farm Households

(No. of households)

Sources of income	Landless	Sources of income	Small	Medium	Large
Thayinnga (FPW)	3	Crop production only	11	23	13
Non-farm worker	5	Crop + Salary	6	5	5
FW + NF worker	4	Crop + Own employed	2	2	1
FW + Own	2	Crop + FW	2	2	0
NF + LS + Salary	2	Crop + LS	1	0	1
NF + RE	1	Crop + FW + Salary	2	0	0
Salary + FW	6	Crop + Salary + Own	0	2	1
Salary + NF	5	Crop + RE	0	1	0
Salary + RE	2	**Total**	**24**	**35**	**21**
Own + Salary	6				
Own + NF	3				
Own + RE	1	**(Total 40 landless)**			

Note: FPW = Farm permanent (seasonal) worker, FW = Farm worker, NF = Non-farm worker, LS = Livestock, RE = Remittance, Own = Own employment, Salary = working as a permanent worker with a fixed salary

Household Assets

The livestock and household assets of the sampled households show that landless households have significantly less owned in all household assets (cart, bicycle, motorcycle, tractor, Television and VCD) than the farm households. Only 2 landless households have a horse cart for earning daily income. Most of the farm households and especially large farm households possess a bullock cart for transporting crops from field to home and for travelling from village to village or town. Nearly 24 percent of the total farm households have a tractor for land preparation in crops production and for transporting purpose. More than half of the large farm households are rich and own motorcycle and tractor. Therefore Chi-square tests show that there is a significant difference in owning motorcycle, tractor and television among the farm households. Only 2 small farm households own the hand tractor. The landless household has no draught cattle. The average number of cattle, pig and poultry of the farm households is 1.9, 0.4 and 5. The landless household has less number of pig and poultry.

The house condition of the landless is obviously worse than the farm households. The majority of the landless (about 88%) use bamboo for their house's wall while significant less percentage of farm household (45%) uses this type of wall. Among the farm households, the small farm households significantly use bamboo for their house's wall. The other types of the wall are wood and brick. Only 5 large farm households possess the brick wall and two stories building.

Only 5 landless households have tin-roofed house and the rest of them use thatch or palm for roofing. About 90, 65 and 16 percent of large, medium and small farm households have tin-roofing, respectively. Therefore the dwelling condition (wall and roofing) is significantly different not only between landless and farm but also among the farm households.

Table 4.7 Household Assets of the Sampled Rural Households

(Number of household)

Assets	Landless	Farm HH	Small Farm	Medium	Large
Own cart Chi square	2 (5%) $P=.000$**	48 (60%)	11 (45.8%)	22 (62.9%) $P=.195$ns	15 (71.4%)
Own bicycle Chi square	24 (60%) $P=.007$**	66 (82.5%)	17 (70.8%)	30 (85.7%) $P=.179$ns	19 (90.5%)
Own motorcycle Chi square	1 (2.5%) $P=.000$**	25 (31.3%)	4 (16.7%)	10 (28.6%) $P=.032$*	11 (52.4%)
Own tractor Chi square	0 $P=.001$**	19 (23.8%)	2 (8.3%)	5 (14.3%) $P=.000$**	12 (57.1%)
Own TV & VCD Chi square	6 (15%) $P=.000$**	49 (61.3%)	9 (37.5%)	25 (71.4%) $P=.017$*	15 (71.4%)

Source: Field survey (2008). * significant at 95% and ** significant at 99% level, respectively. ns = not significant.

Table 4.8   Type of Wall and Roofing of the Sampled Rural Households

(No. of Household)

Type of Wall/Roofing	Landless	Farm Household	Overall
Bamboo wall	35 (87.5%)	36 (45%)	71 (59.2%)
Pearson Chi square	sig = .000**, df = 2		
Tin-roofing	5 (12.5%)	46 (57.5%)	51 (42.5%)
Pearson Chi square	sig = .000**, df = 1		

Type of Wall/Roofing	Small	Medium	Large	Farm HH
Bamboo wall	19 (79.2%)	13 (37.1%)	4 (19%)	36 (45%)
Pearson Chi square	sig = .000**, df = 4			
Tin-roofing	4 (16.7%)	23 (65.7%)	19 (90.5%)	46 (52.5%)
Pearson Chi square	sig = .000**, df = 2			

Source: Field survey (2008). ** significant different at 99% level

4.3.3   Type of Land Ownership and Productive Assets

Before discussion on land distribution, it is useful to ask the farm households whether they are receiving irrigation water for summer paddy production or not. The Pearson Chi-square test shows that there is no significant difference in receiving irrigation water among the farm households. About 37, 40 and 38 percent of small, medium and large farmers receive the irrigation water to grow summer paddy in the study area. The irrigated farmers complain about poor water distribution system for having water logging problem (due to receiving too much water) or receiving inadequate irrigation water to grow summer paddy.

The percentage of landless households in the study villages are ranging from 30 percent to 50 percent of the total households of a village. Among the farm households, more than half of the small farm households own *Le* land only. Then 25 percent of small farm

Table 4.9   Land Distribution and Receiving Irrigation

Water of the Farm Households

Type of Farm Household	Not Receiving Irrigation	Receiving Irrigation Water
1. Small farm	15	9
(0.1 to 5 acres)	(62.5%)	(37.5%)
2. Medium farm	21	14
(5.1 to 10 acres)	(60%)	(40%)
3. Large farm	13	8
(above 10 acres)	(61.9%)	(38.1%)
Total farm households	49 (61.3%)	31 (38.7%)
Chi-square test	sig = .979 ns, df = 2	

Source: Field survey (2008). ns = not significant

Table 4.10   Type of Land Ownership of the Sampled Farm Households

Type of Land	Small	Medium	Large	Farm HH
Le land only	14 (58.3%)	14 (40.0%)	5 (23.8%)	33 (41.2%)
Yar land only	1 (4.2%)	0	0	1 (1.2%)
Le + *Yar* Land	3 (12.5%)	15 (42.9%)	9 (42.9%)	27 (33.8%)
Le + *Kaingkyun* land	6 (25.0%)	5 (14.2%)	4 (19.0%)	15 (18.8%)
Le + *Yar* + *Kaingkyun*	0	1 (2.9%)	3 (14.3%)	4 (5.0%)
Chi-square test	sig = .004**, df = 8			

Source: Field survey (2008). ** significant different at 99% level

households own the land type of *Le* and *Kaingkyun*. The majority of large and medium farms (about 43%) own *Le* and *Yar* land. More percentage of large farms also owns *Le* and *Kaingkyun* land and all types of land. Thus Pearson Chi-square test shows that there is a significant difference in type of land ownership among the farm households. *Kaingkyun* land is silt land and cash crops such as onion, green plants (for using in worship) and vegetables are mainly grown.

The main strategy for protecting crop failure due to frequent drought in the dry zone is "crop diversification". The *Le* land (wet land) is suitable for rice and farmers use to grow sesame or cow pea after rain-fed rice. The major cropping patterns of small, medium and large farm households (who are receiving irrigation water) are 'rice-rice' pattern and 'rain-fed rice-cow pea' pattern. Only one large farm practices 'rice-sesame-cow pea' or 'rice-sesame' cropping pattern. On the other hand, the majority of small, medium and large farm households who do not receive irrigation water practice 'rice-cow pea' and 'rice-sesame-cow pea' cropping pattern. Only 2 small farms grow mono crop of rain-fed rice.

The *Yar* land or dry land is suitable for oil seeds crop and pulses that can provide the farmers a high income because of relatively higher demand (domestic and export) and prices. The majority of the farm households practice 'sesame-green gram' and 'sesame-groundnut' cropping pattern. Then it is followed by 'sesame-pegionpea' and sesame crop only. In *Kaingkyun* land, more than 60 percent of the small and medium farm households grow the green plant that is used for worship and receive more than 30,000 Ks. per month. The rest of them use to practice 'onion'. The majority of large farm households grow onion and vegetables. The average size of *Kaingkyun* land is much smaller but it can provide a considerable income for the farm households.

The F tests show that there is a significant difference among the farm households in total, *Le* and *Yar* land size. The average *Le* land size is 3.1, 5.7 and 9.9 acres for small, medium and large farm households. In *Yar* land, the medium farms own two times of the land size of small farms and the large farms own about 2.6 times of medium farms. The

Table 4.   11 Land and Livestock Assets of the Sampled Farm Households

Productive Assets	Small	Medium	Large	Farm HHs
Average acre of total land F = 100.79, sig = .000**	4.4	7.9	15.3	8.8
Average acre of *Le* land F = 24.9, sig = .000**	3.1	5.7	9.9	6.0
Average acre of *Yar* land F = 6.0, sig = .004**	1.0	1.9	4.6	2.4
Ave. acre of *Kaingkyun* F = 3.0, sig =.053ns	0.3	0.3	0.8	0.4
Average number of cattle F = 4.75, sig = .011*	1.4	1.9	2.6	1.9
Average number of pig F = 0.33, sig = .719ns	0.4	0.4	0.6	0.4
Average number of poultry F = 0.66, sig = .515ns	3.5	6.4	4.4	5.0

Source: Field survey (2008). * significant different at 95% and ** 99% level, ns = not significant

small and medium farms own the same size of *Kaingkyun* land. The F tests show that there is a significant difference in only number of cattle among the farm households.

4.3.4   Level of Household Income and Per Caput Income

The household income of the landless rural households is sum of the income received from all sources. Household income is therefore defined as the sum of the income of the household members such as wage/salary receipts including the imputed value of in-kind payment such as rice, non-agricultural self-employment earnings (gross revenue minus total paid costs) and remittance. In the farm households, the households income means sum of the net income from various crops sold at market (they deducted the cost of crop production and credit from the total income of marketed crops and they also keep especially rice for home consumption and seeds for planting) and other incomes (wage, salary, livestock income, remittance, etc.). The average annual per caput income of landless household is 206770 Kyats (566.5 Kyats per day) while the farm household receives 3 times of landless household's income. The average per caput income of the small farm household is 345,058 Kyats per year (945 Kyats per day) and the medium and large farms receive nearly 2 and 3.4 times of the small farm household's income. Although the number sources of income among the farm households are not significantly different, it is significantly difference between landless and farm household (landless have to more income diversify to meet the basis needs).

The majority of landless (about 82%) are found in the lowest income group (receiving per caput income 30000 to 300000 Ks/year) and no landless is found in the high income group. In the farm households, 60% of the households are classified as lowest and

Table 4.12 Per Caput Income and Different Income Levels

Income levels	Landless	Farm Household		Overall
Lowest income group	33 (82.5%)	22 (27.5%)		55 (45.8%)
Low income group	6 (15%)	26 (32.5%)		32 (26.7%)
Middle income group	1 (2.5%)	8 (10%)		9 (7.5%)
High income group	0	24 (30%)		24 (20%)
Chi-square test	sig = .000**, df=3			
Ave. per caput income/year	206770.03	691597.60		529588.41
Ave. sources of income	1.80	1.49		1.59
Income levels	**Small Farmer**	**Medium**	**Large**	**Farm HH**
Lowest income group	12 (50%)	10 (28.6%)	0	22 (27.5%)
Low income group	9 (37.5%)	11 (31.4%)	6 (28.6%)	26 (32.5%)
Middle income group	3 (12.5%)	4 (11.4%)	1 (4.7%)	8 (10%)
High income group	0	10 (28.6%)	14 (66.7%)	24 (30%)
Chi-square test	sig = .000**, df=6			
Ave. per caput income/year	345058.83	630520.73	1189436.70	691597.60
Ave. sources of income	1.67	1.40	1.43	1.49

Source: Field survey (2008) ** significant different at 99% level

Note: Lowest income group = 30000-300000, Low income group = 300001-600000, Middle income group = 600001-900001, High income group = above 900000 Ks per year

low income groups and 40% is found in middle and high income groups.

Half of the small farm households are classified as the lowest income group. About 37% and 31% of small and medium farm households fall in the low income group. About 66% and 28% of the large and medium farm households are found in high income group. For overall, about 32% and 30% of the total farm households are classified as low and high income groups. Only 10% of the farmhouseholds are classified as middle income group and it presents income divergence among the farm households. Hence Chi-square tests show that there is a significant difference in income levels not only between landless and farm households but also among the farm households.

Income Composition

The fixed salary, income from non-farm laborer and own employment dominate in the income composition of landless household. About 81% and 11% of the households' income come from crop production (sesame, groundnut, green gram, rice, cow pea, onion, green plants, etc.) and fixed salary in the small farm household. Unsurprisingly, about 92% and 96% of the income are received from crop production only in medium and large farm households.

Table 4.13 Income Composition of the Sampled Rural Households

Type of Household	Percent of crop income	Percent of livestock income	Percent of farm labor	Percent of NF labor income	Percent of salary income	Percent of remittance	Percent of own employed
1. Landless	0	0.9	18.0	24.2	31.0	5.3	20.6
2. Farm	89.8	0.2	1.6	0.2	5.7	0.8	1.7
Overall	59.9	0.5	7.0	8.1	14.2	2.3	8.0
1. Small	81.1	0.7	3.9	0.7	11.4	0	2.2
2. Medium	92.4	0	0.8	0	3.3	1.9	1.6
3. Large	95.7	0.1	0	0	3.2	0	1.0
Farm HH	89.8	0.2	1.6	0.2	5.7	0.8	1.7

Source: Field survey (2008)

4.3.5 Food Consumption and Contribution of Food Items to Total Food Cost

The farm households consume significantly higher than the landless households in all food items except vegetables. For example, the per capita consumption of rice (adult equivalent) in landless and farm households is 480 gm and 612 gm per day, respectively. The home consumption quantities of rice and oil seeds are valued at the market prices in the farm households. Most of the landless households buy the low quality of rice (cheaper rice).

Table 4.14 Food Consumption and Percentage Contribution of Food Items to Total Food Cost

Daily Food Consumption and % Contribution to TFC	Landless Household	Farm Household	Overall Household
-Rice (kg) t = 5.72, sig=.000**	1.90	3.0	2.6
-% of rice cost, t = 3.16, sig=.002**	37.0	31.3	33.2
-Oils (kg) t = 6.26, sig=.000**	0.12	0.21	0.18
-% of oil cost t = 1.05, sig=.29ns	20.2	18.8	19.3
-Fish/dried fish t = 5.72,sig=.000**	0.08	0.28	0.21
-% of cost t = 2.87, sig=.005**	5.8	9.6	8.3
-Eggs (Nos.) t = 2.99, sig=.003**	1.05	1.93	1.64
-Meats (kg) t = 4.34, sig=.000**	0.05	0.19	0.15
-% of meats/eggs cost t=2.42,sig=.017*	15.2	21.0	19.1
-Pulses (kg) t = 4.05, sig=.000**	0.08	0.13	0.12
-% of pulses cost t=1.41, sig=.161ns	4.5	3.9	4.1
-Vegs. (kg) t = 1.80, sig=.07ns	0.50	0.58	0.55
-% of vegs cost t=3.98, sig=.000**	16.8	12.9	14.2
-% of beverage cost t=2.55, sig=.012*	0.5	2.5	1.8

Source: Field survey (2008). * significant different at 95% and ** 99% level, ns = not significant
Family size (in adult equivalent) is 4.64 for overall, 4 in landless and 4.97 in farm households, respectively.

Actually they are eating less quantity and low quality of rice. Among the farm households, the small farm household consumes significantly less quantity of oil and meats than medium and large farm households. The small farm household eats less in other food items than the medium and large farm households but it is not significant different.

The comparison of percentage contributions of various food items to the household's total food cost per day between landless and farm households present that the costs of rice, fish/dried fish, meats and eggs, vegetables and beverages are significantly different. In landless household, rice, oil and fish/meats/eggs costs constitute as 37%, 20% and 21% of the daily total food cost, respectively. On the other hand, the contributions of rice, oil and fish/meats/eggs costs are 31.3, 18.8 and 30.6 percent, respectively in the farm household.

Among the farm households, the contributions of rice, meats/eggs, vegetables and beverage costs to the total food costs are significantly different. The percentage contributions of rice and vegetables costs of the small farm households are significantly higher than the medium and large farm households. But the percentage contributions of meats/eggs and beverage costs to total food cost of medium and large farm households are significantly higher than the small farm household.

Table 4.15   Food Consumption & Percentage Contribution of Various Food Costs to Total Food Cost of the Sampled Rural Households

Daily Food Consumption and % Contribution to Total Food Cost	Small Farm	Medium Farm	Large Farm	Farm HH
-Rice (kg) F = 1.99, sig=.143ns	2.7	3.1	3.3	3.0
-% of rice cost F = 4.73, sig =.011*	34.6	31.2	27.5	31.3
-Oils (kg) F = 6.83, sig=.002**	0.18	0.20	0.27	0.21
-% of oil cost F = 1.23, sig =.297ns	19.8	17.4	20.0	18.8
-Fish/Dried fish F = 1.2, sig=.306ns	0.21	0.30	0.30	0.28
-% of fish cost F = 0.349, sig =.707ns	9.1	10.4	8.9	9.6
-Eggs (Nos.) F = 0.24, sig =.731ns	1.7	2	2	1.93
-Meats (kg) F = 10.0, sig=.000**	0.06	0.2	0.3	0.19
% of meat/eggs cost F = 5.59, sig=.005**	14.4	23.5	24.7	21.0
-Pulses (kg) F = 0.519, sig=.597ns	0.12	0.14	0.14	0.13
-% of pulses cost F = 1.05, sig =.354ns	4.4	3.8	3.5	3.9
-Vegetables (kg) F = 3.00, sig=.055ns	0.5	0.6	0.7	0.58
-% of vegs. Cost F =7 .75, sig =.001**	15.9	12.1	10.7	12.9
-% of beverage cost F = 3.88, sig =.025*	1.8	1.6	4.7	2.5

Source: Field survey (2008). * significant different at 95% and ** 99% level, ns = not significant
Family size (in adult equivalent) is 4.97 in all farms, 4.89 in small, 5.04 in medium and 4.93 in large farm household, respectively.

Food Composition

The comparison of food composition (in terms of quantity) of landless and farm households shows that rice is the most important food item in both landless and farm households. Rice consumption contributes nearly 70 percent of the total food consumption. Both landless and small farm households consume more fish and fish products than meats. Although the percentages of oil and pulses consumption are nearly the same between landless and farm households, the large farm household consume more oil and the landless household takes more vegetables (19% of total food consumption) in their food composition. The t-tests show that there are significant different in fish, meats and vegetables consumption between the food composition of landless and farm households.

The food compositions of small, medium and large farm households are significantly different in only rice and meats consumption. The small farm has higher percentage of rice consumption (70% of total food consumption) but they eat less in meats. Therefore F tests show that there is a significant difference in rice and meats consumption among the farm households.

Generally, the households adopt the coping strategies in the early stages of food insecurity include the migration of household members to look for work, searching for wild foods, and selling non-productive assets. In this study, people switch to cheaper, less desirable and perhaps less nutritious foods in the early stages of food insecurity. The migration for working in other places is used when they face a longer period of food insecurity and are in high indebtedness.

Figure 4.1   Food composition of the sampled rural household
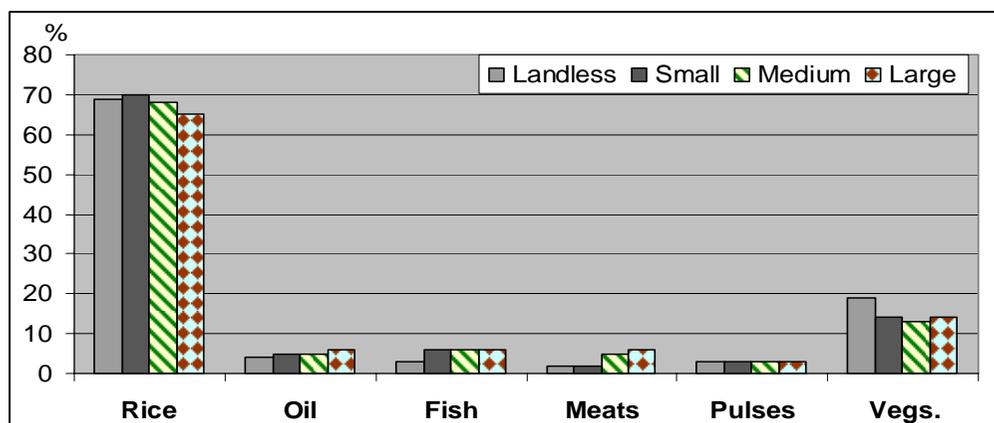
Source: Field survey 2008

4.3.6　Calorie Intake

The rural households' consumption (quantities) of 15 food items and their mean prices are used to compute the value of consumption in Kyats per household per day. If these food quantities and costs are divided by household members in adult equivalent, the average per capita daily food consumption quantities and cost are derived. Based on the per caput food consumption quantities and calorie conversion table (FAO 1985), per caput calorie intake (adult equivalent) of the household is estimated. Then the rural households are categorized into different levels of calorie group, from lowest to high calorie intake group.

Because of less food intakes especially in fish and meats, about 47% and 42% of the landless households are found in the lowest and low calorie intake groups. Most of the farm households (46%) receive the medium level of calories. Only 12% and 22% of the farm households fall in the lowest and low calorie groups. Thus the Chi-square test shows that the level of calorie intake between landless and farm households is significantly different. The average daily per caput calorie (in adult equivalent) of landless and farm households is 1812 and 2450 kcal, respectively.

About 29% and 37% of the small farm households receive the lowest and low level of calories. Only 3 medium farms and no large farm households are found in the lowest calorie group. More than half of the medium and large farm households take the high level of calories. The average daily per caput calorie (in adult equivalent) is 2057, 2546 and 2740 kcal, respectively in small, medium and large farm households.

Table 4. 16　Daily Per Caput Calorie Intake & Different Level of Calories

Calorie Groups	Landless	Farm Household	Overall
Lowest calorie group	19 (47.5%)	10 (12.5%)	29 (24.2%)
Low calorie group	17 (42.5%)	18 (22.5%)	35 (29.2%)
Medium calorie group	3 (7.5%)	37 (46.2%)	40 (33.3%)
High calorie group	1 (2.5%)	15 (18.8%)	16 (13.3%)
Ave. per caput calorie intake	1812	2450	2238
Chi-square test	sig = .000**, df = 3		

Calorie Groups	Small Farm	Medium	Large	Farm HH
Lowest calorie group	7 (29.2%)	3 (8.6%)	0	10 (12.5%)
Low calorie group	9 (37.5%)	6 (17.1%)	3 (14.3%)	18 (22.5%)
Medium calorie group	6 (25%)	20 (57.1%)	11 (52.4%)	37 (46.2%)
High calorie group	2 (8.3%)	6 (17.1%)	7 (33.3%)	15 (18.8%)
Pearson Chi-square	sig = .004**, df=6			
Ave. per caput calorie intake	2057	2546	2739	2450

Source: Field survey (2008) ** significant different at 99% level
Note: Per caput lowest calorie intake = 1200 – 1749 kcal/day, low calorie intake = 1750 – 2299 kcal/day, medium calorie intake = 2300-2849 kcal/day, high calorie intake = above 2850 kcal/day

4.3.7 Access to Credit, Safe Drinking Water and Improved Sanitation

Most of the landless households have lack of capital (for working as street vendors, petty traders, etc.) and they need to borrow money with a high interest rate primarily from the moneylenders. They are always in indebtedness as their income is primarily used in household's daily consumption and paying for daily interests. Only 3 landless households take the credit for income generating activities from the self-reliance group (SRG). Nearly all of landless borrow money from the money lender with a high interest rate (raging from 5 to 20% per month) for investment and consumption purposes. The majority of farm households (about 62%) receive the credit for crop cultivation from the Myanma Agricultural Development Bank (MADB). However, the amount of credit per unit of land only covers about 5 to 7 percent of the total production costs. The small and medium farm households rely on credit and other financial sources than the large farm households. Half of the large farm households are working with their own capital. The average debt amount of landless, small, medium and large farm households are 22625 Ks, 42416 Ks, 40800 Ks, and 33570 Ks, respectively.

For overall, about 79% and 82% of the rural households have received safe drinking water and used improved sanitation. About 70% of landless households have received safe drinking water but about 58% have used improved sanitation. Hence the Chi-square test shows that landless household has significantly less used the improved type of sanitation.

Table 4.17 Received Credit, Safe Drinking Water and Type of Sanitation

(No. of Households)

Credit, Water and Sanitation	Landless (n = 40)	Farm Household (n = 80)	Overall (n = 120)
Received credit Chi square sig = .000**	3 (7.5%)	50 (62.5%)	53 (44.2%)
Received drinking water Chi square sig = .080ns	28 (70%)	67 (83.8%)	95 (79.2%)
Improved sanitation Chi square sig = .000**	23 (57.5%)	75 (93.8%)	98 (81.7%)

Credit, Water and Sanitation	Small (n = 24)	Medium (n = 35)	Large (n = 21)	Farm HH (n = 80)
Received credit Chi square sig = .241ns	17 (70.8%)	23 (65.7%)	10 (47.6%)	50 (62.5%)
Received drinking water Chi square sig = .104ns	17 (70.8%)	32 (91.4%)	18 (85.7%)	67 (83.8%)
Improved sanitation Chi square sig = .749ns	23 (95.8%)	33 (94.3%)	19 (90.5%)	75 (93.8%)

Source: Field survey (2008) ** significant different at 99% level, ns = not significant

Table 4.18 Sources of Credit of the Sampled Rural Households

(No. of Household)

Sources of credit	Landless	Farm HH	Small	Medium	Large FHH
MADB	0	43	16	18	9
SRG	3	1	0	1	0
Pawn shop	5	3	1	1	1
Money lender	32	8	5	3	0
MADB + Money lender	0	6	1	4	1
Own capital	0	19	1	8	10
Total Households	40	80	24	35	21

Note: Myanma Agricultural Development Bank (MADB)

- Having Disease and Children Deaths

The rural households are asked for having diseases and children (under 5 years old) deaths or not. For overall, about 14 percent of the total sampled rural households have various diseases such as tuberculosis, anemia and malaria, etc. Not only landless but also small and medium farm households have various diseases. Only 2 large households reported the household's head or spouse has anemia and malaria which are related with food consumption pattern and health care practice. In Myanmar, there is a belief that woman should not eat meats and fish for a month after delivering a baby. The provision of health education is essential to enhance knowledge and to protect diseases of the rural people.

About 20 and 10 percent of landless and farm households have experienced with children death. Although more percentage of the small farm households have experienced with children death, there is no significant different in children death among the farm households. As most of the village has midwife for maternal care, infant mortality rate is

Table 4.19   Having Diseases & Children Deaths of the Sampled Rural Households

(No. of Household)

Indicators	Landless (n = 40)	Farm Household (n = 80)	Overall (n = 120)
Having diseases Chi square sig = .711ns	5 (12.5%)	12 (15%)	17 (14.2%)
Experienced children deaths Chi square sig = .129ns	8 (20%)	8 (10%)	16 (13.3%)

Indicators	Small (n = 24)	Medium (n = 35)	Large (n = 21)	Farm HH (n = 80)
Having diseases Chi square sig = .563ns	5 (20.8%)	5 (14.3%)	2 (9.5%)	12 (15%)
Experienced children deaths Chi square sig = .882ns	3 (12.5%)	3 (8.6%)	2 (9.5%)	8 (10%)

Source: Field survey (2008) ns = not significant

declined in the rural area. Provision of health education and more access to proper sanitation is required for improving food utilization of the rural household.

4.4 Food Security Status of the Sampled Rural Households

4.4.1 Food Poverty Line Method

Access to food refers to the ability of households to produce or purchase sufficient food for their needs. Access is influenced directly by food prices and household incomes. On average, the small, medium and large farm households produce about 84, 102 and 115 baskets of paddy per year for their home consumption and seeds for planting. The farm households face food insecurity with an average of 0.5 month and maximum period of 7 months especially in small farm households. On the other hand, the landless household has food insecurity period of average 5.3 months and the maximum period is the whole year.

The average daily per caput food cost (adult equivalent) is 499 and 787 Kyats in landless and farm households, respectively. Fortunately, the market prices of most of the food items are the same in the study villages. About 40% of landless households consume daily per caput food cost of 240 to 390 Kyats. Only 15% of landless can use per caput food cost of above 693 Kyats per day. More than half of the farm households consume with per caput food cost of more than 693 Kyats and only 20% of the farm households are found in the group of low food cost.

Table 4.20   Daily Per Caput Food Cost of the Sampled Rural Households

Different Groups	Landless	Farm Household	Overall
Lowest food cost/day	16 (40%)	0	16 (13.3%)
Low food cost/day	9 (22.5%)	16 (20%)	25 (20.8%)
Medium food cost/day	9 (22.5%)	14 (17.5%)	23 (19.2%)
High food cost/day	6 (15.0%)	50 (62.5%)	56 (46.7%)
Ave. per caput food cost	499	787	691
Chi-square test	sig = .000**, df=3		

Different Groups	Small Farmer	Medium	Large	Farm HH
Low food cost/day	11 (45.8%)	5 (14.3%)	0	16 (20%)
Medium food cost/day	5 (20.8%)	6 (17.1%)	3 (14.3%)	14 (17.5%)
High food cost/day	8 (33.4%)	24 (68.6%)	18 (85.7%)	50 (62.5%)
Pearson Chi-square	sig = .001**, df=4			
Ave. per caput food cost.	604	804	970	787

Note: Lowest per caput food cost = 240 – 390 Ks/day, low food cost = 391 – 541 Ks/day, medium food cost = 542 – 692 Ks/day, high food cost = above 693 Ks/day. ** significant different at 99% level. Average adult equivalent family size is 4, 4.89, 5.04, and 4.93 in landless, small, medium & large farm households.

About 45% and 14% of the small and medium farm households use the low food cost of 391 to 541 Kyats per day. About 33%, 68% and 86% of the small, medium and large farm households are found in the group of high food cost. The average daily per caput food cost of small farm household is 604 Kyats which is significantly lower than medium and large farm households.

Despite of having less dependency ratio and more income diversification in landless households, lack of productive assets except labor, low opportunity of receiving credit for income generating and low per caput income make them to use lower food cost (adult equivalent) resulting in low level of consumption and calorie intake. The small farm or subsistence farm households are also struggling to meet minimum calorie consumption. Average calorie intake of both landless and small farm household is lower than the recommended calorie intake level of 2300 kcal per day.

Figure 4.2   Daily Per Caput Food Expenditure & Calorie Intake
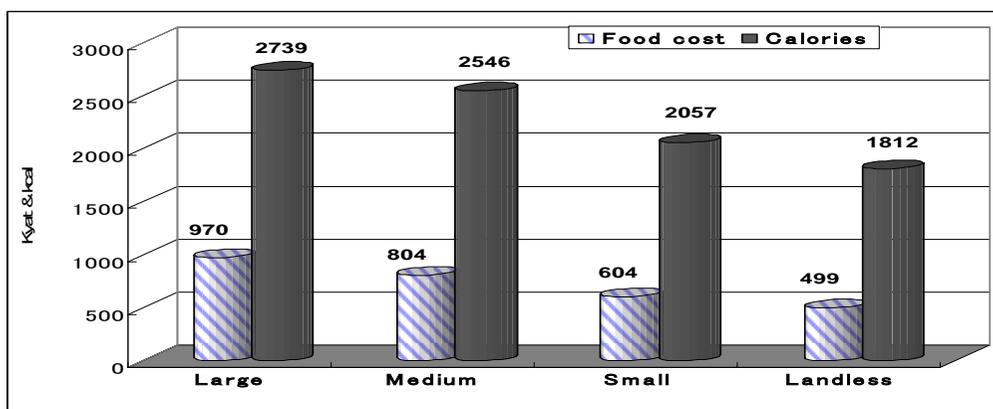
Source: Field survey (2008)

The food share in the household total expenditure and income should be estimated to examine the well-being of different rural households. The landless households are vulnerable as about 92% of their total income is used for food consumption. Actually, 15 landless households have inadequate income for their food cost and they are in high indebtedness. On average, the rural households use about 73% of the total income for food consumption.

Because of food expenditure occupies more portion of the total expenditure; about 82% and 73% of total expenditure are used as food consumption in landless and farm households, respectively. For overall households, food share occupies about 75% of the total expenditure[22]. The non-food items that collected in the survey are namely education,

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[22] The per caput total expenditure (excluding health expenditure) of landless, small, medium and large farm households are 222654, 294005, 407732 and 508984 Kyats per year (adult equivalent), respectively.

clothing, house repairing, lightening, transportation cost, donation, personal use and miscellaneous.

The small farm households have higher food share in the total income and expenditure than the medium and large farm households. Only large farm households are using less than half of their income (38%) for food consumption. It is obvious that the majority of rural households except large farm households are vulnerable in the study area as more than half of their income is mainly used for food consumption.

The national food poverty line of 324.38 Kyats per person per day (adult equivalent) is firstly inflated to the current food consumption cost by using the CSO's Food CPI. The Food CPI in May 2008 is 947.94 and thus the inflated food poverty line is 739 Kyats per day. By using this food poverty line, the rural households consuming less than 739 Kyats per day in May 2008 (survey period) are classified as food insecure household (Table 4.22).

Table 4.21   Percentage of Food Share in Total Expenditure and Income

% of Food Share	Landless	Farm Household	Overall
% of food cost in total exp. t-test t=5.48, sig = .000**	82%	73%	75%
% of food cost in HH income t-test t=3.69, sig = .000**	92%	63%	73%

% of Food Share	Small	Medium	Large	Farm HH
% of food cost in total exp. F-test F=1.98, sig = .144ns	75%	73%	69%	73%
% of food cost in HH income F-test F=7.02, sig = .002**	81%	66%	38%	63%

Source: Field survey (2008). ** significant different at 99% level, ns = not significant.

Table 4.22   Food Security Status of the Sampled Rural Households

Food Security Status	Landless	Farm HH	Overall
Food insecure	35 (87.5%)	38 (47.5%)	73 (60.8%)
Food secure	15 (12.5%)	42 (52.5%)	47 (39.2%)
Pearson Chi square	sig = .000**, df=1		

Food Security Status	Small	Medium	Large	Farm HH
Food insecure	19 (79.2%)	16 (45.7%)	3 (14.3%)	38 (47.5%)
Food secure	5 (20.8%)	19 (54.3%)	18 (85.7%)	42 (52.5%)
Pearson Chi square	sig = .000**, df=2			

Note: Food insecure = below national food poverty line of 739 Ks/person/day (adult equivalent)
** significant different at 99% level.

Majority of the landless households (87.5%) face food insecurity while nearly half of the farm households (47.5%) are also food insecure. For overall, about 60 percent of the sampled rural households are living below the food poverty line. Among the farm households, around 79 and 45% of the small and medium farm households experience food insecurity. Only 14.3 percent of the large farm households are classified as food insecure household. These large farm households possess large family size of 7. The Pearson Chi-square tests present that there is a significant difference in food security status between landless and farm households, and among the farm households.

Because of possessing low or lack of productive assets, seasonal unemployment, low income/wage, low productivity, lack of access to inputs and credit, the landless, small and medium farm households are unable to attain the food sufficiency. Therefore, the poor households face 'food deficiency' at least five months or for the whole year. It is obvious that the marginal farm households have experienced transitory food insecurity while most of the landless households have experienced chronic type of food security.

When the rural households face crop failure (due to drought) or they are in high indebtedness or they have lack of capital, they must sell their land plots by plots and become a landless household. One of the coping strategies for sustaining livelihood asset is to go hunger or having low quality or less preferred food consumption. Thus more numbers of small and medium farm households fall in food insecurity status. Due to lack of productive assets such as land and capital, the poor landless households rely on causal labor or some are migrated to other towns at the lean season. The daily laborer earns relatively low level of real wage due to continuously increasing inflation rate uncovering even daily food consumption.

Consumption (expenditure) data available for the households are analyzed using Foster-Greer-Thorbecke (1984) class of poverty measures to compute food poverty incidence (headcount ratio, food poverty gap and food severity). The formula for the FGT class of food poverty measure is;

$$P_\alpha = 1/n \sum_{j=1}^{q} \{g_j/z\}^\alpha \quad \text{if } \alpha \geq 0$$

where n is the total population, q is the number of poor persons, g is food poverty gap, z is the food poverty line, and the parameter α reflects food poverty aversion; larger values put higher weight on the food poverty gaps of the poorest people. If $\alpha = 0$, the above equation reduces to *q/n*, which is the commonly used 'headcount ratio'. Setting $\alpha = 1$ amounts to aggregating the proportionate food poverty gaps, which shows the shortfall of the poor's consumption from the food poverty line expressed as an average over the whole population. Setting $\alpha = 2$ equals to squared food poverty gap or food poverty severity index.

About 93 and 54 percent of the total population of landless and farm households are living below the food poverty line. For overall, around 65 percent of the total population is

Table 4.23 Food Poverty Incidence of the Sampled Rural Households

Food Poverty	Landless	Farm Household		Overall
Headcount ratio (%)	93.13	53.88		65.13
Food poverty gap (%)	9.18	4.05		6.15
Food severity (%)	4.36	1.35		2.59
Food Poverty	**Small Farm**	**Medium**	**Large**	**Farm HH**
Headcount ratio (%)	83.01	53.61	21.27	53.88
Food poverty gap (%)	5.49	3.02	2.03	4.05
Food severity (%)	1.97	0.95	0.39	1.35

Note: Total population (adult equivalent) = 556.8, Landless population = 159.5, farm population = 397.3, small farm population = 117.5, medium farm population = 176.4, large farm population = 103.4
National food poverty line = 739 Kyats/day

living in food insecurity status. If the implemented program objective is to reduce the percentage of food insecure people, then headcount index should be used as a target. If the program objective is to reach out to the poorest of the poor, then food severity index should be targeted. Among the farm households, around 83, 54 and 21 percent of the total population of small, medium and large farm households are food insecure. It appears that the people in landless and small farm households are in hunger and the majority of poorest of the poor are found in the landless households.

4.4.2 Index of Coping Strategies Method

There are 6 coping strategies (borrow rice, eat low quality or cheaper rice, not eating meats, dropping children from school, migration and sold out the land and livestock assets) that the rural households mainly used in the study area. First, they are asked whether they have enough rice in the last 30 days. The households who have inadequate amount of rice or inadequate income to buy rice are then asked how to cope with this problem. It is simplified way to calculate the index of coping strategies. The number of different strategies used by the households is summed firstly. The more food insecure household will get the high score. Then, calculate the weighted sum of these different coping strategies where the weights reflect the frequency and severity of their food insecure problem. If the household never use a particular strategy, it is counted as 1. Rarely or use 1 to 2 times is counted as 2, from time to time or 3 to 10 times is counted as 3, and often or more than 10 times per month is counted as 4. Based on the index of coping strategies, lastly, the rural households are categorized into 3 groups: low, medium and high index of coping strategies (Table 4.24).

Among the coping strategies, more numbers of households (29, 18 and 5 of landless, small farm and medium farm households) use the strategy of borrowed rice (or taking in advance rice or wages) from the shop or farmers. Then 24, 11 and 2 of landless, small and

Table 4.24   Food Security Status of the Sampled Rural Households

Coping strategy index	Landless	Farm Household	Overall
No coping strategy	7 (17.5%)	45 (56.3%)	49 (43.3%)
Low index of CS	13 (32.5%)	30 (37.5%)	46 (35.8%)
Medium index CS	12 (30%)	4 (5%)	16 (13.4%)
High index CS	8 (20%)	1 (1.2%)	9 (7.5%)
Chi square	sig = .000**, df=3		

Coping strategy index	Small Farm	Medium	Large	Farm HH
No copping strategy	2 (8.3%)	22 (62.9%)	21 (100%)	45 (56.3%)
Low index of CS	17 (70.8%)	13 (37.1%0	0	30 (37.5%)
Medium index CS	4 (16.7%)	0	0	4 (5%)
High index CS	1 (4.2%)	0	0	1 (1.2%)
Chi square	sig = .000**, df=6			

Note: No coping strategy means having sum score of 6. Low Index = Sum of weighted Score of 7-19, Medium Index = 20 – 30, High Index = above 30. ** significant different at 99% level

medium farm households eat low quality of rice as a coping strategy. Unfortunately, 23 landless and 5 small farm households are having the meals without meats. The objective of the children dropping from school is to help or work in own filed or earn income. More numbers of households (21 landless, 6 small, and 4 medium farm households) have used this strategy. Then some of the households (11 landless, 7 small, and 5 medium farm households) have to use seasonal or permanent migration practice to overcome the food insecurity and poverty. Only 9 landless and 3 small farm households have to sell their productive assets as their coping strategy for food security. Actually, the first three coping strategies are generally used in short-term and the last three strategies are used in long-term or when the household has faced more difficulties in access to food.

According to the index of coping strategies, about 17 percent of landless and 56 percent of farm households are categorized as 'food secure' households. The rest of the households are in food insecure ranging the level of food insecurity accordance with their index of coping strategies. Therefore about 20 percent of landless are found in high food insecurity while only one farm household is in this category. Most of the small (71%) and 37% of the medium households are using low index of coping strategies. No medium farm households are found in using medium or high index of coping strategies. All large farm households have enough rice in last 30 days and they do not need to use coping strategy. But one large farm household has older head and his son was dropped from school to manage the farm works. The other 2 large farm households send their sons to work in abroad for earning high income.

Those households especially landless, using a larger number of coping strategies and often used, are more likely to be poor and more vulnerable to destitution. Actually, the index

of coping strategy has three advantages: it is easy to implement; it directly captures notions of adequacy and vulnerability; and the questions asked are easy to understand by both respondents and analysts (John Hoddinott 2001).

Both food poverty line and coping strategy index present similar results on the food insecurity status of the sampled rural households especially landless households. More percentages of small and less percentages of medium and no large farm households are food insecure in coping strategy index method when compared with the result of food poverty line method.

4.5 Factors Influencing Food Expenditure of the Sampled Rural Households

Household income or consumption expenditure measures a household's ability to obtain goods and services. Modeling consumption directly has the attractive feature that consumption model estimates are invariant to the choice of the criteria or food poverty line. The set of variables that are hypothesized to determine per caput food expenditure per day includes socio-demographic characteristics of age of household head and family size, productive assets related to food production of *Yar* and *Le* land, dummy variable whether receiving irrigation water or not, the consumption quantities of rice, oil, fish and meats, and food utilization indicator of using proper sanitation or not. A key consideration in selecting the potential determinants of food expenditure is to choose explanatory variables that are highly correlated with the dependent variable of per caput food expenditure. Therefore the productive asset (land) and family size are included in modeling food poverty because these variables are highly related with the daily per caput food expenditure.

A multivariate correlation analysis was done to know the multicollinearity of all independent variables. Per caput income per day is highly correlated with *Le* land size, landless or farmer (dummy variable) is highly correlated with *Yar* land size, and vegetables consumption is highly correlated with rice consumption. Hence these variables (per caput income, landless/farmer, and vegetable consumption) are excluded in the model. The independent variables which are low correlated (less than r = 0.5) with the dependent variable, are also excluded. Thus variables with high degree of correlation with the dependent variable (log of per caput food expenditure per day) and low degree of correlation with each other are included in the model.

$$\ln FC_j = \beta_0 + \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 X_{3j} + \beta_4 X_{4j} + \beta_5 X_{5j} + \beta_6 X_{6j} + . + \beta_{11} X_{11j} + \varepsilon_j$$

where FC_j = log of average per caput food expenditure per day for the jth household, X_1 = age of household's head, X_2 = gender of head (male=1, female=0), X_3 = family size, X_4 = *Yar* land size, X_5 = *Le* land size, X_6 = rice consumption/day, X_7 = oil consumption/day, X_8 = fish consumption/day, X_9 = meats consumption/day, dummy variable of using improved

Table 4.25   Descriptive Statistics of Variables in the model

Variables	Overall HH Mean & std. dev	Food Secure Mean & std. dev	Food Insecure Mean & std. dev
Per caput food expenditure/day	691 (276)	968 (195)	513 (139)
Age of head (years)	53 (12.4)	52.7 (11.9)	53.3 (12.8)
Gender of head	0.91 (0.29)	0.89 (0.31)	0.94 (0.24)
Family size (No.)	4.87 (1.7)	4.38 (1.58)	5.18 (1.71)
Yar land size (acre)	1.57 (3.3)	2.95 (4.47)	0.69 (1.8)
Le land size (acre)	4.0 (4.3)	6.68 (4.9)	2.31 (2.9)
Rice consumption/day (kg)	2.6 (1.15)	2.71 (1.12)	2.61 (1.17)
Oil consumption/day (kg)	0.18 (0.09)	0.22 (0.07)	0.16 (0.09)
Fish/dried fish consumption/day (kg)	0.21 (0.21)	0.31 (0.23)	0.14 (0.17)
Meats consumption/day (kg)	0.15 (0.19)	0.26 (0.23)	0.07 (0.11)
Using improved sanitation (yes=1)	0.82 (0.38)	0.94 (0.24)	0.74 (0.44)
Receiving irrigation water (yes=1)	0.26 (0.44)	0.34 (0.47)	0.21 (0.40)

Note: Overall household N = 120, Food secure household N = 47, Food insecure household= 73

sanitation =1 and otherwise = 0, dummy variable of receiving irrigation = 1 and otherwise = 0. Descriptive statistics of variables in the statistical model is presented in the following table.

All independent variables (except age and gender of head, and consumption quantity of rice) significantly influenced on the dependent variable. There is a strong negative relationship between family size and per capita food expenditure. According to the regression estimates, other things being equal, one percent increases in the household members will reduce the food expenditure significantly (about 0.7 percent). If the farm household receive the irrigation water, then per caput food cost will be reduced significantly (about 0.02%). Does the irrigated farm household receive relatively low profit (income) and consumption when compared with non-irrigated farm household in the study area? There is need for further research on this issue.

Table 4.26   Factors Influencing Per Caput Food Cost of the Rural Households

	Explanatory Variable	Coefficients		t	Sig.
		B	Std. Error	Zero-order	Partial
1	(Constant)	6.511	.105	61.97	.000**
2	Age of head	-0.0018	.001	-1.301	.196ns
3	Gender of head	-0.0482	.062	-.783	.436ns
4	Family size (No.)	-0.146	.018	-8.249	.000**
5	*Yar* land size	0.01603	.006	2.722	.008**
6	*Le* land size	0.01453	.005	2.651	.009**
7	Rice (kg)	0.03956	.029	1.356	.178ns
8	Edible oils (kg)	1.175	.236	4.989	.000**
9	Fish & dried fish (kg)	0.656	.089	7.336	.000**
10	Meats (kg)	0.890	.100	8.889	.000**
11	Improved sanitation or not	0.176	.046	3.800	.000**
12	Received irrigation or not	-0.08799	.044	-2.007	.047*

a   Dependent Variable: Log of per caput food cost/day. *significant different at 95% level, **significant at 99% level, ns = not significant

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.739	11	1.522	48.314	.000
2	Residual	3.402	108	0.315		
3	Total	20.140	119			

a   Predictors: (Constant), le land size, yar land size, family size, improved sanitation or not, age of head, received irrigation or not, fish, meats, oils, rice consumption per day
b   Dependent Variable: Log of per caput food cost/day

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.912	.831	.814	0.1775	2.053

a   Predictors: (Constant), le land size, yar land size, family size, improved sanitation or not, age of head, received irrigation or not, fish, meat, oils, rice consumption per day. b Dependent Variable: Log of per caput food cost/day

The consumption of oil, fish and meats are highly and directly associated with the per caput food expenditure. Other things being equal, if one percent increases in intake of oil, fish and meats, then per caput food cost could be increased by 0.21, 0.14 and 0.13 percent, respectively. Although rice consumption is directly related with the per caput food cost, it is not significant. Generally, the rural households in the study area eat meats once for a month as pork or beef is available once in a month in the village. The dried fish is mostly available and consumed in the rural area. The household who can go frequently to the market at nearby town eat meats or fish frequently and they are food and nutritional secure. The prices of oil, meats and fish are relatively higher than rice. Hence if the household has more access to oil, meats and fish, their food expenditure would be higher and they will receive more calories.

If the rural household owns more *Yar* or *Le* land which is the most important asset of the rural household, the per caput food cost will be significantly high and they are food secure. Therefore if one percent increases in *Le* or *Yar* land size, the daily per caput food expenditure will be increased by 0.06 and 0.03%, respectively in the study area. The household who uses the improved sanitation has significantly higher food expenditure and more likely to food secure. Overall, the model is significant and it can explain the variation in daily per caput food expenditure by 81.4 percent.

CHAPTER   V
CONCULSION

        The study contributes to understanding food security situation in Myanmar by focusing on the food (rice) availability at the national level and by analyzing farm and non-farm rural households' food security status and their coping strategies for food security in Magway division. Based on the findings of the study, conclusion and recommendation can be drawn to highlight the important points especially for rural households' food security.

(1)   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. Hence the goal of national food policy is the attainment of food security through self-sufficiency, price stabilization and the improvement of nutritional status. Myanmar has succeeded in reduction of malnourishment by cutting the numbers from 4 million in 1990-92 to 2.7 million in 2001-03. The accelerated hunger and poverty reduction originated with market-oriented economic and agricultural reforms, which were implemented in the late 1980s. The reform programs gave farmers more or less free choice of crops, gradually reduction in procurement of rice at low price, free trade flows within the country, allowed them to increase sales to the market and reduced agricultural implicit taxation. Self-sufficiency in rice in terms of availability has been achieved at the country level along with increasing rice production mainly through horizontal expansion.

(2)   The estimated affects of the cyclone on the country's rice self-sufficiency in both Projection 1 and 2 point out that the country could produce sufficient amount of rice for consumption in 2008-09. The situation could be more realized soon after completion of rain-fed rice harvesting. If the actual rice production in 2008-09 is equal to the reduction of just 3 to 5 percent of total rice production in the last year, the country will reach to self-sufficiency ratio of 100 percent. If some amount of rice surplus can be exported, then rice self-sufficiency will be more than 100 percent.

(3)   The MAS's estimates on rice self-sufficiency is quite high because of underestimation on rice consumption (average 135 kg/year against actual consumption 143 kg/year in HIES 2001) and on waste at the harvesting time (maximum 0.9 million MT against 3 million MT[23]). Statistics on rice yield and sown area should be improved to avoid overestimation on rice production.

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[23] Due to inefficient post harvest technology, waste of rice is around 3 million MT in Myanmar (Dr. Myo Aung Kyaw, Living Color magazine, October 2008).

(4)   Despite production of paddy has increased at an average rate of 6.5 percent per year and cover the population growth rate of 2 percent per year) during 2001 to 2006, the real prices of both low and high quality of rice has been increased by 13 and 6 percent, respectively within the same period. The food policy under the market-oriented policy should not only maintain the self-sufficiency in rice production but also stabilize the price of rice with appropriate measures and by reducing inflation. Because of both food and non-food prices were significantly increased in the last two years, the national food consumption survey should be conducted to collect food quantities, pattern and quality aspects by different income groups in both rural and urban to assess the food security status of the country. The transparency of access to data for all users will encourage more understanding on this issue and it may influence on policy change for achieving sustainable food security.

(5)   The per capita income is the lowest in Myanmar when compared with other Asian countries. According to UNDP and MNPED (2007), the poverty estimates for urban was 22 percent, for rural was 36 percent and for total was 32 percent in 2004. The demand-side factors affecting food security are population growth, income growth and distribution, and export revenue and indebtedness. Myanmar has a steady annual population growth rate of 2 percent and food (rice) production on average has to increase 260,000 MT per year to meet nutritional requirement of increased population. Despite the country can produce food to meet increasing demand from population growth, 'low purchasing power' resulting from low level of per capita income and high inflation is the major constraint in reduction of malnourished people. More food production is never a sufficient condition in the achievement of food security as it does not guarantee in people's access to adequate amount and quality of food.

(6)   In order to reach the first Millennium Development Goal (MDG 1) of halving the percentage of undernourished people by 2015, increased per capita income should be emphasized by promoting the private sector investment to expand job opportunities and to absorb surplus of labor from the agricultural sector. It is required to develop food processing and agro-industry for providing jobs and incomes to both landless and marginal farmers. The establishment of Special Industrial Zone in different regions will enhance marketing and trade that will help in sustaining the target GDP growth rate of 10-12 percent per year during the country's Five-Year Plan (2006-07 to 2010-11).

(7)   Inefficient macroeconomic policy is responsible not only for fiscal deficit and huge amount of external debt but also high rate of inflation. The high rate of inflation and rising fuel prices drive the food prices up in Myanmar. The rising food price has been severely affected on the landless and small farm households who have low level of income and a high

proportion of their budget is used for food. Thus improved food security can be attributed, inter alia, to the reduction of inflation. For sustained growth and poverty reduction, Myanmar will need to pursue economic reforms and work toward achieving a balanced budget, balanced trade and low rate of inflation.

(8)   In Myanmar, the majority of the population (about 68.9 percent of the total population) still engages in agriculture sector (FAO Selected Key Indicators 2005). A vibrant rural economy is therefore a prerequisite for reducing undernourishment. Some modest steps are taken to reform the economy in 2007; restrictions on export of rice have been lifted and some state-owned enterprises (SOEs) are privatized. The major strategies to boost agricultural production included development of land resources, provision of irrigation water, promoting of agricultural mechanization, and utilization of high yield quality seeds. In addition, provision of price incentive is essential for increasing crop production and income of the rural households. As mentioned in the chapter 2, the creation of informal trade of rice to neighboring countries actually distorted the economy. The exporting of rice surplus by the private sector should be allowed with appropriate export quota and taxation to encourage rice productivity. Some amount of revenue from export tax should be used to establish national rice reserve for preparedness of natural calamities and wide seasonal fluctuation.

(9)   Still, some institutional reforms regarding income distribution and generation of income activities especially for rural landless are needed to address as the majority of them are living below the food poverty line. The rural financial sector should be reformed and strengthened to include and provide adequate loan for poor landless and small farmers' income generating activities and owning productive assets. Insufficient amount of credit and lack of access to credit imposes heavy costs (through low rate of fertilizer application and low access to improved technology) on agriculture in terms of productivity and income (Turnell 2008).

(10)   Productivity-driven growth in agriculture can have a strong positive impact on the rural non-farm economy through boosting demand for non-agricultural goods and by keeping food prices low. Increasing the productivity of small farmers is especially important as they, and landless laborers, spend more than 70 percent of their income on food. Agricultural growth thus generates a virtuous cycle in which agricultural and off-farm activities sustain each other. Such growth can make a powerful contribution towards reducing the numbers of undernourished when the population growth is moderate.

(11)   Results of this study may have important implications for the food security at the household level. The landless and small farm households constitute 74 percent of the total food insecure household but their contribution to the total sampled household is 53 percent.

The regression model indicates that land asset, consumption of oil, fish and meats, and using improved sanitation significantly affect per caput food expenditure (adult equivalent) in the study area of Magway division. Household size and receiving irrigation water adversely and significantly influenced on per caput food expenditure, *ceteris paribus*.

The current land use right is based on the Land Nationalization Act in 1953 and Tenancy Act and Rules in 1963. All lands belong to the State but farmers are given land use rights on their holdings, which cannot be transferred, mortgaged or taken in lieu of loan repayment. Land use rights are legally inheritable to those who must continue working on land. In the market-oriented economy, the farmers should have totally control on land use such as inherit, transfer and mortgage of land. The market value of land has rapidly risen reflecting the high cost of investment and returns. Like in the other developing countries such as China and Viet Nam, the farmers should have at least specific time of ownership of land to invest and to produce the maximum potential of productivity of land. Furthermore, access to land, which is the major production factor of the rural people, by the landless farmers should be set at a high priority.

(12)   If the comparative advantage concept on crop production is applied within States and Divisions, the farmers in all States and Divisions will enjoy the dual objective of higher profit (income) and food security under market liberalization. The farmers in some irrigated areas have suffered from expensive resource cost allocation for compulsory rice production and receiving relatively low level of profit or no profit from rice production. As the food policy drives the farmers to expand rice sown area by means of transforming dry (*Yar*) land to wet land (*Le*), farmers have faced unprofitable and unsustainable use of land resource in both short and long terms. Both producers and consumers are worse-off at the high cost of production of rice in terms of financial or private cost and social cost of the country.

(13)   The specific programs and projects of GOs and INGOs aim at pursuing poverty eradication and sustainable food security should be funded to cover for all vulnerable households including landless, marginal farmers, displaced household, household affected by HIV/AIDS, and household affected by natural disaster (cyclone in May 2008). The World Food Programme focused through emergency food distributions in the Nargis cyclone affected areas and food around 28000 MT was already distributed. The relief and safety-net programs including food distribution (WFP provides 10.6 kg per a child for attending school and 25 kg per for elder person or single household who has no relative monthly in the study area), and various feedings especially for children should be well targeted in reduction of hunger and malnutrition.

In summary, the success in food and nutritional security could be achieved through a sustainable increase in rice production mainly by means of productivity-driven growth (to

reduce per unit cost of production and thus help for getting price stabilization), increase in per capita income of rural household with more access to resources (thereby increase their access to food), and sound macroeconomic policies to gain effectiveness in reduction of the rural households' food insecurity.

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