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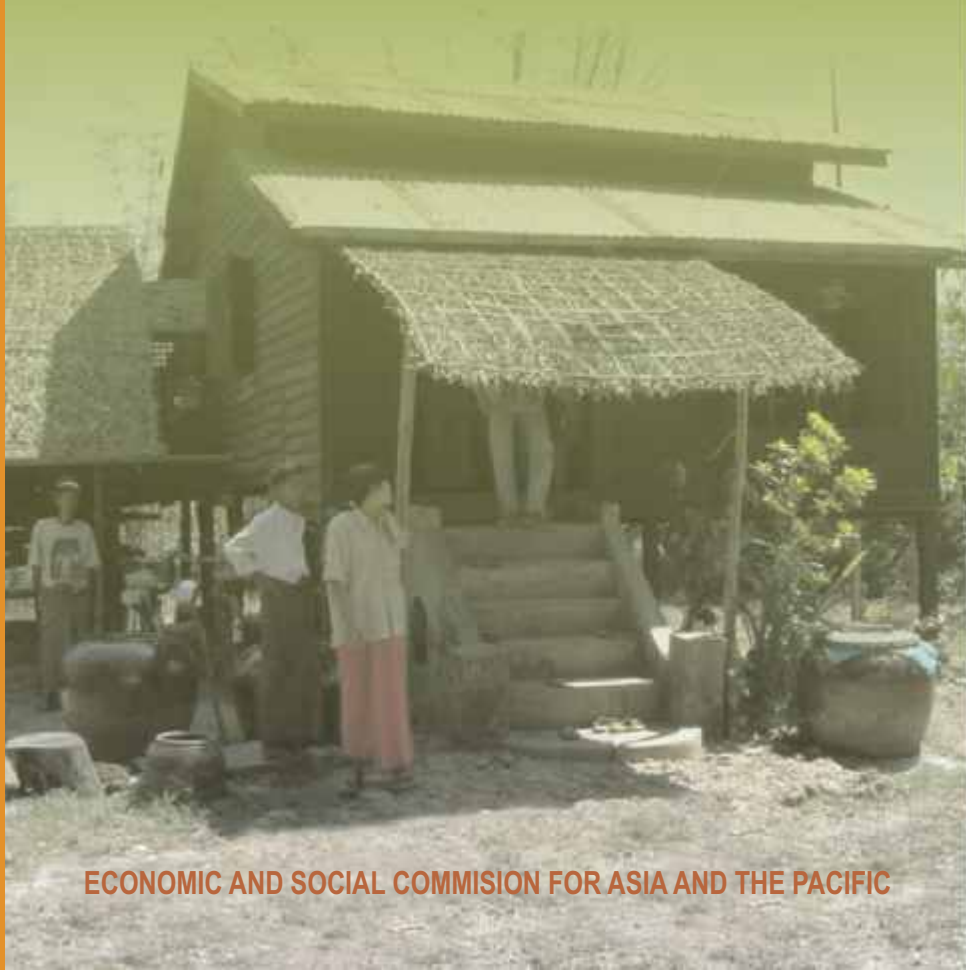
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Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Myanmar

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United Nations
ESCAP

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

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Foreword

Most Asian countries succeeded in multiplying major cereal production through the ‘*Green Revolution*’. This was made possible by the introduction of high yielding varieties and policy support which promoted the construction of irrigation facilities and the use of modern inputs such as chemical fertilizers and pesticides. However, recently the growth in productivity of major cereals has reached a plateau. Agricultural diversification has a number of positive effects, among others, food security, risk mitigation, labour absorption and conservation of biodiversity. It is crucial to be aware of the driving forces and constraints to agricultural diversification to formulate policy options which realize the coexistence of sustainable agricultural development and poverty reduction in rural areas.

Responding to this vital need, UNESCAP-CAPSA conducted a three-year research project, “Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Selected Asian Countries (GRIDIV)”, from April 2003, in collaboration with eight participating countries, Bangladesh, India, Indonesia, Lao People’s Democratic Republic, Myanmar, Sri Lanka, Thailand and Viet Nam.

It is my pleasure to publish “**Identification of Pulling Factors for Enhancing the Sustainable Development of Diverse Agriculture in Myanmar**” as a result of the second phase of the Myanmar country study of the project. This volume presents rural surveys and case studies to collect primary data to support policy recommendations to realize poverty alleviation through agricultural diversification.

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Taco Bottema
Director
UNESCAP-CAPSA

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Executive Summary

The AGRIDIV project emphasizes pulling factors for enhancing secondary crop production. The main objectives of the project are to make policy recommendations and to look at the demand side of secondary crops, which greatly influence the welfare of the rural poor. Without improvements, increased production could jeopardize the life of rural people. The AGRIDIV phase I study was conducted during 2003 and 2004 and policy recommendations for Myanmar were made. AGRIDIV phase II incorporates a case study to buttress the findings of the phase I study. This case study aims to clarify the role of secondary crops such as coarse grains, pulses, roots and tubers (CGPRT) in poverty alleviation through diversification, which could enhance the betterment of life in rural areas.

Agriculture is made up of the crop, forestry, livestock and fisheries sub-sectors. This study deals primarily with crops and the scope of diversification is also limited to crop diversification. The study consists mainly of field surveys conducted in agro-ecologically distinct sites in two townships in Myanmar, namely Thonegwa Township in the delta area and Monywa Township in the central dry zone. Survey design covers the profiles of the study sites, respondents and their households, overall conditions of secondary farming, the marketing and industrial processing systems, the effect of agricultural diversification on poverty alleviation, risk mitigation and environmental conservation, policy impact, infrastructure and institutional support, and the potential and constraints for enhancing sustainable agricultural diversification at the study sites.

The case study confirms that green gram, among other pulses such as pigeon pea, is an important secondary crop in Myanmar. Demand for this crop has increased in recent years mainly due to increased exports. An emerging market is developing and processors in Myanmar are coping well with the change. Pulses are the core of multi-crop farming and represent diversification potential, especially in rainfed areas. The adoption of pulses by the farmers could absorb labour, encourage water use efficiency and raise exports, which will promote poverty reduction, employment creation, income generation, risk mitigation, and sustainability in terms of ecology, the economy and social aspects.

Even under the prevailing liberal market atmosphere, daily expenses per head in all study villages were found to be less than US\$ 0.5 due to the low level of income. The

spread of pulse production has generated almost 30 days of constant employment for both males and females at the harvest time of green gram, mainly in February in Thongwa. One acre of pigeon pea in the dry zone can provide enough fuel for one person for one year. Pulses can contribute not only to create employment, income and ecologically friendly conditions for the majority of the rural population but also to benefit producers, marketing intermediaries and landless labourers, in other words, a win-win situation.

The potential for growth in crop production in the study areas includes firstly, intensification of production under appropriate policy conditions through liberalization as farmers can intensify crop production for which there is a comparative advantage. Secondly, diversification from the prevalent cropping pattern to a financially more rewarding combination of crops is encouraged. Diversification at the farm level will depend upon innovation by individual farmers responding to market opportunities. To be in a position to respond, access to credit, seeds and quality inputs are essential.

Harmonization between a pro-poor approach to secondary crops, such as pulses, and primary crops, such as rice and wheat, is a policy related matter. Forcing a farmer to cultivate paddy when the soil is not suitable, when it is not profitable or when the farmer does not have the experience or financial resources to provide water and fertilizer as and when needed is neither beneficial to the state nor the farmer. The major policy recommendations, which are synchronized with the recommendations of the AGRIDIV phase I report, include improving research and development, quality input supply, soil conservation and soil fertility, poverty alleviation, credit, market research and information, land policy linked with productivity and improvements in the processing industry, which is still in its infancy in Myanmar.

1. Introduction

1.1 The first phase study's main findings

Myanmar is an agro-based country and agriculture is still the most important economic sector as the main source of livelihood for about 75 per cent of the people living on agriculture-related activities. Agricultural diversification could contribute as an effective strategy or tool in terms of environmental protection, depletion of forests, creation of a social safety net and risk mitigation for the rural poor. Moreover, diversification of agriculture is one of the ways to achieve sustainable rural development, especially in the area of fragile ecosystems where high levels of agricultural inputs cannot provide good economic returns. It could especially reduce risk for resource-poor farmers. At the same time, diverse agricultural systems can also contribute towards environmental protection from the viewpoint of resource conservation.

In the phase I study, complementary national level and field level studies were conducted to explore the potentials, prospects and constraints of both horizontal and vertical agricultural diversification to forge congruence between enhanced productivity, sustainability and profitability. The data and information on key CGPRT crops in Myanmar namely maize, pulses including soybean, and potatoes are focused and collected. The Simpson Index of Diversity (SID), ranging between zero and one, was used to measure horizontal diversification at the national level. The more diversification there is in a country, the closer the index is to one. The SID of Myanmar ranged from 0.62 to 0.69 in 1998 to 2000 indicating that there is still enough room to promote crop diversification in Myanmar.

In Myanmar, more than 60 different crops in 8 groups, namely, cereal crops, oilseed crops, pulses, industrial crops, culinary crops, vegetables, fruits and other crops are grown based on the prevalence of different agro-ecological zones. The total cropped area, including both seasonal and perennial crops, amounts to 15.85 million hectares with a cropping intensity index of 149 in 2001-2002. The cereal crop constitutes the largest share with 46 per cent of the multiple crop-sown area followed by pulses and oilseed crops.

Pulses are one of the most important crops from the viewpoint of the national economy, ecology and social impacts. Pulses are a major foreign exchange earner of Myanmar and can slow forest depletion and enrich soil fertility where low levels of fertilizers

are used due to the lack of capital of the poor farmers. At the same time, pulses serve as stable income generators for poor farmers, especially in the dry zone.

The cost and return ratios of rice versus pulses varies depending upon the production area. For instance, the cost and return ratio of irrigated summer rice and non-irrigated black gram in the delta area (rice surplus area) are 1.15 and 1.97 but in the dry zone (a rice deficit area), 1.77 and 1.79 respectively. This is because of the difference in prices in the respective areas.

Agriculture in Myanmar is still production oriented; not yet rural welfare oriented. Rice is a national priority crop and the government accords top priority to increase rice production to achieve self-sufficiency not only at the national level but also at regional levels. This can lead to negative environmental consequences. In terms of trade, there are two types of foreign trade in Myanmar, namely, normal trade from Yangon Port and border area trade, which account for 85 per cent and 15 per cent of total trade respectively. Myanmar is an active participant of the ASEAN Free Trade Area (AFTA) and a member of WTO. As a result of trade liberalization, production of key CGPRT crops has significantly increased as export commodities. In future, Myanmar will have to depend on its processing and manufacturing industries, mainly labour-intensive, resource-based manufacturing.

Myanmar still operates a production-oriented agricultural system. Improving or stabilizing the income of farmers and rural people could be achieved through the diversification of farming activities and the freedom of choice to choose the line of activities for the betterment of life. Increases in production should only be pursued if consistent with improvements in income under the given condition that food shortages are not a critical problem.

CGPRT crops, generally secondary crops after rice in Myanmar, are an important farming resource, particularly for the poor in upland marginal areas like the central dry zone where other agricultural resources and employment opportunities are limited. Generally, CGPRT crops are unable to contribute directly to substantial increases in rural income but these crops can significantly secure and stabilize the income level of the poor in particular.

There are many constraints but also a lot of potential linking the policy, socio-economic and technical factors. Land policy, insufficient credit, regional zoning of specific crops based on agro-ecological suitability without considering profitability, rice-biased policies, unavailability of mechanization for timely land preparation, weakness in research and extension for technology transfer and inadequate input supply are constraints to the promotion of crop production and diversification, including CGPRT crops. However, low rainfall, supplementary rural energy, a liberal agricultural policy, market demand, risk

mitigation and the stabilization of income in marginal areas are the pushing factors for CGPRT crop production and diversification.

It is necessary to improve the research capacity and the human resource development (HRD) programme for CGPRT crops, investment in / for agriculture, distribute fertilizers and seeds, rethink land policy and land resource development, stabilize the financial sector, involve the private sector in agricultural credit and activities, and diversify the farming system for the welfare of the farmers.

1.2 Research issues

Fortunately, food security, especially food availability, has never been a problem in Myanmar. The country has never, hitherto, experienced food shortages as additional rice can be produced to meet the national requirement. However, at the regional level, rice production is not sufficient to meet the local demand in some regions. The delta region has surplus rice production, while other regions located in the northern and central dry zones of the country are rice deficit. Therefore, every year after harvest, rice is traded from south to north as the surplus production is transported to the rice deficient areas. At the household level, based on Central Statistical Organization (CSO) 1997 surveys, 22.4 per cent of rural people and 23.9 per cent of urban people live below the poverty line. Poor people, especially landless and small farmers in rural areas are unable to purchase sufficient food to meet their household requirement because of the low income received from farming and non-farming activities. This suggests that the strategy to achieve food security at the household level through an increase in rice production alone is not very reliable. A strategy of achieving food security through diversification and raising the incomes of the rural households needs to be adopted.

Similarly, Kayah state, Chin state and Magwe division have much higher incidences of poverty than other states and divisions. Although the incomes of landless farmers, small farmers in rainfed and semi-arid areas, and shifting cultivators in the mountainous region are extremely low, the official strategy has focused mainly on increasing rice production to meet domestic demand, but not the income level of farmers. Poverty can be reduced only if a specific programme is designed and targeted to benefit the poor through the selection of project areas where the poor are concentrated, and through the types of activities which the poor can participate. Therefore, broad based agriculture is required to reduce poverty and to achieve food security. To achieve broad based agriculture, further studies and research are necessary in the areas of land use policy, foreign exchange rates, marketing policies

particularly for export commodities, improvements in the research capacity and human resource development (HRD) programme on CGPRT crops and involvement of the private sector in agricultural credit and input supply.

1.3 Study objectives

1.3.1 General objective

The overall goal of the phase II country study is to make sound policy recommendations for the promotion of sustainable agricultural diversification through improving employment opportunities and generating income for the rural poor based on CGPRT crops, namely, pulses so as to significantly reduce poverty in rural areas of Myanmar.

1.3.2 Immediate objectives

In order to achieve the goal, the following objectives were set:

1. To analyse the impact of agricultural diversification on poverty alleviation, risk mitigation and environmental conservation in the study areas.
2. To clarify the constraints and opportunities faced by farmers and small-scale producers of CGPRT crops, especially pulses.
3. To investigate the industrial importance of CGPRT crops and their products.
4. To analyse the impact of agricultural diversification on poverty alleviation, risk mitigation and environmental conservation.
5. To analyse government policies, institutional support and infrastructure provision for the development of pulse production and processing
6. To formulate strategic proposal measures to counter the inhibiting factors of CGPRT crops in production expansion and their industrial absorption at the national and local levels.

1.4 Scope of the study

Generally, agriculture comprises of crop, forestry, livestock and fisheries sub-sectors. This study deals primarily with crop agriculture and the scope of diversification is also limited to crop diversification. This study is based on field surveys for the successful implementation of the project. Survey design covers the profiles of the study sites, respondents and their household, the overall condition of CGPRT farming, mainly pulses, its marketing and industrial processing system, the effect of agricultural diversification on

poverty alleviation, risk mitigation and environment conservation, the impact of policy, infrastructure and institutional support, and the potential and constraints for enhancing sustainable agricultural diversification at the study sites. Both primary and secondary data are used in this phase II study. The primary data is collected from field surveys and the secondary data, both qualitative and quantitative, is collected from public and private institutions at regional and local levels.

2. Conceptual Framework and Methodology

2.1 Conceptual framework

The conceptual framework of the study follows the AGRIDIV Roadmap. This study is devoted to make in-depth analysis of the survey information and collect data in relation to agricultural diversification based on pulses and their industrial demand, which could increase employment opportunities and the income generation of the rural poor.

2.2 Research methodology

2.2.1 Selection of crops

The natural diversity of Myanmar with favourable soil and water resources provides a wide range of tropical, sub-tropical and temperate cropping options with considerable opportunities for growth through intensification, expansion and diversification.

In Myanmar, more than 60 different crops are grown based on the prevalence of different agro-ecological zones. The total cropped area, including both seasonal and perennial crops, amounted to 15.85 million hectares in 2001-2002 with a cropping intensity of 149 per cent. These crops are generally grouped into six categories: cereals, oilseeds, pulses, industrial crops, culinary and other crops. Among these crops, cereal crops make up the largest share (46 per cent) followed by pulses (20 per cent) and oilseed crops (17 per cent).

There are more than 15 kinds of pulses grown in Myanmar, of which green gram, black gram, and pigeon pea are the major ones in terms of sown area and exports. Pulses are a good source of vegetable protein for consumers after meat, egg and fish, and are considered as important crops for domestic consumption and export. From an economic standpoint, pulses are important not only for farmers, traders and processors but also for the country as a whole because the production of pulses and their marketing play vital roles in the agricultural sector and the economy. There is high export value in the agricultural sector. Farmers, traders, transporters, millers of pulses and local exporters are all involved in the marketing chain. Therefore, this phase II study focuses primarily on pulses to analyse for the above-mentioned reasons.

2.2.2 Selection of research sites

Field studies, based on the two agro-ecologically distinct zones of Yangon and Sagaing division, serve as the basis for the analysis in the phase II study. The two study sites selected for this study were Thonegwa township in Yangon (less diversified, delta area) and Monywa township in Sagaing (more diversified, central dry zone).

Thonegwa, a lowland, rainfed area with rice-based farming systems, is one of the major growing regions for green gram after paddy but crop diversification is relatively low. On the contrary, Monywa, a mainly rainfed, semi-arid area where different types of pulses and upland crops are grown, is an important area in terms of crop diversification, marketing and processing the products of pulses, and is the main route for border trade to China and India.

In each study area, two villages, Thonegwa West (TW) and Letpangyo village (LPG) for Thonegwa township and Myayne (MN) and Segyidaw (SGD) village, for Monywa township were selected. Type of crops grown, irrigated and non-irrigated area, the extent of diversity of crops and processing of their products, accessibility to the nearest town and the extent of landless people are the factors taken into consideration in the selection of the study villages.

2.2.3 Selection of respondents

A simple random sampling technique was used to select respondents with the assistance of the village level Peace and Development Council (PDC) and extension managers from the Myanmar Agriculture Service of the respective areas. A structured interview of selected farm households was conducted to investigate the production and consumption situation of pulses in the study area during the survey period. Moreover, this survey approach was supplemented by focused group discussions with villager elders, knowledgeable villagers and representatives from community-based organizations like women and youth associations. Different types of local traders and small-scale entrepreneurs were interviewed to analyse the marketing and agro-processing system of pulses.

A total of 94 farmers and 20 traders and processors were selected for interview. Ten respondents from each area for traders, processors and entrepreneurs have been interviewed to find out the employment and income effect of diversified agricultural systems at the farm level, distribution level and industrial processing level.

2.2.4 Time frame of the study

The time frame of the phase II study was from August 2004 to May 2005, which can be broken down as follows:

- Collection of information on study areas (August 2004)
- Formulation of questionnaires and preparation for field study (September 2004)
- Dispatch of field survey teams for four villages in two study areas (November 2004)
- Compilation and tabulation of survey data (December-January 2005)
- Review and analysis of survey results (February 2005)
- Report writing (March-May 2005).

2.2.5 Methods of analysis

When analyses or assessments of collected data and information are conducted, simple descriptive statistics and measures of central tendency such as mean, maximum and minimum are used. Moreover, the dependency ratio, sex ratio, income distribution for economic analysis, trends, seasonal calendar, diversification index and cropping intensity for agricultural system analysis, cost and revenue structure and profit margins for farmers, traders and industrial processors are calculated. Furthermore, the price competitiveness of exportable pulses was analysed in this study.

3. Profiles of the Study Site, the Respondents and Their Households

3.1 Profiles of the study site

3.1.1 Geographic and administrative setting

Geographically, there are six distinct regions in Myanmar, namely 1) western mountain ranges; 2) northern mountain ranges; 3) eastern mountain ranges; 4) delta area of the Ayeyarwaddy and Sittaung rivers; 5) coastal strips; and 6) the central plains and dry zone. However, administratively, Myanmar is divided into seven states: Kachin, Kayah, Kayin, Chin, Mon, Rakhine, and Shan, and seven divisions: Sagaing, Mandalay, Magwe, Bago, Ayarwaddy, Yangon, and Tanintharyi.

Yangon division has four districts and Yangon is the capital of the division and the country. Thonegwa township is part of the southern district of Yangon division and is 35 miles away from Yangon. It has a long history and has been situated on the join of three creeks since 1152. It is one of the major green gram production areas of Myanmar. Thonegwa township has 64 village tracts and 166 villages. It is surrounded by Thanlyin township to the west, the gulf of Mottama to the east, Kyauktan township to the south and Khayan township to the north and the total area is 322 square miles.

Similarly, Sagaing division has eight districts including Monywa district, which has eight townships including Monywa township, one of the fastest growing intermediate cities in Myanmar over the past few decades. Monywa is on the main route for border trade to China through Mandalay, which was the capital of the Konebaung dynasty and, currently, the second capital of Myanmar, and India. There are 64 village tracts in Monywa township with a total of 194 villages. It is surrounded by the Chindwin river and Yinmarbin township to the west, Ahyardaw township to the east, Chaungoo township to the south and Butalin township to the north and its total area is 266 square miles. The survey was conducted in four villages namely: Thonegwa West (TW) and Letpangyo (LPG) villages in Thonegwa township in Yangon division, and Myayne (MN) and Segyidaw (SGD) in Monywa in Sagaing division.

Demographically, the population of Myanmar was recently estimated to be 52.23 million in 2003 with a 2.02 per cent growth rate. It is projected to rise to 60 million people by

2010. Of the total population, males constitute 25.42 million or 49.71 per cent and females 25.72 million, or 50.29 per cent.

The population of Thonegwa township is 146,130 and the number of males and females is 72,480 and 73,650 respectively. Over 370 thousand people reside in Monywa township and among them, males constitute 182,119 and females 188,207.

Table 3.1 Demographic features of the study area

Township/ Division	Total population (thousands)	Number of males (thousands)	Percentage of males	Number of females (thousands)	Percentage of females	Sex Ratio (M/F)
Thonegwa/Yangon	146.130	72.480	49.605	73.650	50.40	98.41
Monywa/Sagaing	370.326	182.119	49.18	188.207	50.82	96.77
National	52 232.6	25 964.8	49.71	26 267.8	50.29	98.83

Source: Statistical Year Book of respective townships.

3.1.2 Socio-economic profile

Most of the households in the study areas, as in the rural communities of Myanmar, live in their own houses. Even the poor landless households have either bamboo huts of their own in the compounds of their better-off relatives or live in the houses of their relatives who may live close to their land known as "*kwin*" during the cropping season. There are no rent-paying tenants as such in the villages. Some families who temporarily live in the homes of "*kwin*" may even be paid for looking after the houses of such households.

It should be mentioned that the housing conditions of the rich and the poor in any village also reflect their economic and social status. While there are a few exceptions, poor landless households or those with little land generally live in single storey bamboo houses, whereas better-off farm families live in two-storey or more, spacious and better-kept wooden houses. However, the uniformity in household (HH) structure and construction materials in any village is such that no differentiation can be made between the homes of households with medium-sized holdings, between 7-10 acres, and those with holdings of more than 10 acres.

Table 3.2 Socio-economic features of the study areas in 2003

	Yangon division	Sagaing division	National
Population	9 002 515	3 926 374	52 232 577
Number of households	1 910 899	564 763	8 469 502
Average HH size	4.7	7.0	6.2
Cropped area (acres)	1 878 363	4 852 296	41 320 919
Poverty Rate	16.7	24.9	22.9
-rural	16.7	24.3	22.4
-urban	16.6	27.6	23.9

Source: Agriculture Sector Review Project (DAP).

In Myanmar, education is subsidized and provided by the state. Thus, the supply side of education, at least at the primary level, is not much of a problem. The teacher-student ratio, at around 1: 30 for the primary level is also quite favourable. This is partly because of the attention given to this matter by the Department of Basic Education (DBE) under the Ministry of Education and in some villages, additional teachers are provided at the expense of the villagers. Therefore, at the moment, there is a problem in the demand side of education as going to school is time consuming and costly.

An interesting comment was made during the focus group discussion in LPG, Thonegwa with village elders of over 60 years of age. According to the comment, in the past, a whole family could live comfortably from the farming work of just one adult, whereas now the whole family has to work from dawn to dusk to make ends meet; and children aged 12 to 13 no longer have time to play as they have to work alongside their parents in order to maintain their living standards in the face of rising commodity prices.

While the above assertion probably captures the spirit of the times, it overlooks the role of women and children in the family. For instance, since the olden days, the women in peasant families usually share the work of planting and harvesting. As for the children of most peasant families, from an early age they have to tend cattle and buffalo, fetch water and collect firewood depending on their physical strength. However, it was probably not full-time work. The difference between then and now was that as the village economy has become less and less sufficient with the passage of time; everyone in the family has to work hard in order to earn enough cash to buy the things that they had become accustomed to, including durable goods such as bicycles or televisions. This general situation was found to be more or less the same in all the study villages.

In terms of health, only one study village, namely LPG in Thonegwa has a rural health centre. The other villages surveyed have only midwives or auxiliary midwives. People in all the study villages rely on hospitals or private clinics in nearby towns for treatment of any serious illnesses.

As for public health, and in particular with regard to safe drinking water, villages in Thonegwa rely on ponds and villages in Monywa depend on tube wells and underground water. Although the ponds are not protected in Thonegwa, they do not seem to pose any serious health problems. With regards to sanitation, all the villages in this study had experiences of proper sanitation schemes at one time or another. As a result, almost all of the households in the study villages have a toilet facility, the most common type being a fly-proof pit latrine.

3.1.3 Agricultural profile

The soil classification system in use recognizes 24 different soil types in Myanmar and the land utilization of classification is based on seven types by the Settlement and Land Record Department under the Ministry of Agriculture and Irrigation. Generally, the country is divided into four major regions: the delta region, coastal region, central dry zone region and the hilly region.

Therefore, the two ecologically distinct zones of Yangon and Sagaing division were selected in the phase II study. The farming systems and cropping patterns of the two townships depend upon soil type, rainfall and the availability of water. The farming systems of the study areas can be broken down as follows:

- (i) rainfed cultivation;
- (ii) cultivation using residual soil moisture after the rainy season; and
- (iii) irrigated cultivation in the dry season.

Table 3.3 shows the situation of crop diversification in the study area and it has been observed that crop diversification is very site specific in Myanmar as the SID and cropping pattern of Thonegwa in Yangon and Monywa in Sagaing are totally different.

Table 3.3 Crop diversification situation of the study areas in 2003

	Thonegwa	Monywa	National
Net sown area (thousand of acres)	145.742	97.247	27 270
Total sown area (thousand of acres)	253.999	182.440	41 320
Cropping Intensity (percentage)	174	187	152
Crop diversification (SID)(2003)	0.509	0.890	0.828

Source: DAP.

According to the production statistics shown in Table 3.4, differentiation of type of crop grown can be seen in Thonegwa as a rainfed, lowland area and Monywa of the central dry zone area. Although farmers in Thonegwa have generally grown rice during the rainy season and green gram during the cool season every year since 1999, farmers in Monywa township apply different cropping patterns to avoid risk depending on the weather and the availability of irrigated water.

Table 3.4 Type of crop grown in the study area

(acres)

Crop	Thonegwa, Yangon		Monywa, Sagaing	
	(1999-2000)	(2002-2003)	(1999-2000)	(2002-2003)
Rice	142 820	145 356	7 962	8 200
Pedisein (Green gram)	97 790	101 462	7 166	9 050
Pe lun (Cowpea)	1 340	466	557	600
Groundnut	2 419	882	4 440	4 500
Sunflower	3 428	5 833	8 918	15 550
Pesingone (Pigeon pea)	0	0	15 020	17 600
Matpe (Black gram)	0	0	0	100
Kalape (Chickpea)	0	0	9 492	10 000
Sultapya (Lima bean)	0	0	11 140	11 200
Butter bean (Lima bean)	0	0	676	500
Other bean	0	0	3 159	4 200
Sesame	0	0	38 573	44 700
Wheat	0	0	5 626	6 600
Cotton	0	0	12 305	13 500
Maize	0	0	12 755	11 600
Sorghum	0	0	100	750
Vegetables	0	0	5 660	16 180
Culinary crops	0	0	3 162	3 475
Other	0	0	7 594	4 135
Total	247 797	253 999	154 305	182 440

Source: Respective townships.

Significant growth in green gram cropped area has been achieved as a result of double cropping in Thonegwa following monsoon rice. The cropped area under green gram was also increased in Monywa with the introduction of a cropping pattern using upland rice and sesame followed by early maturing legume crops during the late monsoon. Pigeon pea is mainly confined to Monywa but its cropped area has increased due to its drought resistance and its value as a source of wood fuel and as a windbreak. Pigeon pea is normally intercropped with sesame without affecting the yield of sesame. Chickpea is mainly grown as a sequential crop with rice for external trade, and the price of chickpea is fairly attractive.

3.1.4 Extent of unemployment and poverty

In Myanmar, there are 4.8 million farm families involved in agriculture and livestock farming. Of which, 63 per cent of the peasant families own less than 2 hectares (5 acres) of land (farmers in this group are landless and small-scale), 25 per cent own 2 to 4 hectares (5 to 10 acres) and the remaining 13 per cent own more than 4 hectares (greater than 10 acres). Therefore, the majority of farmers are landless and small-scale. Their source of income comes mainly from farming activities and they have no choice except to work as agricultural labourers.

Table 3.5 shows the number of households involved in farming in the study villages by size of landholding. It can be seen from this table that landless households constitute the

largest group of rural households in all of the study villages ranging from a low of 40 per cent in TW village, to a high of 64 per cent in LPG. The average for the four villages is 52 per cent. Since the estimate for the national average of landless in Myanmar is around 40 per cent, the landless percentage in most of the study areas is above the national average. There are structural issues, particularly for rural areas, as a significantly higher proportion of households are landless. They have no other option than to seek wage employment, which is largely dominated by casual labour on agricultural farms. The increasing pressure to generate extra income is felt by landless and small farmers and as a result they seek other income opportunities, which typically tend to be low-skilled, low wage jobs.

Table 3.5 Number of households by size of landholding

Size of holding (acreage)	Thonegwa (TW)		Thonegwa (LPG)		Monywa (MN)		Monywa (SGD)	
Landless	168	(40%)	597	(64%)	151	(43%)	288	(48%)
0-3	39	(9%)	81	(9%)	60	(17%)	43	(7%)
3-5	43	(10%)	48	(5%)	45	(13%)	58	(10%)
5-7	50	(12%)	51	(5%)	15	(4%)	36	(6%)
7-10	63	(15%)	24	(4%)	11	(3%)	41	(7%)
10 and above	12	(4%)	69	(7%)	3	(1%)	50	(8%)
Others (not involved in agriculture)	43	(10%)	58	(6%)	66	(19%)	90	(14%)
Total	418	(100%)	928	(100%)	351	(100%)	606	(100%)

Source: Respective townships.

3.1.5 Extent of environmental problems

The intensification of agriculture can affect not only farm population but also the resource base on which it depends. At the moment, the agricultural sector gives much attention to increase production but not enough attention to agriculture-related environmental problems such as deforestation and depletion of wetlands leading to the loss of biodiversity and soil erosion control. For example, opening new land frontiers has caused extensive pressure on existing forest areas and swamplands, which threaten the environmental and ecological condition of the uplands and the lowlands of the dry zone and the delta.

Although each ecosystem has its own unique problem, a common concern was identified in two study areas: soil fertility needs to be improved. The major specific concerns for Thonegwa township (delta area) are poor soil fertility due to lower levels of fertilizer application than recommended due to the high cost of chemical fertilizers, inefficient soil nutrient management and low yields associated with the planting of poor quality seeds. The problem concerning the environment in Monywa township (dry zone area) is the low and

erratic rainfall pattern resulting in low yields and crop losses, low soil fertility and soil erosion caused by water and wind.

3.1.6 Condition of public infrastructure relevant to CGPRT farming and industry

Two villages, Thonegwa West and Letpangyo were chosen from Thonegwa township, Yangon division. Although both villages have similar cropping patterns, using rain-fed cultivation for rice and residual soil moisture for green gram, Thonegwa West village has better access to Thonegwa town and Yangon. TW village is located about 5 miles from Thonegwa town and is beside the Yangon-Thonegwa main road. Access to town is good. Most of the farmers use bicycles to go to town. Some parts of the village straddle a river making water transportation viable.

LPG village is located some 10 miles from Thonegwa town and between the Thonegwa- Khayan main road. In the rainy season, the main transportation is the waterway and villagers use bicycles and bullock carts in the dry season. There is only one paved road connecting Thonegwa and Yangon. This road also goes to Bago through Khayan township but the road narrows after Thonegwa township.

Similarly, two villages, namely Myayne and Segyidaw, were selected from Monywa township, Sagaing division. The types of crop available, diversity of crop and cropping pattern, and sources of water for crop cultivation are the criteria for the selection of crops. MN village is located about 5 miles from Monywa on the Monywa-Mandalay highway. As there are passenger buses running to and from these two towns throughout the day, MN village has good access to Monywa. SGD village is situated about 15 miles from Monywa and 10 miles from MN village, including about 2 miles of cart tracks. This second village in Monywa township is situated on the approach to the highland area and has less access to Monywa town than MN village.

In terms of government intervention, there is a role for the state to supply essential services like infrastructure such as roads, market access, irrigation and rural electricity. Apart from SGD, the rest of the study villages in Thonegwa and Monywa township have good access to roads and markets to trade pulses.

There is one retail market in the centre of Thonegwa town. There are many wholesale and retail shops surrounding the market. Next to the riverbank there are also some traders' shops. Therefore, the retail market is very important for the marketing carried out by farmers and traders. Moreover, citizens of Thonegwa can access market information from Yangon (Bayint Naung Trade Centre) day by day. Similarly, Monywa is a big city and it

is an important route for border trade to India. Monywa has a crop exchange centre and it is also one of the industrial zones of Myanmar. Therefore, Monywa people can access market information easily from the Monywa Crop Exchange Centre.

Although there are township level offices of the Myanmar Agriculture Service (MAS) and Settlement and Land Record Department (SLRD) under the Ministry of Agriculture and Irrigation in Thonegwa township, Monywa has a township office, district office and divisional office of the various departments under the Ministry of Agriculture and Irrigation (MOAI).

Table 3.6 shows the availability of irrigation for crop production in the study area. At present, there is no irrigation facility in Thonegwa township; it is a completely rainfed, lowland area. Although Monywa township is situated in the dry zone, it has different types of irrigation facilities.

Table 3.6 Affected area by type of irrigation facilities (acre)

Irrigation Type	Thonegwa	Monywa
Dams/weirs	0	5 372
Village ponds	0	14 498
Well/borehole	0	19 944
River pumping	0	0
Windmill	0	0
Others	0	0
Total	0	39 814

Source: Respective township.

3.2 Profile of the respondents and their households

3.2.1 Profiles of the respondents

The study covers a sample of 94 respondents in two townships. Respondents were selected after thorough discussion with village level extension staff from MAS and village level Peace and Development Council. Therefore, based on the different levels of age and their ownership of assets, respondents were chosen to take part in the survey to gain a balanced perception. Respondents' age, education and their occupation are given in Table 3.7.

Table 3.7 Respondent profile

Particulars	Thonegwa (TW)	Thonegwa (LPG)	Monywa (MN)	Monywa (SGD)	Total (percentage)	
Age						
30-40	8	2	6	2	18	(19)
40-50	6	2	6	8	22	(23)
50-60	10	10	0	6	26	(28)
60+	6	12	6	4	28	(30)
Education						
- Monastery education	10	16	0	0	26	(28)
- Primary school education	16	10	18	20	64	(67)
- High school education	4	0	0	0	4	(5)
- Graduate	0	0	0	0	0	(0)
Major occupation						
- On farm	30	26	18	20	94	(100)

Source: Field survey.

Table 3.7 shows that most of the respondents have a basic level of education. All of the respondents' major occupation is farming as they are rural people living in rural areas and have concentrated on farm production for many generations.

3.2.2 The household profile

Size of the households

It can be seen from Table 3.8 that the average household size is 4.97. Across the village, however, household size varies from a low of 4.03 in LPG to a high of 5.42 in TW. These figures are a little different to the national average household size of 5.39 in 2001. The large average household size in TW may be accounted for by extended families comprising of young married couples and their families who have yet to set up a house of their own.

Table 3.8 Size of households in the study area

Village tract	Number of villages	Number of males	Number of females	Total population	Total number of households	Average size of household
TW, Thonegwa	2	1 306	960	2 266	418	5.42
LPG, Thonegwa	5	1 838	1 904	3 742	928	4.03
MN, Monywa	3	862	996	1 858	351	5.29
SGD, Monywa	4	1 470	1 645	3 115	606	5.14

Source: Field survey.

Available labour force

The distribution of the sample population by age shows that the population under 15 years of age accounts for 18 per cent of the total population and that between 15-59 years of age and 60 and over, 70 and 12 per cent respectively (Table 3.9). The distribution of population by age was remarkably even. The percentage of the population under 15 years

of age varied from a low of 15 per cent in SGD, to a high of 22 per cent in MN. Similarly, the proportion of population 60 years and older varied from a low of 4 per cent in TW to a high of 19 per cent in LPG.

Table 3.9 Distribution of sample population by age group

Village	Number of HH	Age (0-15)	Age (16-60)	Age (60+)	Total population
TW, Thonegwa	30	30 (19%)	122 (77%)	6 (4%)	158 (100%)
LPG, Thonegwa	26	22 (16%)	88 (65%)	26 (19%)	136 (100%)
MN, Monywa	18	28 (22%)	86 (68%)	12 (10%)	126 (100%)
SGD, Monywa	20	16 (15%)	74 (68%)	18 (17%)	108 (100%)
Total	94	96 (18%)	370 (70%)	62 (12%)	528 (100%)

Source: Field survey.

Given the remarkably even distribution of the population by age across the villages, the percentage of dependency ratios (people aged 0-5 plus those aged 60 and above divided by the number of people aged 16-60), shown in Table 3.10, varied widely from a low of 29.51 in TW to a high of 54.55 in LPG. The dependency ratio found in the survey is lower than the national level dependency ratio which is nearly 69 per cent. However, the differences in the dependency ratios amongst the villages is not particularly relevant because by the age of six or seven, children in rural communities, and especially in poor families, have to work.

Table 3.10 Dependency ratio and sex ratio (percentage)

Village	Dependency ratio	Sex ratio
TW, Thonegwa	29.51	136.04
LPG, Thonegwa	54.55	96.53
MN, Monywa	46.51	86.55
SGD, Monywa	47.22	89.36

Source: Field survey.

The distribution of population by sex as shown by the sex ratio (namely the number of males per 100 females) reveals that there are more females than males in most of the villages except TW. This finding is in line with the national average of around 98 per cent for both 1998 and 2001. Ordinarily, one would expect males from households to migrate to urban centres or abroad in search of better employment opportunities. One of these sorts of migration was found in TW, which is close to Yangon. The lack of physical mobility among the rural population may partly be accounted for by the element of security provided by the family and the village community. For example, it is not easy to borrow money in times of need in a city or in another village. In their own village, the promise of being available for work in the next season could serve as collateral. Then again, the cost of mobility in the

form of transportation and other expenses may be high relative to the incomes of rural households. Thus, even though life in the village may be harsh, the above considerations may prevent even the poorest from migrating to the city or to another village.

Table 3.11 Number of graduates in the working age group of sample households

Sample village	Population in working age group	Number of male graduates	Number of female graduates	Total number of graduates	Percentage of graduates
TW, Thonegwa	122	4	4	8	6.6
LPG, Thonegwa	88	0	5	5	5.7
MN, Monywa	86	3	3	6	6.9
SGD, Monywa	74	0	5	5	6.7

Source: Field survey calculation.

Table 3.11 shows that the percentage of graduates in the working age group (aged 16 to 60) lies between 5 and 7 per cent. The highest percentage is found in Myayne village. The reason is that most of the farmers in this village grow onion, which is a profitable crop compared to other crops and therefore, the education budget of this village is higher than the other three villages.

Annual income and its source

This study follows a number of other studies in using household expenditure to assess the economic status of rural households. In practice, respondents would rather not discuss their income situation as they are afraid of being taxed more. The economic status of rural households largely depends upon the farm size.

Table 3.12 shows mean monthly household expenditure in the study villages. It is revealed from the table that the average rural household spends at least nearly 60,000 kyats per month. Putting it another way, on a per head basis and setting aside the age and sex, 13,297 kyats per head per month appears to be the average amount of expenditure required to live in a village. This finding is most interesting because there was little variation between the villages in Thonegwa township but wide variation between the villages in Monywa township.

It should be noted, however, that the monthly expenditure of the study villages includes imputed expenditure, which includes the value of farm output for own consumption plus that obtained from living off the land or common property resources such as fishing.

Table 3.12 Household expenditure per month in the study villages (kyats)

Type of expense	Thonegwa (TW)	Thonegwa (LPG)	Monywa (MN)	Monywa (SGD)
Food	33 954	36 155	45 894	34 189
- Agri food (cereal, oil, pulses and veg)	18 795	18 897	31 687	27 436
- Non-agri food (meat, egg and milk)	15 159	17 258	14 207	6 753
Non- food	35 737	34 686	58 649	24 752
- Living	2 866	7 001	6 203	5 137
- Clothing	4 618	4 804	6 426	2 762
- Health	2 867	4 533	4 829	4 135
- Education	8 467	2 993	25 088	3 685
- Other	16 919	15 355	16 103	9 035
Total	69 691	70 841	104 543	58 943

Source: Field survey.

Economic analyses of farms in Thonegwa and Monywa townships suggest that farmers in these areas tend to suffer from higher rates of poverty, reflecting inadequate resources for household needs. Table 3.13 shows a breakdown of household expenditure per month for study villages. Of the total expenditure, 32.62 per cent and 50.42 per cent are spent on agricultural (crop) food and non-agri food (meat, eggs, etc.) respectively. Only 6.78 and 11.66 per cent are used for health and education respectively. In all the villages, the relative share spent on food was over 43 per cent of their total expenditure with the highest at 58 per cent in SGD. Among the villages, costs in SGD are the highest in consuming rice (29 per cent) and LPG is the lowest (13.35 per cent). This clearly shows rural consumption patterns whereby three meals of rice may be consumed in a day.

Table 3.13 Share of food expenditure in total expenditure (percentage)

Expenditure type	Thonegwa (TW)	Thonegwa (LPG)	Monywa (MN)	Monywa (SGD)	Average
Food expense	48.72	51.04	43.90	58.00	50.42
- Agri food	26.97	26.64	30.31	46.55	32.62
- Rice	13.68	13.35	15.14	29.09	17.82
- Oil	7.50	6.54	5.74	09.62	7.34
- Pulses	1.04	1.61	1.87	1.51	1.50
- Potato	1.01	1.08	0.78	0.97	0.96
- Others	3.74	4.06	6.78	3.83	4.60
- Non-agri food	21.75	24.36	13.59	11.45	17.79
Non-food expense	51.28	48.96	56.10	42.99	49.83
- Living	4.11	9.88	5.93	8.72	7.16
- Clothing	6.63	6.78	6.15	4.69	6.06
- Education	12.15	4.22	24.00	6.25	11.66
- Health	4.11	6.40	9.62	7.01	6.78
- Others	24.28	21.68	15.40	15.33	19.17
Total	100	100	100	100	100

Source: Field survey.

The distribution of monthly expenditure across villages reveals to some extent regional differences in the availability of food as well as the economic status of the villages.

In each Thonegwa village, 27 per cent of total expenditure is spent on agri-food, whereas in the Monywa villages, 30 per cent and 47 per cent are spent on agri-food respectively. Based on Table 3.14, the daily expense per head in all of the study villages was found to be less than US\$ 0.5 using a parallel market exchange rate of US\$ 1 equivalent to around 1,000 kyats (local currency), whereas the official exchange rate is US\$ 1 equivalent to 6.5 kyats. Among the four study villages, SGD in Monywa was seen as the lowest because it is far from Monywa town and has poor access to roads and no public transportation.

There is a clear reason why the variation of expenditure per head is larger in Monywa than Thongwa. It can be seen even without statistical analysis such as standard deviation and coefficients of variation. The agro-ecosystem in the dry zone is diverse. As a consequence, the income and expenditure level is also diverse. Among the study villages in Monywa, MN village has the highest household expenditure per month and per head because most of the farmers in this village receive profit from growing onions due to the availability of irrigation water and other profitable secondary crops such as pulses. SGT village has the lowest expenditure as a result of low income due to the lack of roads and market access, being far away from town, having a limited selection of crops, low productivity due to the sloping, eroded land and poor soil fertility. Expenditure of households in Thonegwa is remarkably even as a result of the same type of crop grown, same soil type and good access to the market.

Table 3.14 Annual expenditure per head of the study villages (kyats)

Type of expense	Thonegwa (TW)	Thonegwa (LPG)	Monywa (MN)	Monywa (SGD)
Food	76 877	83 434	87 417	68 379
- Agri food	42 555	43 604	60 356	54 872
- Non-agri food	34 322	39 826	27 061	13 506
Non- food	80 914	80 045	111 712	49 504
- Living	6 484	16 156	11 815	10 274
- Clothing	10 456	11 086	12 240	5 524
- Health	6 491	10 461	9 198	8 266
- Education	19 171	6 907	47 787	7 370
- Other	38 307	35 435	30 672	18 070
Total	157 791	163 479	199 129	117 882
Daily expense				
- Kyats/day	432	448	546	323
- \$/day	0.48	0.50	0.50	0.36

Source: Field survey.

Landholding by tenure status

Of the 67.7 million hectares in Myanmar, only 10.6 million hectares (less than 16 per cent) were under cultivation in 2001-2002 and a further 7.2 million hectares were classified

as fallow and cultivable wasteland. The remaining land area was accounted for by reserved forest (19 per cent), other woodland (29 per cent) and others (25 per cent). Table 3.15 shows more detailed land distribution in the study area. Depending upon the soil type and rainfall pattern, variations in crop type can be seen.

Table 3.15 Land distribution in study area (acres)

Type of land	Thonegwa	Monywa
Agricultural Land	147 529	97 247
- Le land (Paddy)	145 742	9 118
- Ya land (upland)	0	79 956
- Kaing land (land near riverbanks)	0	8 140
- Garden land (Orchard)	1 005	33
- Dani land (Niper palm)	589	0
- Other	193	0
Forest land	0	14 729
Unclassified land not suitable for crops	60 782	58 264

Source: Field survey.

As farmers in Myanmar have only cultivation rights to the land they occupy, there is no legal ability to sell, lease or dispose the land rights to other persons. The British rule of land records and taxation is still in operation. Therefore, land tax rates are not considerable and reach no more than 22.0 kyats per acre and may be as low as 0.25 kyats per acre. The landholding situation of farmers in the study area is shown in detail in Table 3.5.

3.3 Concluding summary

Thonegwa west and Letpangyo village in Thonegwa, Yangon; and Myayne and Segyidaw village in Monywa, Sagaing were chosen for detailed analysis of the impact of agricultural diversification. Thonegwa is a completely rainfed lowland area. TW village is located about 5 miles from Thonegwa town and LPG village is situated some 10 miles away from Thonegwa town. Landless people of TW and LPG village make up 40 and 64 per cent respectively. The extent of landless people and the proximity to town are the selection criteria of these villages in Thonegwa township.

Although Monywa is situated in the dry zone, there are different sources of water available for crops. MN is a village located about 5 miles from Monywa town on the Monywa-Mandalay highway. SGD is situated about 15 miles from Monywa town and 10 miles from MN village, including about 2 miles of cart tracks on the approach to the highland area. The types of crops grown, proximity to town, and the source of irrigation water are the chosen criteria of these villages in Monywa township.

Ninety-four respondents were selected using simple random sampling with the help of the township office under MAS. Although respondents of different ages were interviewed to obtain a holistic perspective, the educational level of them is basic and the predominant occupation is farming.

According to the survey, most of the respondents live in their own house and the housing conditions of rich and poor in any village reflect their economic and social status. Education is subsidized and provided by the state. Currently, however, there is a problem in the demand side of education because going to school is a time consuming and high-cost problem.

Only one village (LPG) has a rural health centre. The remaining villages have only midwives and auxiliary midwives. People in all study villages rely on hospitals or private clinics nearby for treatment of any serious illnesses. With regard to safe drinking water, Thonegwa villages rely on ponds and Monywa villages depend upon tube wells and groundwater. Almost all of the sample households in this study have a fly-proof, pit toilet facility.

Concerning agricultural diversification; the SID of Thonegwa (0.509) and SID of Monywa (0.890) differ significantly. Generally, Thonegwa farmers have grown rice during the rainy season and green gram during the cold season after the harvest of rice since the 1990s due to market demand, especially for export. Monywa farmers apply different cropping patterns to avoid risk due to uncertain weather and the availability of irrigation water.

Landless households constitute the largest group of rural households in all the study villages ranging from a low of 40 per cent in TW to a high of 64 per cent in LPG. The major issue contributing to the increasing amount of landless farmers is that when a son or daughter marry, the parents divide the land to give to them for their livelihood and/or they illegally sell the land to repay debt. In this regard, if poverty alleviation is the main focus for the betterment of the rural poor, there must be some other income generation activities than on-farm jobs to provide sufficient income to meet the needs of the rural people.

Among the study villages, MN village has the highest household expenditure per month and per capita expenditure as most of the farmers in this village receive profit from growing onions with the aid of irrigation facilities. SGD village is the lowest in expenditure as a result of low income due to the lack of roads and market access, being far away from town and having low productivity due to the sloping land and poor soil fertility. Household expenditure in Thonegwa villages is remarkably even as a result of the same type of crop being grown and good access to the market.

Moreover, a similar result was found in the analyses of the share of food expense in total expense. Generally, households spend half of their expenses on food and half on non-food items. Daily expense per capita ranges from 546 kyats in MN (the highest) to 323 kyats in SGD (the lowest), and in Thonegwa it is nearly 440 kyats. However, all of the study villages have less than US\$ 0.5 per person per day expenditure.

In relation to public infrastructure for farming, although Monywa has different types of irrigation facilities like water from dams, ponds and wells, there is no irrigation facility in Thonegwa. Both study areas have good access to market information as Yangon and Monywa have crop exchange centres. Thonegwa has just the township office of the MAS and SLRD under MOAI. Monywa is a relatively large and important city due to Indian border trade and it has township offices of the MAS, AMD, SLRD, ID, WRUD and MCSE under MOAI and district and divisional offices.

Inefficient soil nutrient management due to the low application rate of fertilizer can lead to poor soil fertility and soil mining in some fields in Thonegwa. Monywa has a big problem of soil degradation due to de-forestation because of population pressure, uneven intensity of rainfall and continuous growing of rice using irrigation water which contains high levels of sodium salt.

4. Analysis of CGPRT Farming System

4.1 Average size of farm operation

Table 4.1 shows the average size of farm operation in the study villages. It can be seen from the table that the lowest average farm size is in LPG (2.2 acres) and the highest in TW (6.7 acres). The reason for this is that the landless households of these villages make up 64 and 40 per cent respectively. LPG village has the highest amount of landless people. The main reason is that when a son or daughter get married, the parents divide the farm land to provide a living for the newlyweds and/or they illegally sell their land to repay debts or make investments in another area. The average farm size in Monywa village is about 4 acres. According to discussions with MN villagers, although their farm size is small, the productivity is good due to the availability of irrigation.

Table 4.1 Average size of farm operation in the study area

Village	Number of households	Net sown area (acres)	Average size of farm (acres)
TW, Thonegwa	375	2 521	6.7
LPG, Thonegwa	870	1 885	2.2
MN, Monywa	285	1 037	3.6
SGD, Monywa	516	2 169	4.2

Source: Field survey.

4.2 Patterns of cultivation

Thonegwa town, two hours by car from Yangon, is a typical rural area in lower Myanmar. During the 1990s, Thonegwa township became one of the major producing areas of green gram, one of the major exportable pulses. Before the spread of green gram, the area was a mono-crop, paddy producing area. In the dry season, crops for home consumption such as groundnut and sunflower were cultivated on a limited scale. Paddy was the only crop that could potentially provide some cash income to farmers, but due to the large volume required for home consumption and wage payments together with the state procurement quota, the commercialization of agriculture was hardly possible at that time.

The cropping patterns of the study villages are presented in Figures 4.1 to 4.4. With the spread of pulse cultivation area, the cropping pattern and system in Thonegwa township totally changed from rice mono-cropping before 1988 to a double cropping of green gram after rice in the early 1990s. Table 4.2 shows annual rainfall with a uni-modal pattern in

Thonegwa area. Rainfed paddy continues to be grown in the monsoon (May to November) and is followed by pulses cultivation (November to February).

The initial production of pulses, mainly green gram, was introduced around 1984 by the Agricultural Corporation (predecessor of the Myanmar Agriculture Service), a government agency, as a means to conduct adaptability tests in farmers' fields. However, pulses did not spread at that time due to a lack of market. By contrast, since the early 1990s, following market reform, the sown acreage has increased dramatically but there is no government pressure behind this rapid spread of sown acreage. The major driving force is the market, sometimes known as the invisible hand, with some technical support, such as improved and larger seeds, which are very much favoured by the high-end market. An appropriate rhizobium strain, produced by the agricultural research centre in Yezin and crop residue left over after manual picking of the green gram pods were very beneficial to the farmers. In the case of black gram, little crop residue is left in the field as a result of up-root-and-thresh-somewhere-else harvesting and the threshing system used.

Table 4.2 Rainfall in Thonegwa township (inches)

Month	Normal (10 years average)	1999	2000	2001	2002
January	0	0	0	0.14	0.14
February	0	0	1.4	0	0
March	0	0	0.21	0.60	0.60
April	0	11	8.55	0.10	0.10
May	13.13	9.21	21.71	21.40	18.06
June	19.51	24.61	19.96	30.05	31.69
July	30.38	20.72	14.66	20.25	18.91
August	28.59	19.85	20.81	28.14	28.14
September	19.17	17.97	23.79	26.79	26.79
October	10.35	17.23	11.82	5.56	4.16
November	7.12	2.58	0	0	0
December	0	0	0	0	0
Total	128.35	123.17	122.91	132.83	128.59

Source: Thonegwa township.

Monywa villages are located in a semi-arid area. Based on the traditional, long range forecast on intensity and the onset of the monsoon season in their area, different cropping patterns are adopted. Table 4.3 shows the rainfall situation in Monywa in the dry zone. In contrast to Thongwa in the delta area, annual rainfall is well below that of Thongwa and the rainfall pattern is bimodal compared to uni-modal in Thongwa. As a result, sorghum, pulses, onions and sesame are grown under rainfed conditions and high quality and valuable crops such as onions and vegetables are cultivated using supplemental irrigation from the underground water resource in Monywa. MN is the one and only beneficiary of underground

water in the study villages. Thus, the other study villages lack access to sources of water supply and rely only on rainfed cultivation. Most of the farmers (land owners) in the study villages can be considered as owner-operators of the farmland. One farmer found in MN was purely a tenant farmer who shared a fixed proportion of produce as rent to the landowner.

Table 4.3 Rainfall in Monywa township (inches)

Month	Normal (10-year average)	1999	2000	2001	2002
January	0.05	0	0	0.08	0
February	0.07	0.71	0	0	0.08
March	0.13	0.71	0.55	0.08	0.36
April	0.91	0.67	1.86	0.02	1.61
May	4.77	2.02	3.20	2.77	6.06
June	4.65	1.96	1.14	1.70	3.62
July	2.95	4.68	1.95	2.24	2.63
August	4.67	1.89	3.52	12.84	2.56
September	6.01	5.88	8.38	9.86	8.34
October	5.20	5.68	6.79	1.94	6.54
November	1.58	5.33	0	2.05	0
December	0.33	0	0	0	0.16
Total	31.32	29.53	27.39	33.58	31.96

Source: Monywa township.

In SGD, an upland area in the dry zone, onions, sorghum, chickpea, sesame, butter bean, cotton, wheat, sunflower, pigeon pea, groundnut, red pea (called sultani in the local language) and vegetables are cultivated. Villagers choose the crops to cultivate according to their calculation of rainfall: pre-monsoon, monsoon and post monsoon. As farmers are usually risk averse, they do not put all of their eggs in one basket so to speak. For example, a farmer cultivating 5 acres of land will not choose just one single crop. In fact, it is diversification of farmers' risk. Only certain combinations of crops are possible for multi-cropping. For example, pre-monsoon sesame and pigeon pea or short staple cotton and pigeon pea; sesame; green gram can be cultivated as mixed cropping. Similarly, only a certain combination of crops can be cultivated as double cropping. For example, pre-monsoon sesame and onions or green gram and sultani can be cultivated as double cropping.

Figure 4.1 Seasonal cropping pattern in TW village, Thonegwa

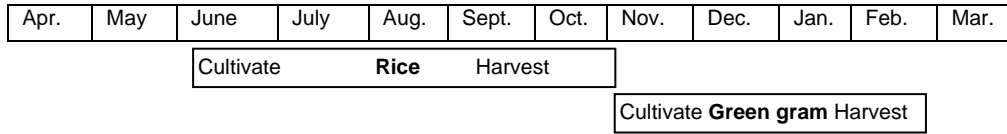


Figure 4.2 Seasonal cropping pattern in LPG village, Thonegwa

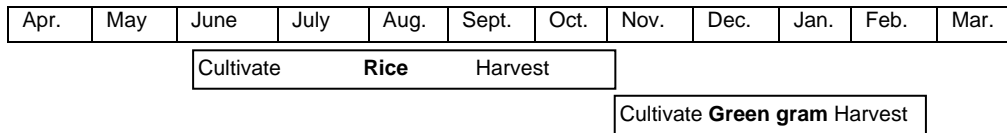


Figure 4.3 Seasonal cropping pattern in MN village, Monywa

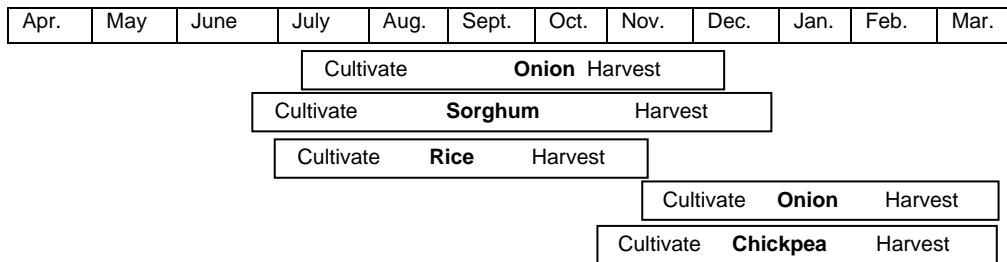
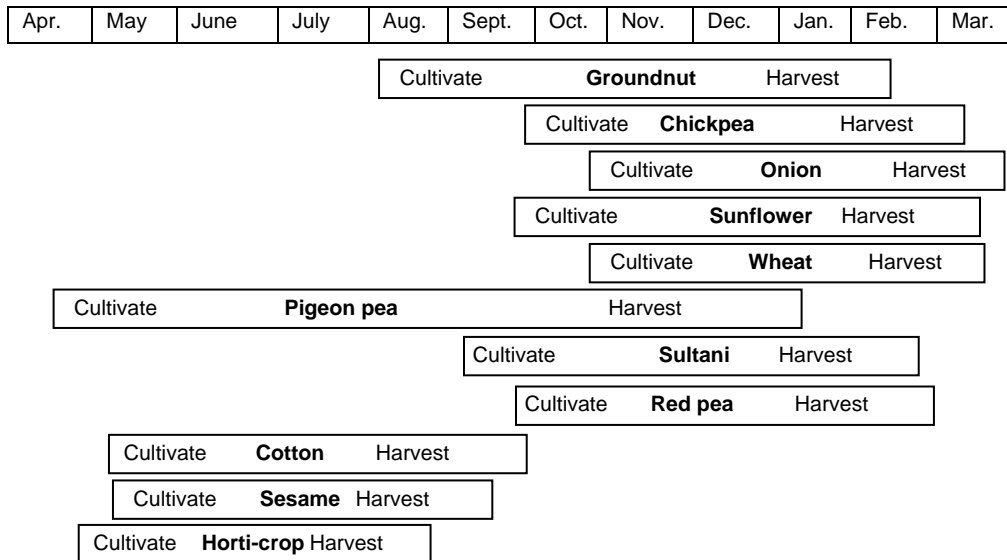


Figure 4.4 Seasonal cropping pattern in SGD village, Monywa



Pulses are conducive to multiple cropping under rainfed and other marginal conditions because of their greater adaptability to biotic stresses. Farmers in the study areas extensively grow pulses for the following reasons:

- a cash crop in multiple cropping systems;
- a contingent crop when the main crop fails or cannot be planted due to unfavourable weather;
- a main crop in the mono-cropped system of Monywa, characterized by inadequate or erratic rainfall;
- supply of wood fuel from pigeon pea; and
- a profitable crop under low external input conditions with high demand in the market.

4.3 Labour use

In the context of Myanmar's rural society, producers, landless labourers and marketing intermediaries (traders and agents) are involved in the farming system and marketing chain. There is no need to explain why farmers and marketing intermediaries are involved in this context, but some explanation is required for agricultural labourers. One of the characteristics of rural Myanmar is the existence of a large population of landless labour households accounting for at least 40 per cent of the rural population. They have no land to till for a decent living and their main income source is agricultural labour. This class of people is regarded as the poorest segment of the rural population in Myanmar. As their livelihoods depend on agricultural labour, any change in the agricultural production systems has a potential impact on them.

Table 4.4 Daily wages in the study areas (kyats)

Village	Contracted agri-labour (including meal)		Seasonal labour (daily waged)		Other labour	
	(male)	female)	(male)	female)	(male)	(female)
	TW, Thonegwa	1 200	800	1 000	600	600
LPG, Thonegwa	1 200	800	1 000	600	600	500
MN, Monywa	1 000	600	800	500	600	500
SGD, Monywa	1 000	600	800	500	600	500

Source: Field survey.

It is interesting to note that although wage rates vary between villages, they are uniform within a village. This is presumably due to the forces of competition as well as social norms of behaviour by which people abide. Note also the difference of wages between men

and women in all villages. This difference is related to the toughness of the tasks performed by men. There cannot be any accusation of gender bias but this may not always be the case. Table 4.4 shows that the daily wages in Thonegwa are higher than in Monywa.

According to an interview with village elders in Thonegwa, it is noted that during the harvesting time of green gram, labour wages depend on the working capacity of an individual in terms of the number of pods picked. During this time, the income of female labour ranges from 1,000 kyats to 2,000 kyats and even children can earn 500 kyats per day. Therefore, labour migration from the dry zone to this area during the harvesting time of green gram is common as the wages in the dry zone are rather low compared with that of Thonegwa.

4.4 Farm productivity

The most important change in the farming system during the last decade was the expansion of pulse production in Myanmar. Nationwide, the production of pulses has increased. On the basis of 10 baskets per acre (as yield per acre has not much changed over the years), the 6.73 million acres under pulses translates to 65 million baskets of pulses. After the reform towards a market economy, liberalized trade is the significant encouraging factor for growing pulses. The comparative cost of production of pulses is lower than the other seasonal crops. Therefore, it is an important factor for growing pulses for resource poor farmers.

Village wide, the advent of pulses has improved the livelihoods of most villagers who are able to cultivate pulses. This means more income for landholders as well as for the landless since they have more work. However, the gains can be disproportionate, as large farm households, who can afford tractors, do not only cultivate pulses but also earn extra income by hiring out their tractor.

According to the survey, pulses are grown both in the rainy season and during the cool season in Monywa township in the central dry zone. This area has less precipitation in the rainy season compared with Thonegwa township and pulses are mostly grown in upland areas, of which there are a lot in this region. Myanmar has a wide agro-ecological zone and thus, the same crop can be produced in both the dry zone and the cool season in Thonegwa township in the delta area.

The success of crop cultivation depends on its yield. The average yields of crops under this study are shown in Table 4.5. Farmers have extensive experience in choosing which crops to grow, forecasting the weather, and estimating the yield of crop which they

grow. Although the yields of pulses in the study area are higher than the national level, there is still a need to augment yield if compared to some neighbouring countries.

Table 4.5 Average yield of crops in sample households

Type of crop	Unit	Thonegwa (TW)	Thonegwa (LPG)	Monywa (MN)	Monywa (SGD)	National average
Rice	baskets/acre	64.7	64.5	63.9	0	66
Green gram	baskets/acre	13.6	13.5	0	0	9
Cowpea	baskets/acre	13.7	13.7	0	0	10
Groundnut	baskets/acre	46	47	0	0	43
Sunflower	baskets/acre	19	19	0	14.97	16.73
Pigeon pea	baskets/acre	0	0	0	11.33	11
Black gram	baskets/acre	0	0	0	0	11
Chickpea	baskets/acre	0	0	14.2	14.16	9
Sesame	baskets/acre	0	0	0	8.09	6
Cotton	viss/acre	0	0	0	121.4	134.09
Maize	baskets/acre	0	0	0	12.95	28
Sorghum	baskets/acre	0	0	24.7	0	36.45
Wheat	baskets/acre	0	0	0	19.02	14
Onion	viss/acre	0	0	1 521.7	1 500.2	2 508

Source: Field Survey and SLRD.

4.5 Cost-revenue structure of farm profitability

Farm profitability depends on the cost-revenue structure of crop production. Farmers normally sell their products during harvest time as a raw material at the farm gate price. Table 4.6 shows the average available returns per hectare for each crop according to the survey. The gross margin of each crop is the value of variable costs deducted from gross income. The variable costs include input costs, land preparation costs, crop management costs and harvesting costs including labour charges and it is calculated by the market price. Gross income is based on the crop yield per hectare and the unit price of the crop.

Table 4.6 clearly shows the profit made from the crops in the study areas. In both study villages in Thonegwa township, profit from green gram is more than three times that of rice. In MN, Monywa, onions can command the highest return for farmers followed by chickpea and then sorghum. Moreover, analysis of survey results shows that onions, chickpea, wheat, pigeon pea and groundnut are profitable crops for farmers.

Table 4.6 Cost-revenue structure of crops in the study areas (kyat/ha)

Crop	Unit	Yield/ha	Farm gate price (kyats)	Gross income	Total variable cost	Gross margin
TW, Thonegwa						
Rice	basket	160	1 078	172 480	115 060	57 420
Green gram	basket	33.6	7 964	267 590	75 860	191 730
LPG, Thonegwa						
Rice	basket	159	1 011	160 749	115 550	45 199
Green gram	basket	33.4	7 885	263 359	75 920	187 439
MN, Monywa						
Onion	viss	3 760	93	349 680	97 520	252 160
Sorghum	basket	61	3 200	195 200	127 250	67 950
Rice	basket	158	1 500	237 000	146 240	90 760
Chickpea	basket	35	6 835	239 225	84 310	154 915
SGD, Monywa						
Cotton	viss	300	426	127 800	101 250	26 550
Pigeon pea	basket	28	6 143	192 004	67 500	124 504
Maize	basket	32	4 500	144 000	80 300	63 700
Groundnut	basket	82	3 194	261 908	144 984	116 924
Chickpea	basket	35	6 600	231 000	84 310	146 690
Onion	viss	3 707	91.4	338 820	97 580	2 412 400
Sunflower	basket	37	4 700	173 900	135 100	38 800
Sesame	basket	20	9 833	196 660	131 140	65 520
Wheat	basket	47	6 200	201 400	69 000	132 400

Source: Field survey.

4.6 The role of diversified farming systems in risk mitigation

It is important for the farmers who have less than 2 hectares of land, especially in non-irrigated areas of the dry zone, to consider crop production in terms of high risk rainfed situations. In other words being particularly susceptible to crop failure and uncertain income. The fragility of their livelihood is exacerbated by their reliance on sales of oilseeds and pulses to purchase staple food, namely rice. In poor rainfall years, when incomes are very low, this can significantly affect food security and necessitate borrowing from informal sources at high interest rates. Moreover, landless households are widely distributed throughout the country and they rely primarily on income from agricultural labour and small-scale homestead activities. The most significant means of improving landless income is through crop diversification if it is confined to crop production, and increased crop production that stimulates demand for labour and higher pay rates. In short, diversification of farming means mitigation of risk.

4.7 Impacts on employment, income and the environment

Rural people have always relied upon renewable, natural resources such as land and soil, water, forests, animals and fisheries. However, the resources in Monywa township

are in danger of exhaustion from excessive population pressure. In this area, people have to travel further and further each year to collect wood fuel. Deforestation through land clearing, soil degradation and the cultivation and grazing of marginal lands seems to be rampant. Indeed, some farmers in SGD mentioned that more fertilizer had to be applied than previously to achieve the same yield, presumably as a result of less and less organic matter in the soil. There is thus, a real danger that renewable natural resources are being extracted and exploited beyond their natural regeneration rate. Therefore, farmers in this region rely on pigeon pea cultivation as it is drought resistant compared to sesame and groundnut and the dry stems of pigeon pea are valuable wood fuel for farmers. One acre of pigeon pea can provide enough wood fuel for one person for a year.

The impact on landless labourers is evident as an increase in employment opportunities for harvesting pulses in Thonegwa township. Before the expansion of pulse cultivation, there were few employment opportunities after the post-harvesting operations of paddy, both on-farm and off-farm. Some male labourers can find employment collecting wood fuel or repairing roofs made of niper palm leaves or digging ponds from time to time, but most female labourers have nothing but to stay at home. However, the spread of pulse production has generated almost 30 days of constant employment for both males and females at the harvest time of green gram, mainly in February in this study area. The study team tried to estimate the labour absorption of green gram production for the whole country, but data is sadly not available for that purpose. Whatever the main occupation of the household is, the redundant labourers in the households, and even the children, can make full use of these opportunities, contributing to regulate the annual income flow of the household.

It also gives these labourers access to credit. Many landless labourers receive advance wages as their weak economic background hinders access to informal credit from relatives or friends. The interest rate on this advance payment is high but they have no choice but to depend on these wage advances to survive. The advances are currently widely observed for the harvesting operation of pulses. As long as these agricultural labourers have to depend on this arrangement, the emergence of additional opportunities for credit access through pulse production deserves positive assessment. Therefore, it is clear that among agricultural labourers, the poorest segments are the main beneficiaries from any increase in employment opportunities created by pulse operations.

Pulse production has been successful in creating employment and income for the majority of the rural population. Producers, marketing intermediaries and landless labourers have all gained benefits and pulses have contributed to raising the general economic level

of the study areas. However, the income generated by pulse production is not high enough to allow the poorest segment of the rural population to escape from persistent poverty. At the same time, the improvement of income distribution is ambiguous. Although the landless labourers, especially the poorest strata, do gain additional income sources, it seems that the benefits to farmers and marketing intermediaries are much larger.

4.8 Potentials and constraints in farming operations

There are two main potentials for growth in crop production in the study areas. These are intensification of production and diversification from the current cropping patterns to a financially more rewarding combination of crops. Intensification under appropriate policy conditions through liberalization will give a significant boost to crop production and farm incomes in the short term as farmers can intensify crop production, of which there is comparative advantage. Moreover, successful intensification includes improved production, and investment and credit availability to finance increased input usage where economically justified. The promotion of small-scale, supplemental irrigation, possibly at the expense of major paddy-oriented irrigation schemes, to reduce the risk to post-monsoon crop production should be encouraged. Strong linkages between extension and research and its outreach to producers are vital, so as to ensure the availability of information that reflects optimal production practices.

Diversification depends upon innovation by individual farmers responding to market opportunities. To be in a position to respond, access to the basic services of credit, seeds and input supply are essential. One area in which a considerable impact from diversification could be expected is in relation to irrigated crops. Current policy is to impose paddy cultivation as a priority crop in all irrigated areas. However, rice is a heavy consumer of water, and a shift to crops requiring low levels of water input, or even only supplemental irrigation in certain months, could prove very advantageous, allowing farmers to greatly increase their sown area under irrigation with no corresponding increase in water supply.

The key constraints to farming operations in the study areas are the lack of access for many farmers to adequate, high quality seeds; the extensive use of research outputs, poor motivation of research and extension staff as a result of low salaries and benefits, and competing demand from different sources to undertake unrelated and/or redundant tasks, such as data collection.

Poor seed quality is a major factor limiting increases in crop yields. With the exception of industrial crops, the production of seed and planting materials is almost

exclusively the responsibility of MAS and DAR. The only private sector intervention is in the production of hybrid maize seeds and through limited imports of hybrid vegetables and fruit seeds by private individuals. The government programme concentrates on the production on rice seeds and there is a modest hybrid maize seed production programme. Government seed production for other crop seeds is negligible. Equal emphasis should be given to pulses and oilseed crops through introduction, testing and appropriate multiplication. There is no significant programme for the introduction and multiplication of new varieties of any of the pulses or oilseed crops and farmers generally select and save their own seeds. Some out-crossing crops such as sunflower have become very mixed and there has been a general degeneration of genetic potential.

Focus group discussions as well as simple calculations of the cost of production reveal a lack of access to finance (credit) to be one of the biggest constraints to rice production compared to pulses. Therefore, farm families with limited cash reserves have to resort to relatives or moneylenders at various interest rates ranging from 5 to 10 per cent per month. Asset-poor farm households are at a great disadvantage in this case. This and the pressure from authorities to cultivate paddy has led in some cases to such households illegally transferring their tilling rights to others, in fear that they may be taken away for not complying with the instructions to grow rice or other priority crops.

Government control on cropping also constrains production as far as it forces farmers to cultivate crops that are relatively less profitable for them. An individual farmer is normally in a better position to know which crops to cultivate so as to optimize his income and/or spread his risks, given the financial and other resources that he can mobilize. For example, forcing a farmer to cultivate paddy when he does not have the experience or financial resources to provide water as and when needed will neither be beneficial to the state nor to the farmer. According to farmers in MN, Monywa the loss per acre from cultivating paddy is said to be 5,000 kyats including the input cost of family labour or 10,000 kyats excluding the input cost of family labour. It is to be noted that the above losses do not include the cost to farmers in terms of the income opportunities that have to be foregone from not being able to cultivate crops that would provide better returns. In brief, such intervention is very harmful to farmers and of little benefit to the country. As a general rule in agriculture, what is best for the individual as determined by that individual, is also best for the state.

4.9 Concluding summary

Thonegwa was a mono-crop, paddy producing area before the spread of green gram and the initial development of pulse production during the 1990s. With the spread of pulses, the cropping pattern has changed to double cropping but there is no government enforcement behind the rapid spread of sown acreage. Therefore, farmers in Thonegwa generally apply a rice-green gram cropping pattern.

In MN, onions, rice and chickpea are grown under rainfed conditions (as the first crop) and onions and vegetables as second crops are cultivated using supplemental irrigation from underground water sources. In SGD, being an upland area in the dry zone, different cropping patterns like onion-chickpea, cotton-sesame, vegetable-chickpea, sesame and sunflower-vegetables, green gram- wheat and sesame, and sunflower-peas are cultivated to avoid risk. Moreover farmers in Monywa rely on pigeon pea cultivation as it is a drought resistant crop and its dry stems are valuable wood fuel for farmers.

Although wage rates vary between villages, they are uniform within a village. The difference in wages between men and women in all study villages relates to the toughness of the task in hand. Daily wages in Thonegwa are higher than in Monywa. Therefore, there is a labour shortage in Thonegwa during the harvest time of green gram and labour migration from the dry zone to Thonegwa occurs at this time. The impact on landless labourers is evident as an increase in employment opportunities for growing green gram. Moreover, many landless labourers receive advanced wages, although the interest on these advanced payments is high. Therefore, the poorest segment of the agricultural labourers is the main beneficiary from any increase in employment opportunities created by pulse production.

According to the survey, profit from green gram is more than three times that of rice in Thonegwa. In MN, onions attract the highest returns for farmers, followed by chickpea and then sorghum. Similarly, onions, chickpea, wheat, pigeon pea and groundnut are profitable crops for farmers in SGD village in Monywa.

The potential for growth in crop production in the study areas is through intensification of production under appropriate policy conditions through liberalization as farmers can intensify production of crops in which there is comparative advantage. More potential exists in diversification from the current cropping patterns to financially more rewarding combinations of crops. Diversification at the farm level depends upon innovation by individual farmers responding to market opportunities. To be in a position to respond, access to credit, seeds and input supply are essential.

Key constraints to farming operations in the study areas are a lack of access for many farmers to adequate quality seeds; lack of access to finance (credit) for the production of rice compared to pulses; government control in cropping to cultivate specific crops such as rice instead of other more profitable crops; the extensive use of research, poor motivation of research and extension staff as a result of low salaries and benefits, and competing demand to undertake unrelated and/or redundant tasks.

5. Analysis of the Marketing System for CGPRT Products

5.1 Forms of products traded and the distribution channels

This study consists of interviews with representatives of the major participants in the marketing system for pulses within the study areas. Participants include farmers, village level collectors, town wholesalers, processors, members of the crop exchange centre, traders at the state and division levels, retailers and consumers. Information like cost and return, activities, as well as opinions on the current marketing system were collected using interview questionnaires and open discussion.

Table 5.1 summarizes the principal domestic uses of pulses and beans. Crop residue from pulses is widely used for animal feed. In the dry zone, the stems from pigeon pea are used as a major source of fuel for domestic purposes.

Table 5.1 Uses of different pulses

Type	Uses
Black gram	Bean sprout, snacks
Green gram	Vermicelli, sprout, curry
Pigeon pea	Curry, crisps
Chickpea	Flour, Vermicelli, tofu, curry, snacks
Cowpea	Sweet paste, snacks
Soybean	Tofu, sauce, fermented bean curd, fermented grain, soya milk

Source: Field survey.

The marketing agents can be broadly categorized into two groups: primary collectors and town wholesalers. Primary collectors are brokers or agents who collect pulses at the farm gate or at temporary purchasing depots. They may be commission agents of big wholesalers, but similarly they might conduct business privately. The primary collectors receive price information from the town wholesaler. They do not know the price in Yangon, Mandalay nor the export price.

Town wholesalers are established wholesalers who do not travel to the fields but use primary collectors to collect the produce. Of course, there are cases where the farmers themselves come to the wholesalers to sell their produce. Town wholesalers buy pulses from primary collectors or farmers and sell them to wholesalers/exporters. Primary collectors are relatively well-off farmers who do it as a side business during the agricultural off-season. Generally speaking, the farther the distance from the town to the village, the more the

primary collectors' share increases and the less the town wholesaler receives in marketing activities.

There are two categories of wholesalers: those whose main occupation is basically trading, and those who are doing it as a side business. The former group deals with other commodities, such as rice or dry commodities and either added pulses as a new item, or completely shifted to it. Town wholesalers receive price information through daily phone contact with Yangon, Mandalay and Myingyan, among others.

Large-scale wholesalers have their own commission agents or brokers. All the Yangon, Mandalay and Monywa wholesalers interviewed had their own agents in the main producing areas and a main market for crop collection. The wholesalers in Yangon market purchased pulses from both lower Myanmar and central Myanmar through agents and commissioners. Mandalay wholesalers collect the crop at the crop exchange centre in Mandalay and also from traders from Sagaing and Magwe.

The main flow of green gram, black gram and pigeon pea, the major export items of pulses, is from the producing areas to the wholesale markets like in Yangon and Mandalay. With regard to exports, Yangon exporters are involved in overseas trade while Mandalay exporters deal with China. Monywa exporters deal with Indian border trade. The marketing channel follows a usual channel: farmers, primary collectors, town wholesalers, retailers and export traders. An FAO report notes that there are about 20 large exporters of pulses and oilseeds, handling over 10,000 tons per year.

5.2 Farm gate price and margin distribution

According to the survey, farmers sell their products to primary collectors who come to the villages or the nearest town (Thonegwa and Monywa) to sell their products in the brokers' houses or markets. Sometimes, poor farmers who need money are forced to sell their products before harvest regardless of price. The payment by the trader to the farmer is mostly in cash. There are only two advancement cases, known as Pindaung. Pindaung means that the trader buys the crop before the harvest at a low price. It is also known as forward sale.

Primary collectors do not store the produce at all. They keep it one week at most. The majority of them do business with working capital between 100,000 kyats and 2 million kyats. Town wholesalers' working capital ranges from 300,000 kyats to 80 million kyats. The majority of wholesalers can only stock less than 5,000 baskets of pulses. The amount of

fixed capital necessary is unclear because the interviews with marketing agents did not give exact figures and were unreliable.

Most of the town wholesalers sell the produce to wholesalers in other big cities. When sold to wholesalers, payment is in cash. Again they have to wait from time to time. For those who sell to export companies, they can get advanced payment within one week. Those who sell to export companies and receive a 1 per cent commission do not have to pay either transportation costs to the collection point or loading/unloading costs.

The income from marketing is not negligible for primary collectors and the level of income for wholesalers clearly proves the attractiveness of the business. When the primary collectors gain a good reputation or some trust from wholesalers, the wholesalers become willing to provide them with working capital, and this enables them to increase their turnover.

Table 5.2 shows estimated incomes from pulse marketing for both primary collectors and wholesalers based on the field survey. The net profit from the sale of green gram of most of the collectors ranges from 60 kyats to 80 kyats per 50 kg bag. Given the current price of green gram, both wholesalers who work on a commission basis (1 per cent of 100 kyats) and those on a non-commission basis fall into this range. Green gram from Thonegwa township is targeted for export through normal overseas trade from Yangon port. Therefore, farmers in Thonegwa township sell all of their products in the market and do not use it for consumption purposes as they receive high prices for this crop. The wholesalers in Yangon store the purchased produce in warehouses or in shops and for 3-4 months at most. It can be noted that the duration of stock for rice seems to be longer than pulses.

Table 5.2 Margin of trade for crops in Thonegwa

	(kyats per basket)				
	Selling price	Gross margin	Transportation cost	Handling cost	Net margin
Green gram					
- Primary collector	8 020	85	15	10	60
- Town wholesaler (non- commission basis)	8 130-8 165	110-145	50	10	50-85
- Town wholesaler (commission basis)	8 020	1%	-		80
Paddy					
- Town wholesalers	1 200	50	15	5	30

Source: Field survey in Thonegwa.

All of the traders interviewed in Monywa township handled mainly onion and wheat for the local market and pulses for export and border trade. Onion is fixed produce for the local market only and not currently allowed for export and wheat imports have also been banned since 2000. Most traders purchase pulses at the Monywa crop exchange centre on

a cash payment basis. The purchased pulses are delivered to the warehouses of exporters in Mandalay by car. Then, purchased pulses are cleaned and graded using machines to meet the demand from Chinese buyers.

The marketing margins of onions, wheat and chickpea in Monywa are shown in Table 5.3. Onion production is risky for traders as it is not allowed for export. Therefore, the price of onion is difficult to estimate because of the supply side problem. Net profit from the sale of onion is 1,220 kyats per bag in a good year as low supply can increase the price due to local demand. The net loss can also be 1,220 kyats when onion supply is higher than local demand. According to interviews with traders in Monywa, trading chickpea was more profitable than wheat before 2000. When imports of wheat produce were banned in 2000, however, the local market price of wheat became more attractive than other crops. The reason may lie in the insufficient supply in the domestic market. Moreover, there is a pest problem for chickpea in storage. Therefore, traders prefer to invest in wheat rather than chickpea.

Table 5.3 Margin of trade for wholesalers in Monywa (kyats per bag)

	Unit	Selling price	Gross margin	Transport cost	Handling cost	Net margin
Onion (wholesaler)						
- Good year	20 viss	4 200	1 900	200	480	1 220
- Bad year	20 viss	1 060	-540	200	480	-1 220
Chickpea						
- Town wholesaler (non-commission basis)	19 viss	7 035-7 061	370-396	150	171	49-75
- Town wholesaler (commission basis)	19 viss	6 650	1%	-	-	66
Wheat						
- Town wholesaler	20 viss	6 800	400	150	90	160

Source: Field survey in Monywa.

5.3 Nature of marketing structure and competition

There is a contrast between TW and LPG in Thonegwa. In the case of TW, the number of farmers who sell their produce to strangers are few. However, most of the LPG villagers sell their farm produce to marketing agents. Ninety five per cent of the farmers in TW sell produce to town wholesalers, while 5 per cent to the primary collectors. Sixty two per cent of the farmers in LPG sell to town wholesalers and the rest to the primary collectors. Therefore, primary collectors seem more active in green gram procurement activity in LPG than TW. The reason may lie in the distance from the town. Since TW is

close to town, the farmers can go almost every day without any special effort. But for the farmers in LPG, the trip to town is not so easy. They have less incentive to acquaint themselves with the traders in town. Moreover, the majority of farmers pay transportation costs by themselves, and since the marketing period of green gram falls in the dry season, the waterways are less used.

All the farmers in TW and LPG sell green gram between one to three times per harvest season. The entire sale is complete within three months after the harvest because of the storage pest problem. Farmers use green gram to sell to the market only and do not use it for home consumption. The cash income from green gram is important for the repayment of farmers' debt. Most of the farmers who borrow money from the informal market repay their debt using income from green gram sales.

Similar results can be seen in MN and SGD villages in Monywa: SGD is further from Monywa town than MN and lacks access to paved roads and market information. No farmers in MN and SGD sell all their pulses at once. Monywa farmers use their pulses such as chickpea and a small amount of pigeon pea for home consumption. The rest is sold within two-three months after harvest. This is probably because of the storage pest problem and the need for cash income to repay credit. Most of the farmers who are small and marginal landholders have to repay debt with the income from pulses. In both Thongwa and Monywa, farmers sell their product to the highest bidders and/or to trusted persons based on a gentleman's agreement whenever it is convenient for them. There are several types of payment systems such as cash on delivery (COD), a down payment system for credit at a certain percentage and on a consignment basis with a floating price. In rare cases, some farmers make forward sales to traders because they are really in need of cash.

Different marketing units are applied in the local market. In general, the measurement tool used in the domestic market is viss (1 viss = 3.6 pounds = 1.64 kg) for pulses, and baskets (nearly 36.4 litres). For export marketing, local exporters use the metric system and convert the local measuring unit (viss) into metric tons.

From observations during the survey, crop price information is quite well known among the sample farmers. The method used to obtain price information is shown in Table 5.4. As TW and MNA are near to town the farmers can go and simply ask for the price by themselves. In the remaining two villages, LPG and SGD, farmers have less opportunity to go to town because of the distance. Transportation agents, such as drivers of line buses or motorboats are also valuable sources of price information.

Table 5.4 The method used to obtain price information (percentage)

Access to information	TW,	LPG,	MN,	SGD,
	Thonegwa	Thonegwa	Monywa	Monywa
Go to town by himself	63	37	70	35
Ask friends and people nearby	14	50	20	55
Cross check with primary collectors	22	11	10	9
Others	1	2	0	1
Total	100	100	100	100

Source: Field survey in Thonegwa and Monywa.

In a market economy, prices are crucial determinants in the allocation of revenue. The price competitiveness of pulses in Myanmar, using nominal protection rates to observe price differentials between domestic and international markets, is shown in Table 5.5.

Table 5.5 Price competitiveness of pulses (US\$/mt)

Period	Price	Black gram			Green gram			Pigeon pea		
		M	C	K	M	C	K	M	C	K
2000	P_Y	459	459	459	340	340	340	301	301	301
	P_I	446	585	461	359	445	409	283	401	313
	P_Y/P_I	1.02	0.78	0.99	0.94	0.76	0.83	1.06	0.75	0.96
2001	P_Y	380	380	380	354	354	354	269	269	269
	P_I	383	553	398	376	487	445	251	342	264
	P_Y/P_I	0.99	0.69	0.95	0.94	0.72	0.79	1.07	0.78	1.02
2002	P_Y	298	298	298	336	336	336	281	281	281
	P_I	279	439	288	385	485	421	272	360	292
	P_Y/P_I	1.06	0.68	1.03	0.87	0.69	0.80	1.03	0.78	0.96

Source: ASEAN Project, DAP.

Note: M= Mumbai, C= Chennai, K= Kolkata

P_Y = f.o.b. price of the selected pulses originating from Yangon and added commercial tax at 8 per cent, income tax at 2 per cent, the cost of insurance at 0.5 per cent and freight up to Mumbai at US\$ 16.

P_I = Pulse prices are taken at Mumbai, Chennai, Kolkata local markets in India.

P_Y/P_I = Nominal Protection Rate.

The f.o.b. price at Yangon is the minimum export price notified by the export pricing committee. Committee members include the Ministry of Commerce, Directorate of Trade, Myanmar Agricultural Produce Trading, the Customs Department and the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI). Compared to the internal price in India (P_I) and the CIF price in Yangon (P_Y) of specific pulses, P_Y is less than P_I . However, competitiveness is slight with an average NPR above 0.9. It can also be noted that Myanmar is neither a price maker nor price taker at the moment. In addition, Table 5.6 illustrates the monthly export price (f.o.b.) of black gram, green gram and pigeon pea in Myanmar. Seasonal price fluctuations are observed in different years.

Table 5.6 Export prices (f.o.b.) of pulses in Myanmar (US\$/mt)

Period	Black gram			Green gram			Pigeon pea		
	2000	2001	2002	2000	2001	2002	2000	2001	2002
Jan.	320	420	275	280	310	290	240	240	210
Feb.	340	360	275	280	310	290	250	240	210
Mar.	340	360	285	280	310	300	290	250	220
Apr.	400	330	300	320	310	310	330	240	240
May	430	310	290	320	310	310	300	210	255
June	415	330	270	300	320	310	300	220	260
July	430	330	250	300	320	300	280	225	250
Aug.	430	330	235	300	320	275	280	230	260
Sept.	410	320	235	280	300	275	230	230	260
Oct.	410	310	235	290	295	275	200	230	260
Nov.	430	300	225	290	290	275	200	220	240
Dec.	460	265	205	290	280	275	200	210	215
Average	401	330	256	294	306	290	258	229	240

Source: Trade News, Ministry of Commerce, 2003-2004.

5.4 Potentials and constraints in the marketing system

The absence of an adequate financing mechanism appears to be a restriction, particularly for the farmers, small traders and collectors, who are generally unable to store the commodity due to a lack of capital. This problem is not as noticeable for larger wholesalers as their greater financial resources allow them more easily to engage in self-financing or to obtain formal credit.

The lack of access to roads and public transportation is another constraint and farmers from LPG and SGD village have less advantages in terms of access to market information compared to TW and MN farmers.

The presence of crop exchange centres in towns (like Monywa) appears to support open trading of many crops and links local players (like village collectors and town wholesalers) on the one side and the processors, wholesalers and exporters on the other.

It is notable that although the marketing margin throughout the system is low, the differing agro-ecological regions of the country and the importance of Yangon and Mandalay as major crop exchange centres, results in large-scale movement for many agricultural commodities within the country. Based on the information received from these major crop exchange centres by telephone, fax and email the price for commodities is set by other, smaller crop exchange centres in the districts in the morning at around 10 a.m. The success story of pulses can be attributed to unrestricted access to markets without compulsory procurement; strong product demand; reasonable returns; and relatively low fertilizer requirement compared to other crops. Domestic marketing reforms and export liberalization were applied to pulses, culinary crops and some oil seed crops. Although this stands in

great contrast to other crops such as rice, the imposition of sudden export regulations without any advance notice is possible, leading to disruptions in the market.

Black gram, green gram and pigeon pea are still competitive in the international market but it should be noted to improve the quality of pulses, which have great potential to expand the export market under a fair, competitive economy. In Myanmar, production levels of these crops depend upon market demand from Asian countries, particularly India. Thus, it should be considered that changes in agricultural policies concerning the trade of importing countries are required to maintain the stability of pulse exports.

Based on the pulse producing area, it can be said that although Myanmar has a dominant position it is neither a price taker nor price maker in the pea and bean international markets. Dependence on a horizontal approach for this crop is not viable nor sustainable as land is a limiting factor and there are other more competitive and economically important crops available. Moreover, some of the cultivated land is being lost to accommodate industrialization and urbanization.

5.5 Concluding summary

In general, most of the farmers sell their produce to primary collectors who come to villages or to the nearest town to sell their produce at the market. The primary collectors do not store the produce at all and they send it after one week at most to wholesalers. Their working capital is between 100,000 kyats and 2 million kyats. The majority of wholesalers can stock only less than 5,000 baskets of pulses. The working capital of town wholesalers range from 300,000 kyats to 80 million kyats.

The net profit from the sale of green gram of most of the collectors ranges from 60 kyats to 80 kyats per 50 kg bag. Wholesalers who work on a commission basis (1 per cent of 100 kyats) and those on a non-commission basis both fall into this range. In most of the transactions payment is settled with cash. The trading period for green gram is shorter than for rice and profit from the green gram per bag is higher than for rice.

Traders interviewed in Monywa handled mainly onions and wheat for the local market and peas for border trade. Onion is risky for traders as it is not allowed to be exported. Therefore, prices of onion are difficult to estimate because of supply side problems. Monywa traders currently prefer to invest in wheat rather than chickpea. When imports of wheat produce were banned in 2000, the local market price became more attractive than other crops due to insufficient supply in the domestic market. Moreover, there is a pest problem for chickpea in storage.

Although the price information of pulses is quite well known among the sample farmers, the methods used to obtain the price information are different. Since TW and MN are near to town the farmers can go and ask for price information by themselves. Farmers in the two remaining villages, LPG and SGD, have less opportunity to go to town due to the long distance. Transportation agents, such as drivers of line buses and primary collectors are also valuable sources of price information.

It can be noted that the absence of an adequate financing mechanism, and the lack of access to roads and public transportation appear to restrict market development. The presence of crop exchange centres in towns appears to support open trading of many crops and links between local players on the one side and the processors, wholesalers and exporters on the other. Moreover, the success of pulses can be attributed to unrestricted access to markets without compulsory procurement; strong product demand; reasonable returns; and relatively low fertilizer requirements compared to other crops.

6. Analysis of the Industrial Processing Business for CGPRT Products

6.1 Types of processed products and annual production

The industrial policies and strategies which have been implemented are mainly oriented towards import substitution. Despite this, the economic, social and environmental features of Myanmar are very favourable for agro-industrial development. There are abundant sources of industrial raw materials such as coal, iron and tin; a domestic market of 50 million people; and a large potential regional and international export market.

The pulse industry in Myanmar is very important, providing 72 per cent of agricultural exports by value in 2000-2001. Pulses occupied over 3 million hectares in 2000-2001, or some 20 per cent of the total sown area. Table 6.1 shows there exists huge export potential for pulses, occupying a large share of the world market.

Table 6.1 Production of pulses in some producing countries (thousands of metric tons)

Country	1992	1999	2000	2001	2002	Average growth rate (percentage)
Indonesia	852.8	266.0	290.9	302.0	305.3	-11.6
Myanmar	691.1	1 544.5	1 665.2	2 140.7	2 140.7	11.9
Thailand	313.4	301.4	281.9	293.7	316.0	-0.2
Viet Nam	187.6	245.1	244.6	242.0	236.9	2.4
China	2 273.3	4 704.4	4 696.5	5 121.5	4 372.0	3.7
Japan	105.5	103.2	104.3	95.8	101.1	0.0
Bangladesh	519.6	385.7	383.0	367.0	346.0	-4.5
India	12 013.4	14 958.5	13 447.0	10 655.2	13 772.8	0.1
Pakistan	939.7	1 088.9	935.2	761.1	721.2	-0.5
Australia	2 009.7	2 987.6	2 152.0	2 507.0	1 359.0	-0.4
World total	50 702.0	56 622.7	54 536.8	53 024.4	55 164.8	0.3

Source: ASEAN Project, DAP.

Myanmar's share of world production of pulses increased throughout the 1990s. Among the various pulses produced in Myanmar, black gram, green gram and pigeon pea are the major export items, and their main destinations are China and India. Myanmar is the second largest exporter and has enjoyed a boom in pulse exports since 1992-1993, with most of the export volume going to Asian countries.

Table 6.2 Export situation of pulses in Myanmar

	1985/1986	1989/1990	1990/1991	1992/1993	1994/1995	1996/1997	1998/1999	2000/2001
Agricultural export value (million kyats)	1 126	4 323	942	1 299	2 478	1 981	1 890	2 312
Share in total export value (%)	43.9	15.2	31.9	36.2	45.8	36.1	28.0	18.9
Pulses exports								
- Volume (thousand of tons)	8.9	5.6	19.5	44.9	42.5	59.5	62.2	83.1
- Value (million kyats)	238	123	515	667	799	1 272	1 135	1 658
Share of total agricultural export (%)	21.1	28.5	54.7	51.3	32.2	64.2	60.1	71.1

Source: Statistical Year Book, 1998 and 2001.

The extent of pulse processing depends on their final use. Most pulses are traded in Yangon and Mandalay markets for export and are exported as fresh produce, involving only limited grading and sorting. Machine splitting of husks is gaining popularity, although peeled pulses fetch less on the market due to the low level of technology used resulting in damaged pulses. Domestic marketing of pulses is through a large network of small and medium size traders and wholesalers. For example, pulses grown in Bago are transported to Yangon and Mandalay where they are cleaned and graded for export.

Pulses have many different uses so the quality preferred varies considerably, being ultimately related to final consumer acceptance of each product. Therefore, exporters need to understand consumer preferences. Each market segment has distinct requirements. For example, special quality goes to Japan but Indonesia prefers polished, small seeds because their end use is for bean sprouts.

6.2 Production capacity

According to an estimation of the Ministry of Industry, there are about 500 enterprises involved in processing. These enterprises comprise of only large- and medium-size operations that have been registered in MoI and do not include the large number of small operations scattered around the country.

There are grading plants for pulses owned by MAPT in Yangon. MAPT has 13 cleaning and grading plants designed specifically for black gram. Under MOAI, MAS also has 13 seed processing plants. The private sector has a few, medium-scale grading plants for pulses. Most of the processing plants are very old and simple.

In Thonegwa township, there are only rice mills because Thonegwa farmers sell green gram raw to Yangon market and then the cleaning and grading process is carried out in Yangon export market. In Thonegwa, rice mills can be categorized into two according to capacity. Generally speaking, those which can mill under 15 tons per day are called huller mills. Those with a capacity greater than 15 tons per day are called *Setkyee* (big mill). On average, there is one huller mill per village. In Thonegwa township, there are more than 200 huller mills and 11 big mills. The increase in the number of huller mills allows farmers to mill rice for their own consumption easily. The huller mills are run by diesel engines, and as such, milling costs are influenced by the price of diesel. Farmers can take all the bran and broken rice with them.

There are few millers who process black gram, green gram and pigeon pea. More are involved in chickpea processing, particularly around Sagaing and Mandalay. Most of the

private enterprises that have installed cleaning and sorting equipment are involved in the export trade. The exporters use machine cleaning and grading to get to the ready cargo stage. During processing, weight can be reduced by up to 2 to 2.5 per cent of the original weight.

Flour mills and vermicelli mills for chickpea processing are found in Mandalay and Sagaing. Two chickpea millers, who own medium-sized mills of 10-25 HP, were interviewed in Monywa. Based on the interviews in Monywa, chickpea flour, chickpea flour mixed with butter bean, green gram, vermicelli and some snacks made from pulses are produced mainly for the local market. Recovery rates ranged from 70-78 per cent and mills operated from 3-10 hours per day, depending on the availability of electricity and raw material supply. Most mills are kept running throughout the year, with the highest number of hours per day just after harvest. Based on the survey findings, the use of chickpea, black gram and green gram as raw materials and the recovery rate of processed products are shown in Table 6.3.

Table 6.3 Recovery rate of finished products of pulses

Pulses	Use of raw material (viss)	Finished product (viss)	Percentage of turnout
Chickpea	19	split chickpea = 14.44	78
Black gram	20	split black gram = 13.60	70
Green gram	19	split green gram = 14.06	74

Source: Field survey in Monywa.

6.3 Cost-revenue structure and business profitability

Based on interviews in Thonegwa, the fixed capital necessary to run a huller mill at the initial stage is 1.5 million to 2 million kyats. The fixed capital requirement for big mills was not clear during the survey. The working capital requirement for a huller mill is around 100,000 kyats to 200,000 kyats. Only one person in LPG had outstanding debt, which incurred an interest rate of 5 per cent per month. The maximum capacity of huller mills is 10,000 baskets of rice per season. The big mills in Thonegwa only process 30,000 to 50,000 baskets of rice, showing the relative smallness of the rice trade. Payments are made in cash. The milled rice is sold to town wholesalers in Thonegwa, Mandalay and Myingyan located in the central dry zone area.

Based on survey findings in Monywa, it can be concluded that there is no processing plant for pulses in MN village. The reason is that MN mainly grows onion. In SGD, four pulse splitting machines have been built and run as this village has a concentration of pigeon pea and chickpea. The fixed capital requirement of these small mills ranges from 500,000 kyats to 1 million. These mills run on diesel and milling costs depend on fuel prices. Farmers may

take all the bran, flour and split pea. The working capital of these mills is around 100,000 kyats. The maximum capacity of these mills is at most 100 tons per year and estimated net income of an owner is 300,000 kyats per year. The small mills process not only chickpea and pigeon pea but also wheat, however, the big mills in Monywa town process only one type of pea due to quality control.

Pulses before cleaning and grading are known as raw. The fee to clean and grade one metric ton of pulses to meet export quality is 2,500 kyats. Similarly, according to a survey in Monywa town, fees for cleaning and grading range between 3,000-3,500 kyats for one metric ton. The duration of storage is not so clear from the survey and the calculation of marketing margin is very difficult because it is very hard to workout the exact margin for each of the marketing chains. Table 6.4 shows the estimated profit of different types of chickpea mills in Monywa Industrial Zone.

Table 6.4 Estimated margin of chickpea mills in Monywa

Type of mill	Fixed capital (million kyats)	Processing capacity (mt/year)	Estimated net margin (million kyat/year)
Split, sort and grade	80	500	2.5
Vermicelli	30	1500	4
Flour mill	50	250	3.5

Source: Interviews with processors, Monywa.

In general, the major source of raw material supply for processors is traders but no contracts exist between traders and processors. Exporters use the processing plants such as cleaning and sorting to meet the quality standards of the export market. Some processors are processors cum traders cum exporters for better efficiency and higher profit and they also run the plant as a rental service for others.

6.4 Potentials and constraints in the industrial processing business

The economic, social and environmental features of Myanmar are very favourable for agro-industrial development. There are abundant sources of industrial raw materials such as coal, iron and tin; a domestic market of 50 million people; and a large potential regional and international export market.

There is still a lot of room to produce value-added products such as sweet paste for local and foreign markets, split grain with or without the husk, vermicelli, sauce and a variety of snacks. The clear example of the benefits of processing split grain is the price, which is almost two times higher than the whole grain. Equal grain size is also important for processing. Pulse processing includes drying, cleaning, grading, sizing, weighing and

bagging. When splitting the pea by machine, unequal size results in lower output, greater loss and unequal size of the split peas. Processing for sizing produces value added products for the high-quality market. It is better to export special quality and first quality products instead of fair average quality for export.

Interviews with processors indicate that the major processing problem is the low level of technology used for processing, particularly the husking and splitting machines. Access to a stable and reliable supply of electricity is another problem processors face but this is relatively insignificant compared to other industries.

Availability of credit is a constraining factor on the ability of processors to modernize their enterprises. Most processors of pulses are relatively satisfied with the capitalization of their enterprise, in the context of their overall situation. However, if production levels were to be increased, domestic and international consumers were to demand higher levels of processing and Myanmar was able to export more of its surplus, then capacity and capitalization would become a constraining factor.

Due to a lack of financing and technical know-how, Myanmar exporters are only able to export the raw form of pulses. The finished stage is just re-cleaned and polished products instead of value added.

Constraints in the pulse processing sector are relatively few compared with other agro-industrial sectors. The main reason for this is the lack of government involvement in production, processing and trading. Most pulses are not processed to any great extent, mainly just husking and grain splitting. Cleaning and grading are rare for domestic sales, with some cleaning and grading undertaken for export quality pulses. As a consequence, except for the splitting of pulses like chickpea, most trade in pulses is of the unprocessed type. In the short term, however, the processing capacity of the pulses industry is adequate to meet current market demand.

One of the ways to develop the processing sector in Myanmar is to attract Foreign Direct Investment (FDI) which attracts technology, investment and an assured market for value-added products. Unfortunately, there are no competitive or strong pull factors for foreign investment under the dark cloud of western economic sanctions. At the same time, there might be push factors for investors but they will be shunned by the current climate.

6.5 Concluding summary

The economic, social and environmental features of Myanmar are very favourable for agro-industrial development. There are abundant sources of industrial raw materials

such as coal, iron and tin; there is a domestic market of 50 million people; and a large potential regional and international export market. Among the various pulses produced in Myanmar, black gram, green gram and pigeon pea are the major exports, and their main destinations are China and India.

The extent of processing of pulses depends on their final use. Most of the pulses traded in Yangon and Mandalay market are for export and are done so as fresh produce involving only limited grading and sorting. Machine splitting of husks is gaining popularity, although peeled pulses fetch less on the market due to the low level of technology used resulting in damaged pulses.

Myanmar is relatively still in its infancy and although there is still great scope to produce value-added products such as sweet paste for local and foreign markets, split grain with or without husk, vermicelli, sauce and a variety of snacks, the low level of technology used for processing, access to a stable and reliable supply of electricity, and the lack of availability of credit seem to be the problems facing processors for the development of the pulse industry. The only way to develop the processing sector in Myanmar is to attract Foreign Direct Investment (FDI) which attracts technology, investment and an assured market for value-added products.

7. Analysis of Institutional Support

7.1 Economic policies

Myanmar has laid down four national economic objectives: the development of agriculture as the base and all round development of the other sectors of the economy; proper evolution of the market-oriented economic system; development of the economy inviting participation in terms of technical know-how and investment from sources inside the country and abroad; the initiative to shape the national economy must be kept in the hands of the state and the national people.

The salient features of the liberalization of agriculture are as follows:

- Freedom of choice of crops and trade;
- Decontrolling price;
- Appropriate legislation for private investment;
- Private sector engagement in domestic and international trade; and
- Enhanced opportunities for private sector participation in the opening up of new tracts of land.

At the beginning of 1995, the Myanmar Industrial Development Committee (MIDC) was formed and there was a push for further industrialization with the following objectives:

- Development of the industrial sector with the agricultural sector as the base;
- Enhancement of the quality and quantity of industrial products;
- Development of new machinery and equipment;
- Production of machinery and equipment for industrial uses; and
- Creation of conditions to transform Myanmar into an industrial state.

The national economic objectives of Myanmar highlight the role of agriculture as the driving force of economic growth, but fail to explicitly identify agro-industrialization as a mechanism by which this can be achieved and the industrial policies and strategies that have been implemented were mainly oriented towards import-substitution.

7.1.1 Price support programme

The agricultural price and subsidy policies of the government are noted to be directly related to official procurement and input policies. Procurement and domestic distribution of paddy and exports of rice is a state monopoly, represented by the MAPT under the Ministry of Commerce (MOC) until 2003. There is a quota system to be sold to the State Economic Enterprise (SEEs) depending on the kinds of crops grown, sown area and yields. Whether or not a farmer has fulfilled his obligation is checked through the registered book controlled by those in-charge of the paddy purchase depot (representing the MAPT) on which all required data and information relating to individual farmers provided by the respective village committees are recorded. The official procurement prices merely cover the cost of cultivation so that the profit margin for farmers remains incredibly thin. The difference between official procurement price and the free market price is an implicit tax on the farmers.

The government controlled all fertilizer production and imports, and distributed it at subsidized rates until the 1990s. Since the government has allowed private sector participation in this area. However, a lack of sufficient incentives, lack of credit and inappropriate extension services constrain the farmers' ability to use the optimum level of fertilizer. The private sector is permitted to import and distribute fertilizer but its ability to do so is constrained by the lack of a distribution and storage network, prevailing import and export regulations, and scarcity of foreign exchange. The amelioration of the stagnating circumstances needs to be addressed.

An interview with farmers indicated that the majority of farmers purchased fertilizer from private traders at the market price, which is about double that of the MAS subsidized rates because MAS supply rates are low. Table 7.1 shows the distribution of fertilizer by different supply source.

Table 7.1 Distribution of fertilizer (thousand of metric tons)

Year	MAS	MOE	Private	Total
1997-1998	189	8	-	197
1998-1999	223	51	-	284
1999-2000	127	-	393	530
2000-2001	266	-	171	437
2001-2002	122	-	154	275

Source: Statistical Yearbook.

The current level of fertilizer use (ranging between 21.0 kg and 53.5 kg per hectare during the past 5 years) is undoubtedly well below the optimum level of application. The fertilizers mainly used in Myanmar are urea, Triple Super Phosphate (TSP) and Muriate of

Potash (MOP), of which TSP and MOP are imported fully from abroad. Urea is produced locally with a capacity of around 100,000-150,000 tons per year. All together, fertilizer consumption in Myanmar is around 200,000 to 300,000 metric tons a year of which more than 80 per cent is used for rice.

The current level of quality seed provision is also well below the desired level even though the Seed Division under Myanma Agriculture Service is the main technical agency responsible for the production of seeds, including for CGPRT crops. In this area also, the harmonization of the private and state sectors is necessary to enhance the capacity of supply. Due consideration to a seed industry development policy should be paid with international standards in plant varietal protection concerning intellectual property rights in order to attract private investment in the seed industry.

7.1.2 Credit support programme for farming, processing and marketing activities

MADB, established in 1953, is the only source of institutional credit for crop cultivation. The bank now has 16 regional offices and 205 branches in 325 townships. It is a small bank with total assets of 6,115 million kyats. The total seasonal loans disbursed by the MADB in 2000/2001 reached 12,124 million kyats, which represents an eight fold increase over the past decade. Rice farmers have been given priority as about 80 per cent of total loans were given to rice farmers alone while the remaining 20 per cent were divided among farmers growing oilseeds, pulses, cotton and culinary crops.

MADB loans are mostly seasonal and only amount to about 1,000 kyats to 5,000 kyats per acre. These rates have been raised recently following the liberalization of the rice trade, but the types and amount of loans as well as the conditions and procedures of giving loans have not yet changed significantly. So far, MADB loans seem to just serve as relief for farmers rather than solve their financial problems.

MADB used to provide preferential micro-finance credit to marginal farmers in border areas at 1 per cent but the government terminated it in 1996 because some farmers failed to repay the cash for these loans. Table 7.2 shows the credit for the important crops from the MADB.

Table 7.2 Credit for the important crops from MADB (kyats per acre)

Crop	1993	1995	2003
Paddy	1 000	2 500	10 000
Maize	200	750	5 000
Groundnut	750	2 500	5 000
Sesame	175	2 000	3 700
Mustard	200	500	1 500
Black gram	250	750	2 500
Green gram	250	750	2 500
Pigeon pea	250	750	2 500
Soybean	250	750	2 500
Jute	500	1 750	3 000
Cotton	500	2 500	6 200
Sugar cane	300	700	2 000

Source: MADB.

Term loans payable over two or three years are also allocated to farmers by the MADB for the purchase of drought cattle, bullock carts, pump sets, power tillers and farm implements. However, the total amount disbursed for these activities is very small amounting to less than 1,400 million kyats per annum, which has declined significantly in recent years because other departments and institutions have begun to disburse loans separately on their own terms and conditions. For example, AMD provides more attractive loan terms for the purchase of farm implements through the installment of the farmers' produce. The government sets the interest rate of all seasonal and term loans at 15 per cent per annum, well below the inflation rate but the seasonal loans are too small to cover the total farm input costs and other costs incurred by farmers. Thus, the majority of farmers are still dependent upon private lenders and traders for financial assistance.

No private banks have yet undertaken the money lending function to the farmers and rural poor, however, this is now in operation but in terms of coverage of the number of poor and areas it is still very limited. Moreover, micro-finance projects in Myanmar are still on an experimental basis in a few selected townships in the hilly Shan state and Rakhine state.

7.1.3 Food diversification policies

Myanmar has designated three national agricultural objectives: food security, export promotion and raising the income and welfare of farmers. The objectives of the agricultural sector of Myanmar are to generate surplus paddy production at first, second is self-sufficiency in edible oil and third is to increase the production and export of pulses and industrial crops.

Increasing paddy production is the most dominant theme currently. To achieve the objectives, priority crops have been identified. These are paddy, pulses, black gram, green gram, pigeon pea, chickpea, cowpea and soybean, oilseeds, groundnut, sesame and

sunflower, industrial crops, cotton, sugar cane, jute, rubber and oil palm. Furthermore, the yields of some of these crops are nationally targeted.

The government has accorded very high priority to increase both monsoon and summer paddies. In this regard, in all areas under completed irrigated schemes, farmers are urged to grow paddy during the summer in addition to growing the routine monsoon paddy. Farmers in the irrigated regions have no choice but to grow paddy even if growing other crops could be more profitable or suitable. In other words, there is an opportunity cost for the farmers in growing summer paddy, which is, in fact, high in many cases. Therefore, crop diversification is in the agricultural plan but not yet at the field level. One obvious clash of interests regarding the objective of the production policy is that the government focuses on maximization of production or output, while the farmers focus on maximization of income and profit.

To achieve self-sufficiency in edible oils, only a limited volume of sesame is exported; between 2-7 thousand tons per year. Oilseed is a centrally targeted pillar crop but is also sold through private trade. It is mainly grown in the central dry zone either as a pure crop or mixed. Two million six hundred thousand hectares of oilseed were sown in 2001-2002, equivalent to 16.4 per cent of the total crop sown area. In terms of area sown the most important oilseed crops are sesame, groundnut and sunflower covering 52 per cent, 22 per cent and 20 per cent of the oilseed area respectively. Niger and mustard cover 5 per cent of the area and are locally significant. In terms of edible oil production, groundnut is the most important followed by sesame.

Pulses are the backbone of agriculture in upland areas, especially in the dry zone where, apart from being a major cash crop, they are a vital source of human protein, important by-product providers for animal feed and a source of fuel from the pigeon pea stems. Their importance in improving soil fertility through nitrogen fixation is widely recognized depending upon the harvesting system. In terms of sown area, pulses are second to cereals occupying 3.2 million hectares or 20.4 per cent of the total crop sown area. The major pulses produced are green gram, black gram, pigeon pea and chickpea covering 24 per cent, 23 per cent, 15 per cent and 6 per cent respectively.

Given the agro-ecological and seasonal diversity of Myanmar, a wide range of tropical, sub-tropical, and temperate fruits, flowers and vegetables can be grown. In 2000/2001, 0.73 million hectares of vegetables and fruits were grown equivalent to 5 per cent of the total gross sown area. The major fruit crops grown are mango, pineapple, banana, citrus and coconut. The main vegetables produced are tomato, onion, cabbage, cauliflower and potato. Although vegetable production trends over the past five years

indicate significant growth in total production for all crops apart from tomato, production patterns for fruit illustrate up and down trends except for mango.

7.1.4 International trade policies

The principles of trade set by the Ministry of Trade, predecessor of the Ministry of Commerce (MOC), in 1989 aimed at easing the cost of living of the people; stabilizing the market and prices; introducing new export commodities and promoting the export of semi-processed and manufactured goods rather than the export of primary commodities; importing essential goods which can support production; and promoting trade activities and extending border trade with neighbouring countries.

The Directorate of Trade under the MOC is responsible for the formulation of trade policies and plans to regulate the smooth flow of international and external trade. MAPT under MOC is responsible not only for agricultural trade and marketing activities but also for the implementation of investment programmes and development projects, such as the construction and installation of new mills, storage facilities and related machinery. The Department of Border Trade is responsible for implementing and facilitating border trade activities with neighbouring countries.

In terms of the promotion of domestic trade, private entrepreneurs, joint venture (JV) and co-operatives have been allowed to engage in agricultural trade. Local and foreign entrepreneurs are allowed to form partnerships and free trade is permitted. In order to promote border trade, a Central Border Trade Supervisory Committee and respective regional committees have been formed. Transit trade, counter trade and border trade were all permitted for private entrepreneurs side by side with state trading organizations. The MOC also formed the Trade Affairs Authority to support various trade activities, sponsored trade fairs, held workshops and seminars on business and marketing management, promotional activities, practices and producers.

All private enterprises involved in foreign trade have to secure export/import licenses. Export licenses are issued by the Ministry of Commerce referring the minimum export price specified by the pricing committee. A commercial tax of 8 per cent and income tax at 2 per cent is levied on all merchandise exports, including agricultural commodities and is payable in US dollars to the Internal Revenue Department. Traders are allowed to import a maximum of 90 per cent of the value of exports, deducting 10 per cent as export tax.

A total of 11 local JVs and 10 foreign JVs were formed following a change in policies and reforms initiated in 1989. Unfortunately, all JVs except one local and one foreign one have already been liquidated. Poor efficiency, corruption, misappropriation and losses were

attributed to such liquidations. An important private institution regarding trade and marketing activities in Myanmar is the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI). Although other institutions like wholesale and retail organizations and NGOs exist, the data and information on these institutions is not readily available. The international activities of the UMFCCI include acting as intermediary and rendering services to foreign and local JVs; marketing and business transactions; participating in trade fairs, exhibitions, conventions and conferences; and providing consultancy services in industrial, economic, legal and environmental issues.

In Myanmar, parallel market exchange rates co-exist with the official rate with a huge difference between the rates. Official rates are around 6 kyats to the US dollar against the market rate of around 1,000 kyats, indicating highly over-valued kyats. However, the actual value of kyats has declined due to high inflation and persistent deficit in the balance of payments. The trade account and the current account have shown a deficit for a long time, although the ratio of the deficits to GDP have declined. The trade deficit in Myanmar has been covered mainly by balance of services such as tourism, balance of transfer accounts mainly remittances from migrant workers, and foreign direct investment.

7.1.5 Investment policies

After almost three decades of experience with a centrally planned economy under the socialist government, Myanmar liberalized domestic marketing, processing and exports on agricultural produce, except for rice and industrial crops such as cotton and sugar cane in 1987. The measures for liberalization were followed by Foreign Investment Law (FIL) in 1988 in order to stimulate Foreign Direct Investment (FDI), which allowed, for the first time in decades, 100 per cent foreign-owned ventures in Myanmar. Cross border trade with neighbouring China, India, Bangladesh and Thailand was also legalized.

Under the FIL of Myanmar, foreigners are allowed to invest either in the form of a hundred per cent wholly foreign-owned enterprise, or in the form of a joint venture with a private or public local entity. If it is a joint-venture, the minimum foreign capital shall be 35 per cent of the total equity capital. The minimum amounts of foreign capital required to be eligible under the FIL are:

- For an industry US\$ 500,000
- For a service organization US\$ 300,000

The major incentives under the law are:

- Corporate income tax exemption for three consecutive years after commercial production;

- Exemption or reduction of tariffs and domestic taxes on machinery and parts imported relating to plant construction;
- Exemption or reduction of tariffs and domestic taxes on imported raw materials for the first three years, which are to be used for commercial production immediately after completion of the construction phase;
- Exemption or reduction of income tax on a maximum of 50 per cent of the profits gained from the export of products;
- Accelerated depreciation of fixed assets;
- Grant rights to deduct research and development expenses from assessable income; and
- Carry forward and off-set losses for up to three consecutive years from the year the loss is sustained.

For the agricultural sector, along with the liberalization measures for the whole economy, the import and distribution of agricultural inputs such as fertilizers and pesticides, handled by the state previously, were also relaxed and subsidies on these items were greatly reduced so as to expand the role of the private sector. Apart from the relaxation of imports, there are also free tariffs on imports of agricultural inputs such as fertilizers, agrochemicals, seeds, agricultural machinery and equipment. In addition, the private sector, including foreign investors, is not only allowed but also encouraged to develop large tracts of cultivable idle land. According to the FIL, foreign investors are able to lease land at reasonable rates from the government for up to 30 years, which may be extended on a case-by-case basis upon negotiation.

According to FIL, the potential areas for investment and trade in the agricultural sector are:

- Developing the land for increased agricultural production;
- Establishing agro-based industries to produce value-added agricultural products;
- Assembling and manufacturing small-scale agricultural machinery and farm equipment;
- Producing agricultural inputs such as fertilizers, seeds, pesticides and related support products; and
- Trading agricultural produce and value-added products, input supplies and agricultural machinery.

7.2 Infrastructure provision

The main agricultural policies of the government revolve around the expansion of cropping and industrial crops, both within SEEs as well as through private sector involvement, and increasing the involvement of the private sector in agricultural input provision. The increasing mechanization of agriculture and the expansion of irrigation are important measures being used to increase production and the productivity of agriculture, as well as increasing the area of land under cultivation.

7.2.1 Irrigation

Irrigated production is expected to make an important contribution to the overall development of the agricultural sector of Myanmar. Notably, nearly 45 per cent of all irrigated areas are served by river-pumped systems. By comparison, reservoirs and river diversion systems account for only 32 per cent and private, village-based systems only around 12 per cent. Given the importance of irrigated paddy in overall crop production, it can be assumed that rice takes the largest portion of the water.

Table 7.3 Irrigated area expansion by irrigation type (million hectare)

Irrigation Type	1998-1999	1999-2000	2000-2001	2001-2002	Percentage
Dams/weirs	0.551	0.573	0.601	0.628	31.5
Village ponds	0.131	0.201	0.232	0.245	12.3
Well/borehole	0.006	0.081	0.089	0.093	4.7
River pumping	0.754	0.840	0.830	0.890	44.6
Windmill	0.0	0.0	0.002	0.000	0.0
Others	0.137	0.146	0.156	0.140	7.0
Total	1.691	1.841	1.910	1.996	100.0

Source: MOAI.

Overall, a total of 289 irrigation projects were completed by 2002-2003 covering an area of nearly 1.4 million hectares. Total investment costs range in the order of 65,282 billion kyats. The annual budget allocation for the development of new irrigation schemes is about 14,000 million kyats.

A number of institutions are involved in the water and irrigation sector, including several Ministry Departments, development committees and private users. The principal government institutions are the Irrigation Department (ID) and the Water Resource Utilization Department (WRUD), both under the Ministry of Agriculture and Irrigation (MOAI). Responsibility for system management lies with ID in the case of dam and river diversion systems and with WRUD in the case of river or groundwater pumping.

To boost agricultural production, the general right to use water for agricultural purposes is firmly vested in Myanmar. There are important acts relevant to irrigation and these are the Burma Canal Act (1905), the Burma Embankment Act (1909), the Underground Water Act (1930), and the Public Works Accounts Code and Public Works Department Code.

A water tax is charged at only 10 kyats per acre for the use of irrigation water from government diversion weirs and reservoirs. An embankment tax is also charged at 5 kyats per acre for projects under the protection of government embankment and drainage canals and 10 kyats per acre for irrigated land that enjoys both irrigation as well as flood protection facilities. The collection of water and embankment taxes falls under the responsibility of the Revenue Department and on average, total revenues reach 20 million kyats per year, of which half is contributed by the water tax and half by the embankment tax. Farmers receiving irrigation from government constructed irrigation schemes are highly subsidized. Clearly this is insufficient to cover system operations and maintenance.

7.2.2 Marketing

Agricultural marketing reform proceeds in two forms in Myanmar. One is domestic marketing reform and the second is export liberalization. Domestic marketing reform has two components. The first is the abolition of compulsory delivery systems. This means that farmers no longer have to sell their produce to the government. Instead, they can sell it freely in the market at prevailing market prices. The second component was the admission of private traders into agricultural marketing. Basically, no legal regulation was introduced to prevent them from engaging in every stage of trading. Under export liberalization, private traders gained permission to export commodities freely upon registration as an exporter.

The MAPT is the largest state trading agency under the MOC and consists of eight main departments and marketing institutions. MAPT is responsible not only for agricultural trade and marketing activities but also for the implementation of investment programme and development projects such as the construction and installation of new mills, factories, workshops and storage facilities and related machinery. A large proportion of the paddy procured is processed by the MAPT's own rice mills and hired (private) rice mills on a contract basis. Other procured crops/grains are locally processed and then exported.

MAPT owns 67 rice mills, of which 36 are equipped with modern rice processing facilities, two modern parboiling rice mills and 17 rice-bran-oil mills. They process rice for local distribution and export, edible-rice-bran oil and industrial oil from fresh and old bran, respectively. The processing capacity of these mills is about 1,000 tons each for edible-rice-

bran oil and industrial oil, and about 3,000 tons of defatted bran is exported annually. The storage facilities owned by MAPT include modern warehouses equipped with cleaning facilities, temperature monitoring aeration, and automatic loading and unloading facilities, and have a storage capacity of about 1.8 million tons.

Exports of pulses and oilseed are also permitted by private traders. Furthermore, from 1998, private entrepreneurs who produce the crops on reclaimed, fallow or virgin land were allowed to export 50 per cent of their rice production. Tax exemption and reductions of import tariffs for agricultural inputs are attractive to the importers. Therefore, private entrepreneurs involved in the agricultural sector and domestic markets for agricultural inputs also developed.

Market information systems exist at the wholesale markets and trading centres. Price determination factors and information are readily available in wholesale markets with local prevailing conditions. For the promotion of domestic and international trade, many new department stores, supermarkets and mini-markets have been opened extensively throughout the country. In this regard, the importance of Yangon and Mandalay as crop exchange centres resulted in the large-scale movement of many agricultural commodities in the country.

MIDC has taken steps to achieve its objectives since its formation. The key areas are: the formation of 13 industrial zones in areas where private enterprises are concentrated; creating public awareness by holding national and zonal seminars, exhibitions and conferences, which can contribute to the creation of markets and exchange of ideas; establishment of a private industrial bank called Myanmar Industrial Development Bank (MIDB) to provide loans for industrial ventures.

7.2.3 Potentials and constraints in infrastructure provisions

The potential for the future development of irrigation in Myanmar is significant and the availability of water resources does not appear to be a constraint. Moreover, the scope for irrigation improvement is considerable and the cropping intensity, which is defined as the ratio of cultivated area over the irrigated area could be increased from 142 to more than 200 per cent. The anticipated combined effect is that the cropping intensity in the irrigable area could be nearly doubled.

There are two constraints to irrigation development. The first are budget constraints to system development and cost recovery as neither the irrigation charges applied by WRUD nor the water tax payment used by ID are sufficient to cover the cost of management. Secondly, the relatively low level of on-farm water management is seen as a

considerable constraint to improve the performance of irrigation. On-farm water management implies a high level of water control offered by the system. In rice-based systems, water has an important function in controlling and tailoring the rice plant. In order to be effective, access to irrigation and drainage facilities at the farm level is an important precondition.

Regarding market conditions, exporters in Myanmar have conducted business without adequate up-to-date market information. Hence, they have used prices for the exports that are lower than prevailing international market prices.

7.3 Research and development

7.3.1 Development of farm processing and marketing technology

Generally, farmers are the best judges of what crops can best be grown in any particular location and be economically profitable and responsive to market prices. They are capable of making sound economic choices. Given a conducive and liberalized environment, it is certain that farmers would respond quickly to economic opportunities and catalyze growth in agriculture and the indirectly related sectors.

Although the total sown area of pulses in Myanmar has drastically increased, appropriate technology, such as improved seeds, agronomic practices and crop protection measures suitable for most areas are needed. In addition, plant variety protection should be enforced and yields of released varieties, especially black gram and green gram, important for the export market, are low and the seeds currently used are old. Therefore, there is urgent need to test and use new improved varieties.

Increased cropping intensity has led to the utilization of farm machinery. Therefore, particularly in tillage and harvesting operations, AMD under MOAI and the Ministry of Industry as well as private entrepreneurs, are domestically manufacturing and importing farm machinery and equipment. However, the use of farm machinery is still inadequate. Furthermore, the majority of farmers in Myanmar have little or no access to agricultural credit for either seasonal or term loans. This is a major constraint to growth in crop production, diversification and to innovate farm business development.

Therefore, encouraging private sector participation by creating an appropriate environment for the supply and distribution of farm machinery should be considered to establish an effective rental market for agricultural machinery in rural areas and access to long-term credit for agricultural mechanization be assured.

Poor seed quality is a major factor limiting growth in crop yields. There is no significant programme for the introduction and multiplication of new varieties of any of the pulses or oilseed crops and farmers generally select and save their own seeds. Some out-crossing crops, such as sunflower, have become very mixed and there has been a general degeneration in genetic potential. Cotton crops are also very mixed and seed produced from government ginneries is particularly poor and mixed.

Agricultural marketing reform in 1987-1988 was the very first measure taken in the process of the transition to a market economy in Myanmar and the most positive response to the marketing reform can be found in the areas of pulses.

The national pulse policy is to increase production to satisfy local demand and to expand exports. Underlying the market economic policy after 1988, food legumes were permitted for export. Trade liberalization policies have made pulses more attractive and profitable crops. In addition, there is international market demand, especially from India. The destinations of exports of pulses from Myanmar are India (77.6 per cent), Pakistan (5.4 per cent), Indonesia (4.3 per cent), Malaysia (2.5 per cent), Singapore (2.5 per cent), Japan (1.3 per cent) and other countries (6.4 per cent) in 2001-2002.

After 1988, due to the liberalization of exports, there were many co-operatives and private exporters involved in export business activities. The UMFCCI is the highest non-governmental organization representing the interest of private business commodities and working for the benefit of the private sector. MAPT, the state marketing agency, plays a leading role, undertakes domestic procurement of pulses directly from farmers at prevailing market prices applying prescribed quality standards. State economic enterprises purchase pulses from all available sources at given market prices. The co-operatives, joint ventures and traders have their own brokers. Since 1998, farmers have sold directly to private traders and there has been no compulsory procurement.

7.3.2 Development of an extension service network

The generation and effective dissemination of improved technologies is a high priority of the MOAI. Agricultural extension plays a key role in disseminating research findings and proper messages to the farmers. Follow-up assistance supporting farmers through training and demonstrations is also crucial for sustained agricultural development.

MAS is an umbrella organization of MOAI that co-ordinates agricultural research and extension in the country. MAS is responsible for the transfer of appropriate crop production technologies through agricultural extension programmes, distribution of certified seeds, and distribution of agricultural inputs. The Agricultural Extension Division (AED) is the largest

branch of MAS with about 12,000 staff, of which more than 1,000 are agricultural university graduates. The main function of the division is to transfer appropriate technologies to farmers through the implementation of extension plans, the collection of information on field problems faced by farmers, and distribution of inputs and seeds. It has a complete office organizational structure from the central office to the village level. A village manager is responsible for technology dissemination to an area of 3,000 to 6,000 acres depending on location and communication facilities. The ratio of extension agents to farmers is about 1:500. The village-tract managers supervise the activities of about ten village managers. Extension camps have been established in every township.

Effective linkages between extension and research are pursued through various mechanisms, including staff training of the MOAI on different crops and subjects. The extension workers are tasked to diffuse the technologies among farmers by means of demonstrations, field days and visits, which serve as feedback to the research for further development. In recent years, there have been significant achievements in technology transfer, such as the increase in cropping intensity brought about by the summer rice programme and surplus production of paddy and pulses.

The Ministry of Agriculture and Irrigation is represented principally by the township managers of the Myanmar Agriculture Service (MAS) and the Settlement and Land Record Department (SLRD). At the field level, MOAI operates directly through the agencies under MOAI, with a presence in the area and through an Agriculture Supervision Committee (ASC). All MOAI agencies can also be present within a state/division, district or township to form the ASC, which is responsible for the co-ordination of all agricultural activities within its geographical area of responsibility.

7.3.3 Potentials and constraints in the development of technology and an extension network

The institutional organization of the extension service represented by the division of MAS, departments and enterprises is well established at the national, state/division, district, township, and village levels. Many extension workers have in-depth practical field experience but the technical skills and academic qualifications of them are very limited. Field staff normally lack transportation and travel allowances, and training programmes targeted at them are very limited. Because of the limited planning capability at the field level, most extension messages are centrally designed, and do not consider socio-economic conditions, poverty issues or markets.

There is a considerable trained extension force available for technology transfer but it is mostly occupied with the achievement of central production targets for pillar crops, especially rice. To have a more significant impact on farm incomes through the development of sustainable integrated farming systems, extension should focus on the adoption of quality seeds and planting materials of new high-yielding varieties and reduce post-harvest losses; irrigation of high-water-demand crops such as paddy should be discouraged in upland areas and irrigation provided to more households for supplementary irrigation of low water demand crops; irrigation water charges should be radically increased to cover full scheme operations and maintenance to provide incentives for prudent water use; and farm enterprises such as kitchen gardening, horticulture, and livestock production, especially relevant for the small and marginal farmers and the landless.

7.4 Concluding summary

Increased paddy production is the most dominant theme at present in Myanmar. The government accords very high priority to increase both monsoon and summer paddy. Therefore, crop diversification is on the agenda of the agricultural plan but not yet at the field level. One obvious clash of interests regarding production policy is that the government focuses on the maximization of production or output, while the farmers focus on the maximization of income and profit.

The current level of fertilizer use (ranging between 21.0 kg and 53.5 kg per hectares during the past five years) is undoubtedly well below the optimum level of application. Moreover, the current level of quality seed provision is also well below the desired level even though the seed division under the Myanmar Agriculture Service is the main technical agency responsible for the production of seeds, including CGPRT seeds. MADB is the only source of institutional credit for crop cultivation. Its loans are mostly seasonal and the amount is small, except for rice and cotton. No private banks have yet undertaken money lending to the farmers and rural poor. Most of them depend upon informal money from private lenders.

A water tax is charged for the use of irrigation water from government diversion weirs and reservoirs. An embankment tax is also charged for projects under the protection of government embankment and drainage canals and for irrigated land that enjoys both irrigation as well as flood protection facilities. Farmers receiving irrigation from government constructed irrigation schemes are highly subsidized. Clearly this is insufficient to cover system operations and maintenance.

The potential for the future development of irrigation in Myanmar is significant and the availability of water does not appear to be a constraint. Moreover, the scope for irrigation improvement is considerable and the cropping intensity could be increased from 142 to more than 200 per cent. The anticipated combined effect on the cropping intensity of the irrigable area would nearly be doubled. Two constraints of irrigation development are: budget constraints in system development and cost recovery; and relatively poor on-farm water management.

The national economic objectives of Myanmar highlight the role of agriculture as the driver of economic growth, but fail to explicitly identify agro-industrialization as a mechanism by which this can be achieved and industrial policies and strategies that have been implemented were mainly oriented towards import-substitution. AMD under MOAI and the Ministry of Industry as well as private entrepreneurs domestically manufacture and import farm machinery but the use of farm machinery is still inadequate.

Market information systems exist at several wholesale markets and trading centres. Price determination factors and information are readily available in wholesale markets at local prevailing conditions. For the promotion of domestic and international trade, many new department stores, supermarkets and mini-markets have been opened extensively throughout the country. Regarding market conditions, exporters in Myanmar conduct their business without proper access to market information in real time. Hence they have price information for the exports lower than the prevailing international market prices.

MIDC was formed at the beginning of 1995 and the key areas of its activity are: the formation of 13 industrial zones in areas where private enterprises are concentrated; the creation of public awareness by holding national and zonal seminars, exhibitions and conferences; and the establishment of a private industrial bank called the Myanmar Industrial Development Bank (MIDB). The economic, social and environmental features of Myanmar are very favourable for agro-industrial development but coupled with long-term deterioration in terms of the trade in raw, unprocessed primary products on the international trade market, implies that the continued reliance on exports of primary products for foreign exchange is unsustainable.

To have a more significant impact on farm income through the development of sustainable integrated farming systems, extension should focus on the adoption of quality seeds and planting materials of new high-yielding varieties and reducing post-harvest losses; irrigation of high-water-demanding crops such as paddy should be discouraged in upland areas and irrigation for supplementary irrigation of low-water-demanding crops to increase the crop sown area; irrigation water charges should be radically increased to cover

full scheme operations and maintenance to provide incentives for efficient water use; and farm enterprises such as kitchen gardening, horticulture, and livestock production, especially relevant for small and marginal farmers and the landless.

8. Prospects for Enhancing the Sustainable Development of Diverse Agriculture

8.1 Overall assessment of potential

In Myanmar, both horizontal and vertical growth opportunities exist in the production and productivity of pulses. Although the production trends illustrate consistent upward trends in sown area and production over the last decade, the yield of pulses has only slowly increased in recent years.

The existence of an export market was important as an initial condition. India's demand for pulse imports is still increasing, reflecting changes in its domestic production trends. It is undeniable that the existence of a big neighbours' market pushed Myanmar's pulse production forward. It is also true that direct access to the export market improved the terms of trade of pulses for Myanmar farmers, as the price of the alternative main crop, rice, has been kept low under private export prohibition.

The second factor is the nature of the crops themselves. Pulses are genuine cash crops and are not widely consumed domestically. The introduction of pulses represented an intensification of land utilization from mono-cropping to double cropping. Even though there are fertilizer recommendations made by extension agents, risk-free dosages, in other words, minimum dosages and methods of spot and split application are employed to grow rice in order to reduce the risks. In terms of economic viability, growing rice may not be profitable but most of the farmers want to assure food security. The fact that pulses are profitable cash crops with relatively little political importance after rice and oil crops and the lack of any intervention whatsoever from the government, also contributed to rapid increases in sown area.

The development of infrastructure during the 1990s can be cited as a supporting factor. Since the beginning of the 1990s, the government has made efforts to develop road networks despite limited financial resources. The construction of a bridge from Thanlyin to Yangon in 1993 facilitated road transportation to the central marketing point for Thonegwa township.

In addition to the transportation infrastructure, the establishment of marketing centres is worth noting. Commodity trading centres were established in Yangon, Mandalay

and other big cities like Monywa during the early 1990s, and many wholesalers scattered in the cities willingly joined the trading centres. It is true that this development helped the accumulation and dissemination of marketing information. Rural marketing intermediaries depend on marketing information from these centres for their daily business, contributing to the smooth formation of the rural marketing system.

8.2 Overall assessment of constraints

Increased cropping intensity has led to the utilization of farm machinery, particularly in tillage and harvesting operations. The agencies under the MOAI and MOI as well as private entrepreneurs are domestically manufacturing and importing farm machinery and equipment. But the use of farm machinery is still inadequate and only 28 per cent of the sown area is mechanically tilled. Most of the pulses in Myanmar are grown as a second crop after rice in rainfed areas effectively exploiting residual soil moisture. Without the removal of the first crop (generally rice) and tillage operations for the second crop (pulses) in a timely manner, area expansion of pulses could not have materialized due to the loss of residual soil moisture.

Improved seeds are one of the major inputs to increase production and improve the grain quality for export. Even though the sown area of major pulses has doubled within ten years starting from 1988, the high quality seed provided to the farmers is way behind the actual needs. Among the major grain legumes, quality seeds of improved varieties are produced only for black gram, green gram and chickpea. It is estimated that the area coverage of improved varieties is not more than 35 per cent for black gram, 25 per cent for green gram and 10 per cent for chickpea.

Most farmers do not have sufficient capital to invest in the farm business. Agricultural loans provided by MADB during the cropping season are also inadequate. MADB's lending ceiling is 2,500 kyats per hectare for black gram, green gram and pigeon pea. Therefore, farmers have to borrow from private moneylenders at high interest rates and as a result the farmers are stuck in a vicious cycle of poverty.

Although the agricultural research system has identified some improved agro-techniques, varieties and post-harvest technology, some have not made it to the fields. In addition, agricultural extension has difficulties in transferring the technology to the farmers. On many occasions, a lack of transport facilities and a limited budget inhibit regular visits of the extension agents to the farmers.

In Myanmar, rice is the priority crop. Thus, more attention is given to the Human Resource Development (HRD) of rice. Therefore, pulses and other sectors have relatively few trained personnel, which is one of the constraints to pulse sector development in Myanmar.

Pest and disease control is important for several pulses and yield losses due to pest infestations can be considerable. Farmers are aware of the need for pest control but are constrained by the availability of the right pesticide and the cost of pesticides even though Integrated Pest Management (IPM) was introduced by extension agents. There is also waste of pesticide as a result of improper use and there are negative environmental impacts as most of the farmers are unaware of IPM principles in pest and disease management.

To increase the productivity of pulses in different cropping systems and agro-ecological situations, information on crop management plays a vital role. It is particularly important in a country like Myanmar where the same kind of crop is sometimes cultivated in different agro-climatic zones. Variables like the date of planting, depth of planting, plant population density, and method of sowing change based on the sowing season, moisture status of the soil at sowing time and cropping pattern being applied. Therefore, a lack of information on these aspects is a limiting factor. Certain unique agronomic practices and suitable varieties are a must for good yields.

Access to adequate market information at the right time is an important factor for the success of trade in the international market. Exporters in Myanmar conduct business without knowing information on time, while others, such as Indian importers in the pulse trade can access up-to-date information.

Agro-based industries are most important to develop the economy. It can increase the income and employment opportunities in rural areas, improve and diversify agricultural production, and help increase the nation's exports. Although agro-industry production accounts for more than one-half of Myanmar's manufacturing production, most of the plants in this industry are small-scale, old-fashioned, and engaged mainly in simple processing like splitting and de-husking of the whole grain, which is required for a good export price and local consumption. Due to a lack of financing and technical know-how, Myanmar exporters are only able to export in the raw form; pulses are just re-cleaned and polished instead of value-added. Therefore, it is not easy to access the quality market without up-grading the current pulse industry in Myanmar.

Another important factor in international trade is that when there is a sellers' market in the international market, it has been found that buyers normally do not pay much attention to the specification. However, when the international market price slumps, buyers strictly

follow the conformity with prescribed specifications. The existing standard specification of pulses in Myanmar (mostly are Fair/Average Quality) is not appropriate for export to international markets to compete in the long run.

8.3 Strategies and policies to enhance the sustainable development of diverse agriculture

Rice dominates the cropping system in Myanmar, covering about 40 per cent of the total sown area. Edible oils, which are still domestically in short supply, have to be imported to meet local demand, and are the second most important commodity in the diet of Myanmar people after rice. Pulses are the third most important crop in the country according to priority, which comprise of about 20 species of grain legumes, and are grown widely in the central dry zone, and to a lesser degree, in the delta and mountainous regions. Pulses contain a high protein content, which can substitute protein from meat and fish and can also improve soil fertility through nitrogen fixation and their local as well as world demand is high. Therefore, it is a profitable crop for both farmers and the nation.

Consequently, the sown area of pulses grew rapidly by about 10 per cent per annum, from 1 million hectares in 1990/1991 to 2.7 million hectares in 2000/2001, and annual production increased nearly fourfold from 0.596 million metric tons to 2.263 million metric tons over the same period. However, their yields have remained low at less than 1.0 mt/ha because the crops have to be grown mostly under rainfed conditions with generally poor seedling establishment and deficient application of fertilizers and pesticides.

Therefore, it is necessary to sustain the present position of being the largest exporter of pulses in Asia and to achieve world market share. It is to focus not only on increasing production to achieve international market share but also to emphasize quality control for market competitiveness.

Thus, to reach the potential yield set in the 30-year agricultural plan, inputs like credit, fertilizer, pesticides, improved varieties, and technological improvements are needed. Moreover, to compete in a globalized market, there is an urgent need to improve grain processing plants, proper storage facilities, improve post-harvest technology and transportation facilities.

The food processing industry is one of the most promising export-oriented industries for the future of Myanmar. An effective and important means of developing agriculture and rural areas is to develop the food industry in rural areas. The promotion of the food industry in rural areas will not only increase employment opportunities but also provide incentives for

agricultural production through the procurement of agricultural products and will improve agricultural production and product quality. Myanmar should develop a diversified export-oriented food industry and should improve the level of its products in the pulse industry.

Moreover, the export price of Myanmar pulses follow up and down trends every year. At present, although Myanmar is a large pulses producer in Asia, Myanmar does not seem to be price maker nor price taker. Therefore, good contacts with importer countries are required to achieve strong markets.

9. General Conclusion and Policy Recommendations

9.1 General conclusion

The agricultural sector, as a dominant force in Myanmar's national economic development, plays a significant role in providing overall domestic food self-sufficiency, promoting external trade and availing raw materials to meet the demand from the domestic, agro-based industries.

At present, pulses stand as critically important commodities not only for farmers and market intermediaries but also for the country in terms of foreign exchange earning. Moreover, pulses provide the main source of dietary protein for people who have limited access to meat and fish, which are more expensive.

Myanmar, with a relatively favourable land-man ratio, has the potential to increase pulse production. Pulses constitute 20 per cent of the total sown area and contribute 40 per cent of agriculture exports including crops, livestock, fisheries and forestry products.

Myanmar introduced many economic changes in 1988 and since then the marketing of pulses has been liberalized. As a result, the producers receive good income and the production of pulses increased rapidly from less than 500,000 metric tons in 1988 to 2.7 million metric tons in 2002. Similarly, the amount of pulse exports expanded from less than 100,000 metric tons to over 1 million metric tons in 2002.

This study has clarified the constraints and opportunities faced by farmers, small-scale producers and processors, who are involved in the production process. Moreover, international competitiveness of black gram, green gram and pigeon pea has been established. Based on the findings, although Myanmar pulses are still competitive in the international market, it should be noted that production should be increased through vertical expansion (by increasing yield); more attention should be given to quality control in favour of market access to achieve world market share and produce more value-added products to meet the preferences of the importing countries.

9.2 Policy recommendations

9.2.1 Improve research and development

Most pulses are grown with residual soil moisture after the first crop, such as rice. In the study areas, limited availability of residual soil moisture and lack of extensive use of improved varieties leads to poor yield. Moreover, pulses are grown using limited amounts of fertilizer and pesticide. This can also tend to reduce yield. Pulses are highly profitable crops and if the costs of production increase due to the increasing costs of inputs and labour charges, increasing yield is the only way to cover the cost of production.

Therefore, to improve productivity, research and development programmes for testing, multiplication and distribution of improved high-yield and high-quality varieties and reduction of post-harvest losses have to be given priority. These programmes have to be linked with improvements in agricultural technology through research and the technical skill of extension staff and dissemination of technical know-how to farmers.

Regarding co-ordination between research and extension services, it is still minimal and needs to be improved and strengthened. The flow of information on site-specific technology through researcher-designed and farmer-managed trials and the feedback from extension to research should be strengthened.

9.2.2 Improvements in input supply

Moreover, availability and accessibility of inputs such as seeds, fertilizers and farm machinery are vital to achieve increased productivity in secondary crop agriculture. Therefore, it is necessary to make strong logistic support from the public sector and to encourage private sector participation in this business through appropriate incentive schemes and to develop a programme of reform and implement private/public partnerships for the production and distribution of quality farm inputs like fertilizers and pesticides in accordance with the fertilizer law and pesticide law. At the same time, in order to improve fertilizer use efficiency, site-specific fertilizer recommendations for secondary crops, such as pulses, should be developed instead of making blanket recommendations for all areas regardless of the fertility level of the soil. Moreover, pulse producers, especially those who extend their sown area for the first time as double cropping after rice where pulses has never been grown, should be educated through extension services to use the proper strain of rhizobium for better yields.

9.2.3 Soil conservation and fertility improvement

During the field survey, soil degradation problems due to soil mining, even in the alluvial plains, such as in TG, and serious gully erosion problems in slopping lands, such as in Monywa, were noted. For the sake of sustainable agriculture, soil conservation and soil fertility improvement measures, such as the construction of low-cost check dams for soil erosion control, especially in the dry zone, prevention of the formation of saline and alkaline soil due to over-irrigation as a result of continuous rice production leading to total soil degradation, the use of organic matter mixed with nitrogen containing chemical fertilizers such as urea for a chelation effect to transform it into a relatively slow-releasing fertilizer, growing grass for soil cover, systematic growing of wind-breaks, alley cropping with pigeon pea and some other annual crops such as groundnut, sesame and maize, and the creation of on-farm, off-farm and non-farm jobs for the rural poor to relieve pressure on land, should be considered.

9.2.4 Credit

The farmers have little credit available from the MADB's loans so they have not been able to invest enough in their farming activities. Therefore, appropriate credit schemes are also important for small and marginal farmers to increase productivity. The agricultural credit scheme should be re-formulated as a more efficient agricultural financing programme for future funding and the management of farm credit.

9.2.5 Poverty alleviation in rural areas

Economic growth and poverty alleviation are not always automatic. The same can be true for food self-sufficiency and poverty alleviation. Without effective alleviation of poverty, people will be prevented from having sufficient access to food. Food availability and accessibility to food are key elements relating to food security. There is a need to address the problems of an increasing rural labour force and of the landless farmers and shrinking land holdings. Myanmar has abundant land and water resources for the expansion of cultivated land and the construction of irrigation facilities. However, it is necessary to implement a comprehensive master plan and prepare medium-and long-term development programmes that strengthen existing agricultural infrastructure, towards the meaningful creation of employment opportunities for poverty alleviation in rural areas and bringing prosperity to an exploding rural labour force and preventing premature urbanization.

Myanmar should prioritize poverty alleviation through development programmes including food production, not only rice production, which requires the development of

mechanisms through which the rural poor can participate, starting from formulation to implementation, in the development programme.

9.2.6 Market research and information

At present, pulses in Myanmar rely mainly on the Indian market and it is mainly based on quantity. Therefore, Myanmar should look for other potential markets to maintain the export price of pulses. At the same time Myanmar should prepare to break into the quality market and adopt a much more professional approach to achieve export markets to maximize export earnings from pulses. Demand from the international market for processed pulses is increasing.

Regarding market information, it is necessary to establish an agricultural market information service not only for the benefit of producers, traders, exporters and consumers but also to increase internal and external trade in Myanmar. To remain vibrant, up-to-date information on crop prices, consumer choices, world demand, import and export prices, and transportation facilities need to be available to all the stakeholders. Access to market information is not yet easily available, while farmers in remote areas lack the means. As long as competition intensifies, it will be essential for such information to be easily available through affordable means such as radio and television; even though the Market Information Service under MOAI publishes a weekly price bulletin.

Currently, crop exchange centres are situated in urban areas like Yangon, Mandalay and other big cities and current market information including price, demand and supply is exchanged by telephone among traders and wholesalers, which means that market information is only shared within a small group. Updated market information is not accessible to farmers who are out of the trader's community. Even in big cities like Mandalay and Monywa, limited access to the Internet for international market information is another weakness for exporters. Therefore, it is essential for such information to be easily available through affordable means such as radio and television.

9.2.7 Processing industry

Undeniably, the pulse industry still remains weak in technology, capital and market. Most of the produce is below international standards in quality and unable to compete in the global high-end market. This is a hindrance to the development of viable agro-based industries in future. The development of viable agro-based industries remains essential in creating employment and raising the living standards of the rural populace. There is a strong potential for it in Myanmar as the raw materials are plentiful and the innovative field, such as

the production of value-added products, remains lucrative and should be explored further. FDI could be the only way to improve the situation at the moment.

9.2.8 Land policy, productivity and credit

Legally speaking, land is owned by the state but during the field surveys, farmers admitted to unwittingly selling and buying land under the nose of local authorities who seem to turn a blind eye. In order to prevent this law breaking, the establishment of a land policy for farmers, guaranteeing clear land rights that allow liberal land use by the farmers and that enable the government to rationalize land taxation, is probably the fundamental need for agricultural development in Myanmar, even when the state continues to function as the ultimate owner of all natural resources including land. More freedom in land use and clear land use rights protected by a legal system are prerequisites for farmers to invest in their land and to improve their productivity.

In addition, legally protected land use rights permit the transfer of these rights and the use of land leases as collateral for loans. The legal transaction of users' rights contributes to a situation in which more efficient farmers are able to produce more. The use of land rights as loan collateral would reduce credit constraints faced by producers throughout the country.

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