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Enhancing Agricultural Productivity and Profitability in Myanmar

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Introduction

Myanmar is in the process of instituting a series of policy and strategic reforms with the aim of achieving national development and catching up with the economic success of neighboring countries. The government has undertaken an assessment of past and ongoing macroeconomic reforms to ensure that maximum benefits are derived from the limited financial and technical resources available to the government by prioritizing policy reforms. In reality, there are a lot of challenges in making this strategy a success.

The top priority in national economic policy is the development of the agriculture sector, which has lagged behind that of neighboring countries. In this scenario, it is important to provide insight for formulating policies and strategies to enhance the profitability and productivity of major crops across major agricultural areas. The purpose of the study is to: (1) measure the productivity and profitability of farming alternative crops; (2) identify and evaluate constraints to improved productivity and profitability of farming; (3) based on (1) and (2), draw implications for agricultural policy in Myanmar.

Overview

Since the new government took office in April 2011, it has sought to end Myanmar's isolation and integrate its economy with the global system. The government has put in place measures to achieve positive changes in the political, economic, and social spheres in line with market conditions and international circumstances. In the economic sphere, development ideologies and strategies are also being altered in accordance with the change in the government system. The new constitution clearly defines the broad economic parameters that will guide the country's transition to becoming a market-based economy where monopolies, nationalization, and demonetization will not be allowed. The government is striving to reduce the poverty rate, lift the country out of the least developed country (LDC) status, and to ensure job opportunities as well as health and social security benefits for its people.

In its first year (2011--12), the government undertook reform measures for macroeconomic stabilization, which remains the highest priority and a precondition for accelerated growth and economic takeoff in Myanmar. Institutional and legal reforms are also being carried out in parallel with macroeconomic policy reforms. A vast array of major policy reforms is also underway to improve the productivity and profitability of the agricultural sector and to jump-start growth in the industrial sector. Myanmar is trying its utmost to mobilize the participation of the local people and foreign investors by clarifying the economic policy and securing the rule of law. It is also in the process of eradicating hindrances to growth by enhancing the institutional and business environment, modernizing the financial sector, and liberalizing trade and foreign direct investment (FDI). However, many other changes in terms of policy and strategies have yet to be made to achieve macroeconomic stability and targeted outcomes as well as to ensure institutional cohesiveness and the private-public collaboration that is vital for the realization of development goals.

At present, Myanmar's economy is dominated by the agriculture sector, which accounts for approximately 30 percent of gross domestic product (GDP). About 70 percent of the country's

population is in the rural areas. On the other hand, the economy still relies on resource-based industries. The most productive sectors are extractive industries, especially oil and gas, mining, and forest products. Manufacturing and other modern facilitating sectors are growing slowly against expected growth rates. Myanmar is a major exporter of primary commodities and an importer of manufactured products in this context. Even natural resources are exported in raw form without value-added production or processing. More than 70 percent of total exports go to the Asian region, and about 90 percent of total imports come from it.

Similarly, about 90 percent of total FDI in Myanmar comes from Asia. Myanmar's top two sources of FDI are China and Thailand, both of which accounted for 73.8 percent of the total. FDI from India is very marginal, accounting for only 0.5 percent of the total FDI approved at the end of 2011. From a sectoral perspective, up to 81 percent of total foreign investments are channeled to the power-generation industry and the oil and gas industry. The bulk of the FDI that Myanmar has attracted so far is concentrated in sectors related to natural-resource extraction, such as power, oil and gas, and gem mining. FDI levels remain low in economic sectors that require less resource use but promise high returns, with the manufacturing sector attracting 4.7 percent; livestock breeding, 0.91 percent; transport and communication, 0.88 percent; and agricultural, 0.27 percent of the total FDI (see appendix I). These are the sectors that are vital for import substitution, export promotion, and job creation while having very little impact on the environment (Tin 2012).

Myanmar's real GDP growth is estimated to increase by 5.5 percent in fiscal year 2011–12 and expected to increase by 6.0 percent in the year 2012–13. Inflation projected at 4.2 percent for the year 2011–12 is expected to pick up to 5.8 percent in 2012–13. Over the next few years, growth is expected to accelerate progressively as economic and institutional reforms initiated in early 2011 are deepened and implemented, economic sanctions eased and subsequently lifted, and the country opened to trade and FDI (Myint 2011). Likewise, Myanmar has to perform well in its duties as chair of the Association of Southeast Asian Nations (ASEAN) in 2014, and comply fully with the requirements of the ASEAN Free Trade Area (AFTA) by 2015. Deeper integration within the ASEAN and rapidly expanding trade with China, India, and other advanced economies would be the further drivers of rapid growth.

Agricultural Development

The structure of the economy or the share of GDP by major sectors has remained substantially unchanged over several decades. In retrospect, the national income accounts of Myanmar are available for the years 1938–39, and the share of agriculture in GDP for that year is estimated to be 47.9 percent, a ratio that remained unchanged after 60 years in 1988–89. It continued, more or less, to be the same ratio in the first decade of the new millennium, only coming down to 29.6 percent in 2010 (CSO 2012). Myanmar remains an agricultural country with 70 percent of its population living in rural areas. Agriculture (including livestock breeding and forestry) is the main industry, employing over 50 percent of the working population. In the rural areas, agriculture employs 64.3 percent of the working population. In urban areas, individuals engaged in agriculture only represent 7.5 percent of the working population (MAS 2011¹).

1. Myanmar Agriculture Services, Ministry of Agriculture and Irrigation, 2011.

Agriculture Sector Policy under Different Administrative Regimes

Government policy on production, procurement, distribution, milling, storage, transportation, domestic wholesale and retail trade, and export were different under different administrative periods. Myanmar's rice export illustrates a number of interesting phases: rice exports under the colonial system, under the parliamentary system, and under the socialist and market-oriented economic systems.

Table 1. Major policies and objectives for agricultural development in Myanmar, 1852–2012

<p>British Colonial Government, 1852–1941</p> <ol style="list-style-type: none"> 1. Setting specific grades and standards for rice to facilitate trade (e.g., standard varieties defined) 2. Assisting in the transmigration of settlers from Upper Myanmar to Lower Myanmar and in the immigration of Indians to settle in Lower Myanmar to develop the Irrawaddy Delta for rice 3. Improving river and rail transport to facilitate north-south movement between Upper Myanmar and the delta 4. Providing tax exemption for 12 years on newly cleared land 5. Providing government loans for development in the rice industry (not used much by farmers) 6. Providing legal protection for private moneylenders and other investors to support the development of the rice sector 7. Constructing embankments at government expense in tidal swamp areas to prevent flooding and encroachment of saline water 8. Providing improved rice seeds to farmers, particularly to improve milling outturn/output (reduced variation in grain size) 9. Encouraging the rice milling industry and trade, both internal and external, by holding many commercial firms and private enterprises 10. Providing a secure ownership title to property owners and providing a “laissez faire” competitive environment with minimal government intervention in production or trade (except in the area of maintaining basic law and order) 	<p>Independent Parliamentary Government, 1948–1962</p> <ol style="list-style-type: none"> 1. Maintaining food self-sufficiency and food security 2. Improving consumer welfare by subsidized sales of basic food grains, particularly rice 3. Expanding food grain production for the promotion of export and raising government foreign exchange (FE) via implicit export laws for food grains 4. Keeping domestic food grain prices low to maintain a low cost of living, which contributes to socioeconomic stability 5. Giving farmers a guaranteed minimum price to maintain stability of farm production and income 6. Stockpiling rice to stabilize the market and domestic price <p>Revolutionary Council and the Socialist Republic Government, 1962–1988</p> <p>(Two more new objectives were added to the parliamentary democratic government's list of six objectives.)</p> <ol style="list-style-type: none"> 7. To encourage food grain production through subsidized sale of inputs, provision of free agricultural extension services and cheap agricultural credit 8. To introduce scientific methods and improved cultivation practices in agriculture in order to raise per-acre yields and total output
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<p>(SLORC 1992) and State Peace and Development Council (SPDC 1997–2011)</p> <ol style="list-style-type: none"> 1. Production of food crops and industrial crops with no restriction 2. To permit the commercial-scale production of industrial and plantation crops 3. To allow private investors and farmers to expand agriculture production in cultivable waste land 4. To encourage the participation of the private sector in the distribution of farm machinery and other farm inputs 5. To utilize agriculturally unproductive land for other production programmes <p>Official food grain policy objectives:</p> <ol style="list-style-type: none"> 1. To achieve a surplus in paddy rice production (or) to produce surplus paddy rice for domestic food security and for the promotion of exports 2. To be self-sufficient in edible oil production (or) to be self-sufficient in vegetable oils 3. To increase the production and export of pulses and industrial crops (or) to expand production of beans, pulses, and industrial crops 	<p>Government of the Union of Republic of Myanmar (2011 to present)</p> <ol style="list-style-type: none"> 1. Development of the agriculture sector, with successive governments utilizing various methods for the development of the agriculture sector <p>General aims of the agriculture policy:</p> <ol style="list-style-type: none"> 1. To raise agricultural productivity 2. To implement/promote modern mechanized farming 3. To achieve the socioeconomic development of rural areas 4. To develop other economic sectors based on agriculture
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British Colonial Government, 1852–1941

In the 1800s, the Kingdom of Myanmar had a population of about 5 million, mostly living in the dry central part of the country. The economy was based almost entirely on agriculture with a domestic textile industry whose output was adequate for local needs. The rich plains of lower Myanmar were a source of rice, fish, and salt (Furnivall 1975). Land in these plains was abundant but cultivation was done only to meet the needs of a slowly expanding population. Traditional cultivation methods were used, and farming was based on a mutual aid system as it was primarily a family enterprise. Small-scale farming was common. Farms were individually owned, and there was no landlordism. Myanmar in the 1800s had a self-sufficient economy based on subsistence agriculture. The growth in rice exports was quite slow until the opening of the Suez Canal in 1869. With the opening of the Suez Canal, domestic agriculture gave way to commercial agriculture (Binns 1947). Myanmar's agricultural sector grew rapidly from the last quarter of the nineteenth century until it became a success story for agricultural commercialization and specialization. The British government introduced an immigration scheme to induce people from Upper Myanmar and India to move to Lower Myanmar. European banks, Indian moneylenders, and private moneylenders made loans available to farmers who wanted to turn jungles into paddy fields.

Agriculture was extremely and successfully commercialized during the British colonial rule and the rice industry became a major source of agricultural export revenue for Myanmar. Together

with the successful commercialization in the agriculture sector, landlordism was introduced and local people lost their lands to moneylenders mainly in the second quarter of the 20th century (Binns 1947). Forest products, petroleum, and mineral products provided other income sources. The export of beans and pulses were only a small portion of total exports (Yi 2012). The earliest British administration in Myanmar adopted the "*laissez faire*" policy or free trade policy. Myanmar became the "No.1 Rice Exporter" and was called the "Rice Bowl of Asia." The rice industry or the agricultural sector became the leading sector in Myanmar. Exports as percentage of production were 64 percent in 1880 and 71 percent in 1940 (Russell 1947). During the period 1901–02 to 1928–29, Myanmar exported a remarkable amount of rice (about 2 million tons to the world market), reaching its highest level in the rice-exporting history of the economy (Hla 2004). When the agricultural infrastructure was seriously damaged in World War II (1942–45) and most of the country's agricultural lands reverted back into jungles, Myanmar farmers grew rice mainly to meet their own needs.

Independent Parliamentary Government (1948–1962) and Revolutionary Council and Socialist Government (1962–1988)

After the war and during the post-independence period, the Land Nationalization Act 1948 was reviewed and repealed and a new act was passed in 1953 in order to abolish landlordism and to bestow land ownership to the farmers. However, Myanmar was able to export only 1.5 million tons from 1947–48 and from 1961–62. This export volume was considered only a "middle exporting level." After independence in 1948, agricultural production reached prewar levels only in 1959–60 (Hla 2004). At that time, the rice export percentages of production were decreasing and were half of that of the percentage achieved before World War II. Export as a percentage of production decreased from 71.5 percent in 1940 to 35.9 percent in 1950. Rice was the largest sown area during the parliamentary democracy period followed by oilseed (second largest), and beans and pulses. The rice-sown area increased while the area sown to beans and pulses decreased because the demand for rice was very high due to the Korean War, and the government encouraged the cultivation of rice rather than of beans and pulses (Yi 2012). The changing structure of cropping areas was a clear reflection of the changing structure of incentives as well as the responsiveness of farmers to changes in the relative price incentives of rice and beans and pulses. A central feature of Myanmar's rice sector policy since independence was the government's control of exports while free-market agents operated domestic consumption. Domestic free trade prevailed at both the wholesale and retail levels; farmers were completely free in their choice of crops and the markets in which they sold these crops until 1962. However, there was also some intervention in domestic retail marketing to distribute subsidized rice to the poor. Between 1948–49 and 1960–61 the official procurement price of rice was kept constant and well below the export price.

During the socialist period, agricultural policy implied the following two elements: (1) food prices were repressed and wages kept low in order to promote industrialization and (2) export crops were purchased below the international price with the resulting revenues used to promote industrialization (Myat 2004). The Revolutionary Council prioritized agricultural development. After 1964–65, however, this emphasis changed to industrial development. Government intervention and controls were introduced to cover almost all aspects of food grain production, procurement, distribution, milling, storage, transportation, and domestic wholesale and retail trade, etc.

The socialist government's policy emphasis was on consumer welfare with extensive use of food subsidies and limited private marketing. The government subsidized the sale of rice to consumers and distributed rice through the state economic enterprise (SEE) (Furnivall 1975). The agricultural sector was relatively stagnant from 1962 to 1973 as there were no significant improvements in technology or institutions. From 1972–73 up to 1986–87, the agricultural sector improved because of the support of government institutions and technological change (Tin 2004). The Green Revolution and Institutional Supporting Program (also known as the Whole Township Paddy Production Program) was introduced in Myanmar in 1977–78, and the program was expanded annually. During the socialist period from 1977–78 to 1982–83, Myanmar's yield per-acre of rice and beans significantly increased. At that time, rice was the largest sown crop and beans and pulses was the third-largest crop group. Export as percentage of production decreased from 38 percent in 1962 to 9 percent in 1985 (Hla 2004; Yi 2012). After the 1983–84 to 1987–88 periods, sown acreage, production, and yield per-acre of rice did not remarkably change.

State Law and Order Restoration Council (SLORC, 1988–1997) and State Peace and Development Council (SPDC 1997–2011)

Under the market-oriented economic system, rice production increased through a remarkable, government-led horizontal expansion and slight increase in vertical expansion. It was mainly due to the utilization of effective irrigation systems, the introduction of summer paddy rice, the consequences of the rice policy reforms implemented in 2003, and the attractiveness of increasing the price of rice. However, rice exports fluctuated highly, and the country was able to export only 1 percent of total production in the 2000s (see appendix).

Table 2. Myanmar agricultural exports in world ranking

Year	World Ranking	
	Rice Export	Pulse and Beans Export
1961	2	2
1965	4	2
1970	5	5
1975	7	9
1980	6	8
1985	7	5
1990	11	4
1995	12	2
2000	14	1
2005	15	2
2008	21	2

Source: Calculations made from FAOSTAT data

Since the early 1960s, agricultural policies have aimed at maximizing national agricultural output rather than individual farmers' incomes. After 1988, domestic self-sufficiency and food security became the cornerstones of farm policy. Starting in the early 1990s, the government prioritized domestic rice sufficiency and the attainment of a surplus as well as encouraged the growing of multiple rice crops, even though pulses and beans were much more profitable than paddy rice. There was also an obvious mismatch between the policy objective of the government to maximize output and the individual farmers' efforts to maximize income. This mismatch has long remained a stumbling block to effective policymaking in the national agricultural sector (Tin Soe 2004).

Various production programs and policies such as the Green Revolution in 1980s, the market liberalization of rice, the summer paddy rice program introduced in 1991–92, the commercialized farming system in 2000, the new rice policy in 2003, the initiatives of the private sector, and the changes in cropping patterns played a vital role stabilizing the country's rice production. Still, though, rice exports have been very low in the past five decades, reaching only about 0.8 million tons in 2011 and have been on a general downtrend in trade (MAS 2012). This was mainly because Myanmar failed to maintain market competitiveness due to the mismanagement and misallocation of productive resources. The increase in the number of rice-exporting countries in the world market was also a factor in the decrease in Myanmar's rice exports and its loss of share in the world market.

Myanmar started exporting beans and pulses to India in small volumes during the British colonial era. In 1941, over a million acres were sown to various kinds of beans and pulses. A total of 244,000 tons were produced and 102,000 tons were exported.² Beans and pulses achieved high growth in terms of production and export during the same period. Liberalization of the beans-and-pulses market in the 1990s led to a dramatic increase in production from 0.5 million metric tons in 1990–91 to more than 5 million metric tons in recent years (MAS 2011). As a result, Myanmar is currently the second-largest exporter of beans and pulses. The highest annual compound growth rate of beans and pulses exports reached 30.42 percent. This growth was also a consequence of the

2. Andrus, J. Russell, *Burmese Economic Life* (London: Oxford University Press, 1947), 47.

liberalization of the beans-and-pulses market, favorable weather conditions, the rising trend in the price of pulses, higher profitability, and easy substitution with other crops. As a result, Myanmar was listed as the world's largest exporter of pulses and beans in 2000 and the world's second-largest exporter in subsequent years. India is Myanmar's major market for beans and pulses. Sales to India account for 70 percent of Myanmar's exports of beans and pulses. After India, Myanmar's other high-potential export markets for beans and pulses are China, Malaysia, and Singapore, in that order. Pulses and beans are the most successful export items. The stable production of beans and pulses was aided by crucial factors such as market liberalization, a good trend in the price of pulses, and easy substitution with other crops.

Table 3. Total cultivation area of different crops, 1995/96--2010/11 ('000 ha)

Sr.	Crop Name	1995/96	2000/01	2005/06	2008/09	2009/10	2010/11
1	Cereal crops	6,661	6,946	8,101	8,776	8,777	8,779
2	Oil crops	2,091	2,685	3,059	3,655	3,748	3,690
3	Pulses	2,046	2,934	3,808	4,277	4,383	4,501
4	Industrial crops	710	882	952	1,238	1,260	1,299
5	Culinary crops	133	221	285	289	335	328
6	Other crops	1,243	1,782	2,550	4,726	4,860	4,970
<i>Total Sown</i>		12,884	15,450	18,755	22,926	22,363	23,567

Source: Myanmar Agriculture at a Glance (2011), Department of Agricultural Planning, Ministry of Agriculture and Irrigation

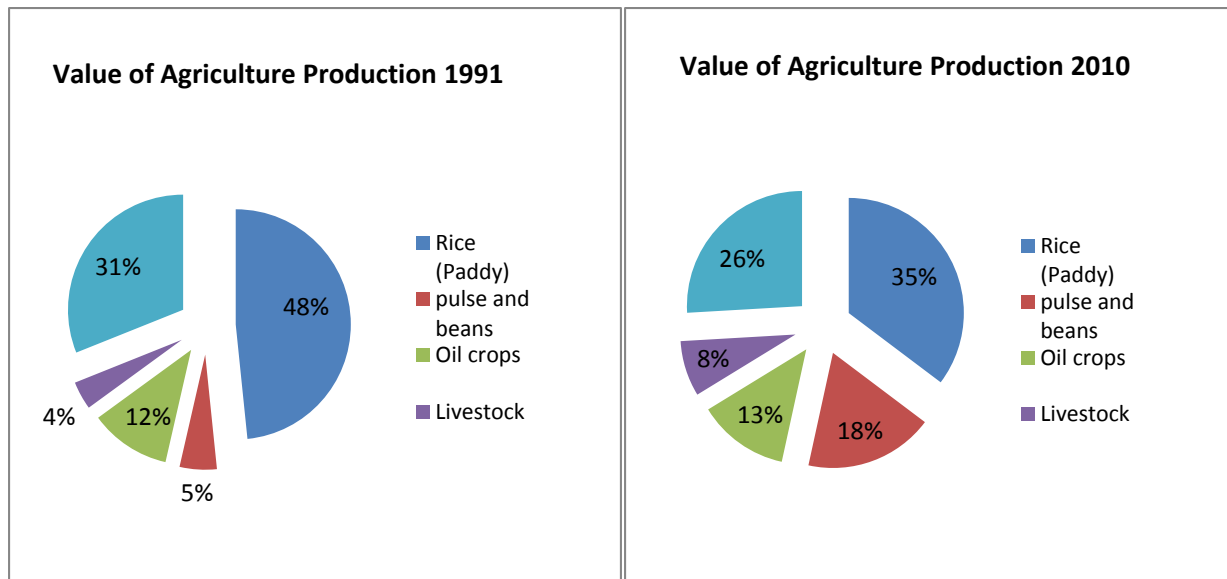
Table 4. Growth of cultivated land area and production, 1990/91—2009/10 ('000)

Crop		1990/91	2009/10	Growth
Paddy rice	Sown Acre	12,220	19,933	1.63
	Prod: Ton	13,748	32,166	2.34
	Export (Rice)	134	818	6.10
Pulses and beans	Sown Acre	2,281	10,163	4.46
	Prod: Ton	544	5,241	9.64
	Export	195	1232	6.32

Source: CSO (2012)

There is a high-level of mismatch between the increase in the cultivated land area, the rate of agricultural production, and the levels of exports. Cultivated land area for all crops increased approximately 2.31 times in the past two decades with rice cultivation increasing 1.63 times and pulses and beans, 5.36 times. Rice became the third-largest export and beans and pulses, the main export, of the agriculture sector. Exports of major agricultural crops, including pulses and beans and rice, have gradually increased in the last two decades.

Figure 1. Value of agriculture production, 1991 and 2010



Source: Compiled from data obtained from FAOSTAT (the Statistics Division of the Food and Agriculture Organization), 2013
Note: Gross production value (constant 2004–06 million SLC)

Value of agricultural production varied year by year depending on the price of paddy rice and various types of pulses as well as the foreign exchange rates. Production value of paddy rice and pulses and beans amounted 53 percent of the total value of agricultural production, including livestock, in 1991 and 2010. However, the percentage contribution of production value to total value of agricultural production apparently changed between rice and pulses and beans in the last two decades.

While the sown acreage and agricultural yield are claimed to be on the rise, inputs of fertilizers, pesticides, and other high-yielding varieties (HYVs) are on the decline. The alleged robust growth for said period is not consistent with the severe shortages and the lack of both basic and high-tech infrastructure. In this scenario, it is important to examine the role of improved technologies and profitability in poverty alleviation and agricultural development. Providing a clear and accurate picture of Myanmar's economy is a particularly demanding task as available data are outdated, missing, inaccurate, or based on older statistical methodologies. The absence of accurate and reliable economic data is in itself a fundamental problem because it makes providing an exact diagnosis of the economy difficult and the task of crafting socioeconomic policy more complicated and sometimes even misleading. This study attempts to provide a sense of where Myanmar's agriculture sector stands today and what some of the key development issues are, including major issues related to productivity and profitability.

Survey Profile

In order to answer the research questions, an attempt was made to mix the best of qualitative and quantitative research methods, use both deductive and inductive approaches, and corroborate and complement findings. The survey is a form of cross-sectional assessment on the current scenario of the Myanmar agricultural sector. It covers three major areas—the coastal area (Rakhine), the

delta area (Ayeyarwady), and the more arid central area (Nay Pyi Taw). First, a review was carried out on the concept and context of agricultural development in Myanmar. Focus group discussions (FGDs) and a questionnaire survey were then conducted in the selected areas. The sample size for the quantitative survey was 500 households from six villages in the three selected areas. The FGDs and survey were conducted in February and May 2012.

Rakhine State lies in the westernmost sector of the country where transport is difficult and waterways are relied upon as the principal means of transport. Paddy rice can be cultivated only on a quarter of the land area of Rakhine State but its food sufficiency reached 168 percent in 2010 (MAS 2012). There is a high potential for cultivating more pulses and beans and edible oil crops as well as for the commercial-scale cultivation of pepper and rubber plantations, which will favor infrastructure and institutional development. The government is also trying to develop the state's agricultural sector by making arrangements to grow crops on all cultivable land, increase per-acre yield, and boost agricultural production.

Ayeyarwady Region is located in the southwestern part of the central plains of Myanmar. As a delta region, numerous rivers and creeks cross its land, which is flat and fertile. It is renowned as the rice bowl of the country and has bright prospects for the further development of agro-based, wood-based, and aqua-based industries. However, the region has yet to realize its economic potential.

Mandalay/Nay Pyi Taw Region is situated in the arid area in central Myanmar. It is an area of strategic importance as the current administrative capital of the country is situated here. However, the region faces hurdles in achieving self-sufficiency in rice production and a decline in the cultivation of other crops. Farmers in the area have been unable to cultivate crops due to lack of rain and the lack of dams. In response to this, the government has implemented water-availability initiatives and certain regional development tasks in order to boost the cultivation of paddy rice and other crops.

Cropping Pattern and Calendar

Multiple cropping has been practiced for decades in Myanmar. With the current cropping density at 172 percent, the cultivation of crops exceeds the total acreage by a large margin especially with the practice of double or triple cropping in a year depending on the availability of irrigation water and capital investment. The increasing practice of crop rotation, companion cropping, and relay cropping will result in higher income for farmers while helping address such challenges as seasonal unemployment and underemployment in the rural areas (Kan 2004). In addition, crop diversification and rotation will prevent the susceptibility of monoculture crops to disease and reduce the use of pesticides meant to counter these diseases. In Myanmar, most farmers attempt to produce more than one crop per year. Under these circumstances, short-season varieties may fit better into the overall production patterns than higher-yielding, long-season types. Table 5 presents the multicropping pattern in Myanmar.

In the reviewed areas, double cropping is practiced widely while the multiple-cropping pattern is limited to certain areas. This may be due partly to the dependence on rainfall for agricultural water, relatively small number of short-growth varieties, insufficient capital to cover agricultural expenses, and lack of sufficient farm equipment and appropriate input for other technologies. In

the reviewed areas, the most common first crop is monsoon paddy rice followed by either pulses and beans or summer paddy rice. The cultivation of a third crop, however, is rare.

Table 5. Crop calendar for triple cropping

Crop	June	July	August	September	October	November	December	January	February	March	April	May
Monsoon Paddy Rice												
Pulses and Beans (Black gram)												
Summer Paddy Rice												

Crop calendar for double cropping

Crop	June	July	August	September	October	November	December	January	February	March	April	May
Monsoon Paddy Rice												
Pulses and Beans (Black gram)												

Crop calendar for double cropping

Crop	June	July	August	September	October	November	December	January	February	March	April	May
Monsoon Paddy Rice												
Summer Paddy Rice												

Source: Myanmar Agriculture Services, Ministry of Agriculture and Irrigation, Myanmar.

Profitability of Rice, Pulses and Beans

In the agricultural sector, agricultural productivity and profitability are inextricably linked. This paper emphasizes the determinant factors that affect agricultural production in selected areas in Myanmar. Average income from paddy rice for farmers is approximately USD 160 to USD 230 per hectare. The profitability rate (profit/revenue ratio) for monsoon paddy rice is slightly lower in the Nay Pyi Taw Region at about 28.52 percent but higher in Rakhine and Ayeyarwady at 30.69 percent and 29.97 percent, respectively. Similarly, the profitability rate for summer paddy rice is also higher in Ayeyarwady at 30.87 percent than in Nay Pyi Taw at 29.74 percent. However, Nay Pyi Taw is higher than the others in terms of profit per hectare in terms of money. The difference in profitability in spite of similar gross income is a result of Nay Pyi Taw's location in the arid zone where the use and cost of irrigation and other inputs are higher than that in other rain-fed areas. For pulses and beans, the profitability can be twice as high in some areas in spite of similar costs for the cultivation of monsoon paddy rice. With average profitability of about 58 percent, pulses and beans are considerably more profitable to grow than rice.

Table 6. Profitability of rice and pulse and beans, 2011 (USD per ha)

	Crop	Average cost	Average revenue	Average Profit	Profit ratio (%)
Rakhine	Monsoon paddy rice	376	543	167	30.69
	Pulses and beans	277	672	395	58.76
Nay Pyi Taw	Monsoon paddy rice	462	646	184	28.52
	Summer paddy rice	544	775	231	29.74
	Pulses and beans	439	1034	595	57.53
Ayeyarwady	Monsoon paddy rice	379	541	162	29.97
	Summer paddy rice	475	687	212	30.87
	Pulses and beans	374	905	531	58.66

Source: Survey data (see appendices)

There is a significant difference in profit between the cultivation of paddy rice and the cultivation of pulses and beans in Myanmar. However, the reason farmers are sticking to paddy rice cultivation rather than totally shifting to pulses and beans cultivation is somewhat interesting.

The first point is moisture retention of soil, which is linked to weather conditions and irrigation. Seed varieties used for monsoon paddy rice mature longer. Because modern pre- and postharvest technologies cannot be used, it takes a long time to cultivate the subsequent crop(s). Due to these

circumstances, weather conditions favourable for the cultivation of pulses and beans have passed and the soil already lacks adequate moisture. For this reason, pulses and beans cannot be grown. Likewise, the location and soil quality of the farmland on which farmers grow crops influence their choice of which crops to grow.

The second point is that because farming families grow paddy rice continuously, they do not need to buy paddy rice elsewhere for their personal consumption or for the next growing season at the current market rate. This, therefore, reduces their consumption expenditures and ensures food security until the following harvest season.

Third, because crops from a previous harvest can be used as seeds for subsequent crops, it also addresses the farmers' need for capital for the next growing season. Expenditure for seeds constitutes 6 percent of total expenditures for paddy rice and 13 percent for pulses and beans. In the case of farmers with only a small capital, the amount of starting capital they would need to have is a factor to consider in choosing which crops to grow.

Fourth, because paddy rice has been cultivated from generation to generation, farmers tend to regard themselves as well-versed in the methods for growing paddy rice. They also regard paddy rice as their "lifblood crop" and essential to their families. The price and market of pulses and beans are less stable compared to those of paddy rice. These factors hinder farmers from choosing to grow pulses and beans.

Fifth, the government's encouragement and availability of loans are also important. According to 2009–10 statistics, loans for paddy rice made up 82 percent (about USD 77 million) of total agricultural loans extended by the government while loans for pulses and beans made up 7 percent (about USD 6.45 million). This can be taken as an indication of how intensively the government has been assisting the rice production sector (see appendix X). Although the government is no longer forcing farmers to grow policy crops or planned crops, farmers are still hindered from shifting from paddy rice to pulses and beans by the government's plans to raise rice production.

Determinants of Agricultural Productivity and Profitability

Yield

In the places being studied, farmers are growing mainly paddy rice and black gram. The survey revealed that the average yield of monsoon paddy rice is about 68 baskets an acre (3.86 tons per hectare). The average yield in the Nay Pyi Taw region is about 71.25 baskets an acre (4.05 tons per hectare) while the average yield in Rakhine State is about 63 baskets (3.25 tons per hectare). Yield of summer paddy rice on average is about 74 baskets (4.20 tons per hectare). Crop yield varies with the seasons or regions because the soil and weather, the utilization of modern inputs, and the varieties of paddy rice being grown also vary. Rates of yield by varieties of paddy rice are set out in table 7.

Table 7. Yield of different varieties of paddy rice, 2011 (ton per ha)

Ayeyarwady		Rakhine		Nay Pyi Taw	
Variety	Yield	Variety	Yield	Variety	Yield
Paw-San	2.80	Shwe war Tun	3.58	Paw-San	3.13
Sin-Thu-Kha	3.85	Nga Sein	3.48	Sin-Thu-Kha	3.87
Ma-Naw Thu Kha	3.43	Ma-Naw Thu Kha	4.42	Ma-Naw Thu Kha	4.25
Thee Dutt Yin	3.52	Sri Dom	3.40	Ate Ma hta	3.66
Weighted Average	3.30	Weighted	3.57	Weighted	3.86

Source: 2012 survey

Yield of black gram on average is 16 baskets an acre (1.29 tons per hectare). Nevertheless, in cultivating pulses and beans, the same qualitative problem as that encountered in paddy rice will have to be addressed as a top priority. Thailand and Viet Nam, for example, are extensively and effectively using good agricultural practices, thanks to an educational campaign. In contrast, there is less usage of good agricultural practices as well as little awareness of it in Myanmar. For this reason, Myanmar's farm produce is not competitive in the international market, and farmers are forced to sell to nearby markets at bargain prices.

Price

Export prices for Myanmar's agricultural produce remain lower than those obtained by other exporting countries for the same produce. For example, the export price of Emahta (25 percent) rice from Myanmar is USD 390 per ton, while similar rice from Thailand and Pakistan fetches USD 445 and USD 440, respectively. The export price of beans (dry) from Myanmar is USD 615 per ton while a similar item from China and Thailand fetches USD 811 and USD 787, respectively (MOAI 2010). Myanmar rice is sold at a low price because it fails to impress the international market. Likewise, pulses and beans cannot extensively penetrate the international market and have to be sold to nearby countries at a low price.

A rapid currency appreciation that occurred in 2010–11 had a reverse impact on Myanmar's agricultural sector. The exchange rate of the Myanmar kyat to the US dollar was MMK 1,300 to USD 1 in 2006–07 but it was MMK 1,000 to USD 1 in 2010 and MMK 700 to MMK 800 to USD 1 in 2011. This rapid appreciation of Myanmar's currency depressed the price of paddy rice and ruined the profitability of production for many farmers and manufacturers. The price of agricultural products being exported fell from 15 to 20 percent in the local currency. The change in exchange rates thus depressed exports and discouraged investments in agriculture, which hindered the promotion of the quality and yield of farm produce.

Cost of production

When calculating the costs of agricultural production, imputed costs such as the labour cost of family members; the cost for using cattle, agricultural implements, and machinery owned by farming families; the cost for producing farm manure; and the actual costs should be evaluated at the rates prevailing in the villages. Such imputed costs can be regarded as farmers' other income or costs that are not incurred by farmers as part of the total production cost.

Table 8. Cost structure of the production of monsoon and summer paddy rice and pulses in the survey areas, 2011 (%)

Items	Monsoon Paddy Rice	Summer Paddy Rice	Black Gram
1. Material Input Cost	26.85	35.78	40.89
Seed	5.63	5.72	13.24
Fertilizer	16.73	23.80	20.54
Pesticide	4.49	6.26	7.11
2. Labour and Cattle Cost	51.46	42.11	34.19
Own labour cost	5.38	6.36	4.26
Hired labour cost	33.25	31.16	24.12
<i>Total labour cost</i>	38.63	37.52	28.38
Own cattle and cart	4.48	1.61	3.98
Hired cattle and cart	8.34	2.98	1.83
<i>Total cattle and cart cost</i>	12.83	4.59	5.81
3. Machinery Cost	21.69	22.12	24.92
Own machinery	5.09	6.47	5.30
Hired machinery	16.59	15.65	19.62
Total Production Cost	100.00	100.00	100.00

Source: Survey

Seeding Cost

Since 2000, local farmers have been using 75 high-yield varieties (HYVs) such as Hsin Shwe Li, Hsin Shwe Wah, Hsin Thukha, Manaw Thukha, Shwewah Htun, and Paw San Hmwe; 10 varieties of hybrid seeds; and 10 regional varieties. In the surveyed areas, the total cost of seeds, fertilizers, pesticides, weedicides, and other inputs constitute more than 30 percent of the total cost. The cost of seeds represents 6 percent of the total cost in paddy rice and 12 percent of the total cost in pulses and beans. In the surveyed areas, most of the farmers used seeds from previous harvests or seeds bought from other farmers. The seeds are often of disqualified and mixed varieties. Moreover, the farmers consecutively or repeatedly use old varieties of seeds for a certain period of time. The average period in which farmers use a rice variety consecutively is 5.16 years, with 24 percent of the farmers using the same variety for over a decade and 11 percent using the current variety for over 15 years. Farmers in Rakhine State were slower to adopt newer varieties compared to farmers from other areas like the Ayeyarwady Region where farmers adopted new varieties more quickly depending on these varieties' yield. Out of the large number of varieties of pulses and beans, farmers used only a few, with different areas using different varieties. The primary factor guiding farmers in determining which variety to grow is usually good yield (98 percent) while the second

priority factor is marketability or exportability (74 percent). The third factor is resilience to pests (71 percent).

With regard to the availability of seeds, 62 percent of the farmers buy seeds from their own villages. The sourcing of seeds from local suppliers is most common in Rakhine State and least common in Nay Pyi Taw. About 31 percent directly purchase seeds from the Ministry of Agriculture, and 7 percent acquire them from other sources. The principal sources of information on seeds are other farmers (85 percent), agriculture staff (58 percent), and advertisements and brochures (36 percent). The selection of crops, however, is determined mainly through other farmers' results and experiences.

Farmers continue to rely mainly on traditional agricultural practices, using a part of the current harvest as seeds rather than purchasing specially produced seeds. Because farming is their livelihood, they are risk-averse, especially since the recovery time from one year of crop failure is usually two or three years. This makes the dissemination of new and better varieties and agricultural technologies especially challenging, with farmers reluctant to adopt any kind of innovation without tangible results. As farmers aim to maximize returns rather than output, the cost of inputs relative to the cost of the resulting output is a key factor and may result in lower input usage than would be required for optimal technical performance. The farmers' use of seeds distributed by the Ministry of Agriculture also depended on their knowledge of their fellow farmers' results and experiences with such seeds.

Fertilizer and pesticide

The use of chemical fertilizers and pesticides remained very low in Myanmar compared to their use in other countries (see table 9). When chemical fertilizer prices increased more rapidly than the price of crops such as rice and beans, the ratio of crop prices to chemical fertilizer prices dropped. Dramatic reductions in fertilizer subsidies in the aftermath of the new 2003–04 rice policy, the use of chemical fertilizers, and agricultural output fell to even lower levels. In the places being studied, 46 kg an acre (114 kg per hectare) of fertilizer was used. Almost every farmer in these areas possesses traditional knowledge on soil fertility improvement and soil conservation. However, they were not using farmyard manure (e.g., cow dung) regularly and properly for land development. Of the farmers interviewed, less than 50 percent used cow dung and other natural fertilizers in tillage every two or three years. They used chemical fertilizers but in amounts far less than the actual amount required. One of the factors for the decrease in the availability of cow dung was due to the growing popularity of farm machinery like powered tillers and tractors. This led to the subsequent decrease in the cattle population. Farmers growing green gram, black gram, and pigeon pea as a second crop can use stubble and other waste products as organic manure but farmers who are growing summer paddy rice as a second crop would have to buy organic manure to use in tillage.

Table 9. Mineral fertilizer consumption per hectare of ASEAN countries (unit: kg plant nutrient/ha)

No	Country	1995	2002	2003	2004	2005
1	Cambodia	2.6	5.6	3.7	5.2	6.0
2	Indonesia	83.2	89.9	79.2	100.6	94.1
3	Malaysia	143.6	156.9	174.6	233.0	200.1
4	Myanmar	17.8	1.5	2.0	0.7	0.2
5	Philippines	60.4	67.5	87.7	88.7	76.0
6	Thailand	73.8	87.8	128.2	113.6	97.5

Source: FAO (2007).

The cost of chemical fertilizers amounts to between 15 percent and 25 percent of total agricultural expenses, making the effectiveness of fertilizer use an issue of primary importance. With the domestic production of fertilizers, farmers should have access to more affordable chemical fertilizers. However, in reality, fertilizers remain highly priced and of questionable quality. With regard to land preparation for cultivation, farmers are making more widespread use of low-cost natural inputs such as cow dung, lime, natural compost, and nitrogen treatment in order to manage and improve soil quality. Despite the fluctuating exchange rate, the price of fertilizers and pesticides remains either the same as it was (or even higher) when the exchange rate was MMK 1,000 to a US dollar because the input market is virtually an oligopolistic market. Increased labor wages and inadequate agricultural loans have led to lower use of fertilizers.

According to calculations made by the Asia Program Unit of the Harvard Kennedy School's Ash Institute, the International Development Enterprises (IDE), and Myanmar's Ministry of Agriculture and Irrigation, each time 100,000 tons of fertilizer are not utilized, between 600,000 and 800,000 tons of rice is not produced (Dapice et al. 2009). If it is calculated based on this rate and using data from the survey, every time 10 kg of fertilizer per acre is not used, 4 percent of crop yield (1.7 percent per hectare) is reduced. Therefore, to get higher yields, more fertilizers will have to be used. The use of chemical fertilizers seems to be confined to later periods in the season to encourage plant growth and increase yields.

Technical calculations that take into account the characteristics of the crops and quality input requirements are beyond the reach of most farmers who simply purchase as much fertilizer as their financial means allow. Moreover, systematic training for farmers on the use of chemical fertilizers remains very rare, with 94 percent of the respondents claiming that they have never attended any training course. As a result, their use of scarce resources for fertilizers does not have as much impact on agricultural productivity as it should. Besides, soil fertility improvement and soil conservation are very important challenges for farmers who are growing monsoon and summer paddy rice consecutively and annually. Because the farms are irrigated all year round, the surface of the earth sinks or erodes. The soil lacks the necessary compaction and can turn acidic. If this happens, improving the quality of the land can be done by letting the soil lie fallow, cultivating different crops/rotating crop patterns, and using biocomposers. While it is widely accepted that crop rotation and diversification are beneficial for soil protection, only 29 percent of the

respondents practice crop rotation and diversification, indicating the gap between awareness and actual practice.

In order to develop the agricultural sector, profitability needs to be improved by improving productivity. Promoting the use of fertilizers is one way of achieving the latter. Because farming families lack capital, the fertilizers being used in Myanmar are of questionable quality. Farmers have inadequate know-how on the proper use of fertilizers, have to contend with restrictions on fertilizer use, and need to be made more aware of the benefits of the correct use of fertilizers.

Farmers need assistance in choosing fertilizer brands and training on the proper methods of using/handling fertilizers and pesticides. They have difficulty accessing information on the types of chemical inputs, the correct proportion and amounts to use, and how and when to use them. Ninety percent of information passed on to farmers comes from their fellow farmers, media hype and promotion, and sales staff of the companies selling the products. The farmers have little chance of getting this kind of information and learning about these techniques from experts and from the government's agricultural department.

For pest management, which is a vital aspect of farming, a study of farmers' awareness and practices regarding plant-related insects, diseases, and treatments indicate the following facts. Although black gram is contributing higher revenues and benefits among all the crops being grown, it is vulnerable to a wide range of pests and diseases. Due to this situation, properly managed plant-protection practices are required to maintain a good yield. Farmers have been applying a high amount of pesticides, fungicides, and foliar fertilizers to black gram. Systematic training for farmers on the use of pesticides is very rare, with 95 percent of the respondents claiming they have never attended any training course.

In the study areas, every farmer has traditional knowledge on soil fertility improvement and soil conservation. However, they cannot use farmyard manure (cow dung) as a fertilizer on a regular basis due to scarcity. Only less than 50 percent of farmers can apply a small quantity of cow dung every two or three years during land preparation time and whatever amount they may be able to apply might not meet the optimum requirement. Farmers with draught cattle and dairy cattle can apply more cow dung, but the quantity of draught cattle is decreasing due to the growing use of machinery in crop production. Some farming households with no draught cattle buy cow dung at a high price from other farms just to be able to apply it in their fields. The importance of cow dung may be understood in light of the low quality of compound fertilizers typically available to local farmers and the low number of farmers with the means to use high-quality compound fertilizers.

All growers of black gram reported applying crop residues of pulses as organic manure (green manure) in their farms. Some farmers noticed that the application of green manure is a good practice for other crops but not appropriate for pulses because they think the residues can harbor pests and be a source of disease. They, therefore, burned this green manure and applied it on the field. Although farmers have a certain level of knowledge on soil fertility improvement, they need to practice land fallowing, changing cropping patterns, and the use of biocomposers and fertilizers. Soil problems are a major concern in the study areas due to the continuous practicing of the double paddy rice cropping system.

In the long term, with increasing attention being paid to food safety as well as food security, opinions and views on the use of chemical fertilizers, pesticides, and other modern inputs have

undergone significant changes. Under the circumstances, the low usage of fertilizer and pesticides in Myanmar can now be promoted as “natural agriculture,” which may appeal to high-end markets, in a case of turning a weakness into a strength. Systematically transitioning from a situation in which little fertilizer is used to a situation in which no fertilizer is used might make the products more saleable on the world market as “naturally produced” (organic) Myanmar products. However, changing to natural agriculture requires so much more than simply not using chemical inputs. A variety of good agricultural practices must be extensively practiced in order for products marketed as “natural” to meet prescribed standards.

Labour and Cattle Cost

Myanmar agriculture is still using conventional agricultural techniques. Labor cost accounts for 40 percent of total production cost in paddy rice and for 30 percent of total production cost in pulses and beans. Migration of workers to urban and suburban areas lessens rural-urban disparities, creates lifestyle changes, and improves the living standard in rural areas. However, this migration also determines the minimum wages of workers who are working in agricultural sector. For instance, construction in urban areas like Nay Pyi Taw and Yangon create wage-earning opportunities for the landless and the land-poor from the rural areas. The daily wage rate for unskilled labor in urban areas is about MMK 2,500 to MMK 3,000 (USD 2.50 to 3.50 per day). If workers in the rural areas are offered wages less than what wage workers can earn in urban and suburban areas, they might refuse to work in the rural areas and migrate instead. This would lead to shrinkage of the workforce in the rural areas.

Sometimes, even though the disparity between rural and urban wages is not too large, workers still move to urban areas due to greater job security there. As a result, a labor shortage ensues in the rural areas during growing season. This shortage increases wages, which further raises production cost. In the places being studied, cattle are being used mainly for harrowing; hand-pushed tractors are also used for this task. The cost of the use of cattle represents 12.83 percent of the total cost in paddy rice and 5.81 percent of the total cost in pulses and beans.

Technology and Machinery Cost

The development of the agricultural sector is largely influenced by improvements in production efficiency, which, in turn, depends on the development and application of appropriate technology and the farmers’ adoption of such technology (DPO 2011). Hand-pushed tractors are used for harrowing as well as for transportation and irrigation.

Farmers’ utilization of modern machinery is constrained by small farm size, lack of capital, and the high price of fuel. Even at the price at which fuel is officially selling in the country’s urban areas, Myanmar still has the fourth-highest fuel prices in the ASEAN region. The price is even higher in the rural areas than in the urban areas because fuel is bought from urban areas and resold in rural areas. The high production cost of summer paddy rice and pulses and beans cultivation, which mainly uses fuel, decreases the profitability of farmers. Low profitability decreases investment and decreased investment, in turn, affects profitability, creating a vicious circle. These factors are obstacles to the realization of the aim to achieve a modern, mechanized farming system.

An obstacle in the adoption of new technologies and inputs is their affordability. For example, the cost of fertilizers amounts to 15 percent to 25 percent of the total cost of farming while equipment

costs come to 15 percent to 30 percent. The rate of increase in the cost of chemical fertilizers and fuel for equipment is higher than the rate of increase in rice prices. Thus, the provision of financial support for modern inputs and technologies, the distribution of high-quality inputs, and the conduct of effective education are equally important.

Another important issue is the evaluation of the rationale for any resistance on the part of traditional family farmers and peasant cultivators, whether the resistance is due to irrational stubbornness or environment-specific reasons. The project for raising the yield of paddy rice was successfully implemented in Myanmar in 1974. Measures similar to the above-mentioned methods led to successes during the 1993–96 period. While there was a time lag on the part of farmers in accepting new inputs and new technologies, the adoption rate was rapid once the indications of success became apparent. Experience has shown that older farmers, who usually have greater concerns about change, can be effectively and rapidly won over through the establishment of model farms and villages to showcase successes, provision of training for the new generation from the farming households, and the dissemination of field experience. As has been stated earlier, farmers are reluctant to adopt any kind of innovation or new technologies without tangible results since the recovery time from one year of crop failure is usually two or three years.

Other Factors

Loans

There are organized money markets and unorganized money markets in Myanmar. For organized money markets, loan portfolios consist of three types of loans: (1) a seasonal crop production loan (e.g., paddy rice 5,000 to 8,000 kilos/acre; 20,000 kilos/acre; and later on, 40,000 kilos/acre commencing 2011); (2) a farm development and investment loan; and (3) a border area development loan. Seasonal crop production loans are given for one year, covering three separate seasons for the cultivation of the following main crops: paddy rice, groundnuts, sesame, mustard, maize, peas, and beans, sugarcane, jute, and long staple cotton.

In the survey areas, Myanmar Agricultural Development Bank (MADB) extended loans amounting to MMK 6,000 per acre in 2006. These loans increased yearly until reaching MMK 20,000 in 2010. The interest rate remained the same—17 percent in the monsoon and summer seasons—in 2010. The bank loan was limited to paying for no more than 10 acres. In 2011–12, the MADB reduced its interest rate to 15 percent per year and the loans per acre was increased to MMK 40,000 per acre for each season. In the Nay Pyi Taw region, the Myanmar Agricultural Bank is lending MMK 40,000 an acre (USD 115 per hectare) with an interest rate of 15 percent per annum. Households who borrow more than USD 115 or own more than 2.5 acres (1 hectare) will have to deposit 10 percent of the loan in the bank. Because they will have to pay interest on the money saved, the total interest rate would come up to 17 percent per annum. Ninety percent of the families surveyed borrow money from the MADB.

The amount of money loaned, however, covers only 25 or 30 percent of total production cost so farmers will have to go to unorganized money markets such as money-lending organizations or private lenders for the rest. These agriculture-focused money-lending companies loaned MMK 30,000 per acre of monsoon paddy rice and MMK 50,000 per acre of summer paddy rice in 2011–12. If farmers borrow from agriculture-focused companies or microfinance organizations, they will have to pay an interest of 2 to 3 percent per month. It should be noted that 23 percent of farmers

are borrowing from such companies. If they borrow from the informal finance sector or from private moneylenders and leave their gold ware as collateral, they will have to pay 3 to 5 percent interest. If they borrow from private moneylenders without leaving their gold ware as collateral, they will have to pay interest as high as 15 or 20 percent.

According to survey data, 40 percent of farmers are obligated to pay high interest for their loans. Inflation is currently at 4.8 percent per annum while the interest rate for money deposited in the bank is 8 percent per annum, and the interest rate for money loaned to other businesses is about 12 percent per annum. At a time when agricultural development and measures to improve the quality of life of people in the rural areas are being implemented, the MADB and other microfinance organizations are collecting interest rates of 15 and 36 percent per annum, respectively, and restricting the amount of loans that can be availed of. The MADB has extended an increasing amount of loans to farmers on a year-by-year basis (see appendix X). The amount of loans borrowed by agricultural producers from the MADB has amounted to nearly USD 94 million. Therefore, the organization is required to lay down agricultural policies in order to continue extending agricultural loans at reasonable interest rates and to minimize bad debt rates as first priority.

Market, pricing, and meteorological information

Farmers are in a disadvantaged situation with regard to the flow of market, pricing, and technological information as a result of severe constraints in information distribution and resources. Access to real-time information on changing demands in the market, the quality of the crops, and fluctuations in market prices as well as the accuracy of the information is vital. According to the survey data, most of the farmers (57 percent) obtain the information they need from brokers and traders, with 31 percent obtaining it from agriculture-specific or -related companies, and 12 percent from news journals and letters. There are very few reliable alternative sources of market information that farmers can access, with 90 percent of them having to rely on the information provided by the buyers themselves.

Other principal determinants of agricultural success include natural disasters and climate change-related conditions such as storms, floods, rainfall, and droughts. The rural population relies mainly on radio news broadcasts for weather-related news. While 71 percent have access to other information sources such as newspapers and journals, only 7 percent read weather-related news. This indicates that both the public sector media and private broadcasting and print media need to be a source of “infotainment” that would provide more benefits to the rural population than entertainment. Similarly, more information sources need to be made accessible to the rural population while ensuring institutional development for strengthening of information distribution networks.

Firm Size

In Myanmar, all farmland is owned by the government after the passage of the Land Nationalization Act of 1948 and the implementation of the national agriculture policy of the state granting farming rights to farmers started in 1953. The Land Nationalization Act has many influences on the formation of size of holdings and their fragmentation as well as on the tenure system. Until 2012, all agricultural land was owned by the government, and farmers were entitled

to tilling rights but not the right to sell, mortgage, or transfer land. However, because of instances of illegal sale or inheritance by offspring, whatever land the farmers owned became progressively smaller. These small farms could not achieve economies of scale with regard to cultivation, which affected their profitability. They also could not mechanize. Because farmers were growing whatever variety of seeds they preferred, the resulting “impurity” of varieties started affecting their farms’ productivity. Myanmar, however, has a very small land tax, and land reform is considered to be the first priority in the development of the agriculture sector.

According to estimates made by the Central Statistical Organization (CSO) in 2009–10, Myanmar has a population of 59.13 million, including a rural population of 40.48 million. According to the Integrated Household Living Condition Survey in Myanmar, which was conducted in 2009–10, the number of rural agricultural households is about 5.25 million. Of this number, 4.42 million households own 12 million hectares of land. On average, a farming family is cultivating 2.71 hectares (about 6.69 acres) of land. However, farmers do not evenly own land, and most farmers are cultivating less than 5 acres of land.

In the places where the survey was conducted in 2012, average ownership of land by farmers is 1.86 hectares (4.6 acres) in the Ayeyarwady Region, 1.34 hectares (3.31 acres) in Rakhine State, and 1.49 hectares (3.68 acres) in Nay Pyi Taw (Pyinmana). Reclamation of virgin land is being done to expand cultivated land but less reclamation is being done in Rakhine State and Nay Pyi Taw than in the Ayeyarwady Region. Sixty-eight percent of the total households sampled in the survey are working less than 2 hectares of land while 22 percent are tilling between 2 and 4 hectares of land. Regional data show that the number of households working on 2 hectares of land or less is 63 percent in the Ayeyarwady Region and more than 70 percent in Rakhine State.

Table 10. Average farm size by region

Region	Ayeyarwady		Rakhine	Nay Pyi Taw
	MyaungMya	Hinthata	Myauk-U	Pyinmana
Average firm size (Ha/HH)	2.15	1.62	1.34	1.49
Cultivated land area (Ha/HH)	4.13	3.22	1.79	3.04
Cropping density	1.92	1.99	1.34	2.04

Source: 2012 survey

Table 11. Farm size groups of selected households

Items	Ayeyarwaddy (%)	Rakhine (%)	Nay Pyi Taw (%)	Average (%)
Small farm (0 > to 1.2 ha)	29.07	34.86	31.14	31.69
Medium farm (1.2>to 2ha)	33.78	35.70	38.13	35.87
Large farm (2> to 4 ha)	24.08	19.64	21.10	21.61
Very large farm (>4 ha)	13.07	9.80	9.63	10.83

Source: 2012 survey

The availability of sizable underutilized land resources is a crucial factor in favor of Myanmar. In particular, the potential availability of seven million hectares of land for expanded agricultural production offers tremendous potential (MOA 2011). If a substantial portion of this land were to be made available to small/marginal or landless households who were also provided with adequate training, evidence-based motivation, working capital as well as market access and support, the level of rural poverty would be substantially reduced.

Findings and Implications

There were several challenges at different levels in the agriculture sector. At the policy level, policymaking faces frequent contradictions between the need for domestic food sufficiency and the promotion of exports, greater emphasis on domestic price stability than price incentives, and inconstant material and financial subsidies from the government. Similarly, at the institutional and firm level, the key obstacles to achieving agricultural development are the lack of economies of scale; the nonapplication of science-based pre- and postharvest production and handling technologies; the lack of standardization, accreditation, and certification of product quality; inadequate knowledge and understanding of export markets and consumer preferences; and the lack of adequate banking services and flexible credit arrangements. Therefore, the following policy actions should be taken into consideration as a way to overcome these challenges:

- It is vital to set up an effective and stable coordination system for policy decisions and implementation across government agencies and other organs at both the national and local levels.
- Government should invest more to improve the infrastructure through which a value-based supply chain can be developed for the agriculture sector. Public- private partnership would be a feasible approach to promote investment in public infrastructure.

- Agricultural loans are generally small, short term, and are usually meant for production purposes, not for investment. Myanmar’s agricultural sector needs a more vibrant credit system that supplies long-term agricultural loans and credits through the proper channels.
- Policies that foster opportunities for people in the rural areas to access off-farm work will be important in reducing rural poverty and in increasing savings and capital. Such policies should include those that improve the education levels of people in the rural areas, relax restrictions on the movement of labour for people seeking off-farm work, and encourage the establishment of small- to medium-scale enterprises in both rural and urban areas.
- Another key strategic component for agricultural development is a trade policy that is a separate policy document supporting the trading environment in order to maximize the attractiveness of, and profits from, agricultural products in the local region and global markets.
- Fertilizer supplies are of uncertain quality and used in very modest amounts. A subsidy programme for agricultural inputs should aim at promoting access to, and the use of, fertilizers among farmers in order to increase short-term agricultural productivity and profitability. It is noteworthy that agricultural subsidies encouraging production and productivity have been widely criticized because of the cost of subsidies and often because of market distortion over the medium and long term.
- Optimizing farm size to achieve the benefit of economies of scale is crucial. It may be carried out in various ways: allocating new farmlands to farming households and encouraging rural collective farming, contract farming, and commercial-level farming. It will increase economic efficiencies that result from carrying out a process on a larger scale.
- The knowledge and skills of the farmers towards technological changes are critical to an inclusive and sustainable growth of the agricultural sector. However, farmers are reluctant to adopt any kind of technological innovation without tangible results. This indicates that evidence-based motivation will be more effective than extension services in attracting farmers to adopt better crop varieties and farm technologies.
- A problem worse than poor yields is poor quality of the crops produced. Strategies should be applied to reduce the following practices: (1) the improper use of fertilizers and pesticides; (2) using a part of the current harvest as seeds; and (3) the sowing of seed varieties easily available in the region, which results in the impurity or crossbreeding of seeds due to fact that the small farms in these areas adjoin one other. These are the main factors causing the decline in the quality of Myanmar’s agricultural produce.
- Another fundamental problem is the scarcity and inaccuracy of information and data from farmers, development partners, and the government, which is needed in order to provide an exact diagnosis of the economy for agricultural policymaking. It is important to develop an agricultural statistical system for the country.

Conclusion

Myanmar is rich in natural resources, land, and water and has weather conditions favorable for agriculture. However, since it was isolated for more than five decades, the agriculture sector was left behind in terms of technology, market access, and capital investment. The high impact of natural disasters and climate change, the low quality of current agricultural produce, low productivity, and high transaction costs are significant hurdles to realizing the aims of agricultural development, rural development, poverty alleviation, human capital formation, and the building of a modern developed nation. In this scenario, enhancing agricultural productivity and

profitability in Myanmar will be realized through the provision of modern technologies and extension services, basic and high-tech infrastructure, having agencies teaching good agricultural practices, establishment of an information network on the agricultural market, appropriate institutions, and credit market development. Public and private partnerships in agriculture are gaining importance. In order for farmers to truly grow their way out of poverty, they need active participation in any national policies and in the implementation process. On the other hand, FDI in agriculture sector is still negligible at present, which reflects the need to review the investment climate and business environment in Myanmar. Apart from attracting FDI, assistance to the agriculture sector in the forms of grants and loans in order to improve infrastructure development would be vital to jumpstart the initial quick wins. In the long run, the government has to reduce the negative impacts of agricultural production growth on the environment and gradually reduce the currently high share of agriculture in GDP by increasing the industrial share associated with services sector.

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Appendices

Appendix I: Gross domestic product and agricultural output (current price)

Year	GDP (Kyat Million)	Agriculture (Kyat Million)	Share in GDP (%)
1997/98	1,119,509.2	583,437.1	52.1
1998/99	1,609,775.6	841,222.2	52.2
1999/00	2,190,319.7	1,143,169.5	52.2
2000/01	2,552,732.5	1,245,437.8	48.8
2001/02	3,548,472.2	1,740,174.2	49.0
2002/03	5,625,254.7	2,717,625.1	48.3
2003/04	7,716,616.2	3,461,961.9	44.9
2004/05	9,078,928.5	3,714,681.2	40.9
2005/06	12,286,765.4	4,718,474.3	38.4
2006/07	16,852,757.8	6,068,007.3	36.0
2007/08	23,336,112.7	8,246,217.0	35.3
2008/09	29,227,535.0	9,235,953.3	31.6
2009/10	33,760,927.9	9,957,062.0	29.5

Source: Myanmar Agricultural Statistics (1997/98-2009/10), Ministry of Agriculture and Irrigation, Myanmar; Central Statistical Organization, Ministry of National Planning and Economic Development, Myanmar (2011)

Appendix II: Foreign investment of permitted enterprises as of 30/11/2011 (By sector, in USD million)

Sr. No.	Particulars	Permitted Enterprises		
		No.	Approved Amount	%
1	Power	5	18873.720	46.69
2	Oil and Gas	104	13815.375	34.18
3	Mining	64	2794.463	6.91
4	Manufacturing	160	1753.951	4.34
5	Hotel and Tourism	45	1064.811	2.63
6	Real Estate	19	1056.453	2.61
7	Livestock & Fisheries	25	324.358	0.80
8	Transport & Communication	16	313.272	0.77
9	Industrial Estate	3	193.113	0.48
10	Agriculture	7	173.101	0.43
11	Construction	2	37.767	0.09
12	Other Services	6	23.686	0.06
	Total	456	40424.070	100.00

Source: Directorate of Investment and Company Administration, Ministry of National Planning and Economic Development, Nay Pyi Taw, Myanmar

Appendix III: Myanmar rice production and exports

Year	Production (‘000 MT)	Export (‘000 MT)	Percentage (%)
1988–89	13,164	47	0.36
1989–90	13,803	166	1.2
1990–91	13,968	132	0.95
1991–92	13,201	180	1.36
1992–93	14,837	199	1.34
1993–94	16,759	261	1.56
1994–95	18,194	1,041	5.72
1995–96	17,952	354	1.97
1996–97	17,675	93	0.53
1997–98	13,578	28	0.21
1998–99	17,077	120	0.7
1999-2000	20,125	55	0.27

2000—01	21,323	251	1.18
2001—02	21,914	939	4.28
2002—03	21,804	793	3.64
2003—04	23,135	168	0.73
2004—05	24,751	182	0.74
2005—06	27,682	180	0.65
2006—07	30,922	15	0.05
2007—08	31,449	357	1.13

Source: Central Statistical Organization (2010): Statistical Yearbook, Ministry of National Planning and Economic Development, Nay Pyi Taw, Myanmar.

Appendix IV: Myanmar pulses and beans export

Year	Value (US\$,000)
1988	8,138
1989	18,566
1990	86,821
1991	78,195
1992	96,940
1993	121,836
1994	135,099
1995	238,990
1996	212,441
1997	224,528
1998	179,362
1999	187,445
2000	255,332
2001	280,889
2002	287,470
2003	272,000
2004	222,800
2005	240,000
2006	655,000
2007	750,000
2008	415,400

Source: Central Statistical Organization (2009): Statistical Year Book, Ministry of National Planning and Economic Development, Nay Pyi Taw, Myanmar.

Appendix V: Top export countries in the world for beans (dry) product, 2008

Ranks	Countries	Quantity (tonnes)	Value (1,000 \$)	Unit value (\$/tonne)
1	China	959,823	778,265	811
2	Myanmar	675,000	415,400	615
3	USA	415,321	343,287	827
4	Argentina	229,199	264,598	1,154
5	Canada	293,595	256,901	875
6	Nicaragua	54,641	75,536	1,382
7	Colombia	41,887	55,690	1,330
8	Ethiopia	74,389	49,651	667
9	Netherlands	18,620	44,502	2,390
10	Bolivia	34,422	41,648	1,210
11	Thailand	51,227	40,305	787
12	Peru	35,078	36,675	1,046
13	Mexico	22,944	30,361	1,323
14	United Kingdom	61,375	27,276	444
15	Egypt	37,882	26,163	691
16	Belgium	23,802	24,288	1,020
17	United Arab Emirates	25,983	20,881	804
18	Kyrgyzstan	33,471	19,949	596
19	Australia	21,733	18,132	834
20	Portugal	11,436	15,701	1,373

Source: FAOSTAT

*The data of Myanmar and Egypt is estimated data using trading partners database

**Appendix VI: Average price of fertilizers in Yangon and Mandalay markets (2010–11)
(USD/50kg bag)**

Items	2010		2011	
	Yangon (USD)	Mandalay (USD)	Yangon (USD)	Mandalay (USD)
Urea fertilizer -from China (46%)	22.41	21.50	25.32	23.80
Potash fertilizer Potash (red)	27.66	29.02	27.66	30.23
T-super fertilizer				
(1) GTSP (46%)	22.61	21.80	29.13	28.45
(2) GSSP (16%)	10.62	9.73	12.33	11.77
(3) GSSP (12%)	9.73	10.50	12.60	10.96
Compound fertilizer				
(1) Armo (16:16:8:13)	41.26	-	40.87	42.84
(2) Armo (15:15:15)	46.58	-	46.64	47.76
(3) Armo (10:10:5)	16.56	-	16.60	NA
(4) Golden Lion (16:16:8)	29.88	-	NA	22.37
(5) Golden Lion (15:7:8)	25.47	-	25.28	19.93
(6) Golden Lion (10:10:5)	21.09	-	21.24	28.15

Source: 2012 survey

**Appendix VII: Cost of cultivation in Ayeyarwady
(USD/Ha)**

Item	Monsoon Paddy Rice	Summer Paddy Rice	Other Crops (P&B)
1			
Input (cost)			
Seed**	25.85	40.21	63.19
fertilizer and pesticide	91.91	117.76	86.79
2			
Family labour and machinery	60.31	68.93	60.31
3			
Hired labour and machinery	201.05	248.44	163.71
4			
Total production cost (1+2+3)	379.12	475.33	374
Yield (ton)	3.69	4.32	0.54
Price	146.61	159.25	678.28
Gross return	541.39	687.58	904.68
Profit per ha	162.27	212.25	530.68
Profit/revenue ratio (%)	29.97	30.87	58.66

Source: 2012 survey

** Monsoon paddy rice (2bsk/arca); Summer paddy rice (3 bsk/arca); Beans (20 Pyi per arca)

Appendix VIII: Cost of cultivation in Rakhine (USD/Ha)

Item	Monsoon Paddy Rice	Summer Paddy Rice	Other Crops (Pulses and Beans)
1			
Input (cost)			
Seed**	22.98		86.16
fertilizer and pesticide	91.91		77.55
2			
Family labour	103.4		51.7
3			
Higher labour	157.97		61.75
Total production cost (1+2+3)	376.24		277.16

Yield per hectare	3.58	1.07
Price	151.67	629.84
Gross return	542.83	672.07
Profit per hectare	166.58	394.91
Profit/revenue ratio (%)	30.69	58.76

Source: 2012 survey

** Monsoon paddy rice (2bsk/arca); Summer paddy rice (3 bsk/arca); Beans (20 Pyi per arca)

Appendix IX: Cost of cultivation in Nay Pyi Taw (USD/Ha)

	Monsoon Paddy Rice	Summer Paddy Rice	Other Crops
1 Input (cost)			
Seed**	27.28	45.95	61.43
fertilizer and pesticide	101.1	149.35	129.8
2 Family labour	80.78	73.24	38.77
3 Higher labour	252.74	275.72	209.09
Total production cost (1+2+3)	461.9	544.26	439.1
Yield (ton)	4.26075	4.94247	1.6
Price per ton	151.67	156.72	645.98
Gross return	646.22	774.6	1,033.92
Profit per hectare	184.32	230.34	594.82
Profit/revenue ratio (%)	28.52	29.74	57.53

Source: 2012 survey

** Monsoon paddy rice (2bsk/ arca); Summer paddy rice (3 bsk/arca); Beans (20 Pyi per arca)

Appendix X: Agricultural loans by crop, 2005–06 up to 2010 (USD million)

	Crop	2005–06	2006–07	2007–08	2008–09	2009–10
I.	CEREALS	23.05	38.69	50.42	58.32	76.77
	1. Paddy Rice	22.99	38.56	50.09	57.92	76.12
	2. Wheat	-	-	-	-	-
	3. Maize	0.07	0.14	0.33	0.40	0.64
II.	OILSEEDS	2.78	3.97	5.63	6.31	9.73
	4. Groundnut	1.49	1.96	2.21	2.60	3.88
	5. Sesame	1.24	1.95	3.36	3.58	5.67
	6. Sunflower	-	-	-	-	-
	7. Mustard	0.04	0.06	0.06	0.13	0.18
III.	CONDIMENTS	-	-	-	-	-
	8. Chili	-	-	-	-	-
	9. Onion	-	-	-	-	-
	10. Garlic	-	-	-	-	-
IV.	TOBACCO	-	-	-	-	-
	11. Tobacco	-	-	-	-	-
V.	FIBRES	0.29	0.25	0.32	0.39	0.53
	12. Cotton	0.29	0.25	0.32	0.39	0.53
VI.	OTHERS	1.26	1.96	3.25	3.96	6.45
	13. Pulses	1.26	1.96	3.25	3.96	6.45
	14. Potato	-	-	-	-	-
	15. Sugarcane	0.00	-	-	-	-
	16. Jute	-	-	-	-	-
GRAND TOTAL		27.38	44.88	59.63	68.97	93.49

Source: Myanmar Agricultural Development Bank

Note: Exchange rate used is USD 1= MMK 1,000