



Myanmar

Agriculture, Natural Resources, and Environment Initial Sector Assessment, Strategy, and Road Map



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April 2013

Asian Development Bank

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Printed in the Philippines.

ISBN 978-92-9254-353-2 (Print), 978-92-9254-354-9 (PDF)
Publication Stock No. RPT136157

Cataloging-In-Publication Data

Asian Development Bank.

Myanmar: Agriculture, natural resources, and environment initial sector assessment, strategy, and road map.
Mandaluyong City, Philippines: Asian Development Bank, 2013.

1. Agriculture. 2. Natural resources. 3. Environment. 4. Myanmar. I. Asian Development Bank.

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Abbreviations

ANRE	–	agriculture, natural resources, and environment
BCI	–	Biodiversity Conservation Corridors Initiative
CAPE	–	Country Assistance Program Evaluation
EIA	–	environmental impact assessment
GMS CASP	–	Greater Mekong Subregion Core Assistance Support Program
GMS CEP	–	Greater Mekong Subregion Core Environmental Program
FAO	–	Food and Agriculture Organization of the United Nations
FDI	–	foreign direct investment
GDP	–	gross domestic product
GMS	–	Greater Mekong Subregion
MADB	–	Myanmar Agricultural Development Bank
MAS	–	Myanmar Agriculture Service
MECF	–	Ministry of Environmental Conservation and Forestry
MOAI	–	Ministry of Agriculture and Irrigation
SAPE	–	sector assistance program evaluation
SEA	–	strategic environmental assessments
SWOT	–	strengths, weaknesses, opportunities, and threats
UNDP	–	United Nations Development Programme

Acknowledgments

This initial assessment of agriculture, natural resources, and the environment in Myanmar was prepared as a basis for dialogue with the government and possible Asian Development Bank (ADB) support. Preparation of this initial assessment was greatly facilitated by the Government of Myanmar, notably by the Ministry of Agriculture and Irrigation, which provided extensive data and guidance regarding key sector trends, achievements, and challenges. The views expressed in this paper are those of the authors—Pavit Ramachandran, Zorayda Buco-Opana (consultant), and Ted Breckner (consultant)—and do not necessarily reflect the views and policies of ADB or the Government of Myanmar.

I Sector and Subsector Performance

A. Introduction

1. This interim assessment, strategy, and road map (ASR) of Myanmar's agriculture, natural resources, and environment (ANRE) sector highlights the Government of Myanmar's plans for addressing priority needs and identifies—in a preliminary manner—possible areas of international assistance for the sector. The ASR will be periodically revised based on new information and reflecting the evolving development partnership with Myanmar.

2. Like most other development partners, the Asian Development Bank (ADB) has not extended loan or technical assistance to Myanmar since the late 1980s. However, ADB has maintained limited involvement with the government through the Greater Mekong Subregion (GMS) Economic Cooperation Program and its 10 working groups. The agriculture and environment working groups, in particular, have generated a good deal of information relevant to Myanmar's ANRE sector. Considerable secondary information and data have also been available from multilateral and bilateral organizations active in Myanmar, supplementing their useful guidance.

3. In order to have a better firsthand understanding of the sector and possible areas of support by development partners, an ADB mission visited Myanmar in two separate consultation missions fielded in April and June 2012. Another consultation mission was fielded in March 2013. The information and findings gathered during the missions served in drafting an interim assessment of Myanmar's ANRE sector. Subsequently, the assessment has been updated to reflect the findings of follow-up ADB missions and consultations with the government. To determine more fully the current status and needs of the ANRE sector, an intensive review must be conducted.

B. Country Context and Sector Overview

4. Myanmar is a large country, with a land area of 676,577 square kilometers (km²). Its strategic geographic location provides Myanmar the potential to become a land bridge between South and Southeast Asia and to link the People's Republic of China (PRC) to these markets. Myanmar shares borders with Bangladesh, the PRC, India, the Lao People's Democratic Republic (Lao PDR), and Thailand; it also has a 2,800-kilometer (km) coastline along the eastern side of the Bay of Bengal.

5. The population is estimated to be approximately 60 million and growing at about 1.5% annually, but the lack of a census for the past 2 decades has meant there

Human Development Index

Year	Myanmar	World
2012	0.498	0.694
2010	0.490	0.690
2005	0.435	0.666
2000	0.382	0.639
1990	0.305	0.600
1980	0.281	0.561

Source: United Nations Development Programme.
<http://hdrstats.undp.org/en/countries/profiles/MMR.html> (accessed April 2013).

is little reliable data on Myanmar's demographics and land use pressures. Per capita gross domestic product (GDP)—at about \$715—is one of the lowest in Southeast Asia. Myanmar was ranked among the poorest (161 out of 180 countries) by the International Monetary Fund. It ranks 149 of 187 countries on the United Nations human development index, placing lowest in East and Southeast Asia.¹ Some 26% of the population lives in poverty.

6. Despite economic sanctions since the late 1980s, Myanmar's economy has maintained relatively steady growth—by an estimated 5.5% in fiscal year 2011 (ended 31 March 2012) and by an average of 4.9% over the previous 3 years. Prior to the devastation wrought by Cyclone Nargis in 2008, the economy had reportedly been growing at more than 10% annually. The economy is predominantly agricultural, with rice being the main crop and staple food. In 2010, the agriculture sector accounted for about 36% of GDP, down from 57% in 2001. In contrast, the share of GDP accounted for by the industry sector more than doubled, to 26%. Liberalization of the economy and opening up to foreign direct investment (FDI) has prompted rapid growth of the industry sector, notably exports of natural gas. Although employment data are unavailable, it appears that the agriculture sector still accounts for about 70% of total employment. It also accounts for between 25% and 30% of exports, by value.^{2,3}

7. The imposition by many countries of deep economic sanctions in the late 1980s, in response to Myanmar's suspension of democratic liberties, clearly hampered development. During nearly 3 decades, Myanmar lost most access to international investment and assistance, including from ADB and the World Bank. Consequently, development of Myanmar's ANRE sector has lagged greatly behind its potential.

8. The government that took office in March 2011 has introduced sweeping reforms, both to the political process and economic system. Among the economic reforms, the Farmland Law and Foreign Investment Law address issues fundamental to development, as does unification of the former multiple exchange rate system. More importantly, the Framework for Economic and Social Reforms (FESR) has been drafted to push ongoing reforms forward and to accelerate Myanmar's greater integration into the international community. Policies emphasize agro-based industrial development, equitable sharing of resources among the regions and the states of the country, promoting local and foreign investments, effective implementation of people-centered development, and poverty reduction. Key measures under the FESR include (i) land reform, (ii) improving access to credit, and (iii) creating job opportunities.

Myanmar has been facing daunting challenges. Poverty is the pressing issue of the economy, resulted from low income, mainly generated from agriculture. The prolonged conflicts among ethnic groups, international sanctions imposed on the country, natural disasters like Cyclone Nargis and the ripple effects of global economic crisis have worsened the country's vulnerability.

Yin Yin Mya, Deputy Director General, Central Bank of Myanmar, at the 46th ADB Annual Meeting in Delhi, India, 4 May 2013

¹ The *Human Development Report* has published the human development index (HDI), which was introduced as an alternative to conventional measures of national development, such as level of income and the rate of economic growth. The HDI is a broader definition of well-being and provides a composite measure of three basic dimensions of human development: health, education, and income. Between 1980 and 2012, Myanmar's HDI rose by 0.8% annually from 0.281 to 0.498 today, which gives the country a rank of 149 out of 187 countries with comparable data. The HDI of East Asia and the Pacific as a region increased from 0.432 in 1980 to 0.683 today, placing Myanmar below the regional average.

² United Nations Development Programme (UNDP). 2011. *United Nations Strategic Framework 2012–2015—Myanmar*. Yangon.

³ Agricultural exports, as a percentage of total exports, dropped to 26% in 2008, reflecting the devastation of the rice and other crops by Cyclone Nargis. In 2009, agricultural exports accounted for 28% of total exports.

9. From a strategic development and poverty reduction point of view, the agriculture sector is of central importance. In addition to being the core means of livelihood for the great majority of the population, improvements in agricultural productivity and marketing are critical to raising the livelihoods of the rural population—some 36% of which lives below the poverty line. The government places the highest priority on development of the sector and sees it as the basis for food security, increased employment, and export promotion.⁴

10. As context for an assessment of the ANRE sector, the country may be divided into five major topographic and climatic zones: the Mountainous Region, the Shan Plateau, the Central Dry Zone, the Delta Region, and the Coastal Region. The Mountainous Region covers the north and west of the country, bordering India, and is characterized by high mountains (up to 5,800 meters above sea level), dense forest, and uplands. To the east is the Shan Plateau consisting of rolling hills and uplands at an elevation of about 2,000 meters. The population density in the Mountainous Region and the Shan Plateau is low, consisting largely of ethnic minorities. Both regions are characterized by low levels of development, poor infrastructure, and poor communications.

11. Farther south is the Central Dry Zone, with the lowest annual rainfall; an extended dry season; and infertile, sandy soils. Nonetheless, it has the second-highest population density in Myanmar. The Delta Region is a vast fertile area that is at the confluence of three major river systems: the Ayeyarwady,⁵ the Sittaung, and the Thanlwin. The Delta Region has the highest population density; highest land productivity; moderately high rainfall; generally flat topography; and an excellent environment for agriculture, especially rice production.⁶ Yangon, the country's largest city and commercial capital, is located in the Delta Region. The Coastal Region runs along the eastern side of the Bay of Bengal and the Andaman Sea, bordering Thailand. The southern portion of this region has the highest annual rainfall (exceeding 4,000 millimeters per annum) and is highly suitable for growing perennial crops such as coconut, oil palm, and rubber.

12. Agricultural production takes place on only about 12.4 million hectares⁷ (ha), or 18% of Myanmar's total land area of about 68 million ha. Some 5.7 million ha is considered cultivable but is currently unused. The principal crops include

- (i) rice, which covers about two-thirds of the total area under cultivation;
- (ii) beans and pulses, which have recently become major export crops and are grown on about 4.2 million ha;
- (iii) oilseeds (especially in the Central Dry Zone), grown on 3.3 million ha; production is insufficient to meet national demand and about 200,000 tons of palm oil are imported annually;
- (iv) vegetables and chilies, grown on about 0.8 million ha, principally in highland areas; and
- (v) other crops, including maize, cotton, rubber, sugarcane, and tropical fruit crops.⁸

13. Just under 50% of the total land area is heavily forested or unsuitable for agriculture (mountains and deforested hill slopes). Myanmar has one of the largest forest reserves in Southeast Asia, providing a

⁴ UNDP. Op. cit.

⁵ The Ayeyarwady, along with its major tributary, the Chindwin, drains 58% of the country's territory.

⁶ Some 50% of Myanmar's rice cultivation and production is in the three Delta Region divisions of Ayeyarwady, Bago, and Yangon. The Ayeyarwady division alone accounts for 25% of rice production.

⁷ Food and Agriculture Organization of the United Nations. 2012. *Myanmar Country Profile*. Rome.

⁸ Double-cropping of rice and other annual crops accounts for the total cropped area exceeding the total cultivated area of 12.4 million ha.

rich habitat for tropical and subtropical flora and fauna.⁹ Besides being a major economic resource, this huge forest reserve, much of which is closed, provides an important component of biodiversity, ecological preservation, and environmental sustainability within Southeast Asia.

14. In addition to extensive land and forest resources, the country has abundant water resources. Five major rivers flow through the country, providing the basis for increased irrigation and hydropower generation.¹⁰ Myanmar's water resources are greatly underutilized: less than 20% of croplands are irrigated, and the hydropower potential has barely been tapped. Water availability, however, is highly seasonal—80% of rainfall occurs during the monsoon—and significant parts of the country experience serious drought during the dry season.

15. Associated with the country's abundant water resources are substantial fisheries in the major rivers, the 1,900 km of coastline, and the 500,000 ha of mangrove swamps. There is also considerable potential for aquaculture development in the low-lying river delta areas in the south and center of the country. Between 1998 and 2009, fisheries production almost tripled, mainly due to aquaculture development. Fish and shrimp have become major export items.

16. Another significant component of the agriculture sector is livestock, which includes cattle, buffalo, swine, and poultry. Most rural households raise livestock, thereby contributing significantly to household protein (meat, eggs, and milk) and to farm economy through draft power and by-products (hides and leather). Livestock represents a considerable portion of household income and capital; livestock production accounts for about 7.5% of overall GDP. Almost all livestock is raised in household backyards although there is some commercial production near major cities. Livestock numbers have little changed for the past decade, except for the poultry population, which has tripled—possibly due to the spread of commercial production techniques in peri-urban areas (footnote 2). The shortage of livestock for draft power is one of the constraints to increased agricultural production in Myanmar.

C. Overall Sector Trends

17. Agricultural production grew strongly from 2000 to 2007, increasing by almost 10% in some years. In 2008 and 2009, however, vast agricultural areas were devastated by Cyclone Nargis, resulting in slightly negative growth in agricultural production. It recovered somewhat in 2010 and 2011, although flooding and currency appreciation subdued production.

18. Despite strong growth during most of the past decade, agriculture's contribution to GDP declined from 57% in 2001 to 36% in 2010 (Figure 1). In contrast, the share of GDP accounted for by the industry sector more than doubled, to 26%, reflecting natural gas, oil, mineral, and gemstone exploitation. Liberalization of the economy and opening up to FDI has prompted rapid growth of the industry sector.

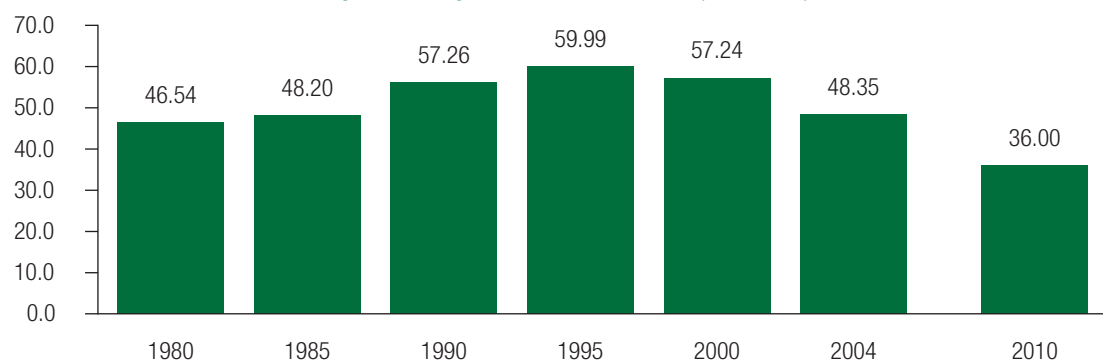
19. A parallel increase in employment generation in the industry sector is unlikely, as the mineral and gas sectors are capital rather than labor intensive. Although employment data are limited, it appears that the agriculture sector still accounts for about 70% of total employment. Further, it appears to be the only sector in which employment could relatively quickly be expanded nationwide. This is an important consideration, given that about 30% of the rural population is landless and has no source of income other than providing labor to the agriculture sector.¹¹

⁹ Ministry of Agriculture and Irrigation. 2011. *Myanmar Agriculture at a Glance*. Nay Pyi Taw.

¹⁰ The four rivers listed earlier plus the Mekong River.

¹¹ In addition, some 37% of rural households have landholdings of less than 2.0 ha.

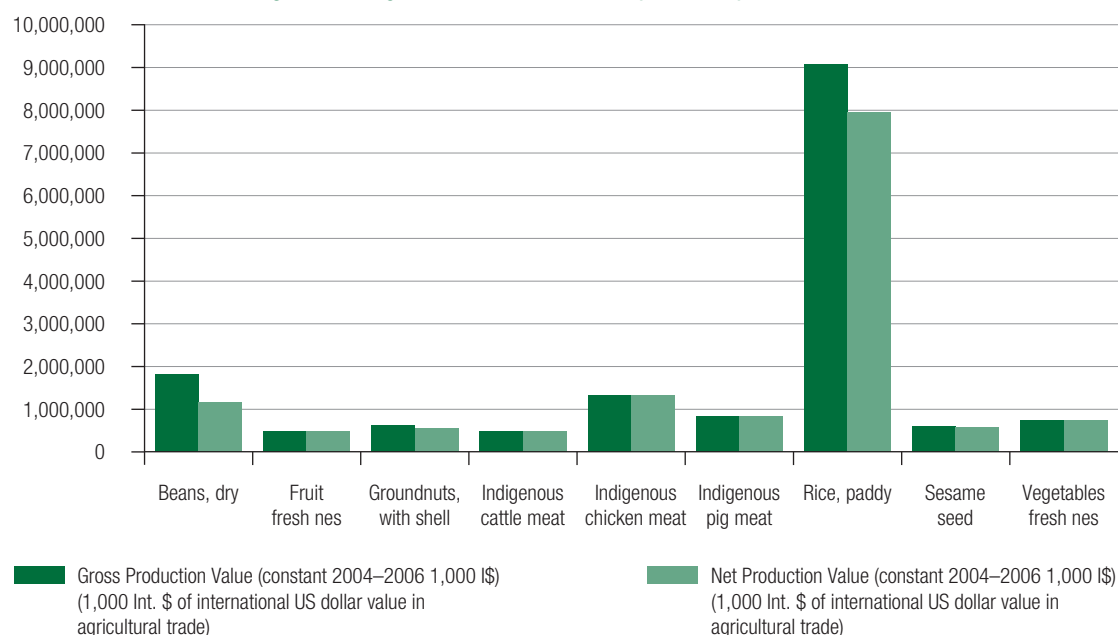
Figure 1 Agriculture, value added (% of GDP)



GDP = gross domestic product.

Source: World Bank. <http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS> (accessed April 2013).

Figure 2 Agricultural Products in Myanmar by Value, 2010



Int. \$ = or international dollar is a hypothetical unit of currency that has the same purchasing power parity that the US dollar has in the United States at a given point in time, often used as a benchmark year for comparisons; nes = not elsewhere specified.

Source: Food and Agriculture Organization of the United Nations. FAOSTAT: <http://faostat.fao.org/site/339/default.aspx> (accessed December 2012).

20. Future growth of the sector is strongly linked to the food crop subsector, which accounted for 80% of the total agricultural production, as shown in Figure 2.

21. Rice is Myanmar's main crop, but beans and pulses have recently become major exports¹² and are an important component of agricultural production.

¹² Myanmar now exports somewhat more than 1.0 million tons of beans and pulses annually (mostly to India), which makes it the world's second-largest exporter of leguminous crops.

22. There are a number of factors hampering growth of agricultural production. These include (i) low producer prices; (ii) high costs for farm inputs such as fertilizers; (iii) inadequate access to markets and inputs due to the poor condition of the rural road network, as well as the imposition of road and bridge tolls by local administrations; (iv) lack of access to credit; (v) limited irrigation; (vi) a land tenure system that provides tillage rights but not ownership;¹³ (vii) nontransparent market mechanisms; (viii) poorly developed research, training, and extension services; (ix) lack of electricity in rural areas; and (x) an appreciating exchange rate. In areas devastated by Cyclone Nargis, several of these factors have been exacerbated by the destruction of critical rural infrastructure (including flood and salinity control structures) which have yet to be repaired 4 years later.

23. Unless structural and policy reforms and major infrastructure investment are undertaken to address these factors, it is unlikely that significant results will be achieved in poverty reduction and inclusive economic growth in the country. It is vital that agricultural productivity greatly improves.

24. Stocktaking of the ANRE sector is needed, especially in terms of Myanmar's natural resources and the environment. Based on the experience of neighboring countries, severe strains on natural resource and environmental management will accompany opening up of the economy and more rapid development. These strains will likely include accelerated demand for land for commercial-scale agricultural production; sharply increased demand for water resources for agriculture, industry, and urban needs; hydropower development; exploitative use of forests; land conflicts between agriculture and urban usage; and endangerment of native biota (flora and fauna) habitats. An inventory and assessment of these critical resource pressures is required. The problem tree is in Appendix 1.

Poverty Alleviation Initiatives Since 2010

Guidelines for Rural Development and Poverty Alleviation

1. Development of agricultural production sector
2. Development of rural productivity and cottage industries
3. Development of micro saving and credit enterprises
4. Development of rural cooperative tasks
5. Development of rural socioeconomy
6. Development of rural energy
7. Environmental conservation

Source: International Relations and Development. http://www.icird.org/2012/files/ppt/2301_Aung%20Thu%20Nyein.pdf

D. Selection of Priority Subsectors

25. A focused approach to sector development will be required, given limited funding—including whatever level is likely to be provided by ADB and other development partners. From this perspective, it is necessary to identify priority subsectors. In accordance with ADB's Strategy 2020, these should be subsectors that will (i) generate inclusive growth, (ii) contribute to environmental sustainability, and (iii) promote regional cooperation and integration.

26. The first priority should be the food crop subsector, which accounts for most of the main agricultural commodities produced in the country (i.e., rice, beans and pulses, oilseeds, fresh fruit and vegetables). Enhanced production and marketing in this subsector has the potential, in a relatively short term, for (i) increased agricultural productivity; (ii) improved incomes for farm households; (iii) reduced poverty levels; (iv) increased exports; and (v) employment in other sectors by stimulating demand for transport, processing, marketing, and storage services. Many of the measures to strengthen the food

¹³ This has recently changed. Two new land laws, the Farmland Law and the Vacant, Fallow and Virgin Lands Management Law, were enacted in March 2012.

crop subsector (e.g., improvement of rural infrastructure) will also benefit the livestock and fisheries subsectors.

27. A related subsector, which merits priority attention, is water resources management. The primary means for improving food crop production will be through extension and upgrading of the irrigation systems. Further, as noted earlier, the experience of neighboring countries has been that as development accelerates, increasing demands are placed on water resources and these need to be carefully managed. This is especially the case when water resources are shared with neighboring countries. Focus on water resources management would contribute to inclusive growth, environmental sustainability, and regional cooperation and integration.

28. As economic growth accelerates, considerable pressure is placed on biotic resources—forests come under threat, uncontrolled and illegal logging is difficult to halt, wildlife habitat is lost, water bodies become polluted, and valuable productive land is permanently lost to urbanization and industrialization. In view of the importance of environmental sustainability, capacity building in natural resource management in Myanmar is urgently needed. Regional cooperation must also be promoted and facilitated. Some of the biodiversity corridors being developed in the Greater Mekong Subregion (GMS) border on Myanmar and should, selectively, extend into Myanmar. The indicative investment pipeline is in Appendix 2.

E. The Food Crop Subsector

1. Food Crop Subsector Features

29. The food crop subsector is clearly a vital component of the overall economy and is central to the well-being of Myanmar's population. Table 1 illustrates the growth in cultivation and production of a number of key crops since 1990, based on national sources and figures provided by the Food and Agriculture Organization of the United Nations (FAO).

Table 1 Myanmar: Growth in Food Crop Area and Production, 1990–2010

Crop	Year				
	1990	1995	2000	2005	2010
Rice					
Area ('000 ha)	4,760	6,032	6,302	7,384	8,051
Production ('000 metric tons)	13,971	17,956	21,323	27,683	33,204
Beans					
Area ('000 ha)	433	1,104	1,762	2,184	2,745
Production ('000 metric tons)	263	752	1,285	2,175	3,029
Sesame Seed					
Area ('000 ha)	924	1,131	964	1,337	1,570
Production ('000 metric tons)	206	304	295	503	722
Vegetables					
Area ('000 ha)	136	167	207	238	277
Production ('000 metric tons)	163	226	280	336	371

ha = hectare.

Source: Food and Agriculture Organization of the United Nations. FAOSTAT: <http://faostat.fao.org/site/339/default.aspx> (accessed January 2013).

30. Each of the four crops shown has grown rapidly in area and production. The area planted with rice has nearly doubled, and production has increased nearly threefold, indicating the impact of enhanced yields. The increase in planted area and production of bean products has been even more dramatic: the planted area has increased sixfold while production has increased more than elevenfold. The only crop that has lagged somewhat has been sesame (representative of all oilseed crops); production more than tripled even though the planted area less than doubled.

31. These figures, especially for rice, have been questioned by some researchers. For example, Dr. U Myint, in *Reducing Poverty in Myanmar: The Way Forward*,¹⁴ notes that in 2008/2009, Myanmar's rice output was estimated at 35.8 million tons (t) (unhusked paddy), but rice exports were only about 1 million t. Thailand, which also produced about 35 million t of rice, was able to export some 8.7 million t. Thus, Thailand, with almost the same rice production yet 10 million more people (68.4 million versus Myanmar's 58.4 million), was able to export more than eight times the amount of rice as Myanmar. It is hard to explain whether this discrepancy was due to overestimation of production, underreporting of exports, substantially increased per capita consumption, or a combination of all three. A similar situation applies to pulses. Official figures show a rapid growth in pulse production from 2.5 million t in 2001 to 5.0 million t in 2008. However, exports remained constant at about 1.0 million t.

32. Generally, rice production has kept pace with the increase in population and domestic demand. The Integrated Household Living Conditions Survey Poverty Profile, undertaken by the United Nations Development Programme (UNDP),¹⁵ found that only 5% of the population in 2009/2010 (mainly in isolated upland regions) suffered from food poverty. An FAO study in 2010 reached a similar conclusion, finding that the availability of domestic rice marginally exceeded total domestic utilization (including seed, waste, food consumption and other uses).¹⁶ Both studies, however, found considerable variation among regions in the country.¹⁷

33. Although growth in food crop production appears to be leveling off, there is still scope for expansion of the subsector. Current rice yields of about 4.1 t/ha could be raised to at least 5.0 m/ha with increased irrigation and adequate inputs. Further, with improved and expanded irrigation in the dry season, the annual cultivated area could be increased. Improved rural transport links and reduced postharvest losses would ensure that more rice reached the domestic and international markets. The same observations apply to other food crops, such as beans, pulses, and vegetables, which are often grown in the off-season, or between rice crops. The export potential is strong, as Myanmar is surrounded by expanding economies, including India, Malaysia, the PRC, Singapore, Thailand, and Viet Nam—which collectively constitute a major and rapidly growing market for food.

34. Reestablishing Myanmar as a major player in the rice export market—as it once was—would strongly contribute to growth of the economy. Annual rice exports are less than 1.0 million t. Rice quality, which is characterized by a large admixture of different rice varieties and a high percentage of broken grains, is generally much poorer than that of Viet Nam and Thailand. The price per ton of Myanmar rice on the world market is 20%–30% lower, which would not be the case if the quality were better. Myanmar

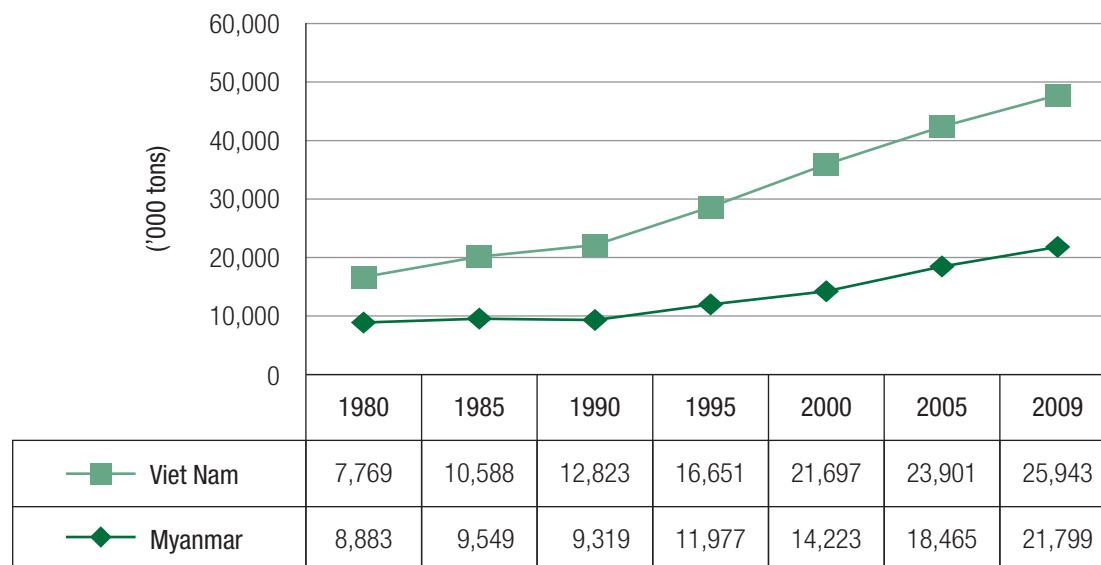
¹⁴ U Myint. 2011. *Reducing Poverty in Myanmar: the Way Forward*. Nay Pyi Taw.

¹⁵ UNDP. 2011. *Integrated Household Living Conditions Survey Poverty Profile*. Yangon.

¹⁶ FAO. 2010. *Special Report: FAO-World Food Programme Crop and Food Security Assessment Mission to Myanmar*. Rome.

¹⁷ In terms of food security, the variation was particularly marked between accessible lowland and isolated upland regions. In Chin State, Rakhine State, and the Northern and Eastern Shan states, levels of food insecurity were high and, even in states and divisions that have surpluses, food poverty can occur among the landless. The FAO report indicates that “The Mission observed both chronic and acute lack of access to food resulting from poorly functioning markets; poor transportation infrastructure; and inadequate demand for skilled or unskilled labour”. It further noted that, in Rakhine State, “The Mission observed poorly maintained roads and bridges, factors that negatively impact food commodity transport. Local authorities informed the mission of policies that had the effect of restricting transportation of food commodities. As a result, market access is poor, even if agricultural output is high.”

Figure 3 Production of Milled Rice



Source: International Rice Research Institute. <http://ricestat.irri.org:8080/wrs/>

could draw from Viet Nam's performance, which was a net rice importer until 1990. Viet Nam is now the second-largest exporter of rice in the world, accounting for a significant share of the country's foreign exchange earnings. Just as Viet Nam has increased both the quantity and quality of its rice production, Myanmar could, potentially, do the same.

35. Viet Nam began its economic reforms in the late 1980s, prior to which marketing of rice was strictly controlled and farmers were required to sell to the state at disadvantageous fixed prices. Much of the rice produced was never marketed and, rather, was consumed locally or used as livestock feed. The country experienced serious food insecurity and was a net rice importer—heavily dependent on supplies from the World Food Programme. Within 3 years of the removal of these controls, and freer access to both domestic and international markets,¹⁸ farm-gate prices for rice rose as did the volume of marketed rice. By 1990, Viet Nam was a net exporter.

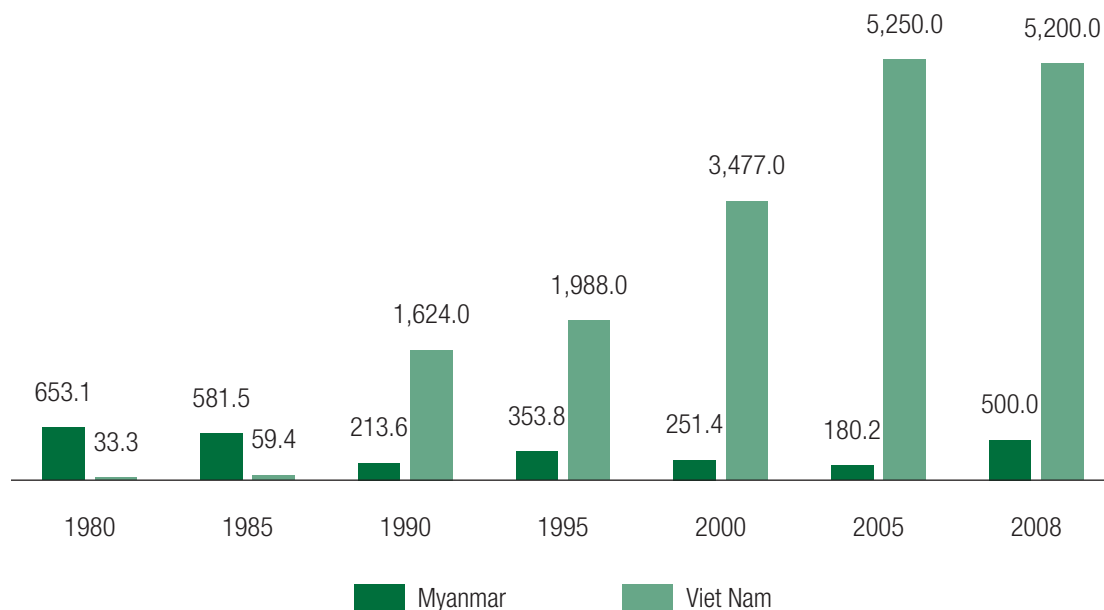
36. Myanmar's position is quite different. Since the late 1980s, domestic marketing of agricultural commodities has been largely without restriction and primarily in the hands of the private sector. Moreover, paddy purchases from farmers (based on a quota system at fixed prices) was discontinued in 2003, the same year in which the government dropped its monopoly on rice exports and allowed private sector involvement. Domestic marketing of industrial crops—cotton, sugarcane, and rubber—was also liberalized.

37. To date, these measures have yet to generate a response similar to that experienced by Viet Nam. One reason for this is the low price producers receive for their crops. According to some studies,¹⁹ the real (inflation-adjusted) price of paddy fell by nearly 50% between 2006 and 2011. This has been attributed

¹⁸ International marketing was still undertaken by state-owned enterprises.

¹⁹ Ash Center for Democratic Governance and Innovation. 2011. *Myanmar Agriculture in 2011: Old Problems and New Challenges*. Harvard; FAO. 2010. *Special Report: FAO-World Food Programme Crop and Food Security Assessment Mission to Myanmar*. Rome; U Myint. 2011. *Reducing Poverty in Myanmar: the Way Forward*. Nay Pyi Taw; UNDP. 2011. *United Nations Strategic Framework 2012–2015—Myanmar*. Yangon.

Figure 4 Rice Export Quantity ('000 tons)



Source: International Rice Research Institute. <http://ricestat.irri.org:8080/wrs/>

to appreciation of the exchange rate and high inflation, reducing the incentive for farmers to produce beyond subsistence levels. In effect, the market exchange rate²⁰ has risen by nearly 100% in recent years, from about 1,300 Myanmar kyats (MK) to the dollar in 2006–2007 to between MK750 and MK850 currently.²¹ This reduced rice export prices in domestic currency terms has seriously undermined the profitability of production for many farmers. Other factors discouraging increased production were high transportation and transaction costs.

38. Rapid inflation over the last 5 years has increased the prices of agricultural inputs to the point that they are generally unaffordable to farmers who, in most cases, do not have access to credit. The FAO 2010 study (footnote 17) found that, as a result of the lower price of rice and the higher price of fertilizers in 2008, the profitability levels were lower than the previous year, and in some areas were negative.

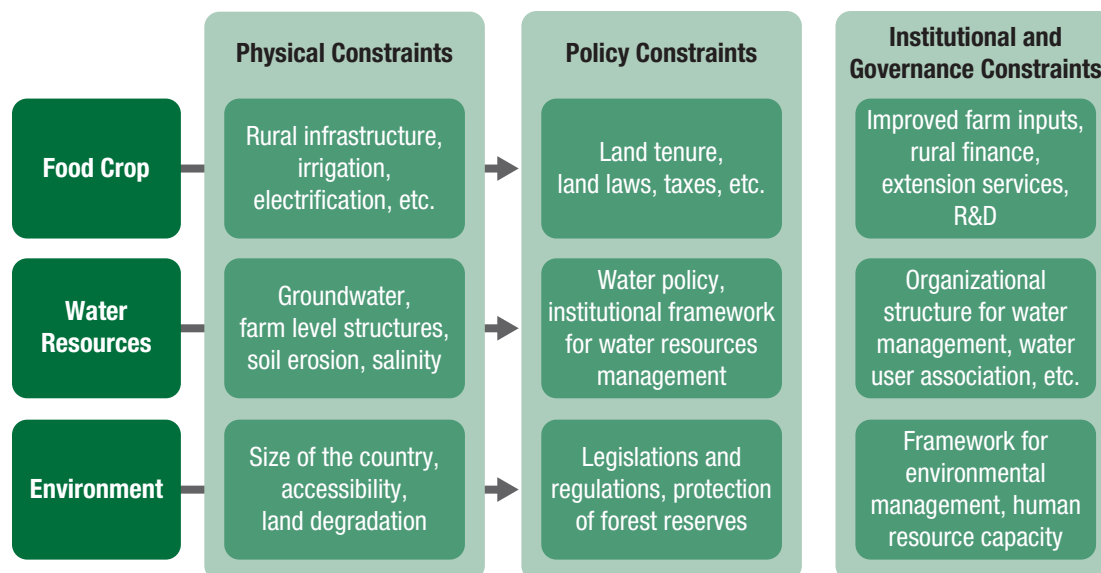
39. A further factor hampering increased production has been the impact of Cyclone Nargis. In some of the most productive areas of the country, draft animal numbers declined and fields were devastated by seawater flooding; salinity and flood control infrastructure were destroyed; and access roads and storage facilities were extensively damaged. About 50% of farmers are in debt and with few viable means of earning enough to lessen the burden.²²

²⁰ The official fixed exchange rate of about MK5–MK6 per dollar, which was abolished in April 2012, had not been used for most private export or import trade or capital flows since 1988.

²¹ Part of the cause of the appreciating exchange rate is the booming activity of the oil, gas, minerals, and gemstone sectors, which are generating large amounts of foreign exchange. This situation has all of the elements of Dutch disease—rapid growth of foreign exchange earning sectors but with limited employment possibilities, with the accompanying rise in the exchange rate undermining the competitiveness of the traditional agriculture-based economy.

²² Under these circumstances, land tenure restrictions, which appear to be counterproductive, may help protect against landlessness. All land belongs to the state, and farmers cultivate on the basis of tilling rights. They do not own their land. As a result, they cannot—at least officially—sell land to reduce their debts. If this were possible, Myanmar could soon have an even more skewed land ownership pattern, with more and more small farmers selling their holdings to repay their debts, and thereby becoming landless.

Figure 5 Key Constraints in Agricultural Development



Source: J. H. Mir. 2013. Inclusive and Sustainable Agriculture Development in Myanmar: ADB's Perspective. Presentation at the Myanmar International Trade and Investment Summit, 4–5 March 2013. Myanmar. Yangon.

40. The 10% tax on exports further reduces price incentives.

41. The cumulative impact of these factors is felt throughout the economy. Suppressed food crop production increases food insecurity, especially in those parts of the country that do not produce surpluses (such as the Mountain Region, the Shan Plain, and the Central Dry Zone). It reduces the employment and income opportunities of the rural landless population. It depresses the demand for agriculture inputs and consumer goods, as well as demand for transport services. Foreign exchange earnings are forgone. To realize the inclusive growth potential of the food crop sector, the structural factors holding back increased production must be resolved.

2. Food Crop Subsector Constraints

42. In addition to the structural factors discussed above, there are sets of “normal” constraints that commonly affect crop production in developing countries: (i) physical constraints, (ii) policy constraints, and (iii) institutional performance and governance.

a. Physical Constraints

43. Several physical constraints affect the capacity and incentives for farmers to enhance the quality and quantity of their food crops, or to continue to produce at current levels. These include the following:

- (i) **Rural infrastructure deficiencies.** Rural roads, tracks, bridges, and boat landings are in poor condition, limiting access to markets; storage and postharvest and market facilities are inadequate, resulting in high transaction costs. These deficiencies were exacerbated by Cyclone Nargis.
- (ii) **Inadequate irrigation.** While many reservoirs and irrigation schemes have been built in the recent few years, several have not been fully developed. Tertiary and field-level

canals do not exist or are in poor condition. With current low farm-gate prices and lack of farmland ownership, there is little incentive for farmers to develop them on their own.

- (iii) **Limited and unreliable rural electrification.** In addition to social benefits, reliable provision of electricity to rural areas would enable low-cost operation of agricultural processing facilities and, perhaps more importantly, low-cost pumping of surface and groundwater for irrigation. About 40% of the irrigated area is irrigated through pumping, but because of nonexistent or unreliable electricity services, diesel or gasoline pumps must be used. These are much more expensive to operate than electric pumps and represent yet another disincentive to farmers to investing in increased food crop production.
- (iv) **Inadequate flood, drainage, and salinity control structures.** Much of the low-lying Delta Region is subject to flooding, storm surges, and salinity intrusion, resulting in crop losses and reduced yields. Many of the flood, drainage, and salinity control structures were damaged during Cyclone Nargis and need to be rebuilt or replaced. Until this is accomplished, crop production in the otherwise highly productive Delta Region is vulnerable to future catastrophic climatic events.

b. Policy Constraints

44. The government places a high priority on the agriculture sector, especially the food crop subsector, to be an engine of inclusive economic growth. Accordingly, many reforms have been introduced since the late 1980s, during which the agriculture sector has evolved from central planning to a more market-based system. Significantly, in 2003, the government ended production quotas and opened up the export market to the private sector. Innovative measures have been taken to promote increased agricultural production, designed to improve rural livelihoods.²³

Ministry of Agriculture and Irrigation

Five Strategies for Agricultural Development

1. Development of new agricultural land
2. Provision of sufficient irrigation water
3. Provision and support for agricultural mechanization
4. Application of modern agro-technologies
5. Development and utilization of modern varieties

Source: <http://www.moai.gov.mm/>

45. However, in addition to the macroeconomic and financial factors discussed, there are policy and structural issues that hinder the government's agricultural objectives:

- (i) **Land tenure situation.** Until the recent approval of the revised land laws, all land in Myanmar belonged to the state and farmers had only tillage rights. Formally and legally, land could not be mortgaged, bought, or sold, but could be inherited. This meant that (a) there was little incentive to invest in improving land or the structures on it; (b) over time, landholdings became smaller and dispersed as they were divided among the next generation; (c) farmers had no collateral for securing loans to meet production costs; and (d) in upland areas, where shifting cultivation is practiced, farmers operated more or less as squatters with few user rights and thus paid little attention to conservation and sustainable food production practices. The revised land laws include major reforms that will provide farmers with tenure or outright ownership. Support will be required to ensure that meaningful and effective implementation regulations are formulated and implemented. It will also be necessary (in view of reported high levels of farmer indebtedness) to ensure that the enactment of the new law does not result in increased landlessness.

²³ Similarly, the Government of Myanmar established several major agricultural statistical agencies (Appendix 3) to aid in planning and setting up of appropriate government programs in agriculture.

- (ii) **Consistency of the land laws with the extant legal and investment framework(s).** In particular, the Myanmar Citizens Investment Law, the Foreign Investment Law, and the emerging frameworks for small- and medium-scale enterprise governance in the agriculture and agribusiness sectors need to be carefully assessed and rationalized.
- (iii) **Tax on exports.** An 8% tax on exports and a 2% income tax applies to exporters of farm products. The revenue from these taxes is ultimately transferred to farmers in the form of various subsidies. The tax was suspended but, if reimposed, it will have a repressive effect.
- (iv) **Directed planting.** Farmers within government-sponsored irrigation systems are directed to produce rice in order to meet production targets. With few incentives to do so during the dry season (when rice production is more costly), many farmers grow no crop at all. This reduces the overall agricultural output, employment available to landless laborers, and the level of economic activity generally.

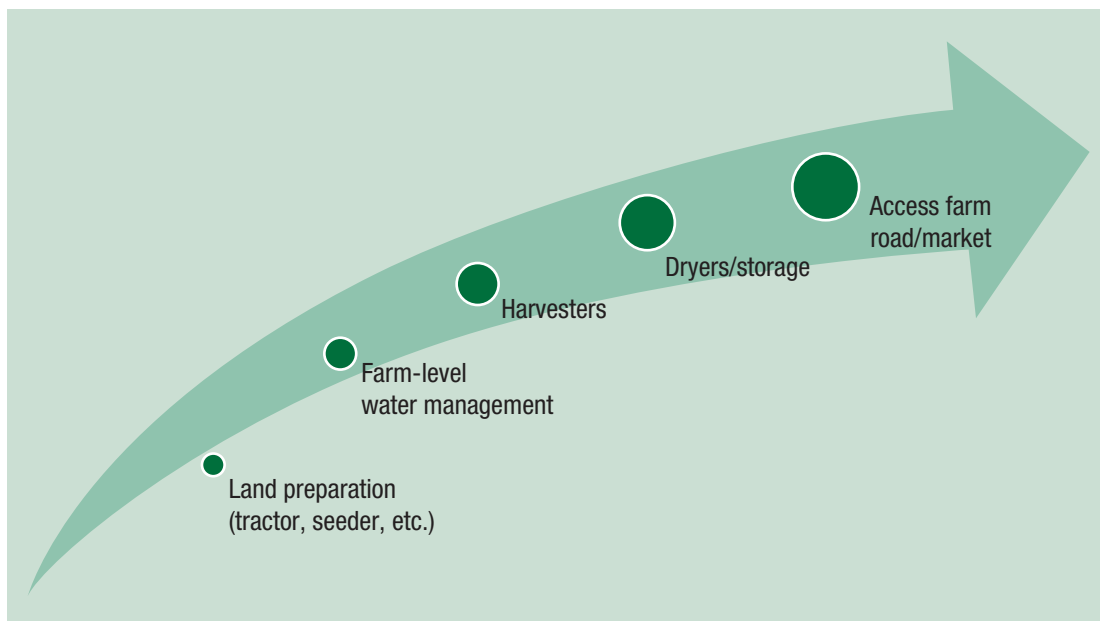
c. Institutional Performance and Governance

46. The Ministry of Agriculture and Irrigation (MOAI) is responsible for managing the food crop sector. With a staff of 70,000, it is one of the largest ministries and covers a wide range of activities, including planning, water resources management and irrigation, mechanization, settlement, and land records. The Myanmar Agriculture Services is the largest unit within the MOAI, with a staff of more than 14,000 in nine divisions covering a wide range of field operations, including extension services, agricultural research, seed multiplication, plant protection, and land use. Efficiency and effectiveness of the ministry is limited by budgetary constraints, insufficient technical expertise, and inaccessibility to many rural areas. Institutional constraints include the following:

- (i) **Inadequate access to fertilizers and other inputs.** While a now-dated reference, the UNDP Issues and Strategies Study²⁴ indicated that in 2006, only about 180,000 t of fertilizers were used in the agriculture sector, against 600,000 t needed to achieve potential levels of production. Fertilizers are expensive and difficult for farms to obtain, given the lack of credit and poor state of the road network. While Myanmar has ample supplies of natural gas from which to produce urea fertilizers, the Ministry of Gas and Energy favors gas exports for foreign exchange. Consequently, Myanmar's urea plants, including two new plants, are running at about 25% capacity. Unless natural gas is more readily available to fertilizer producers, urea fertilizer will remain in short supply. Other nutrients need to be imported.
- (ii) **Limited access to improved seed.** The recently established public-private Myanmar Rice Specialized Companies are designed to facilitate access to improved seed, but so far the results have been limited. Most farmers use seed retained from the previous harvest, which tends to be of poor quality and deteriorates genetically over time. The recent promotion of hybrid seed is ambitious and would result in higher yields, but the response by farmers will importantly depend on better incentives to supplement the added expense. The purchase of hybrid seed at the beginning of each planting season is difficult, as this is when farmers' incomes are at their lowest.
- (iii) **Inadequate access to rural finance.** The Myanmar Agricultural Development Bank (MADB) is the sole source of institutional credit for crop production. MADB loans are mostly seasonal and cover only about 10% of the production costs facing farmers. Recently, in response to the indebtedness and liquidity problems of farmers, the MADB has increased the size of loans. This, however, has led to other problems, including high nonperforming loan rates.

²⁴ Op. cit.

Figure 6 Agricultural Infrastructure



Source: Asian Development Bank.

- (iv) **Limited coverage and expertise of agricultural extension services.** While the MOAI has field staff throughout the country, reports indicate that they are neither well trained nor well supported with funding, information, travel allowances, and equipment. An extension worker is expected to cover, on average, 2,400 ha (some 1,200 farms)—far more than is physically possible.
- (v) **Limited farmer-based institutional services.** There is little in the way of institutional services organized by agriculture producers. Cooperatives tend to focus on trade rather than on facilitating increased agricultural production. Further, water user associations are limited. In the absence of decentralized farmer organizations, management of the sector appears to be top down and directed by government-set targets.
- (vi) **Limited funding for agricultural research and training.** Myanmar has a number of research and training facilities, and efforts are being made to improve agricultural technology. However, funding is limited, and training does not appear to have had a significant impact on promoting either production or the livelihoods of the rural population. The UNDP *Issues and Strategies Report* indicates that in 2003, Myanmar invested an average of \$0.06 in agricultural support for every \$100 of agricultural output. This is among the lowest in the world. The average in 2000 was \$0.41 for Asia and \$0.53 for the developing world. With agricultural research expenditures averaging only 20% of its peers and competitors, Myanmar's farm productivity and incomes have lagged.
- (vii) **Lack of access to market information.** There is no mechanism to provide farmers with knowledge of market prices and supply/demand trends for individual agricultural products; hence, there is little guidance on planting, storage, or marketing decisions. Returns to farmers tend to be based on the low prices at harvest time, with most profits going to traders and exporters.

3. Summary of Constraints and Opportunities in the Food Crop Subsector

47. The discussion outlined a range of constraints to the development of the food crop subsector in Myanmar. The main constraint is low farm-gate prices, which discourage farmers from expanding production or even maintaining production at current levels. Nonetheless, initiatives can and should be taken to improve the incentives, including (i) lowering transaction costs and (ii) providing a more positive policy and institutional framework.

48. Better rural infrastructure would help lower transaction costs for both inputs and outputs, and thus encourage farmers to respond to market opportunities. Further, rural infrastructure projects would generate employment opportunities and raise cash incomes among the rural population, thus alleviating debt burdens and stimulating demand. Rural infrastructure projects could include (i) improved roads, tracks, and bridges; (ii) more efficient irrigation systems resulting in lower irrigation costs; (iii) more extensive flood protection, drainage, and salinity control; (iv) storage and drying facilities; and (v) improved social infrastructure (e.g., health clinics, schools). Rural electrification would substantially lower agricultural production costs as well as open up off-farm employment opportunities.

Table 2 SWOT Analysis of the Myanmar Food Crop Subsector

Strengths 1. Ample land resources in the most populated parts of the country 2. A population experienced in agriculture and agricultural practices 3. Ample water resources in much of the country 4. Ample labor resources 5. Available markets both domestically and internationally 6. Existing irrigation facilities and the technology to expand and improve irrigation infrastructure 7. A recent commitment to open market policies 8. Overall food self-sufficiency except for isolated regions	Weaknesses 1. Serious price disincentives at least partially as a result of macroeconomic policies 2. Limited access to needed inputs 3. Limited access to working capital 4. Inadequate physical infrastructure (rural access, storage, processing, marketing, and power) 5. Susceptibility to drought in some areas 6. Incomplete irrigation infrastructure 7. Weak support services (extension, agricultural research, credit) 8. The new Land Law regulations have yet to be defined and implemented; existing land tenure policy does not act as an incentive to increased farm production 9. Difficult terrain and poor soils in large parts of the country, especially in areas inhabited mainly by ethnic minorities 10. Food deficits in areas with poor transport and poor land resources
Opportunities 1. Investment in rural infrastructure and rural electrification would offset price disincentives. 2. Policy reforms in terms of taxation and land would provide additional production incentives. 3. The completion of partly constructed irrigation schemes can be undertaken at low capital cost. 4. Private sector initiatives in improved production and marketing can be scaled up. 5. Off-farm wage and employment generation potential.	Threats 1. Failure to address current disincentives could lead to reduced production, increased rural unemployment, and increased landlessness. 2. Absence of regulatory mechanisms for land use and zoning may divert cultivable areas to inappropriate commercial exploitation. 3. Catastrophic climatic events would cause further damage to the subsector; flood protection and salinity intrusion structures damaged during Cyclone Nargis remain unrepaired. 4. Shifting cultivation in upland areas ties farmers to a subsistence existence; damages forest, soil, and wildlife resources and causes siltation in lakes, reservoirs, and rivers.

Source: Asian Development Bank.

49. Provision of a more positive policy and institutional framework should include removal of the export tax and clarification of the regulations concerning the new Farmland Law. In addition to its application to lowland areas, the new Farmland Law should apply to shifting cultivation in order to reduce upland degradation. In many countries, secure land tenure has proven to be a key to increased and more sustainable agricultural production.

50. The strengths, weaknesses, opportunities, and threats (SWOT) analysis shown in Table 2 summarizes the situation currently facing the food crop subsector.

F. The Water Resources Subsector

1. Features of the Water Resources Subsector

51. Myanmar's water resources meet its household needs, crop production and aquaculture requirements, industry needs, and hydropower generation. Myanmar's rivers, lakes, wetlands, and coastal areas also provide a major mode of transport, as well as providing the environment for a wide range of aquatic species. Fisheries from these sources contribute significantly to Myanmar's overall food supply and exports.

52. With an annual average rainfall of about 2,300 millimeters (mm) and five major rivers, Myanmar has abundant water resources (Table A4.1). The country also has ample groundwater resources (Table A4.2). When reviewed more closely, however, the situation is somewhat more complex, both from a seasonal and geographic point of view. About 80% of rainfall occurs during the 5- to 6-month monsoon season (from mid-May to October). For the remaining 6–7 months of the year when droughts are common, rice cannot be grown without irrigation. Drinking water shortages occur in many parts of the country. During the dry season, the country's water resources are not nearly as abundant as might initially be assumed. Further, there is potential for conflicts among water users.

53. Rainfall amounts vary considerably from one region to another—from highs of 4,000–6,000 mm annually along the coastal reaches and in the mountains of Rakhine and Tanintharyi, to as low as 500–1,000 mm in the Central Dry Zone. With such low levels of rainfall, there is insufficient precipitation to produce a rice crop. Rice cultivation in the relatively heavily populated Central Dry Zone depends therefore on irrigation, even during the monsoon season.

54. In contrast, excessive rainfall in other regions of Myanmar, notably in the Delta Region, often results in flooding, the loss of standing crops, and the displacement of significant portions of the population. Therefore, while Myanmar undoubtedly benefits from its water resources, these resources are neither unlimited nor always beneficial. Serious drought conditions may occur in some regions and, at other times, excessive rainfall and flooding damage the production base and community livelihoods.

55. Only a small portion (3%–10%)²⁵ of the country's water resources is used. Agriculture accounts for about 90% of total water use, with domestic water supply and industry accounting for the

Water Resources Potential

- There are four main river systems namely the Ayeyarwady, the Chindwin, the Sittaung, and the Thanlwin.
- Due to favorable climatic condition, the total surface water potential of Myanmar is about 1,000 km³ per year from 10 major river basins.

Source: FAO Aquastat. http://www.fao.org/nr/water/aquastat/countries_regions/myanmar/index.stm

²⁵ These figures are somewhat deceptive in that they look at total annual supply. The proportion would be much higher if dry season supply and usage were used.

remaining 10%. (These figures exclude hydropower generation.²⁶) Most water is surface water, with groundwater use amounting to only 9% of the total (despite its potential for dry season irrigation).

Table 3 Irrigation by Area and Type, 2008–2009

Type	Area (hectare)	%
Dams and Weirs	664,000	29
Tanks	321,000	14
Wells	138,000	6
Pumps	867,000	38
Others	285,000	13
Total	2,275,000	100

Source: Ministry of Agriculture and Irrigation. <http://www.myanmar.gov.mm/ministry/agri/waterresources.htm>

56. Despite irrigation being the main use of water, most rice is produced as a rain-fed crop during the monsoon season.²⁷ Water control infrastructure is needed in the highly productive Delta Region to prevent salinity intrusion and flooding and to improve drainage. Gravity irrigation systems and tanks have been developed over many years in the Central Dry Zone, and it is there that most irrigation infrastructure is located. Table 3 illustrates the types and quantity of irrigation.

57. Irrigation facilities cover close to 2.3 million ha, or about 19% of the country's cultivated area. However, only some 900,000 ha are irrigated during the dry season, with the balance of coverage serving to provide supplementary irrigation during the monsoon season. The largest irrigated area is served by pumps (mainly farmer operated), which covers 38% of the total irrigated area. The second-largest area is surface irrigation from dams and weirs (57% managed by the government and 43% by farmers), which covers 29% of the total irrigated area. In terms of responsibility, pumped irrigation and groundwater are the responsibility of the Water Resources Utilization Department, while dams and weirs are the responsibility of the Irrigation Department—both of the MOAI.

58. In addition to irrigation infrastructure, embankments in the Delta Region, which include drainage facilities, have been strengthened to protect large areas from flooding and salt intrusion. Prior to Cyclone Nargis, there were some 318 flood protection works, both government (88%) and private (12%), protecting a total of 1.2 million ha of cultivable land. Many of these structures were badly damaged during Cyclone Nargis, leaving much of the most productive part of the country vulnerable to catastrophic weather impacts. Water resources control infrastructure also includes about 180,000 ha of aquaculture ponds, primarily in the Delta Region. This is a growing industry with ample potential for expansion, leading to foreign exchange earnings.²⁸

²⁶ Published figures indicate that total installed hydroelectricity capacity in 2010 was at least 2,449 megawatts—6% of the potential. Several large dams are planned and are in various stages of development, with some expected to be commissioned in the next few years. They are being built with financing from the People's Republic of China, India, and Thailand, and much of the electricity produced will be exported to these countries. They are mainly located in the mountainous north, east, and west of the country. In the process, agriculture lands, especially in the upland areas inhabited by ethnic minorities, have been or will be flooded.

²⁷ In addition, some dry season rice is grown in the Delta Region with irrigation from pumping.

²⁸ The aquaculture industry in Viet Nam generates some \$4.0 billion annually. Myanmar has the land and water resources to reach similar levels.

59. There is considerable potential for further development of Myanmar's water resources and related infrastructure. Groundwater resources have barely been tapped, in contrast to those of neighboring Bangladesh and India. Dangers to Myanmar's water resources include pollution from mining and industry; overexploitation during the dry season; competing uses between hydropower generation, domestic water supply, and agriculture; siltation of reservoirs; and extreme variations in river flows resulting from shifting cultivation and loss of forest cover.

2. Water Resources Subsector Constraints

a. Physical and Institutional Constraints

60. Physical constraints affecting the water resources subsector include the following:

- (i) **Seasonal and geographic limits on water availability.** Despite having relatively abundant water resources, some regions experience little rainfall even during the monsoon season. The resulting shortages result in competition for scarce water resources during the driest periods of the year, and perennially in the driest parts of the country.
- (ii) **Surface water in many situations is below the level of the surrounding agricultural land.** Unless water capture and storage areas can be developed and dams or weirs constructed, water for irrigation needs to be pumped from nearby water sources.²⁹ This is expensive, especially when electricity is not available and diesel or gasoline engines are needed to run the pumps (97% of the pump-irrigated area is via diesel pumps). With low farm-gate prices yet constantly rising fuel prices, there is little incentive for farmers to increase their production.
- (iii) **Tertiary and farm-level structures needed in conjunction with surface water systems have not been completed or have deteriorated over time.** The result is inefficient water use, with far more water than necessary being used close to the headworks of irrigation systems while farmers at the end receive insufficient water or none at all. Because of this, farmers at the end of irrigation channels evade paying water fees, and maintenance (already a problem) becomes an even greater issue.
- (iv) **Upland deforestation and soil erosion are resulting in the siltation of reservoirs and canals.** Consequently, the economic life of reservoirs is shortened, and the storage and conveyance capacity of reservoirs and canals reduced.
- (v) **Flood control, salinity control, and drainage structures remain damaged after Cyclone Nargis.** This leaves large areas of the most productive riceland in Myanmar prone to damage by cyclones, floods, and salinity intrusion, thereby endangering crop production and the livelihoods of millions of people.

b. Policy Constraints

61. Efforts to establish a planning and institutional framework for overall water resources management have made little progress. In 2003, the Irrigation Department endeavored to establish a national water coordination agency responsible for overall management of water resources. A national-level Myanmar Water Resources Committee conference was scheduled together with the formulation of a strategic management plan. Subsequently, the MOAI Inter-Ministry Task Force on Water Resources presented a strategic plan for integrated water resources management. However, there appears to have

²⁹ Tidal and flood recession irrigation are practiced in the Delta Region.

been no official approval of the plan and no move to set up an institutional body responsible for overall water resources management.

62. The MOAI has adopted five measures to increase irrigation coverage to about 25% of the area under cultivation: (i) construction of new reservoirs and dams, (ii) renovation of existing reservoirs to raise storage capacity and facilitate the efficient delivery of irrigation water, (iii) diversion of water from streams and rivulets during high water levels into adjacent ponds or depressions for storage, (iv) lifting water from rivers and streams using pump irrigation, and (v) efficient use of groundwater.

63. While there would appear to be ample water for the government's envisaged expansion of irrigation, planning is needed to reconcile competing water needs—especially during the dry season. The urgency of this will increase as the economy accelerates and the population continues to grow. Competition for water resources from industry, hydropower generation, and domestic consumption will intensify. Legislation or decrees regarding water management are needed, optimally leading to a unified and well-coordinated water resources framework.³⁰

The latest national environmental performance report reveals the acceleration of forest destruction since 1990, averaging around 400,000 hectares annually. In less than a century, more than 72% of the country's mangrove forests have disappeared. Land degradation, particularly in upland areas and in dry zones, is a major issue, resulting from population pressures combined with inappropriate land use and cropping patterns, and shifting cultivation. Previously known as the "last frontier of biodiversity in Asia," Myanmar's biodiversity is presently under increasing pressure and threat.

Javed H. Mir, ADB Blog, 4 March 2013. <http://blogs.adb.org/blog/myanmar-must-face-environmental-catch-challenges-stimulate-growth>

c. Institutional Performance and Governance

64. Agencies engaged in water resources management have been active. The area provided with irrigation has significantly increased since 1995, from 1.6 million ha to 2.1 million ha in 2004 (more recent data are not available). Unfortunately, most irrigation systems are functioning inefficiently due to unfinished farm-level distribution networks, siltation in reservoirs and canals, high operational costs of pumping systems, and deterioration of control structures. Irrigation service fees for gravity-fed systems are very low and do not cover recurrent costs; much of the management and maintenance costs are met using limited budget of the Irrigation Department of the MOAI. Much higher fees apply in pumping systems operated by the Water Resources Utilization Department, recouping operation and maintenance costs. The high fees, however, discourage farmers from dry season cultivation. Some consolidation of responsibilities may be desirable between the Irrigation Department, which has a mandate for gravity-fed irrigation, and the Water Resources Utilization Department, which has a mandate for pumped irrigation (including groundwater).

65. A further concern is the lack of an organizational structure for irrigation management by the end users. Farmer water user groups exist, but their level of involvement in management decisions and operation and maintenance responsibilities is not clear. This area would require further study.

³⁰ The Conservation of Water Resources and Rivers Law was enacted by the State Peace and Development Council in 2006. However, it deals mainly with the use of rivers from the point of view of transportation, the regulation of fishing, and the regulation of sewage discharge.

66. It is also necessary to clarify responsibility for the provision and operation and maintenance of flood control, drainage, and salinity control infrastructure, as well as the role of beneficiaries in operation and maintenance. Repair of damage to this infrastructure, as a result of Cyclone Nargis, can be expected to be one of the early areas of support by development partners including ADB.

3. Summary of Constraints and Opportunities in the Water Resources Subsector

67. Myanmar's lack of an overall water resources management policy and related institutional structure will need to be corrected, although the urgency of this is eased to some extent by the relative abundance of water resources.

68. The impact hydropower development on the availability of water resources for agriculture is another concern.³¹ The retention of large volumes of water by hydropower dams, several of which are under construction or planned on the Ayeyarwady, Chindwin, Sittaung, and Thanlwin, will affect river flows, especially during the dry season. It appears, though, that their cumulative effect has not been assessed, nor have modeling studies been undertaken.³²

69. In addition, extractive activities, such as mining and logging, are having a negative effect on water quality in several rivers, including the Ayeyarwady. Accelerated economic development, prompted by Myanmar's strategic location and opening up to foreign investment, will intensify urbanization and industrialization. In turn, this will intensify the competition for water resources and—in the absence of strong environmental legislation—further pollution of rivers, groundwater, and other water bodies. To avoid the severe water resources situation being experienced in some neighboring countries, Myanmar must ensure sustainability through appropriate legislation and establishment of a sound institutional management system.

70. Table 4 summarizes the strengths, weaknesses, opportunities, and threats (SWOT analysis) for the water resources subsector.

G. Environment Thematic Issues

1. Features of the Myanmar Environment

71. Myanmar has a wide range of terrain and ecological and climatic zones. Its rich natural endowment includes evergreen forests in the southern part of the country, deciduous dipterocarp forests and thorn scrub in the central part, and subalpine forests in the north. Large, slow-flowing rivers and large lakes support extensive freshwater ecosystems, while expansive seacoasts with tidal mangroves sustain vital marine ecosystems. Areas of particularly rich biodiversity are the Malaysian rain forests present in the southern part of Myanmar (in the Tanintharyi Division) and the mountainous area of Kachin State in the upper north, home to Himalayan fauna. With a large part of the country still forested, Myanmar's flora and fauna are extensive and include a number of endangered species, such as the tiger (the largest reserve in the world is located in Myanmar) and the Irrawaddy dolphin (only a few still survive).

³¹ This is in addition to the impact that the flooding of productive agriculture areas will have on land availability.

³² The impact could be positive if flows are evened out, with retained water from the monsoon season being released during the dry season. However, peak electricity demand generally occurs just prior to the monsoon, during the hottest part of the dry season, so competition for water at that time of year can be anticipated, especially in the Central Dry Zone.

Table 4 SWOT Analysis of Myanmar's Water Resources Subsector

Strengths 1. Relatively abundant water supplies during the monsoon season, with the country generally having ample rainfall for crop production and being served by a number of major rivers that contribute to irrigation 2. Relatively advanced technical skills among personnel of the Ministry of Agriculture and Irrigation 3. Manageable demand from industry and household use for water resources 4. Water resources infrastructure exists (for irrigation, flood control, drainage, and salinity control), which can be upgraded and expanded to help increase agricultural production 5. A rural population with a tradition of water resources management	Weaknesses 1. Insufficient rainfall in the dry season to grow rice, necessitating irrigation 2. Insufficient rainfall in the Central Dry Zone to grow rice without irrigation, even during the monsoon season (high-value crops could be substituted.) 3. Absence of overall policies, legislation, and institutional structure for water resources management 4. Limited awareness among policy makers and planners of the potential economic, social, and ecological damage that can result from unregulated water resources exploitation 5. Limited information in terms of basic data on rainfall, seasonal flows, fluctuations, current, river morphology, and likely future levels of exploitation (including water extraction, water retention for hydropower, sand mining, and industrial and urban development) 6. An unclear institutional structure for the management of irrigation, drainage, and flood control systems, especially at the beneficiary user level 7. Insufficient funding for the sustainable operation of water resources management infrastructure 8. Pricing incentives, which distort water demand and use in the agriculture sector; fees for gravity irrigation schemes are too low and encourage excessive water use, while fees for pumping are so high as to discourage irrigation at all
Opportunities 1. There is still ample surface water for increased irrigation coverage. 2. Groundwater resources are abundant and largely untapped. 3. Some of the hydroelectric dams could be multiple-use storage, supporting irrigation as well as power generation. 4. Water for irrigation systems can be used more efficiently, thus covering larger areas at little incremental cost. 5. Some gravity irrigation schemes may be suitable for a mini-hydro component, thereby boosting rural electrification. 6. Adequate water resources and suitable land resources exist in the Delta Region to support a commercial aquaculture industry.	Threats 1. Unregulated retention for hydroelectricity generation, overlooking proper consideration of other uses, could reduce low season river flows, disrupt annual river flow patterns, intensify salinity intrusion in delta areas, affect river morphology, and disrupt aquatic habitat 2. Competition for sparse low season flows among users, especially in the Central Dry Zone 3. Pollution from mining and reservoir clearing activities 4. Pollution from industrial waste and sewage discharge near urban areas 5. Siltation from upland agriculture and forestry activities 6. Damage to standing crops, livestock, housing, and rural infrastructure due to floods, restricted drainage, and salinity intrusion, especially in areas affected by Cyclone Nargis

Source: Asian Development Bank.

72. Myanmar's **forest cover** and quality have steadily declined over the last 30 years, although it remains higher than other countries in the Greater Mekong Subregion (GMS). Forest cover decreased from 61% of the land area in 1975 to 49% in 2006. Natural forest loss averaged 392,540 hectares annually during 1989–2006, representing a major acceleration in the loss of forest cover. An update of the situation since 2006 is essential.

73. While the government has long endeavored to apply sustainable forest management practices, available data show that commercial logging operations have consistently exceeded the annual allowable cut. Illegal logging in remote and difficult-to-monitor areas, conversion of forests to agricultural land, and fuelwood use are additional factors. More than 80% of total primary energy in Myanmar is supplied by fuelwood.

74. **Land degradation**, particularly soil erosion in upland agricultural areas and dry zones, is an increasing problem in Myanmar. Degraded farming areas, as a percentage of total cultivated area, were estimated at 33% in 2008, reflecting natural processes, excessive forest harvesting, mono-cropping practices, and shifting cultivation. Increased population pressures, particularly in the upland areas, are closely correlated with land degradation and falling land productivity. From 1980 to 2008, the upland population increased by 7.0 million to 17.5 million, accounting for about 30% of the total population.

75. **Climate change** has become of considerable concern following Cyclone Nargis in 2008, which caused catastrophic destruction and loss of lives and livelihoods.³³ Myanmar's vulnerability to climate change is now widely recognized. The potential impacts of climate change for Myanmar include a rise in the sea level, saltwater intrusion, loss of mangroves, higher incidence of droughts, loss of biodiversity and ecosystems (e.g., wetlands), and loss of land resources. Myanmar is already experiencing some effects of climate change, namely rising temperatures, shorter monsoon durations, and greater frequency of intense rainfall and severe cyclones along the coastline.

76. While climate change is mainly related to global phenomena, developments in Myanmar are exacerbating the human health impact, agricultural insecurity, and loss of biodiversity. Deforestation is of particular concern, as decreasing forest cover and deterioration of its quality reduce adaptive capacity and the absorption of greenhouse gases. Forest fires represent an additional climate change pressure, especially in the dry forests that dominate the central part of the country.

77. Myanmar's **biodiversity** is under increasing threat, especially in the Indo-Myanmar hot spot where economic development and growth of the population are damaging natural habitats and threatening some species. The main contributors to biodiversity loss are (i) the conversion of closed forests for other land uses, (ii) shifting cultivation, (iii) weak regulation and control of commercial exploitation and trade in endangered flora and fauna, and (iv) insufficient environmental impact assessments and integration of biodiversity concerns into the development decision-making process. Forest degradation is particularly damaging to terrestrial biodiversity, potentially affecting about 36% of threatened mammals and birds. In addition, the loss of wetlands and grasslands is threatening bird species. Over the past several decades, mangrove forest coverage has declined by more than 70%.

78. The government has responded to biodiversity loss by establishing protected areas. To promote the conservation of ecosystems, habitats, and biomes, the government has a policy target to establish a network of protected areas that would cover 5% of the country's total area by 2010. The protected area network expanded steadily, particularly during 1996–2004, and now includes 34 protected areas equivalent to 4.4% of the total land area. The government, through law enforcement departments, has increased its efforts to prevent illegal trade in wildlife. In 1997, Myanmar acceded to the Convention on International Trade in Endangered Species of Wild Fauna and Flora, an international treaty to protect endangered species.

79. Mining and energy are major sectors of the economy, attracting considerable foreign investment and generating significant export earnings. Myanmar is endowed with a variety of mineral resources as well as high-quality gems and precious stones. Exploitable reserves of industrial minerals

³³ The Government of Myanmar signed several international agreements and conventions related to climate and environment, the list of which is found in Appendix 5.

are also available. Mining production grew at an average annual rate of 15.5% during 2001–2006. Myanmar is also endowed with extensive nonrenewable energy sources in the form of coal, oil, and natural gas, in addition to its vast hydropower potential. The exploitation of these energy resources poses environmental risks.

80. Awareness of environmental consequences caused by the mining and energy sectors is increasing, but substantive regulatory responses have lagged. While Myanmar lacks a national policy framework for environmental improvement in the mining and energy sectors, some relevant sector policies exist. For example, all mine projects are supposed to be subject to regular inspection, monitoring, and reporting. However, training of personnel for these responsibilities is inadequate. Further, the air and water quality data needed to assess the effectiveness of control and mitigation measures are limited. Recognizing this, the government is devoting more attention to monitoring of environmental quality. It is also requiring the mining and energy sectors to improve data and information relevant to environmental management and sustainable development.

81. Myanmar's *National Environmental Performance Report 2007–2010*, prepared under ADB's GMS CEP-BCI,³⁴ indicates the priority concerns in Table 5.

Table 5 Priority Environmental Concerns in Myanmar

Ranking	Priority Environmental Concerns	Description of Concerns
1	Forest resources	Losses of forest vegetation, forest area and decline of forest products, and forest services
2	Land degradation	Soil erosion, decline of soil fertility, and increase of land salinity
3	Climate change	Increased emission of greenhouse gases
4	Inadequate solid waste management	Inadequate collection, disposal, and management of solid waste from household, municipal, and industrial premises
5	Threats to biodiversity	Losses of habitats, fragile ecosystem, and extinction of plant and animal species. Poaching, mining activities, and social impacts Natural genetic resources
6	Impacts of mining industry on environment	Land degradation, land contamination, surface and underground water pollution, air pollution due to industrial processes

Source: Government of Myanmar (NCEA), ADB, and UNEP. 2006. *National Environmental Performance Report, 2007–2010*. Yangon.

2. Environment Subsector Constraints

a. Physical Constraints

82. The main constraints to effective management of the environment subsector are the vastness of the country, the inaccessibility of many areas, and the limited management resources (human and financial). To properly designate and manage protected areas will require human and logistical resources far beyond what is currently available, or likely to be available in the foreseeable future. While the inaccessibility of much of Myanmar helps to conserve the natural environment, this has not prevented the overexploitation of resources or the encroachment by human activities. Moreover, the experience of neighboring countries suggests that Myanmar will quickly be subject to severe natural resource pressures as economic growth accelerates.

³⁴ ADB. 2005. *Regional Technical Assistance for the Core Environment Program and Biodiversity Conservation Corridors Initiative in the Greater Mekong Subregion*. Manila (TA 6289 REG). The regional technical assistance was approved in December 2005 in the amount of \$24.97 million.

b. Policy Constraints

83. The government has taken steps toward establishing the policies, legislation, and regulations needed to manage Myanmar's natural resources. These include (i) the National Environmental Policy promulgated in 1994; (ii) the National Sustainable Development Strategy launched in 2009; (iii) the Forest Policy Statement in 1995; (iv) the establishment of forest reserves; (v) forestry master plan for a 30-year period starting from fiscal year 2001–2002; (vi) the initiation of various soil conservation and land rehabilitation programs through the MOAI;³⁵ (vii) national plan for disaster risk reduction; (viii) the Wildlife Protection and Protected Area Law issued in 1994; (ix) the establishment of protected wildlife areas; (x) the promulgation of the Mines Law in 1994; and (xi) the approval of the Environmental Law in 2012.

84. These measures provide a general framework for environmental management. However, their implementation appears to be beyond the capacity of the ministries. As noted earlier, the financial and human resources needed for effective management of the environment are simply not available. Nor is there adequate awareness of environmental issues. Consequently, serious environmental damage continues—including destruction of mangrove forests, flooding of wildlife reserves by new hydropower reservoirs, and the destruction of habitat for endangered species. A well-focused strategy for addressing priority concerns is needed.

c. Institutional Performance and Governance

85. The Ministry of Environmental Conservation and Forestry (MECF) was formed in 2012 by combining the earlier Ministry of Forests with the National Commission for Environmental Affairs. This reflects the growing importance placed by the government on environmental protection. However, the MECF has limited capacity to implement environmental management measures. Forest resource management, on the other hand, has a long history and is backed by a well-established Forest Department. Unfortunately, the department lacks expertise in biodiversity conservation and hence is ineffective in meeting its mandate concerning noncommercial forest flora and fauna.

86. The Environmental Law provides the legal basis for implementing a range of environmental management measures. The MECF is charged with drafting the regulations to enact the law. As a minimum, these will include regulations and standards on environmental safeguards on environmental pollution abatement (i.e., for industrial or urban pollution discharge standards and procedures) and on environmental quality standards for air, water, heavy metals, and toxic substances. The MECF received technical support from the United Nations Environment Programme in drafting the Environmental Law. Developing the required regulations and creating the enabling conditions for effective implementation will require substantial technical expertise, which the MECF lacks.

87. In parallel with development of the regulations and standards, the MECF will need to upgrade its infrastructure (i.e., hardware) and mechanisms (i.e., software) for undertaking environmental monitoring. The existing network of monitoring stations is inadequate and likely outdated. The MECF also needs to coordinate with the Department of Meteorology to access data necessary to undertake various climate vulnerability assessments. In connection with the regulations, sector-specific guidelines will be necessary to help sector agencies in applying the Environmental Law. The development of sector-specific guidelines

³⁵ To sustain agricultural productivity in upland areas, targets have been set for the reclamation of sloping agriculture land and slash-and-burn areas. Despite such initiatives, the land rehabilitation program has lagged expansion of areas under cultivation. The growing population in upland areas has resulted in a large expansion of cultivated areas, and multiple cropping has become more common. While the total crop area increased from 10.5 million hectares to 22.3 million hectares between 1985 and 2008, the percentage subject to rehabilitation measures steadily dropped to only 3% in 2008.

provides the MECF an opportunity to develop institutional arrangements for interagency coordination on environmental management.

88. Importantly, human resource capacity for environmental management will need to be strengthened, calling for a systematic training program for environmental management practitioners. Given the scale of capacity development required, several institutes (including forestry and agriculture universities and colleges) should be enlisted for training of trainers and curricula development. A broad-based information and awareness program will also be needed, targeting all segments of society with relevant material on the Environmental Law. This could be carried out most efficiently in partnership with the private sector.

3. Summary of Constraints and Opportunities in the Environment Subsector

89. Myanmar's natural environment is relatively pristine, reflecting the vastness of its resources over a large geographic area and their inaccessibility, both physically and (until recently) economically. The country still contains some of the most unique physical and biological natural resources in Southeast Asia and the world. Policies are in place to protect these resources, but exploitation pressures are intensifying. The financial, human, and logistical resources available to counteract these pressures are far less than what is needed, making substantial development partner support for this area critical. Preservation and conservation of Myanmar's ecological wealth will depend on focusing on priority areas and hot spots, as well as priority sectors (mining, hydropower development, forestry), and ensuring that sound environmental policies, laws, and regulations are applied and enforced. Coverage can then be expanded to the country as a whole.

90. There is considerable scope for sustainable and inclusive development of Myanmar's natural resources, especially if the emphasis is on a green growth development strategy characterized by resource efficiency and sustainable consumption and production. The government has adopted policies to properly manage the country's natural resources and ensure environmental protection, providing the basis for integrated national and sector planning, strengthening of safeguards, and implementation of environmental regulations and guidelines.

Table 6 Summary Statistics on Environment

Environmental Indicators		
Threatened species	2011	260
Forested area (% of land area)	2009	49.1
Carbon dioxide emission estimates (000 tons and tons per capita)	2008	12,765/0.3
Energy consumption per capita (kilograms oil equivalent)	2009	98.0
Rainfall in the capital city, total mean (millimeters)		2,681
Temperature in the capital city, mean °C (minimum and maximum)		22.6/32.3

Source: UN data. <http://data.un.org/CountryProfile.aspx?crName=MYANMAR>

91. Table 7 provides a SWOT analysis for the environment subsector.

Table 7 SWOT Analysis for the Environment Subsector

Strengths 1. Ample and varied renewable natural resources including wide forest cover and unique flora and fauna, much of which is still relatively undisturbed 2. Designated forest and wildlife reserves covering a significant portion of the country (about 26% is in forest reserves, and the country has 34 protected wildlife reserves equivalent to 4.4% of the total land area) 3. A basic framework for environmental management through current laws and policies as well as the experience of the Forest Department in managing forest and wildlife reserves	Weaknesses 1. The country is so large and the ecological resources so diverse that it is physically impossible to monitor and manage all of them on a continuous basis. 2. Despite past experience of the Forest Department in protection and conservation, the recently established Ministry of Environmental Conservation and Forestry does not have sufficient expertise or funding to effectively carry out its mandate. 3. There is little expertise and few, if any, standards for non-forestry-based environmental management—air pollution standards, wastewater discharge standards, mining waste disposal, etc. 4. Government services do not have the power to police and regulate vested interests.
Opportunities 1. With international cooperation and support, the most important ecological resources of the country can be protected and preserved. 2. Since many of the key unique ecological areas border on those in neighboring countries, the inclusion of Myanmar in regional cooperation programs can increase the overall managed habitat of key biodiversity areas. 3. Strong enforcement of policies and regulations in areas of high priority can provide the basis to extend sound environmental management to other areas of the country.	Threats 1. Unrestricted and unregulated mining, industrial development, hydropower development, urban expansion, wastewater discharge, shifting cultivation, and commercial agriculture development 2. A lack of awareness among senior policy makers, civil servants, politicians, technocrats, and the general public of the vulnerability of the country's natural resource endowment 3. Unregulated and illegal exploitation of the country's natural resources (timber, aquatic resources, wildlife species) by citizens of neighboring countries

Source: Asian Development Bank.

A. Government Strategy, Policies, and Plans

92. The government's economic development strategy gives high priority to the agriculture sector. Of the four economic development objectives³⁶ of the government, agriculture sector development is regarded as one of the major driving forces and the basis for uplifting of social well-being. In accordance with the government's plans, the major role of the agriculture sector is to fulfill food security, to increase foreign exchange earnings through agricultural exports, and to spur rural development generally. Over the past decade, some major policy agricultural reforms have been implemented and give credence to the government's plans. These include the abolition of rice production quotas; the liberalization of domestic and international marketing of rice in 2003 and of most industrial crops in 2004; the passage of a series of regulatory laws for the sector—a plant pest quarantine law (1990), a fertilizer law (2000), and a pesticide law (1993); and construction of a large number of irrigation schemes and the provision of pumping equipment to farmers.

93. However, there are many shortfalls between the objectives and actual conditions: access to rural areas is severely constrained by the poor state of rural roads; almost nowhere are rural areas served by electricity; government funding for the management of the sector is far below what is needed; and a repressive 10% tax is imposed on agricultural exports. These factors weaken the sector. Thus, despite the stated priority of agriculture as the source of sustainable national economic growth, serious constraints to growth remain. The challenge will be to effectively promote the agriculture sector through identifying the priority actions for growth, assigning effective and meaningful budgetary allocations, and strengthening key institutions.

94. It remains to be seen how the new orientation of the government will affect the stated plans and policies for the sector. Strong commitment to implementing them will be essential, as well as understanding of the critical factors for growth of the sector, including those—such as rural roads and rural electrification—that are not the responsibility of the MOAI. Policies and measures to stimulate private sector involvement are also needed, especially regarding marketing, processing, storage, and input supply. Some of these issues are interlinked. Improved rural roads and more reliable electricity supply will create a better operational environment for the private sector, stimulate demand for agricultural produce, and enhance the returns to farmers—in turn generating a demand for labor and improving rural incomes overall.

95. Financial resources in support of the sector are uncertain. Myanmar's development partners are only in the initial stages of reengagement. Beyond statements of general principles and aspirations, it is difficult for the government to provide a detailed plan for the sector until funding is clarified. In the absence of knowing what resources would be available for implementation, at this juncture formulation of a step-by-step, time-bound plan for development of the sector, with targets and indicators, is not possible.

³⁶ FAO. 2011. *National Medium Term Priority Framework. 2010–2014*. Nay Pyi Taw.

B. Potential Areas of International Assistance for the Agriculture, Natural Resources, and Environment Sector

96. It is expected that, in view of the central role of agriculture in Myanmar's economy and the direct link between agriculture, inclusive growth, and poverty reduction, international development assistance will give close attention to the ANRE sector. Equally important will be assistance to other sectors vital to the agriculture sector. Rural electrification would have a major impact on agricultural production and the overall welfare of the rural population. Some 75% of the population, primarily in rural areas, still lacks access to electricity, even though Myanmar exports substantial quantities of energy resources to neighboring countries. Rural electrification could potentially have a greater impact on agricultural production and rural welfare than many forms of direct investment in the sector.

97. Myanmar has the resources and generation capacity to achieve rural electrification. In addition to existing hydropower plants, a number of plants are under construction. Further, Myanmar has extensive natural gas resources that can be used for power generation. In partnership with the private sector, rural electrification should be an achievable goal.

98. Investment in transport infrastructure would also contribute importantly to the ANRE sector. Transport costs are a significant factor in moving agricultural produce to market, reducing the returns to both producers and traders. Port facilities are primitive and inefficient, adding additional cost and time to the export of agricultural produce and undermining Myanmar's competitiveness. Strategically focused transport investments would reduce transaction costs and improve the market price of agricultural commodities.

99. Assistance to the finance sector would also benefit the ANRE sector. Rural finance needs to be available in an efficient, timely, and sustainable manner. While legislation has been passed concerning regulation of microfinance activities, the overall financial system must be sound. Restructuring of the Myanmar Agricultural Development Bank (MADB) will need to be undertaken, in the context of a strengthened overall regulatory system for the finance sector.

100. Private sector involvement in all aspects of the agriculture sector, including the supporting sectors earlier discussed, will be important. To illustrate, allowed full access to Myanmar's abundant natural gas resources, private sector urea plants could produce fertilizers for both domestic consumption and for export. This would have a major impact on productivity and production by providing access to fertilizers at prices that farmers can afford. The private sector also has an increasingly important role in agro-processing and marketing value chains, both nationally and regionally.

101. Initial support for the sector by multilateral financial institutions should include focus on the following: (i) policy and institutional adjustments through program lending; (ii) investment in rural infrastructure, notably irrigation, flood control, drainage, and salinity control; (iii) reduction of transaction costs through investment in rural transport infrastructure (rural roads and trails, market infrastructure, and postharvest storage and processing facilities); and (iv) support for rural credit.

102. Each possible intervention is discussed below.

1. Policy-Based Support

103. Policy-based support for the ANRE sector would enable the government to continue building on recent reforms. The government initiated steps in 2012 to improve market-based incentives for boosting agricultural productivity, including abolishing the commercial tax on exports of several key agricultural commodities, a microfinance law providing for entry of microfinance institutions

into the market, and the inclusion of crops as possible loan collateral. Also in 2012, the government enacted major land law reforms including the Farmland Law and the Vacant, Fallow, and Virgin Lands Management Law. The MOAI has requested support in reviewing the new land laws and their consistency with the existing investment and regulatory frameworks. The review will need to include the Myanmar Citizens Investment Law, the newly instituted Foreign Investment Law, and the governance framework for small and medium-sized enterprises. In parallel, institutional and technical capacities within the MOAI will need to be strengthened, including (i) an inventory of current land uses and land resource data, (ii) guidelines for developing agroecological zones, and (iii) developing land valuation rates consistent with market conditions. The government's 5-year agricultural development plan must also be reviewed. This assessment of the planning and policy framework will feed into development of a coherent agriculture sector development strategy covering investment priorities; medium-term expenditure plans; and recommendations for enhanced marketing for food crops, agricultural inputs, and priorities for food security.

2. Rural Infrastructure (Water Resources and Transport Infrastructure)

104. Support for rural infrastructure development will require sequencing of the types of investment to be made and their location. A possible first priority would be investment in rural access in the Delta Region—the most densely populated region and the most productive agriculturally. It is the primary rice-producing area with significant poverty reduction potential. It also has untapped linkages to local markets at the township and city levels, and for export to neighboring countries (e.g., via the GMS East–West Economic Corridor). Constraints include poor rural connectivity (farm-to-market roads and inter-village roads),³⁷ deficiencies in water resources infrastructure (community water supply and irrigation systems), postharvest losses (lack of collection points and drying and processing centers), and lack of access to credit. Improved rural access would directly reduce transaction costs for a wide range of producers and generally improve the welfare of a large portion of the rural population. Currently, however, there is no single agency operationally responsible for rural infrastructure or overall rural development.³⁸

105. Again in accordance with requests of the government, upgrading of irrigation schemes within the Central Dry Zone could be a focus of support, based on the following justification: (i) it is the second most densely populated region and with even higher levels of poverty; (ii) it is a traditional agriculture area, and improved irrigation would significantly strengthen productivity and output; (iii) relatively low-cost investment would be involved as the main structures have already been constructed; and (iv) there is ample potential for expansion.³⁹

3. Rural Finance

106. The finance sector in Myanmar is not strongly aligned with credit-based operations. The MADB, the only possible agency to undertake rural credit on a large scale, is a department of the MOAI and is not really a bank. However, the MADB does have both the mandate to provide rural finance and a network covering much of the country. A concerted effort could help transform the MADB into a useful conduit for assistance to rural producers and entrepreneurs. At this juncture, though, development assistance in support of rural credit would likely be limited to studies and diagnostics as a basis for future

³⁷ Due largely to the nature of being a very low-lying delta area with numerous water courses and waterlogged lands.

³⁸ The Department of Rural Development (DRD) was established on 7 June 2012. By virtue of Presidential Order No. 67/2013, dated 9 August 2013, DRD was subsumed under the Ministry of Livestock and Fisheries and the Ministry was renamed Ministry of Livestock, Fisheries, and Rural Development.

³⁹ There are more than 200 systems in need of upgrading.

policy-based lending operations. Another option would be to initiate activities on a small scale through nongovernment and local government channels, so that a better understanding is gained of the rural finance situation in Myanmar. The UNDP and a multidonor fund (the Livelihood and Food Security Trust Fund) are engaged in such operations and could be an important coordinating point for initial investments.

4. Other Country-Based Interventions

107. In addition to the standard “first steps” in reengaging development assistance for a country in transition, several other activities could form part of initial development assistance in support of the agriculture sector. Capacity building for the ministry, agricultural research, training and extension, and support should be improved and developed in order to match the agricultural performance of its neighbors in the region. Already, the agricultural education system⁴⁰ in Myanmar includes three universities:

- (i) Yezin Agricultural University, under the MOAI, with courses that cover crop sciences, animal sciences, and fisheries. It also operates seven regional research stations where students can conduct research during their final year.
- (ii) University of Veterinary Science, also in Yezin but under the Ministry of Livestock and Fisheries, covers veterinary sciences and fisheries.
- (iii) University of Forestry, under the Ministry of Environmental Conservation and Forestry, specializes in issues of land management, environment, and forestry. In addition to these degree-conferring institutions, seven state agricultural institutes offer postsecondary, diploma-level training to agriculturalists for careers in extension or agribusiness.

108. Support for natural resource management, including water, land, and biodiversity, would largely be in the form of capacity building and assistance to strengthen safeguard capabilities and procedures. These will most likely be funded through technical assistance and related policy-based lending.

5. Greater Mekong Subregion Interventions

a. The GMS Core Environment Program (GMS CEP)

109. The GMS CEP is well positioned to support initial assessments, capacity building, institutional strengthening, and demonstration through innovative pilots.

110. Safeguard support could include capacity building through development of regulations and sector-specific guidelines, training of trainers, and curriculum development for safeguards training. Pilot testing of safeguards, e.g., strategic environmental assessments (SEAs) and environmental impact assessments (EIAs) would also be helpful. Priorities for SEA and EIA piloting would include the energy (hydropower), transport, and mining sectors and special economic zones.

111. Knowledge sharing of the experiences of neighboring countries with environmental legislation would contribute to identifying best practices. Regional experience with environmental safeguards and related environmental management measures could be the basis for the MECF to map out its regulatory and capacity-building strategy.

⁴⁰ USAID/Burma, Michigan State University, and the Myanmar Development Resource Institute's Center for Economic and Social Development. 2013. *A Strategic Agricultural Sector and Food Security Diagnostic for Myanmar*. Draft working paper. Yangon.

112. Specific areas of support to the MECF and other agencies could be determined following knowledge-sharing events. These could also contribute to formulating extension of the GMS Biodiversity Conservation Corridor (BCI) Initiative to Myanmar.

113. **Assessments:** Myanmar lacks a clearly formulated land use policy and planning process. Various government agencies (e.g., forestry, agriculture) undertake land use planning related to their respective mandates. However, insufficient coordination between agencies has resulted in conflicting and inefficient land use. This problem will compound with the expected growth of Myanmar's economy following the relaxation of international sanctions. CEP-BCI has supported other GMS countries with multi-criteria analysis to assess trade-offs concerning alternate land uses. Similar support could be provided to Myanmar. Assessment of agroecological zones and technical capacity for spatial mapping would provide the basis for future land use planning.

114. **Monitoring:** Building on environmental performance assessments, CEP-BCI could provide capacity building to establish environmental monitoring frameworks and protocols. Monitoring stations and information management systems would be needed.

115. **Pilot projects:** To demonstrate integrated conservation and development practices, pilot projects could be undertaken in collaboration with support to agriculture and tourism, in support of sustainable livelihoods in these sectors.

b. GMS Core Agriculture Support Program (CASP)

116. **Agricultural research, extension, and education:** These are important components of overall agriculture development. Based on initial assessment, Myanmar needs capacity building at all levels. Agricultural research institutes, universities, and vocational schools need improved buildings, equipment, and curriculum. The link between research and extension needs to be enhanced through (i) research on climate adaptation and mitigation, as well as on trade opportunities for high-value agri-food products; (ii) promoting climate-friendly farming practices such as rice intensification to reduce methane emission and water use; (iii) research to develop traditional products of high nutritional or medicinal value, including from non-timber forest products to improve rural household food security; (iv) promoting the use of information and communication technologies and distance learning modalities, especially to promote gender-responsive technology transfer; (v) certification systems, such as organic certification, to enhance market access; and (vi) encouragement of private sector participation in technology transfer, extension services, financing, and public-private partnerships for expanding successful models of contract farming.

117. **Biosecurity and sanitary and phytosanitary standards:** These are important for both food security and trade.⁴¹ Concerns include (i) animal health (e.g., avian flu, livestock diseases); (ii) plant health and invasive species; and (iii) food-borne illnesses. Specific issues related to agricultural trade include (i) implementation of international guidelines on food safety, (ii) finance to enable compliance with international phytosanitary standards, and (iii) risks from informal border trade. Action in these areas will help promote expansion of Myanmar's exports.

118. **Agricultural productivity and food security:** Modernization at the farm level will be required to attain higher productivity, mainly through improved seed quality, the use of fertilizers, and better postharvest practices. Myanmar should promote "green" export products, capitalizing on its low use of fertilizers and pesticides. Livestock, fisheries, and aquaculture are subsectors where Myanmar has

⁴¹ S. Xayphannha, L. Rio, L. Ignacio, K. van der Meer, and D. Humpal. 2006. *Lao People's Democratic Republic: Sanitary and Phytosanitary Standards Management: Action Plan for Capacity Building*. Vientiane.

considerable potential, subject to appropriate policy development and investment. Improved food security involves not only increasing aggregate output but also food safety, nutritional content, and equitable access.

119. **Agri-food trade and efficient value chains:** Product specialization and trade can be facilitated by (i) linking rural areas to primary, national, and regional roads and markets; (ii) expanding and improving irrigation facilities and services; (iii) improving postharvest facilities and agricultural product marketing (e.g., cold storage, grading facilities, labeling, etc.); (iv) capacity strengthening of farmer organizations; and (v) increased private sector participation in each of these areas.

120. **Sustainable natural resource management:** Measures to improve productivity, food security, and overall development of the agriculture and forestry sectors must be consistent with sustainability. In this connection, attention is needed to improve the controlled use of chemical inputs (the primary source of rural pollution) and to facilitate a shift toward more resilient and climate-friendly farming practices.

Experience in Other Greater Mekong Subregion Countries Applicable to Myanmar

121. As development assistance to Myanmar has been very limited for more than 2 decades (ADB has not operated in Myanmar since 1988), an examination of past experience is not of much direct relevance to this initial assessment report. More relevant is experience in restarting operations in other GMS countries that have gone through the transition from central planning to a more market-based economic system. In this context, ADB's development assistance is highly relevant to three GMS countries: Cambodia, the Lao People's Democratic Republic (Lao PDR), and Viet Nam. Appendix 6 reviews ADB's experience in these countries in some detail. The review indicates that the approach followed in two of these countries had a highly positive effect on growth of the agriculture sector. Drawing on this experience, the main thrust of reengagement activities should be development of a conducive environment for the sector's growth. This would entail (i) establishing a conducive policy environment through program lending; (ii) establishing a conducive physical environment for production by improving irrigation, flood control, and drainage facilities; (iii) improving market access through the provision and upgrading of rural transport infrastructure such as roads, bridges, and trails; and (iv) establishing a conducive financial environment by facilitating access to rural finance.

122. The current situation in Myanmar is similar to that in the three countries examined but in some ways quite different. Similarities include a primary crop, rice, grown under monsoon conditions; a formerly centrally planned economy; and, like Viet Nam, but unlike Cambodia and the Lao PDR, a well-developed institutional structure with relatively competent government services. Likewise, the sector still operates under a number of structural distortions. A large proportion of the infrastructure serving agriculture is either in poor condition or badly deficient. Although there is an agricultural credit system, it does not fully serve the needs of the rural population.

123. In restarting operations in Myanmar, a similar approach to that followed in other Southeast Asian countries, and particularly the strategy followed in Viet Nam, would most likely have a major beneficial impact for the ANRE sector.⁴² As outlined earlier, this would entail the following:

- (i) program lending to help create a conducive policy and institutional environment;
- (ii) a focus on the rehabilitation and upgrading of key water resources infrastructure;
- (iii) the provision, upgrading, and improvement of rural transport infrastructure; and
- (iv) promotion and support of a program of rural finance.

124. A focus on rural infrastructure (both water resources and transport) is seen as particularly important, since it will directly impact on the rural population by providing employment and cash inflows during implementation and result in reduced transaction costs and improved services upon completion.

⁴² Many of the market reforms undertaken by Viet Nam in the late 1980s and early 1990s have been undertaken in Myanmar.

125. The Lao PDR experience suggests caution against simply providing funding infusions through program loans. While important policies were improved, the impact often takes a long time to be realized (laws may take years to formulate and promulgate implementing regulations). Further, funding through program loans does not necessarily directly benefit the sector, as it is absorbed into the Treasury as general revenues.

126. Past experience suggests that meeting the most pressing agricultural needs provides a level of credibility, encouraging lending to broaden to other sectors such as natural resource management and environmental sustainability.

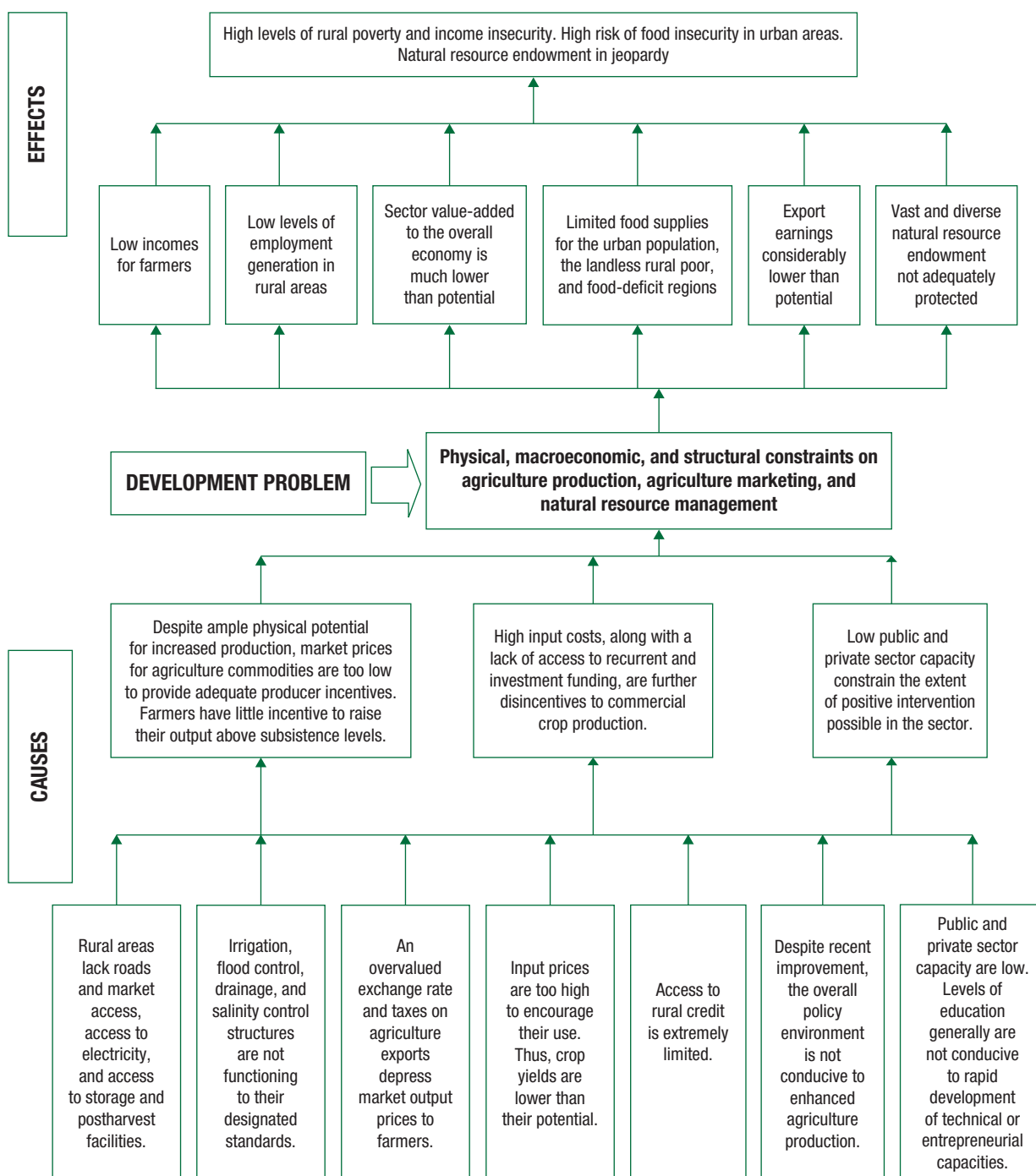
127. At this initial stage of assessment, three risks can be identified with respect to international assistance:

- (i) **Limitations in planning and implementation capacity:** For the past 3 decades, Myanmar has been largely isolated from development partner project planning and implementation practices. During this period, many new development concepts have evolved, which government personnel are likely unfamiliar with. Government personnel will need to be extensively briefed on project processing and procurement procedures of development partners. Contractual expertise in the private sector (for example, in rural infrastructure design and implementation) is also very limited. This could result in processing and implementation delays until capacity is strengthened. Development partners will need to understand the limitations of Myanmar's planning and implementing agencies, and to provide adequate support and guidance. Appendix 5 lists several major development partners⁴³ that include multilateral and bilateral donor agencies and international organizations.
- (ii) **Lengthy approvals and clearance processes:** Delays in securing government approvals (e.g., of field trips, mission clearances, and approval of letters and memos) can potentially encumber implementation and impact on the timing and benefits of investments by Myanmar's investment partners.
- (iii) **Potential damage by catastrophic events:** Cyclone Nargis caused considerable damage to flood control, drainage, and salinity control infrastructure, resulting in much of the most productive parts of the Delta Region being vulnerable to further damage until these structures are repaired. Works funded by ADB and other development partners in these areas could be subject to damage from floods and cyclones until protective works are completed.

⁴³ The list of development partners is in Appendix 7.

Appendix 1

Problem Tree



Appendix 2

Indicative Agriculture and Natural Resources Investment Pipeline (2013–2016)

Priority Investment Areas

Consistent with the sector assessment of the Asian Development Bank (ADB) that was concluded and confirmed in discussions with the Ministry of Agriculture and Irrigation in 2012, ADB is proposing the 2013–2016 operational program for the agriculture and natural resources sectors that are aligned with the stated government priorities on food security and agricultural growth articulated in the Framework for Economic and Social Reforms—in particular, the emphasis on (i) rural infrastructure, including small and medium-scale irrigation systems and improved rural roads; and (ii) broader development of the rural sector through community-based development schemes and “cash for work” rural works programs.

The sequencing interventions within the proposed operational program will allow for the initial piloting (and testing) of rural infrastructure and development approaches in diverse geographic and administrative regions and consolidation and/or scaling up investments within those areas.

Lending Pipeline 2015, Firm

Project Name: Irrigation Command Area Development Project

Targeting Classification: general intervention

Primary Theme: agriculture and natural resources

Year of Project Preparatory Technical Assistance: 2013

Financing Modality: Asian Development Fund: \$75.0 million; Cofinancing: To be determined (TBD); Government: TBD

Lending Pipeline 2016, Standby

Project Name: Flood and Drainage Management Project in the Delta

Targeting Classification: targeted intervention—geographic

Primary Theme: agriculture and natural resources

Year of Project Preparatory Technical Assistance: 2014

Financing Modality: Asian Development Fund: \$50.0 million; Cofinancing: TBD; Government: TBD

Nonlending Products and Services, 2013

Project Name: Enhancing Rural Livelihoods and Incomes in Myanmar

Targeting Classification: targeted intervention—geographic

Primary Theme: multisector

Financing Modality: \$12.0 million proposed under Japan Fund for Poverty Reduction

Project Name: Capacity Building for Portfolio and Project Implementation in Myanmar

Targeting Classification: general intervention

Primary Theme: agriculture and natural resources

Financing Modality: \$1.0 million proposed under Japan Fund for Poverty Reduction

Appendix 3

Major Agricultural Statistics Agencies¹

There are several statistics agencies responsible for collecting, compiling, and disseminating economic and social statistics in Myanmar. Some major statistics agencies related to the agriculture sector are as follows:

A. **Settlement and Land Records Department (SLRD)** is the only government agency with the mandate to collect and disseminate agricultural statistics. The SLRD's statistical activities include

- monitoring the progress of land preparation and cropping and condition of weather and crops;
- making crop forecasts;
- carrying out periodic crop surveys;
- compiling data on farmer and farm size distribution;
- taking annual inventory of agricultural machinery and implements for the whole country; and
- compiling the annual season and crop report, which provides statistics on rainfall; land use; irrigation and flood protection; crop acreage, yield per acre, and production; multiple cropping; and inventory of agricultural machinery and implements.

The SLRD operates through a network of 17 states/divisions and 287 township land records offices together having nationwide coverage.

B. **Myanmar Agriculture Service (MAS)**, under the Ministry of Agriculture and Irrigation, is responsible for agricultural research and extension developments. With more than 8,000 extension agents down to the village level in the whole country, the MAS produces primary statistics on procurement, distribution, and use of agricultural inputs. It also cooperates with the SLRD in the collection of crop statistics.

C. **Central Statistical Organization (CSO)**, under the Ministry of National Planning and Economic Development, is the sole authoritative national statistics organization that has the mandate to collect, process, organize, and supply data on economic and social statistics of Myanmar. The CSO compiles various data from both public and private sectors.

Some data and information compiled by the CSO were obtained from physical observation, interviews, method of registration, transcription from official records, and sample surveys. The CSO collaborates with the SLRD for the agricultural production and land use statistics and also establishes bilateral relationships between other agencies, such as the Livestock Breeding and Veterinary Department, the Department of Fisheries, and the Forest Department.

¹ <http://www.fao-apcas.org/myanmar.html>

Surveys conducted are population, household expenditure, agriculture, health and social data, vital statistics, livestock, labor force, transport, and private sector industrial statistics.

D. **Planning Department**, under the Ministry of National Planning and Economic Development, is responsible for measuring the growth of national economy including the agriculture sector. Production statistics for all economic sectors are compiled from the administrative records of concerned departments and ministries, while price data for various commodities are collected and compiled from sample surveys.

E. **Livestock Breeding and Veterinary Department**, under the Ministry of Livestock, Fisheries and Rural Development, collects, compiles, and disseminates annual livestock production statistics, such as livestock population and production of livestock and livestock products. The department is also responsible for animal health and livestock development activities.

F. **Department of Fisheries**, under the Ministry of Livestock, Fisheries and Rural Development, is responsible for compiling fisheries statistics for planning, survey of socioeconomic conditions of fishers, appraisal of freshwater and marine fisheries, and marketing. It is also responsible for the management of fisheries; conservation of fishery resources; providing extension services; conducting research; and compilation of data including production from freshwater and marine fisheries, and volume and value of exports.

G. **Forest Department** (Ministry of Environmental Conservation and Forestry) produces forest resources data, statistics on primary forest products, and data on forest revenue. The Myanmar Timber Enterprise produces statistics on timber extraction, sawmilling, and trade involving forest products, particularly in the public sector.

H. **Other agriculture-related government agencies:** The Department of Population, under the Ministry of Immigration and Population, is responsible for conducting population censuses and demographic surveys, and estimating and publishing national, state/division, and urban and rural population figures for Myanmar. Another important department for preparing agricultural statistics is the Department of Labour under the Ministry of Labour. The Department of Labour also conducts labor force surveys and disseminates agricultural labor force statistics through various statistics reports.

Appendix 4

Catchment Areas and Surface Flows of Major Rivers in Myanmar

Table A4.1 Catchment Areas and Surface Flows of Major Rivers in Myanmar

River Basin	Catchment Area (km ²)	Inflow (km ³)
1. Chindwin	115,300	141.29
2. Ayeyarwady (upper)	193,300	227.92
3. Ayeyarwady (lower)	95,600	85.80
4. Sittaung	34,400	41.95
5. Rivers in Rakhaing State	58,300	139.25
6. Rivers in Tanintharyi Division	40,600	130.93
7. Thanlwin (in Myanmar)	158,000	257.92
8. Mekong (in Myanmar)	28,600	17.63
9. Bilin River and other rivulets	8,400	31.17
10. Bago River	5,300	8.02
Total	737,800	1,081.88

km² = square kilometers, km³ = cubic kilometers.

Source: Ministry of Agriculture and Irrigation. 2011.

Table A4.2 Groundwater Resources in Myanmar

River Basin	Catchment Area (km ²)	Inflow (km ³)
1. Chindwin	115,300	57.58
2. Ayeyarwady (upper)	193,300	92.60
3. Ayeyarwady (lower)	95,600	153.25
4. Sittaung	48,100	28.40
5. Rivers in Rakhaing State	58,300	41.77
6. River in Thanintharyi Division	40,600	39.28
7. Thanlwin (in Myanmar)	158,000	74.78
8. Mekong (in Myanmar)	28,600	7.05
Total	737,800	494.71

km² = square kilometers, km³ = cubic kilometers.

Source: Ministry of Agriculture and Irrigation. 2011.

Appendix 5

Selected International Agreements and Conventions Related to Climate and Environment

Agreement/Convention	Status – Date
Convention for the Protection of the Ozone Layer (Vienna Convention) – 1988	Accession – 24 November 1993
Convention on Biological Diversity	Signed – 11 June 1992 Ratified – 25 November 1994
The Cartagena Protocol on Biosafety	Signed – 11 May 2001 Ratified – 13 February 2008
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Accession – 13 June 1997 Entry into force – 11 September 1997
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)	Entry into force – 17 March 2005
Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa – 1994	Accession – 2 January 1997 Entry into force – 2 April 1997
International Treaty on Plant Genetic Resources for Food and Agriculture – 2001	Accession – 4 December 2002
International Plant Protection Convention – 1952	Adherence – 26 May 2006
International Tropical Timber Agreement – 1994	Signed – 6 July 1995 Approval – 31 January 1996
Plant Protection Agreement for the Asia and the Pacific Region – 1956	Adherence – 4 November 1959
United Nations Convention on the Law of the Sea	Signed – 10 December 1982 Ratified – 21 May 1996
United Nations Framework Convention on Climate Change (UNFCCC)	Signed – 11 June 1992 Ratified – 25 November 1994 Entry into force – 23 February 1995
Kyoto Protocol	Accession – 13 August 2003 Entry into force – 16 February 2005

Source: International Centre for Integrated Mountain Development. <http://www.icimod.org/?q=myanmar&page=myanmar>

Appendix 6

Overview of ADB's Experience in Restarting Agriculture, Natural Resources, and Environment Operations in Cambodia, the Lao People's Democratic Republic, and Viet Nam

1. Since the early 1990s, the Asian Development Bank (ADB) has reengaged with three Southeast Asian countries facing similar social, economic, and physical resource constraints and challenges as Myanmar. These are Cambodia, the Lao People's Democratic Republic (Lao PDR), and Viet Nam.

2. All three countries formerly had centrally planned economies and were in transition to more market-based systems. Rice was the predominant crop (nearly a monoculture in Cambodia and the Lao PDR), and all three had low standards of living and high levels of poverty. Moreover, the Lao PDR and Viet Nam were characterized by dual forms of rice production: in the lowlands, by the majority of the population; and shifting cultivation in the uplands and mountain areas, largely by ethnic minorities. All three countries have extensive but complex water resources within a monsoon climate regime—a wet monsoon season and a long dry season. All three were faced with uncertain land rights for farmers and all had previously practiced a highly centralized form of agricultural production and marketing with directed production, fixed prices and markets, and inputs being supplied by the government.

3. Myanmar differs from these three countries in a variety of ways but shares a number of similarities from which parallels can be drawn. Viet Nam, like Myanmar, has an extensive land area; a relatively large population; a high degree of climatic and geographic diversity; and a relatively well-educated, technically competent, and capable civil service.

4. ADB's support for the agriculture sector was a significant, if not the primary, component of its lending and capacity-building program in each of the three countries. The main focus of the initial lending program in each country was to improve the environment within which the sector operated. There were four basic thrusts:

- (i) Program loans were provided to help ensure a conducive policy environment with appropriate farmer incentives, while at the same time providing fiscal resources for the governments.

- (ii) Priority was given to rehabilitation of infrastructure in the rural areas, yielding quick returns in terms of productivity and employment at the grassroots level, thereby stimulating the local economy and demand for goods and services; rural infrastructure included irrigation, flood control, drainage, and salinity control.
- (iii) Priority was also given to improving access to markets and services and reducing transaction costs through improved rural transport facilities.
- (iv) Rural finance was strengthened in order to promote innate rural entrepreneurial initiatives and to facilitate development of new crops, inputs, improved processing equipment, storage facilities, and transport equipment.

5. As such, the first loans provided to all three countries included, in various combinations and at various times (i) a program loan aimed at creating a policy environment conducive to sector growth and income generation for the rural population; (ii) infrastructure loans aimed at the rehabilitation and upgrading of irrigation, flood control, and drainage facilities, and rural roads and other transport infrastructure; and (iii) a rural finance or credit project aimed at supporting entrepreneurial initiatives in rural areas.

6. Initial lending to Viet Nam in support of rural development included the following:

- (i) Irrigation and Flood Protection Project in 1993,
- (ii) Agriculture Sector Program in 1994,
- (iii) Red River Delta Water Resources Sector Project in 1994,
- (iv) Rural Credit Project in 1996, and
- (v) Rural Infrastructure Sector Project in 1997.

7. In Cambodia, a similar approach was followed, although with an emphasis on access through rural road rehabilitation rather than irrigation and flood control rehabilitation, reflecting that rice production in Cambodia is largely rainfed. Accordingly, the early projects included

- (i) Rural Infrastructure Sector Project in 1995,
- (ii) Agriculture Program Loan in 1996, and
- (iii) Rural Credit and Savings Project in 2000.

8. Finally, a similar approach was taken in the Lao PDR, but with different timing. Rather than implementing infrastructure projects and program loans almost simultaneously, infrastructure investment was considerably delayed until capacity of the relevant government agencies had been strengthened and a detailed development plan had been formulated. The initial initiatives following reengagement thus consisted of the Agriculture Sector Program loan in 1989 and the Second Agriculture Sector Program loan in 1993.

9. These loans were focused on capacity building and the formulation of legislation governing the sector. They were accompanied by substantial advisory technical assistance. Similarly, considerable effort was devoted to preparing an agriculture development plan.

10. During the 1990s, ADB supported only two, rather small agriculture-related investment projects in the Lao PDR—the Community-Managed Irrigation Project and the Shifting Cultivation Stabilization Project. Differing again from Cambodia and Viet Nam, subsequent investment in the sector was diverse rather than focused, including upland projects, irrigation projects, a smallholder development project, and a livestock project. Despite considerable effort, not much progress resulted from ADB's rural finance program. The two program loans were of most significance for the agriculture sector.

11. Taking into account the differences in country characteristics, sizes of the programs, and the different levels of technical and institutional development, ex post facto studies on the impact of the sector lending programs for the three countries provide some useful lessons.

12. In Viet Nam, an assessment of the impact of ADB lending on the agriculture sector was undertaken for the 2009 Country Assistance Program Evaluation (CAPE). It was found that ADB funding for the sector had had a major impact, including (i) a sharp increase in paddy production between 1993 and 2007, from 22.8 million tons (t) to 35.6 million t; (ii) an increase in paddy exports from 1.7 million t earning \$363 million equivalent in foreign exchange in 1993 to 5.3 million t earning \$1,405 million equivalent in foreign exchange in 2005; (iii) an increase in domestic paddy consumption from 21.1 million t in 1993 to 30.5 million t in 2005; (iv) an increase in coffee production from 136,000 t in 1993 to 1.0 million t in 2007, with coffee exports increasing from 122,000 t in 1993 valued at \$111.0 million to 829,000 t in 2005 valued at \$735.5 million; (v) an increase in tea production from 37,700 t in 1993 to 153,000 t in 2007; and (vi) an increase in pepper production from 9,750 t in 1993 to 82,000 t in 2007, with exports increasing in value from \$9.2 million in 1993 to \$149.4 million in 2005. With these major productivity gains, ADB's program then diversified into forest protection, agricultural research, and the development of non-rice crops.

13. In Cambodia, the 2009 Sector Assistance Program Evaluation (SAPE) concluded that progress in agricultural development was partly attributable to ADB investments and technical support. These included (i) the provision of 1 million land titles to rural residents, with a further 2 million as a condition of a program loan in support of implementation of the Land Law; (ii) an increase in rice yields from 1.8 tons per hectare (t/ha) in 1998 to 2.6 t/ha in 2007; (iii) a doubling of rice production from 3.5 million t in 1998 to 6.7 million t in 2007; (iv) the achievement of self-sufficiency in rice production, with a 2.0 million t exportable surplus; (v) an increase in maize production from 55,000 t in 1998 to 380,000 t in 2007; and (vi) an increase in cassava production from 82,000 t in 1998 to 2.0 million t in 2007. Given the level of development and the country's resources, the thrust of recent activities has remained focused on policy reform and infrastructure development.

14. In the Lao PDR, a Rapid Sector Assessment (as part of the 2010 CAPE) indicated that while investments have generally been successful, their impact was mainly limited to the project areas. Between 2000 and 2007, the increase in rice production was marginal, from 2.2 million t to 2.7 million t. Successful development models for the sector have been formulated and tested, but a major investment thrust is needed to generate more significant impact results. Most likely, future investments will focus on water resources and infrastructure.

15. In assessing the results of ADB operations in Southeast Asia, it appears that the strategy used to initiate operations in support of the agriculture sector worked relatively well in Cambodia and Viet Nam, but less so in the Lao PDR.

16. Policy-based program lending was necessary to help bring about a policy environment conducive to agricultural growth and to strengthen farmer incentives.

17. A focus on infrastructure rehabilitation (as opposed to new construction) allowed rapid improvement of infrastructure at relatively low cost (since the basic structures already existed) and with few safeguard concerns (since construction and development took place on existing sites and rights of way). Lastly, the provision of rural finance unleashed latent entrepreneurial capacity among the rural population, leading to a high level of grassroots investment and stimulus to the rural economy.

18. The Lao PDR's relatively weak outcomes reinforce the conclusion that the three forms of intervention are needed, and should be combined. Solo interventions are unlikely to generate meaningful impacts, especially if the funding is modest and the projects are not well focused.

Appendix 7

Major Development Partners

Multilateral Donor Agencies

United Nations¹

- Economic Commission for Asia and the Pacific (UNESCAP)
- Food and Agriculture Organization of the United Nations (FAO)
- International Labour Organization (ILO)
- International Organization for Migration
- Joint United Nations Programme on HIV/AIDS (UNAIDS)
- Office for the Coordination of Humanitarian Affairs (OCHA)
- United Nations Children's Fund (UNICEF)
- United Nations Development Programme (UNDP), i.e., The Global Environment Facility²
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- United Nations Environment Programme (UNEP)
- United Nations High Commissioner for Refugees (UNCHR)
- United Nations Human Settlements Programme (UN Habitat)
- United Nations Office for Project Services (UNOPS)
- United Nations Office on Drugs and Crime (UNODC)
- United Nations Population Fund (UNFPA)
- World Food Programme
- World Health Organization

¹ http://www.mofa.gov.mm/?page_id=710

² http://www.thegef.org/gef/sites/thegef.org/files/publication/Myanmar%20-%20Fact%20Sheet_FINAL.pdf

*Asian Development Bank*³

Association of Southeast Asian Nations

*International Monetary Fund*⁴

*Organisation for Economic Co-operation and Development (OECD)*⁵

*World Bank*⁶

Bilateral Donor Agencies⁷

- Australia
- European Union
- Japan
- Norway
- People's Republic of China
- United Kingdom
- United States

Partial List of International Nongovernment Organizations⁸

- Food Security Working Group
- HOPE International Development Agency
- PACT⁹
- World Vision¹⁰

³ <http://www.adb.org/documents/myanmar-interim-country-partnership-strategy-2012-2014?ref=countries/myanmar/strategy>

⁴ <http://www.imf.org/external/pubs/ft/scr/2013/cr1313.pdf>

⁵ <http://www.oecd.org/countries/myanmar/investmentpolicyreforminmyanmar.htm>

⁶ http://www.worldbank.org/en/country/myanmar/whats-new?docty_exact=Interim+Strategy+Note&

⁷ http://www.mof.go.jp/about_mof/councils/customs_foreign_exchange/sub-foreign_exchange/proceedings/material/gai240625/03.pdf

⁸ The entire list is in this website: <http://lrcmyanmar.org/en/ngoprofiles/International%20NGO>

⁹ <http://www.pactworld.org/myanmar>

¹⁰ <http://www.worldvision.org.mm/>

Appendix 8

Field Visit Photos (2012)



Pan The Naw Township, Ayeyarwady Region: Boat Shed (A. Somesan)



Wet season rice harvest in full swing in early October (A. Somesan)



Pathein town's clock tower (A. Somesan)



Fishers crossing the river from the Main Yangon to Patheingyi Road (A. Somesan)



Fishnets (A. Somesan)



Community-built footbridge replaced the storm-damaged culvert (A. Somesan)



Around 200 primary school students in a makeshift hall near Koen Su (A. Somesan)



Slates and white chalk stones used as learning aids (A. Somesan)



Nay Pyi Taw Houses of Parliament (A. Somesan)



The road to Yangon, which runs parallel to the waterway to Koen Su and 40 other villages after the rainy season (A. Somesan)



Traveling by canoe or banca in the Ayeyarwady Delta Region in order to reach some villages near Koen Su in Kan Gyi Dauk Township (A. Somesan)



Sunset in Ayeyarwady (L. Thomas)



Small taro harvest being prepared before transport to Yangon

Myanmar: Agriculture, Natural Resources, and Environment Initial Sector Assessment, Strategy, and Road Map

This sector assessment, strategy, and road map highlights the Government of Myanmar's plans and strategies for addressing priority needs for the agriculture, natural resources, and environment sector and identifies possible preliminary areas of international assistance. It assesses key sector development needs by analyzing the strengths, constraints and weaknesses, various risks, and potential threats, as well as the opportunities, including further evolving the development partnership with the Asian Development Bank (ADB).

This sector assessment, strategy, and road map also provides lessons learned from other countries in the Greater Mekong Subregion, identifying the specific elements that can help Myanmar in its transition from a centrally planned economy to a more market-based system. Hence, ADB's reengagement activities will be focused on developing a conducive environment for the sector's growth.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.7 billion people who live on less than \$2 a day, with 828 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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