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PROMOTING AGRICULTURAL GROWTH IN MYANMAR: A REVIEW OF POLICIES AND AN ASSESSMENT OF KNOWLEDGE GAPS

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Introduction

Across Southeast Asia, agricultural growth has historically been a major driver of overall economic growth and poverty reduction (Christiaensen, Demery, and Kuhl 2011).[2] Indonesia, Malaysia, Thailand and Vietnam all enjoyed rapid agricultural growth as part of their successful development over the past several decades. Given broad similarities in the economic structures of these countries in the 1970s, 1980s and 1990s in comparison with Myanmar today, the historical evidence suggests that rapid agricultural growth in Myanmar has the potential to be the engine for broad-based economic growth and poverty reduction. Moreover, the current democratic reforms in Myanmar create opportunities for development of agricultural and economic policies for greater food security and poverty reduction.

Official statistics indicate that agriculture is the largest economic sector in the country, accounting for nearly 43 percent of GDP and providing the main source of livelihood for nearly 70 percent of the population (Haggblade et al 2013). Agricultural productivity in Myanmar is low compared with most of Southeast Asia, which partially explains the disparity in relative incomes across the countries. Raising Myanmar's productivity to the level of its agro-ecologically similar neighbors, and thereby spurring rapid agricultural growth, could significantly raise rural incomes and reduce overall poverty.

The majority of Myanmar's farmers are engaged in the production of rice, which occupies nearly 50 percent of total sown area (USDA 2014). At the same time, a large percentage of the rural population remains landless, with estimates ranging from 25% to 50% depending on the region (Haggblade et al. 2013). While increasing productivity in the rice sector would improve the livelihoods of Myanmar's numerous paddy farmers, a long-term solution must be to also introduce greater diversification in the agriculture sector and to develop value chains that offer employment opportunities for the numerous landless (Byerlee et al 2014). The potential to do so certainly exists with urbanization and rising incomes driving consumption patterns toward more high-value products which require greater processing and logistics (Reardon et al. 2012). The shared border with more developed economies and the ASEAN agreement facilitating freer trade also offer opportunities for growth in exports of high-value commodities and processed products. The challenge remains on how to support such diversification which will require large amounts of investment by government and private agro-enterprises of all sizes. Government policies will likewise have an important part to play in creating an enabling environment for private sector growth.

This paper reviews the agricultural policy environment in Myanmar up until 2014 with an eye towards identifying policies that can help to accelerate productivity and profitability in the agricultural sector. We draw heavily on the Framework for Economic and Social Reform (FESR) (2012) which provides the policy intents of the government both overall and at a sectoral level. Although limited, in some instances we rely on government data which is publically available only up until 2010. This paper primarily examines the evolution of input policies and their measures of implementation, i.e. those focused on farm inputs (land management; finance; water management; research, education and extension services; rural electrification; seeds; fertilizer and mechanization). We also provide a brief overview of policies which affect farm diversification (including rice productivity and crop diversification) and output policies including policies related to post-farmgate processing; logistics and transport; wholesale markets; and broad macro-economic and trade policy.

[22]See also de Janvry and Sadoulet (2010) and Fan, S., B. Yu, and S. Jitsuchon (2008).

Table 1—Myanmar Agriculture Policy summary matrix

Policy Area	Key Legislation	Key Players	Policy Problems	Policy Options
Input Policies				
Land management policy	• Farm Land Law (2012) • Vacant, Fallow and Virgin Land Management Law (2012) • Foreign Investment Law (2012) • Special Economic Zone Law (2014)	• State Land Records Department of the Ministry of Agriculture and Irrigation • Farmland Administration Body • Central Committee for the Management of Vacant, Fallow and Virgin Lands • Land Allotment and Utilization Scrutiny Committee • Land Confiscation Inquiry Commission	• Comprehensive land policy is still not developed. • The Farmland Law grants rights to individuals, which in many cases will be male heads of households. • Communal ownership is not recognized. • The land cadaster is outdated and poorly constructed. • Government is able to seize land and seeking recourse and compensation is difficult and the mechanisms unclear.	• Include both husband and wife on land registration certificates and define use rights more broadly than the individual. • Update the land cadaster digitally using GIS. • Make land seizures a more transparent process and define the terms for seeking recourse.
Finance	• Myanmar Agricultural Development Bank (MADB) Law (1990) • Microfinance Business Law (2011) • Mobile Banking Directive (2013)	• MADB under the MOAI. • Microfinance Supervisory Committee implements the policy • Microfinance Supervisory Enterprise for licensing and monitoring MFIs	• Land is the primary form of collateral leaving the landless unable to access loans through MADB. • Rice farmers are able to borrow more money from MADB than non-rice farmers. • Term Loans for equipment are only 2% of MADB's lending portfolio • There is limited private provision of microfinance. • Costs of operating in rural areas and caps on interest rates render rural finance uncompetitive.	• Revise MADB's mandate to serve all farmers, not just those growing rice. • Diversify the loan portfolio to include greater provisions for equipment loans • Look to neighboring countries (Bangladesh) that have well developed mobile banking systems and policies. • Utilize advances in technology to reduce infrastructure and travel costs. • Review and revise interest rate ceilings and other policies that discourage rural credit provision.

Water and Irrigation	• Conservation of Water Resources and Rivers Law (2006)
	• The Canal Act (1905)
	• Myanmar Embankment Act (1909)
	• Myanmar Irrigation Manual (1945)
	• Water and Embankment Tax Law (1982, revised 2007)
		• MOAI
		  ○ Irrigation Department
		  ○ Water Resources Utilization Department
		• Ministry of Environment Conservation and Forestry
		• National Water Resource Management Committee
			• No overarching water policy
			• Overlapping jurisdiction for irrigation and water management between 10 ministries
			• Government sponsored irrigation is primarily for rice.
			• Overexploitation and pollution are concerns.
				• Develop a consolidated water policy and improve inter-ministerial coordination.
				• Make irrigation systems more demand-driven rather than focusing on supply management.
				• Institute appropriate environmental impact assessments when exploring water resource exploitation.

Policy Area	Key Legislation	Key Players	Policy Problems	Policy Options
Rural Electrification	• Myanmar Electricity Law (1984) (updates pending approval) • Electricity Rules (1985)	• Ministry of Energy • Ministry of Electric Power • Ministry of Industry • National Energy Management Committee • MOAI is responsible for biofuels and micro-hydropower for irrigation purposes • the Ministry of Livestock, Fisheries and Rural Development is tasked with advancing 'rural electrification'	• No policy for rural electrification • Overlapping responsibilities between MOAI, Ministry of Livestock, Fisheries and Rural Development, Ministry of Electric Power and Ministry of Industry	• The updated Electricity Law moves in the right direction with provisions for decentralized power regulation, privatization and contracting arrangements but has yet to be passed and implemented.

Research, education and extension services for agricultural development		• MOAI
		  ○ Department of Agricultural Research
		  ○ Agricultural Extension Division
		  ○ Central Agricultural Research and Training Center
		  ○ Yezin Agricultural University
		  ○ State Agricultural Institutes
		• University of Veterinary Sciences under the Ministry of Livestock and Fisheries
		• University of Forestry, overseen by the Ministry of Environmental Conservation
			• Very low public expenditure on ag-research compared to neighbors.
			• Intellectual property rights laws are not in place so there is very little private sector research.
			• Few extension agents and there is a disconnect between them and research centers
			• Research is still very heavily focused on rice.
				• Agricultural R&E has high returns and should be invested in.
				• Finalize and enforce the Plant Variety protection act.
				• Involve extension agents in the research process and make extension more participatory and demand-driven.

Seed	• Plant Pest Quarantine Law • The Seed Law • Import- Export Law • Law on Bio Safety • Plant Varietal Protection Law	• National Seed Committee • Department of Agricultural Research • The Seed Division of DOA	• Still large public provision of seeds but supply is inadequate. • Seed Law rules and regulations have not been passed.	• The Rules and Regulations of Seed Law must be passed to encourage greater private sector participation.
Fertilizer	• Fertilizer Law (2002) • Fertilizer Rules and Regulations (2007)	• Ministry of Energy • Myanma Agricultural Service • Fertilizer Committee • Fertilizer Technical Body	• Legislation regulates fertilizer quality but inspections rarely take place and low quality is a concern. • State-owned fertilizer plants are still operational • Obtaining or renewing licenses can be a slow and arduous process	• Provide additional resources for quality testing facilities and building capacity. • Either sell state owned fertilizer plants or have them compete on equal footing with private business. • Review licensing procedures to streamline the process.

Mechanization	• Import / Export law	• Agricultural Mechanization Department • Ministry of Industry • Ministry of Cooperatives	• State provides mechanized services and sells mechanization equipment to increase usage. • State provision focuses on large machinery, which is not tailored to small farm sizes. • Finance through MADB for mechanization is limited	• Eliminate state provision of mechanized services and encourage private sector import and service provision that better match farmers' preferences.

Section 1. Land management policy

Land governance policy is an important, though controversial, target for reform in many developing countries. The fundamental concerns of land governance policy are who gets to occupy and use the land, how the land can be used, and how the government will implement the policy and administer any rights granted under it. These questions are of fundamental importance to farmers employing traditional farming practices, which are considered both labor and investment intensive. By providing secure land tenure rights, governments are providing landholders the peace of mind that their land will not be encroached upon or appropriated by the government without due legal recourse. This assurance is believed to lead to increased investment, more productive use through market reallocation and increased access to credit for productivity enhancing purchases, among other benefits.

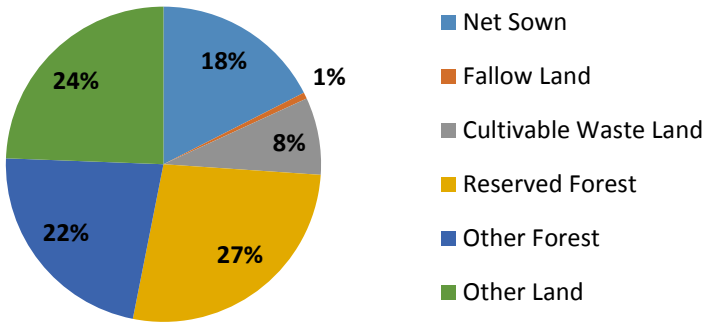
The GoM recognized the importance of land rights for smallholder and impoverished farmers by making 'equitable and sustainable use of land' a component of the FESR (2012). The current development of the national land use policy is moving in the direction to achieve this goal, while also addressing some of the shortcomings to achieving effective use of land for agricultural growth in Myanmar. The recently enacted Farmland Law is the first attempt made at major reform in this sector in many years. This section will first take a look at the current situation in Myanmar, and then it will consider the status of tenure security in Myanmar from a historical perspective, identify key players, and discuss the challenges that lie ahead.

The current situation

Myanmar's economy is quite dependent on agriculture with agriculture accounting for a majority of all employment and representing around 36 percent of GDP in 2012 (ADB 2012b). However, land ownership in Myanmar is highly fragmented. The average farm size, 2.71 hectares in the 2009/10 farming season, is deemed low by international standards but moderate in comparison with Myanmar's regional peers (UNDP 2011). Poor farm households are at a further disadvantage when it comes to land size, as they have an average of 1.8 hectares versus the non-poor average of three hectares (IBID).

Of the 67.7 million hectares contained within the boundaries of Myanmar, 11.84 million hectares (18 percent) were sown in the 2012-2013 cropping season (MoAI). Approximately 5.4 million hectares were classified as cultivable wasteland and 0.4 hectares were considered fallow equaling about 9 percent of total land (Figure 1). Rural landlessness rates are quite high, with estimates ranging from 25 to 50 percent of the population (Haggblade et al. 2013), despite Myanmar's favorable population density compared to its neighbors, including Bangladesh.[3] The highest rate of general landlessness can be found in the Delta/coastal area, which is also the area with the highest population density. High rates of landlessness imply that any agricultural reform will need to be holistic and value-chain focused so as not to further marginalize this potentially vulnerable population.

Figure 1—Land Utilization in 2012-2013



Source: MoAI Agriculture Statistics

Table 2—Freedom over property rights

Country	Score
Bangladesh	20
Cambodia	30
Indonesia	30
Lao PDR	15
Malaysia	55
Myanmar	**10**
Thailand	45
Vietnam	15

Source: Heritage Foundation 2014 Index of Economic Freedom, Rule of Law, Property Right

[3] Myanmar's population density is 0.43 ha/person (Tin Htut 2012), while Bangladesh has 0.06ha/person with 40% landlessness (Haggblade et al. 2013).

The lack of firm property rights is a cause for concern in Myanmar. The country scored lowest among its neighbors in an index by the Heritage Foundation measuring economic freedom with respect to property rights (Table 2). The index is based on issues ranging from the performance of land titling regimes to the protection of private property and the independence of the legislature and judiciary. The foundation attributes Myanmar's low performance to the lack of protections for private property, disadvantages of private and foreign companies in disputes against the GoM, and the pervasiveness of corruption. Further, though institutional reforms have been undertaken since 2011, the country's rule of law score declined from 2013 to 2014 (Heritage Foundation 2014). A 2013 report by DfID and FCO (as cited in Henley 2014) stated that over 2,000 complaints about land grabs and dispossession were received by the cross-party Land Acquisition Investigation Committee since 2012. Even the GoM has acknowledged that these issues could have serious repercussions on growth and FDI, social cohesion, and democratic governance in the future (Obendorf 2012).

Land management policy evolution in Myanmar

Since 1953, when the Land Nationalization Act removed private land ownership rights, each successive government regime has maintained a policy on state ownership of land while allowing peasant farmers the right to cultivate. The approach to land management has varied somewhat over time, however. In the Parliamentary era (1948-1962) the land management approach focused on "equity (land use rights) rather than productivity", while the BSPP regime (1963 to 1988) focused on strengthening "government control over farmers" (Nyunt 2013) and even created cropping plans for farmers and enacted procurement quotas (Haggblade et al. 2013). Under the market economy approach of the SLORC/SPDC government (1989-2010), there was some liberalization in trade and marketing (IBID) and new provisions allowing land use for large-scale agricultural enterprises resulted in land related conflicts with customary users (Oberndorf 2012).

Recent progress has been made in land tenure, as the current government recognized the importance of land rights by making 'equitable and sustainable use of land' a component of the FESR (2012). In addition, the Government made legislative changes with regard to access to land for agricultural use, namely: *the Farmland Law* (2012) and *the Vacant, Fallow and Virgin Land Management Law* (2012). Moreover, laws such as the *Foreign Investment Law* (2012) and *the Special Economic Zone Law (2014)* stipulate provisions for land use by private investors. Each of these laws is summarized below.

The **Farmland Law**, passed in 2012, includes a provision for formal state recognition of individual users' rights through issuance of a Land Use Certificate by the township level authority. This certificate allows the farmer the right to sell, transfer or mortgage the land, a departure from the previous user rights system (Hiebert and Nguyen 2012). Moreover, there is a provision stipulating that compensation must be paid if the Government acquires the land for other purposes. The law does however continue Government's control over land classification and maintains the focus on rice cultivation, as rice self-sufficiency remains a major concern of the GoM.

The **Vacant, Fallow and Virgin Land Management (VFVLM) Law** (2012) is a law created to establish land use rights on vacant, fallow and virgin land. The law creates rights for land use by investors for perennial and horticulture crops, livestock and aquaculture up to 30 years, with the possibility of extension for up to an additional 30 years. Large-scale land use for commercial crops is possible for up to 5,000 acres per request, with a total limit of 50,000 acres.[4] While foreign firms can use farmland only through joint ventures with Myanmar entities, the Myanmar Investment Commission (MIC) can approve a land lease for commercial activities with the permission of the Central Committee on Vacant, Fallow and Virgin Lands (JICA 2013). The VFVLM law also has a provision for small farmers to acquire rights to use this type of land, though acreage is limited to 50 acres or less.

[4] Previous allotment of land must be 75 percent or more utilized in order to qualify for an additional land permit.

The **Foreign Investment Law** (2012) provides a new legal framework for foreign direct investment in agriculture and agribusiness (Haggblade et al. 2013). The law allows foreign firms to lease or use land for an initial period of up to 50 years with the possibility of two 10-year extensions; land can be leased for the sole use of foreign investors or as joint ventures with Myanmar individuals, firms, cooperatives or State-owned enterprises. The MIC has the authority to authorize leases by foreign investors (DICA 2014).

The **Special Economic Zone Law** (2014), which lays out the framework for developing Special Economic Zones, allows companies to lease land in the zones for an initial 50 years, with the possibility for a 25 year extension.

Lastly, recognizing the need for a coherent policy approach to these various laws, Myanmar is developing a national land use policy (President's Office 2014). The proposed land use policy and the national land law will provide the framework for coordination between different land use needs, for managing land statistics, and for effective land governance and taxation.

Key Players

As part of the latest effort of the land reform in Myanmar, the National Land Resource Management Central Committee has been formed with the authority to oversee all of the agencies involved in land management and development of land related policies. The main purpose of this group is the development of a National Land Use Policy and a National Land Law (President's Office 2014). In addition, the committee has been tasked with addressing the coordination challenges of the various land-related stakeholders and will also help coordinate between the central and sub-national governments.

The Ministry of Agriculture and Irrigation is responsible for the implementation of the Farmland Law and the VFVLM law. The primary agencies involved are the State Land Records Department (SLRD), which is responsible for updating and maintaining land use rights records, and the Farmland Administration Body (FAB). The FAB has multiple layers, headed by a committee chaired by the Minister and including the Deputy Minister and the Director of the SLRD. Regional/state level committees and local committees also exist. The main objectives of the FAB are the review of farmland use applications, formal recognition and approval of use rights, valuation of farmlands, resolving land disputes, and enforcing land use conditions (Oberdorf 2012).

The Central Committee for the Management of Vacant, Fallow and Virgin Lands is the committee responsible for administering and approving land use rights, as well as settling disputes with regards to VFV land use. It is also chaired by the Minister of Agriculture and Irrigation, with the Director of the SLRD serving as Secretary; other committee members are appointed by the President (ibid).

Two other committees exist to serve an advisory role. The Land Allotment and Utilization Scrutiny Committee, a cabinet level committee, serves an advisory role on issues of national land use policy, and the Land Confiscation Inquiry Commission concentrates on land confiscation issues.

Summary of Challenges

The current legal space created by these new laws has the potential to help Myanmar's agribusiness industry. However, it may also allow tenure insecurity to persist, which will perpetuate the vulnerability of smallholder and landless farmers. Additionally, while the legal framework has been laid out for the new Farmland and VFVLM laws, they lack a comprehensive land policy to guide implementation and harmonize the various laws affecting land. The following section will take a closer look at some of the challenges of the current legal framework for land tenure in Myanmar, while also considering Myanmar's neighbors' experiences as examples of potential steps to pursue and avoid.

Expanded access to credit is one of the main factors behind the Farmland Law's provision to allow banks to accept land as collateral for loans. However, that may not be the case if Myanmar does not enact clear and

transparent methods for banks to collect on their unpaid debt. A lesson can be learned from Vietnam, where banks are still reluctant to lend using land-use certificates as collateral due to the perceived difficulty of seizing land to cover loan defaults (Kirk and Taun 2009). Without transparent and reliable laws for land seizers, banks in Myanmar are unlikely to take similar risks.

Another concern with the current Farmland Law is that it grants occupancy rights to individuals. Regional experiences suggest that this may be a problem for two reasons. It may lead to male-dominated land ownership and it ignores the existence of other customary forms of land ownership and use. Myanmar's neighbor, Vietnam, has made some strides on the former issue by amending the land law in 2004 so both the husband's and wife's name appears on the land use certificate (Kirk and Taun 2009). In terms of the latter issue, the GoM could learn from Cambodia and Vietnam, both of which define use rights more broadly than the individual, recognizing communal land rights. Vietnam also allows households, religious establishments, and organizations to establish use rights (FSWG-LCG 2012).

The GoM should also take into account that the majority of the rural households are either smallholders or landless. While there is a provision for requesting land through the VFVLM law, it does require the potential landowner to have the resources to develop the land. The GoM might want to consider being more inclusive with land policies, considering the fact landlessness and poverty are correlated. After Cambodia passed its 2001 Land Law granting ownership rights to people already occupying the land[5], they acknowledged landlessness by allotting land concessions to the landless without charge (Nabangchang and Sriswalak 2008). Provisioning land for the use of smallholders and the landless would be a big step towards ensuring inclusive economic growth and reducing poverty throughout Myanmar.

Care should also be taken to clarify when land can be expropriated by the government under the VFVLM, what recourse farmers have, and how and when farmers will be compensated. Myanmar should learn from its past and from its neighbors' failures, where, despite legislation protecting smallholders' rights, land concessions and logging rights that threaten tenure security are approved by the government (Nabangchang and Sriswalak 2008).

Despite all of the improvements in the legal framework and even if all of the above are addressed, without improvements in land management, especially without a reliable land record system, conflicts over land ownership will continue to be a challenge. The Farmland Management Body, which replaced the previous land committees, reviews and approves land use certificate requests. Once approved, the State Land Records Department will issue and administer the certificates. However, the department is said to have low capacity and too few staff to manage these tasks (Nabangchang and Sriswalak 2008). In addition, the cadastral map used for land ownership records is outdated, with some maps dating back to the colonial period (JICA 2013). Myanmar would benefit from making investments in human capital as well as developing an accurate land information database. Myanmar should take cues from Thailand and Vietnam, who have both worked with the World Bank to increase their land records capacity and are both in the process of developing more accurate maps using spatial analysis (Nabangchang and Sriswalak 2008).

Conclusion

Myanmar's land reforms are a promising start in moving towards an equitable land use system. With the recent passage of the Farmland Law (2012), Vacant, Fallow and Virgin Land Management Law (2012), Foreign Investment Law (2012), and the Special Economic Zone Law (2014) the legal space surrounding land is changing, making investment in Myanmar more attractive while simultaneously creating more tenure security for farmers. Unfortunately, there are still many key areas that need to be addressed. Myanmar should learn from the successes and failures of its neighbors by ensuring that land tenure is inclusive and that land and credit access are made available to all. In addition, it is necessary to create strong and clear mechanisms for when land can be

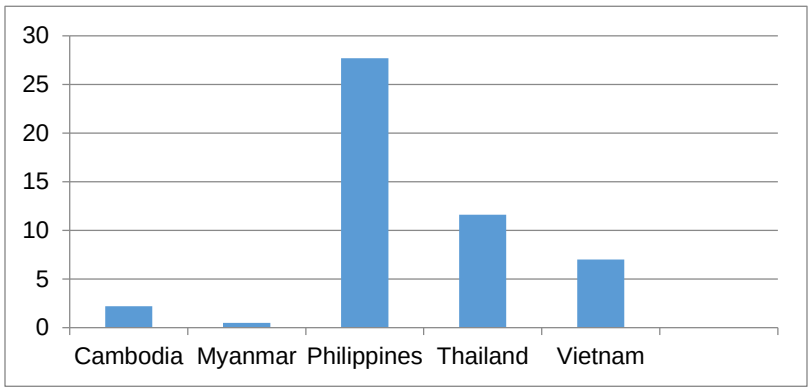
[5] After completing a 5 year occupation.

expropriated and to put in place the proper systems to reliably track land tenure rights. The proposed national land use policy is a great opportunity to ensure these areas are addressed.

Section 2. Agricultural Finance

Providing adequate access to rural finance is a common problem in developing countries and Myanmar is no exception. Myanmar has 0.05 bank branches per 1,000 km; less than a quarter of the next lowest country regionally, Cambodia. Approximately 10% of the population is included in the formal financial sphere, which is concentrated in the urban areas, therefore, the rate of access to formal financial services in rural areas, for agriculture or otherwise, is certain to be even lower than the national average (Kloeppinger-Todd and Sandar 2013). Although agriculture accounts for 43 percent of Myanmar's GDP and provides employment for over half of the population, agriculture finance comprises only 2.5% of the formal sector's outstanding loan debt further indicating a dearth of credit access (IBID). The Government of Myanmar identified this lack of access to credit as an issue and included the expansion of microfinance (MFI) services and access to credit from the Myanmar Agricultural Development Bank (MADB) as "quick wins" in the FESR (2012).

Figure 2—Number of Bank Branches per 1,000 km, by Country



Source: Kloeppinger-Todd, 2013

Many barriers prevent the efficient allocation of access to finance, such as lack of infrastructure, poor institutional capacity, profit-limiting policy constraints, and the dominance of state-owned banks with objectives other than profit (Steel and Charitonenko, 2003). Myanmar also lacks other financial offerings, such as formal remittance services, insurance markets, equipment rental, and grain storage (for later sales or to use as collateral), which may also contribute to the relative inefficiency of the agriculture sector.

The provision of finance in rural Myanmar derives from both state and non-state actors and is composed of formal institutions such as state-owned banks, private banks, MFIs and NGOs and informal and semiformal outlets such as local pawnshops, merchants, community organizations and family and friends (Proximity Designs 2014). Formal banking options include 4-state owned banks, 19 private domestic banks, and one private-owned finance company (De Luna-Martinez and Anantavrasilpa 2014). This section will primarily focus on formal financial institutions. It will start by first assessing the Myanmar Agricultural Development Bank, the state sponsored agricultural development bank, followed by a look at the provision of microfinance in the country. It will then touch on three potential sources of rural finance: commercial banks, farmer cooperatives, and mobile-banking. The section concludes with a summary and some suggestions for future work.

Myanmar Agricultural Development Bank

The Myanmar Agricultural Development Bank (MADB) was established in 1953 and was originally under the Ministry of Finance. Now owned and operated by the Ministry of Agriculture and Irrigation, the MADB is the main source of agricultural finance. The bank is mandated to "effectively support the development of agricultural, livestock and rural socio-economic enterprises in the country by providing banking services" (MADB Law 1990). The bank has a large presence, with 206 branches as of 2012 (De Luna-Martinez and Anantavrasilpa 2014) and, according to a 2013 report, is the only large bank operating in rural areas (Kloeppinger-Todd and Sandar 2013). As of March 2012, the MADB had approximately $130M in assets and 1.87M customers and a loan portfolio totaling 116,275 million Kyat; six times what it was in March 2010 due to increased loan sizes. The MADB used to have more coverage in Myanmar. However, in 2007 the government withdrew all village banks and left only township level banks, shrinking from 11,200 branches to just over 200 (Kloeppinger-Todd and Sandar 2013). Since borrowers have to travel to the bank branches, as staff are not allowed to travel to customers to conduct loan operations, borrowing and paying off loans has become a more onerous process.

The MADB Law (1990) and supplementary order (1991) govern the legal structure of MADB. Under this structure the bank does not face the same standards as other banks, such as on liquidity, capital, reserve ratios, accounting rules, loan classification and provisioning, and risk management; it is also not required to follow International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS) (De Luna-Martinez and Anantavrasilpa 2014). The Auditor-General must audit the bank and certify its profit and loss statement, but unlike other banks, the MADB is neither supervised nor regulated by the Central Bank. However, as the result of an addendum to the MADB Law, the bank is subject to inspections by the Central Bank.

There are two types of loans offered by the MADB: Seasonal Crop Production Loans (SCPL), typically for working capital, and Term Loans (TL), typically for farm machinery and special projects. Approximately 98 percent of loans taken out in 2012 were SCPLs and 85 percent were taken out for monsoon season farming (De Luna-Martinez and Anantavrasilpa 2014). MADB's lending operations are conducted locally and most are based on collective guarantees instead of being backed by collateral.[6] The loan approval process is based on village credit committees, consisting of local authorities, local staff of MoAI and farmer representatives, without MADB staff involvement. The lending process does not consider credit risks of the borrowers, even with the natural and market risks that farmers face (De Luna-Martinez and Anantavrasilpa 2014). If one member of the collective defaults, the other members are responsible for payment. If the group is unable to repay, MADB must absorb the loss even though it has no involvement in the approval process and has little ability to manage its risk portfolio. In fact, it has no documented guidelines for managing its risk (IBID). Therefore, in order to mitigate risk, MADB only lends in townships with a full repayment history on loans. This method has heretofore kept loan delinquency low, though it is felt that the lack of diversity in MADB's loan portfolio and the high rate of unsecured loans leave the bank very vulnerable to default (IBID).

The MADB lacks the operational autonomy necessary to run the bank in a sustainable manner. The managing director of the bank and all nine board members are appointed by various government agencies, all with their own agendas (De Luna-Martinez and Anantavrasilpa 2014). The MoAI sets MADB's deposit and lending interest rates, presumably with no regard to profitability, the market or risk. Until 2012, MADB offered loans at the commercial rate and mobilized capital and liquidity through deposits. However, in 2011 nearly 90 percent of retail

[6] Approximately 99.9 percent of loans are dispersed using the group lending method. Farmers form groups of 5-10 people and collectively commit to pay back the loan (De Luna-Martinez and Anantavrasilpa 2014). Loans for Machinery, only approximately 0.02 percent in 2012, require collateral in the form of compulsory savings. For machinery being sold by the private sector, borrowers must have 50 percent of the total cost in savings, whereas with equipment sold by the government, borrowers are only required to have 40 percent. The equipment itself is also considered collateral in the case of non-payment (IBID).

deposits were returned because of perceived issues with withdrawals by Parliament. MADB found a new funding source in the Myanmar Economic Bank (MEB), which was mandated to provide subsidized funding at 4 percent interest. MADB's interest rates are currently capped at 8.5 percent and the bank pays 8 percent interest on deposits, so without this source of cheap funding the bank would not survive (De Luna-Martinez and Anantavrasilpa 2014).[7]

The bank's operations also reflect the GoM's focus on rice sufficiency, as rice farmers account for 80% of loans granted (JICA 2013), even though the institution is legally allowed to provide loans for "livestock and rural socio-economic enterprises" (MADB Law 1990). Loans are even structured to in favor of small-scale rice farmers, with a limit of up to 100,000 kyat per acre versus 20,000 kyat for non-rice farmers, both limited to ten acres. This gives rice farmers an unfair advantage in accessing cheap credit (De Luna-Martinez and Anantavrasilpa 2014) while disadvantaging the landless, who are unable to access MADB's seasonal loan products.[8] Yet even for rice growers, loan sizes are likely inadequate, as one report claims that it costs approximately 4 times the maximum loan size to grow high quality rice (IBID). The focus on rice growers also creates an unbalanced portfolio, leaving the bank vulnerable to default in years with low rice profitability. New products should be created to cater to a more diverse clientele in order to create a diverse portfolio with reduced risk covariance.

The MADB is also said to have poor administrative procedures. For instance, the bank lacks a functioning IT system, so records are kept on paper, leaving them vulnerable to fire or other disasters. The MADB also does not have the means to monitor and evaluate its performance and has essentially no information to demonstrate the effectiveness and impact of services it offers (De Luna-Martinez and Anantavrasilpa 2014).

There is a general consensus that direct intervention into the rural finance industry, such as mandating interest rate caps or providing subsidized capital or directly provisioning loans, is inefficient and often causes more harm than good. Instead governments interested in providing rural finance should provide an enabling environment, such as strong property rights, macroeconomic stability, transparent and enforceable contract law, and a strong and effective regulatory environment for financial services while there should be adequate independence from the political process during and after the reform process to protect against political interference and patronage (Nagarajan and Meyer 2005, Rosegrant and Hazell 2000). Two examples of successfully reformed agricultural banks in Southeast Asia are Bank Rakyat Indonesia (BRI) and Thailand's Bank for Agriculture and Agricultural Co-operatives (BAAC).[9] These banks have distinguished themselves by establishing autonomy from the government, strengthening their corporate governance structures and emphasizing risk management. The latter reform was accomplished by investing in IT infrastructure to assess the risk profile of clients and assign a corresponding interest rate (De Luna-Martinez and Anantavrasilpa 2014).

Microfinance

Microfinance was first introduced to Myanmar in 1997, primarily as an international development assistance activity, utilizing a poverty-targeting approach and operating in the urban areas. In Myanmar, microfinance institutions (MFIs) are concentrated in the urban areas and currently are active in 12 states and divisions (Duflos et al. 2013) and continue to target the poor, especially landless farmers who cannot receive MADB support. MFIs tend to be group-based in Myanmar and their terms are stringent, mandating loan length, stipulating regular and frequent payments, and requiring attendance at group meetings (Kloeppinger-Todd and Sandar 2013).

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[7] Since the MEB pays its depositors an 8 percent interest rate, the government has to step in to subsidize the difference (De Luna-Martinez and Anantavrasilpa 2014).

[8] One estimate states that nearly 3.5 million farmers without land titles are unable to access loans from the MADB (De Luna-Martinez and Anantavrasilpa 2014).

[9] See De Luna-Martinez and Anantavrasilpa 2014, Llanto and Badiola , and Nagarajan and Meyer 2005

Until the Microfinance Business Law was passed in 2011, MFIs operated without legal status and were regulated based on memorandums of understanding with the Government of Myanmar. The new law grants licenses to legally registered institutions (local and foreign) for the provision of credit as well as deposit taking. Approximately 166 licenses have been issued, 50 of which were to institutions that also provide deposit services (Nehru 2014). The law also sets the lending and borrowing interest rates, as well as capital limits and establishes some consumer protections[10] and compels microfinance banks to follow the Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) regulatory guidelines issues by the Central Bank (Duflos et al. 2013). However despite the new law, the GoM should consider mandating higher capital requirements and extra measures to ensure the solvency of deposit-taking institutions, as there is currently no differentiation in regulation and supervision between these two types of institutions.

Oversight and regulation are carried out by two different national government bodies. The Microfinance Supervisory Committee (MSC) implements the policy and the Microfinance Supervisory Enterprise (MSE) is responsible for licensing and monitoring of MFIs. In addition to its regulatory oversight duties, MSE also provides loans, taking over this duty from the Myanmar Small Loans Enterprise (Duflos et al. 2013). Some concerns have been raised over the level of capacity within MSE to regulate the financial market given their previous role as a loan provider. It is also noted that they are understaffed, with an estimated 5-6 staff members per state involved in supervision (Duflos et al. 2013).

Microcredit provision is more difficult in rural areas than in urban areas due to higher transaction costs, the lumpiness of farm incomes, and the high segmentation of MFIs causing a co-varying risk portfolio (Nagarajan and Meyer 2005). Experience has shown that MFIs must offer flexibility in disbursement and repayment schedules, cater credit and other products to client needs, and create a diverse portfolio. Others have offset risks and spread out costs by expanding the scale at which they operate to cover more clients, even in urban areas (IBID). However the stringent loan terms and the low interest rates set by the government are often too low to cover the additional costs of operating in a rural environment. This is likely the reason why most MFIs in Myanmar are concentrated in the urban market, are small and donor funded, and do not offer additional services (Duflos et al. 2013).

In order to increase rural access to microfinance, research is needed to find financial products that meet the different circumstances in rural areas. Myanmar should look to its neighbors for guidance in developing the rural MFI market. An example of a new innovation in the rural finance market is the micro-agricultural loan product in the Philippines and Bangladesh, which, instead of requiring one lump sum payment at harvest time, allows for lump sum payments as well as small incremental payments, presumably from non-farm income, to farmers to smooth out the repayment process (Llanto and Badiola 2011). Myanmar could also learn from the example of BASIX in India, a multifaceted MFI that has thrived in the rural areas, providing both credit and deposit services, as well as risk-mitigating insurance on crops and livestock. The MFI is able to mobilize credit domestically and internationally and has developed partnerships with other organizations for their insurance offerings (Nagarajan and Meyer 2005).

Other Sources of Agricultural Finance

The MADB and MFIs are not the only available tools for agricultural finance. Commercial banks may be able to service larger farmers. Meanwhile, Myanmar currently provides funding though cooperatives and mobile banking has shown in other countries to be an efficient tool for banking in general.

Commercial banks

Myanmar's banking system thrived before the BSPP took over and nationalized all privately owned banks in 1963. It was not until after the SLORC/SPDC regime partially liberalized the economy in the 1990's by enacting the Central Bank Law and the Financial Institutions Law that private banks began to operate in the country again

[10] Currently the loan interest rate is capped at 30% annually and the deposit rate is set at a minimum of 15% (Duflos et al. 2013).

(Nehru 2014). However, several "shocks" have occurred that have degraded public trust in the financial system: two demonetizations in the 80's, a banking crisis in 2003, the unexplained government closure of a large bank in 2005, and a mini- banking crisis in 2012. As of 2013, there were 4 state banks, 11 semi-government institutions, 11 fully private domestic banks, and 35 representative offices for foreign banks (ibid). The GoM has banned foreign-owned banks from establishing subsidiaries in Myanmar, though this is being revised as part of Myanmar's integration with ASEAN. (McNulty 2012 as cited in Duflos et al. 2013

The Central Bank Law of 2013 separated the Central Bank from the Ministry of Finance and put commercial banks under the regulatory authority of the Central Bank of Myanmar. It is yet to be seen whether this regulatory independence will provide confidence to commercial banks to expand. Another obstacle is the lack of real-time financial data, as reporting between the commercial banks and the central bank is transmitted by facsimile (Nehru 2014). In addition, the lack of a credit monitoring system forces banks to rely on strict collateral requirements, which prohibits asset-poor individuals from accessing credit.

Commercial banks have not played a major role in agriculture finance thus far and tend to be concentrated in urban areas. One reason is that prior to the Farm Land Law (2012), banks were unable to accept land as collateral for loans. By receiving tenure certificates through the Law, commercial banks should, theoretically, be able to expand finance for farmers. However, the increased operational costs in rural areas and the maximum annual interest rate of 13 percent on loans and the minimum rate on deposits of 8 percent may make lending to lower income rural clients a bad investment and to poor and landless clients, lacking in collateral, extremely unlikely. Expansion into rural areas is further hampered by the fact that the MADB, with low interest rates due to subsidization, dominates agricultural loans and is even known to bundle inputs from SOEs with loans (Nehru 2014).

Cooperatives

Cooperatives in Myanmar have a legacy dating back to the early 1900s and have historically been seen as a tool of the government to assert their control (Ferguson 2013). However, the GoM sees cooperatives as a tool to help improve socio-economic conditions and microfinance as the primary method to fulfill this objective. According to government officials, there are plans to open a cooperative with microfinance services in every village in Myanmar (Ferguson 2013).

The two legal documents defining the operations of cooperatives in Myanmar are the Cooperatives Law (1992) and Regulations (1998). These documents provide the Ministry of Cooperatives the power to "liquidate" cooperatives as well as register and review their office-holders and proceedings, as well as "issue rules and procedures as it sees fit" to implement the law (Ferguson 2013). The government is preparing a new law governing the cooperatives and it is expected to be completed and passed before the 2015 elections (ibid).

The Ministry of Cooperatives is the main body overseeing cooperatives while the Department of the Cooperatives is responsible for regulating and approving new cooperatives and also oversees the microfinance services of cooperatives that have not obtained a microfinance license. Cooperatives in Myanmar are organized by the Central Cooperative Society (CCS), which is the central body, and contains 20 unions, 461 federations and 10,751 primary societies as of March 2012. Approximately 142 of the societies are financial cooperatives (Duflos et al. 2013). As of September 2013, 68 cooperatives had received microfinance licenses. The Union of Savings and Credit Federation is the organizing body for financial cooperatives and also serves as a source of lending to cooperatives and to individuals.

As reported by the CCS, financial cooperatives enjoy high repayment rates. However, the repayment terms may be ill-suited for agricultural loans due to the lumpiness of farming income. In most cases financial cooperatives collect payments daily and the loan duration is only 6 months (Duflos et al. 2013).

Mobile banking

Mobile banking is a new phenomenon in Myanmar that is not yet fully developed. Due to limited infrastructure and extremely high costs of access and usage, some estimates say it could take 5-6 years before mobile banking is fully operable (Duflos et al. 2013). Nevertheless, changes in telecommunication policies and increased investments by the private sector[11] could eventually make mobile banking a major rural financial product if the costs of switching to mobile banking are more competitive than manual labor. If cheaper than labor, mobile lending could help reduce the costs of servicing loans, for both the banks/MFIs and the clients, and may lead to expanded access in rural areas where bank density is low.

The Central Bank of Myanmar is currently developing new regulations to foster mobile banking, focusing on the bank-led model. According to the Myanmar's Mobile Banking Directive (2013), interested banks are required to apply for a mobile banking license from the Central Bank in order to legally provide mobile banking services (Vanderbruggen 2014). It is not clear whether non-bank mobile services, such as payment to service providers, etc., fall under the directive (ibid). However, in order to make mobile banking more viable, investments to improve the reliability and security of mobile data, investments to decrease usage costs, clear regulations on the participation of non-bank affiliated mobile banks, and training to ensure financial literacy should all be considered.

Myanmar can turn to its neighbors for some ideas on how to effectively harness mobile technology. For example, one bank in the Philippines has loan officers simply collect payments or deposits and submit funds to the branches using a g-cash wallet rather than investing in branch infrastructure (Llanto and Badiola 2011). SafeSave in Bangladesh is also a pioneer in using mobile technology for micro-finance, both assessing loan customers and documenting loan payments using Palm Pilots (ibid). More research is needed to identify whether mobile banking is right for Myanmar and how to effectively use it to expand credit access into rural areas.

Conclusion

Myanmar has a lot of potential to expand agricultural finance opportunities in the country, though there are many barriers preventing a strong and vibrant agricultural finance industry. The provision of agricultural finance is primarily led by the MADB, whose focus on landholding borrowers and restrictions on loan size makes this credit source inadequate or inaccessible for many. In addition, MADB's low interest rates make other loan options less competitive and create a dependency on subsidized credit. Myanmar should consider reforming the MADB's operations as well as promote diversity in lending opportunities. In order to serve more borrowers, more research is needed into products that meet the various needs and circumstances of agricultural entrepreneurs. In addition, more work needs to go into learning from what is currently being done on the ground in order to identify successes and to create an enabling environment for credit expansion in rural areas going forward. The government of Myanmar should also take some cues from its neighbors' experiences in reforming their financial sectors, in particular their efforts to evaluate and account for risk, reduce operating costs, and diversify lending options.

Section 3. Water Management for Agricultural productivity

Myanmar has abundant water resources, consisting of 24,000 cubic meters per capita of renewable fresh water each year by the Ayeyarwady River and related systems. This figure is over ten times the levels available in China and India (Hagbladde et al. 2013). However, water availability varies by the season. Approximately 80% of rainfall occurs during the monsoon months, which introduces the potential for flooding during the wet season and causes significant parts of the country to experience drought during the dry season (ADB 2013). Moreover, water is

[11] Two international companies, Telenor and Ooredoo, have been granted operating licenses and plan to start in late 2014.

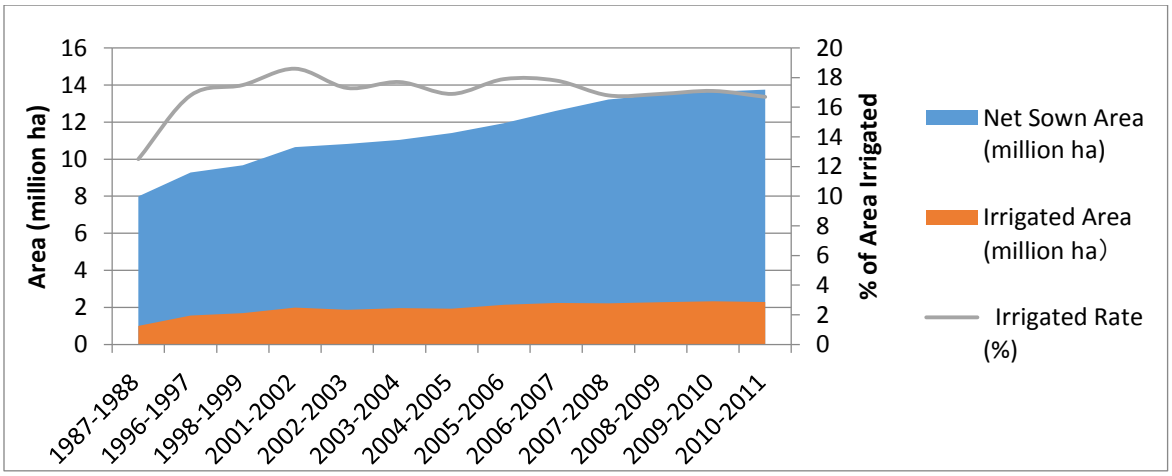
underutilized; only 3-10% of the available fresh water is used[12]; around 90% of which for agricultural activities (IBID). Most of Myanmar's water is sourced from the surface, leaving groundwater largely underutilized in comparison to neighbors Bangladesh and India (IBID).

Given increasing global water scarcity, effective management of water resources will offer Myanmar a significant agricultural competitive advantage (Haggeblade et al. 2013). However, it is important to keep the environmental implications of expanding irrigation and intensifying agriculture in mind. It is said that erosion has caused the length of Inle Lake to shrink from 56 km to 15 km in the last fifty years (Johnston et al. 2010). This section will highlight the current state of irrigation in Myanmar, focusing on its legal and administrative aspects and touching on concerns over the environmental impact of expanded water usage.

Current State of Irrigation

Irrigation for agricultural use has increased by approximately 156% from 1990 (1.16 mha) to 2011 (2.97 mha) (MoAI Settlement and Land Records Department). Despite the increase, only 17% of cultivated land in Myanmar was irrigated in 2011 (IBID) and only 39% is irrigated during the dry season (ADB 2013).

Figure 3—Irrigated Cultivated Area 1987/88 - 2010/11



Source: MoAI Settlement and Land Records Department

The Myanmar irrigation system is comprised of large-scale irrigation schemes located in Sagaing, Mandalay and Bago provinces and, elsewhere, small-scale schemes using pumps, river diversion, reservoirs and private localized methods (Johnston et al. 2010). According to a report by the ADB (2013), approximately 17% of irrigation comes from government dams and weirs and a larger fraction (38%) comes from pumped irrigation, most of which is farmer-operated and relies on diesel for fuel. Fujita and Okamoto (2006) point out that the reliance on pump irrigation may make farmers more responsive to rice prices. Pump irrigation is more costly and may preclude rice growing when prices are low, which may explain why summer paddy production plunged in 1997/98 (IBID).

[12] However, as 80% of rain is concentrated between mid-May and October. The remainder of the year droughts and drinking water shortages are experienced in many parts of the country (ADB 2013).

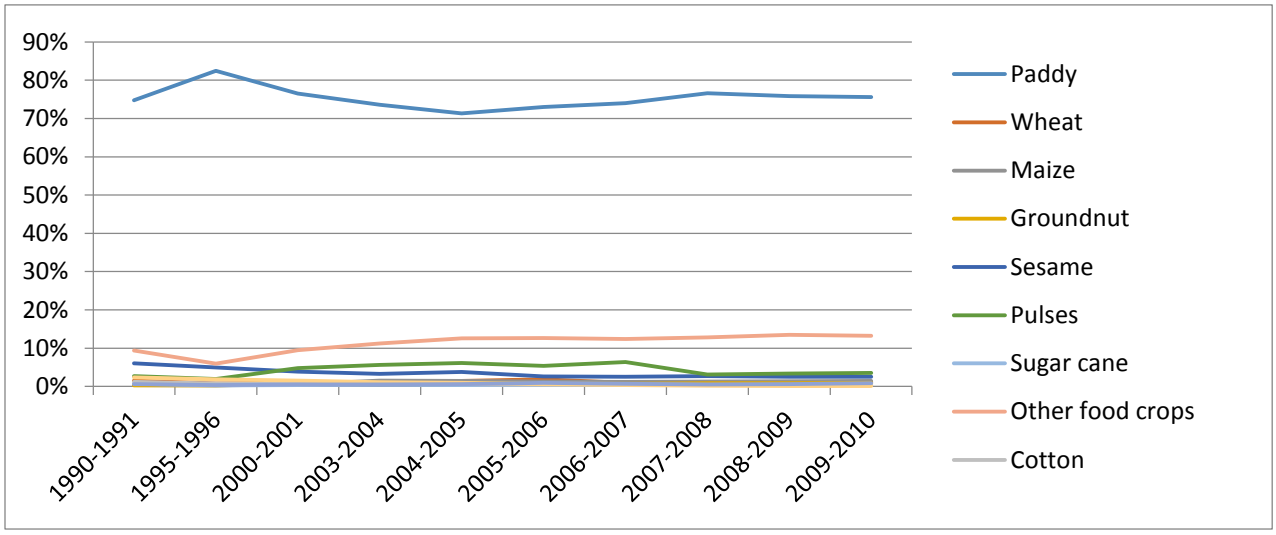
Table 3—Percent of Irrigated Area, by Type

S.N.	Year	Total Irrigated Area	Government Irrigation		Private Irrigation		Wells	Other Sources
			Canals	Tanks	Canals	Tanks		
		Thousand Acres	%	%	%	%	%	%
1	1990-1991	2479	24.7	15.6	26.8	3.8	2.1	27
2	1995-1996	4341	15.8	8	14	2.2	2.3	57.7
3	2000-2001	4720	18.8	11.2	12.6	1	4.7	51.7
4	2003-2004	4843	19.3	13.1	12.2	1.9	5	48.5
5	2004-2005	4762	20.3	14	13.3	1.5	5.4	45.1
6	2005-2006	5278	20.3	13.3	12.2	1.4	4.6	48.2
7	2006-2007	5545	19	13	12	1.7	5.3	49
8	2007-2008	5561	17.6	12.1	11.7	2.3	6.5	49.8
9	2008-2009	5621	17.5	12.2	11.7	1.9	6.1	50.6
10	2009-2010	5755	17.3	11.2	11.7	1.9	6.5	51.4

Source: Settlement and Land Records Department.

As Figure 4 shows, rice production did drop off after 1995/96 and currently comprises approximately 75 percent of irrigated area. Unfortunately this bias towards rice production in Southeast Asia makes it harder for farmers to diversify their crop production. Government sponsored irrigation schemes in Myanmar are often tailored to flooded paddy production (IWMI 2015), and thus are not optimized for higher value crops and may lead to land allocation inefficiencies. In addition, to meet production targets, the beneficiaries of government sponsored irrigation systems are instructed to grow rice over other crops, which impacts agricultural production due to the increased cost of rice production in the dry season disincentivising farmers from producing at all (ADB 2013). This and other policy issues prevent irrigation from being more productive in Myanmar.

Figure 4—Area of Crops under Irrigation 1990/91 - 2009/10



Source: Settlement and Land Records Department

Policy and Administration Environment

Myanmar lacks an overall water management policy and legal system. Institutional arrangements are still unclear, with several ministries involved in the management and provision of water and dozens of laws governing various aspects of water resources management. The most recent law, the Conservation of Water Resources and

Rivers Law (2006), only deals with river transport issues. Water management for irrigation is specifically covered by two different laws dating back to the early 1900s, The Canal Act (1905) and the Myanmar Embankment Act (1909), with the most recent updates occurring in 1998 (Mu Than 2008).[13] In addition, the Myanmar Irrigation Manual was released in 1945 (ibid). Unfortunately limited information exists on these laws and the authors were unable to find a summary of their coverage. However, it is certain that a unified water resources law could establish a more effective legal framework for coordinating and managing water resources for different users.

At present, ten different ministries have overlapping jurisdiction over water use, which likely causes coordination issues. For example, MoAI may be responsible for irrigation involving a particular dam, but the Ministry of Environment Conservation and Forestry is responsible for watershed management (FAO 2013). Also, the Ministry of Livestock, Fisheries and Rural Development provides fish pond licenses, however MoAI is responsible for ensuring cultivators' access to water. A cross-ministerial committee, The National Water Resource Management Committee, was set up in November 2013, with the Vice President as the chair and 23 other members from the various ministries that have involvement in water resource management. An Expert Group (EG) was also created to provide support and advice to the committee (FAO 2013). The committee's aim is to 'implement the multi-purpose water management system which guarantees the equity and transparency of water utilization among the people by managing and conserving the water resource carefully in the country (President Office Notification 12/2013). However, the focal agency for this committee is the Ministry of Transport, whose mandate is managing waterways for transportation purposes, which may bias the committee's focus.

The primary ministry in charge of irrigation is the Ministry of Agriculture and Irrigation. Two departments share responsibility for irrigation; dams and weirs are tasked to the Irrigation Department and pumped irrigation and groundwater are the purview of the Water Resources Utilization Department (ADB 2013). The fact that surface irrigation and groundwater irrigation are managed by two separate departments is potentially problematic, in that the management of surface irrigation has an impact on the replenishment of groundwater stores. It is also unclear whether either of these departments have jurisdiction over private irrigation schemes.

Myanmar's public water distribution system has been historically oriented towards supply management. This system deprives it of the efficiencies gained through demand-oriented distribution (FAO 2013). The existing literature mentions water user's groups, associations, and committees that may have some involvement in maintenance (JICA 2013, ADB 2013), though their roles and level of involvement are unclear (ADB 2013). Decisions on actual distribution of water are made by administrative structures at the village tract level (JICA 2013).

The payment for water provision was determined by the Water and Embankment Tax Law, which was passed in 1982. The law, revised in 2007, sets the fee schedule for irrigated lands and flood protection infrastructure. In practice, farmers are also charged different rates depending on the irrigation scheme. Fees for water from gravity-fed irrigation are low and most of the recurrent costs are born by the Irrigation Department (ADB 2012); one report suggests this figure reached almost 98% in 2000 (Naing 2005). Pump-irrigated water managed by the Water Resources Utilization Department incurs a higher fee in order to recoup maintenance and operational costs (ADB 2013). Approximately 40% of the irrigated area in Myanmar is irrigated through pumping and the higher costs levied to these farmers may also impact dry season cultivation decisions (ibid).

Although the National Commission for Environmental Affairs (NCEA) is an overarching agency tasked with environmental governance, decisions affecting the environment are still being made by the various ministries and departments responsible for each specific area, such as agriculture, water, and forests (Myint 2007 as cited in Kattelus 2014). In addition, the new Environmental Law (2012) sets the rights and responsibilities of the Ministry of Environmental Conservation and Forestry, which does not require environmental impact assessments and does not allow the NCEA to authorize them (Burma Rivers Network 2008 as cited in Kattelus et al. 2014). The law also does

[13] The updates were limited to increasing fines and jail sentences.

not mandate steep enough fines to deter domestic and international businesses from abusing the water supply (Kattelus et al. 2014). In sum, the policy environment around irrigation is disconnected and ill-managed and environmental laws are still in need of strengthening in order to protect the environment and ethnic minorities from over-exploitation. More of these issues will be covered in the next sub-section.

Climate Change, Pollution, and Exploitation Issues

The future of irrigation in Southeast Asia may be severely affected by climate change (Johnston et al. 2010). Some possible repercussions of an increase in temperature are higher rates of evapotranspiration, vertical shifts in ecosystems, changes in seasonal timing, and increases in frequency of extreme climate events (Johnston et al. 2010). Other, non-climate related, concerns are pollution caused by mining and industry, overexploitation of water during the dry season, and increasing population and changing diets of urban areas stressing the water supply. River flows may also be increasingly impacted by hydropower infrastructure and other forms of environmental damage (ADB 2013). Some of these repercussions will increase the demand for irrigation while others will require water mitigation, such as using pumps to drain fields.

While Myanmar currently has an abundance of unutilized surface and groundwater, the government should take caution to avoid repeating its neighbor' mistakes. For example the Mekong Delta in Vietnam experiences local water shortages and the intrusion of seawater in the dry season due to over-exploitation of the river (Johnston et al. 2010). To prevent over-exploitation and negative impacts to surface and groundwater, the government should assess the performance and potential of groundwater and surface irrigation in order to maximize efficiency and to stave off environmental damage.

Another concern that has been raised is the conflicting priorities of irrigation, hydropower and the environment. As of 2010, Myanmar, an energy poor country, has only taken advantage of approximately 6% of its hydropower offerings (Johnston et al. 2010). However, the literature warns that the forthcoming projects on the Thanlwin, Chindwin, Sittaung and Ayeyarwady rivers will have an impact on farming and fisheries, particularly affecting dry season flows (Johnston et al. 2010, ADB 2013). Much care, consideration, and research on impact should be put into these projects, especially because they are often initiated by foreign companies and the energy does not benefit the local populations.

Conclusion

The current policy and administration environment of water resources in Myanmar is scattered and unfocused. Overlapping interests lead to unclear jurisdiction. There is great need for a consolidated water resources law that clearly establishes jurisdiction, institutes a fairer water use management system for all types of water users, and creates a more effective legal and operational framework. Even within MoAI, jurisdiction is broken between two different departments leading to differences in pricing and budgetary obligations. Coupled with ineffective regulation of environmental damage and the growing concerns for climate change, pollution and over-exploitation, it is clear that the GoM needs to reorganize its efforts in order to provide straightforward and effective management of Myanmar's water resources systems. Ideally this system would capitalize on the country's rich water resources while also taking precautions to mitigate environmental damage and allowing for more diversity in cropping decisions.

Section 4. Rural electrification

Myanmar's infrastructure, including rural roads, telecommunication systems, and the energy grid all rank as the least developed among the ASEAN countries (ADB 2012a). While about half (49%) of the country's population has access to electricity, the rural electrification rate is considerably lower at 28% (OECD 2013). Only around 3,500 villages have access to grid electrification, while the rest (about 59,000 villages) are either have off-grid access or have no electricity (Myo Aung San 2012). Most off-grid sources provide only a limited amount of

power to meet very basic requirements such as lighting and this service is generally intermittent; available for two hours a day (ADB 2012a).

While the specific benefits of electrification vary across countries, there is a general consensus that the benefits of investing in electrification and consumers' willingness to pay for the service generally outweigh the long-run supply costs such that cost recovery is achievable (IEG 2009). Households who receive access to electricity benefit from additional income, improved education for children (for both boys and girls), greater access to productivity enhancing technologies, and improved access to information.

Lighting is the first item purchased once electricity is available and this seemingly modest convenience is responsible for generating a number of the most common benefits achieved through electrification. Evidence from Bangladesh suggests that more and higher quality light extends the time period available for income generating activities, allowing businesses to stay open longer and for individuals to work later in the evening (Barkat 2002). There is also some evidence that lighting induces adults to shift leisure activities from daylight hours to the evening. Using two rounds of the India Rural Economic and Demographic Survey (REDS) from 1982 and 1999 during which electricity expanded greatly in India, Van De Walle et al (2013) were able to show that the mean number of days that men undertook regular wage work increased by 16.6 days with electrification with a subsequent drop in the amount of casual labor supplied. This same study found that as men take up formal wage labor, women spend a greater amount of time participating in casual work, perhaps picking up tasks left by men (Van de Walle et al 2013).

Beyond lighting, research using panel data from Vietnam found that government programs connecting rural villages to the electricity grid reduced the amount of time necessary to collect firewood and drinking water and to prepare meals and to husk rice, the burden of which typically falls on women (Khandker, Barnes and Samad, 2013). This frees up additional time for women to participate in income generating activities. Evidence from Bangladesh, India and Vietnam suggests that electrification also leads to greater school attendance by children. In India, where the effect was only significant for girls, the authors posit that electrification reduces the opportunity cost for holding girls at home, because they will be able to shift household responsibilities to the evening hours (Van de Walle et al 2013). In Vietnam it was found that household electrification increases school attendance by 6.3 and 9.0 percentage points for boys and girls, respectively, while in Bangladesh electrification was found to increase the total completed years of schooling and study time for children in rural households (Khandker, Barnes and Samad, 2009). Televisions also appear in households soon after connection with the grid. While watching television is a leisure activity, the positive influence of TVs (and other media platforms such as radios) cannot be ignored. There is evidence that information acquired through TV has been shown to enhance knowledge about contraception (Perters and Vance 2010) and nutrition (IEG 2008) and may enhance women's empowerment and improve their bargaining power within the household.

However, the vast majority of studies suggest that electrification generally benefits wealthier households earlier and to a greater degree than poor households. Wealthy households have the ability to connect to the grid earlier than poorer households who may struggle to pay upfront fees, and the wealthy are also more likely to purchase items that use electricity such as TVs, refrigerators or processing equipment. Nevertheless wealthy and poor households alike benefit from improved public facilities such as street lighting and medical facilities with refrigeration.

Electrification policy

The Ministry of Electric Power (MoEP), the national authority on electricity, has set the ambitious goal of providing more than 5 times the current energy supply in the next 15 years (to around 25,000 MW, from the current level of 4,300 MW (*Irrawaddy* July 11 2014). However, 76% of total electricity is sourced from hydro-electric dams, making capacity fluctuate seasonally, while gas (21%) and coal (4%) facilities operate at less than peak performance due to maintenance issues (ADB 2012a). There are further concerns that the performance of

these outdated facilities will decrease over the next five years (OCED 2013; Aung Myint 2012). Major investments are required to upgrade the existing infrastructure as well as additional power plants to provide adequate electricity or, in the least, to maintain the current supply.

Access to affordable and reliable electricity acutely affects the business sector (EAT 2012) and is a major constraint to improving agricultural productivity and diversification (Byerlee et. al, 2014). Expanding agricultural processing beyond simple rice mills and developing high value sectors such as fisheries and livestock will require reliable power supply, especially for perishable items that require cold storage. Moreover, rural electrification has the potential to substantially lower agricultural production costs, reduce food loss, as well as open-up off-farm employment opportunities (ABD 2012a).

The current electrification legal and policy framework is based on the Electricity Law (2014), which replaced the Myanmar Electricity Law (1984) and the Electricity Rules (1985). Four main principles govern Myanmar's energy policy: (i) maintaining energy independence; (ii) promoting renewables; (iii) improving energy efficiency; and (iv) increasing household use of alternative fuels. The Ministry of Energy (MOE) oversees energy matters though responsibilities are shared across a poorly coordinated web of six ministries, including the Ministry of Electrical Power[14]. The Ministry of Agriculture and Irrigation is responsible for biofuels and micro-hydropower for irrigation purposes while the Ministry of Livestock, Fisheries and Rural Development is tasked with advancing 'rural electrification' as one of its functions. Although there is no rural electrification policy the Ministry of Electrical Power and Ministry of Industry also handle rural electrification (ADB 2012a). No specific provisions are given to ensure electricity for agricultural uses, such as processing. Understanding the myriad of responsibilities of the different ministries and enterprises is challenging and coordination has been a problem. Recently however, the Government of Myanmar has established the National Energy Management Committee (NEMC) and the Energy Development Committee to strengthen coordination among the six ministries. These committees aim to improve resource planning for and oversight of investment in energy sector development, including electricity generation (President Office Notification 12/2013).

The revised Electricity Law 2014 creates the Electricity Regulatory Commission to advise the Ministry of Electrical Power, set standards, and regulate inspection. This new law further decentralizes power generation activities to the state and regional level for smaller power facilities under 30MW. This provision may be an interim solution to the development the national grid and may have impacts for local agricultural development. This draft is meant to improve the 1984 Electric Law which lacked provisions on the contractual framework between producers, users, transporters or distributors of electricity. In addition environmental issues, ownership, financing, tariffs, land use, or other issues relevant to power project were missing. Up to now, most of these issues are settled in individual contracts between private investors and the government though a more comprehensive and transparent legal framework is needed (Van Der Bruggen 2014).

The NEMC works with the Privatization Commission to oversee the transfer of state-owned companies to the private sector (Van Der Bruggen 2014). The 2012 Foreign Investment Law opened the door for greater foreign investment to advance Myanmar's energy needs, although licensing processes and distribution requirements are not defined (BLP 2014). The Myanmar Investment Commission is the primary body that grants investment permits and sets the terms of agreements with foreign investors. Power generation businesses can be fully foreign owned, enjoy tax free status for 5 years, and land leases for up to 50 years with opportunities to extend for two consecutive 10 year periods. Discretionary benefits may also be granted including duty free imports on machinery and equipment and other benefits related to income and export taxes. The existing legal provisions allow foreign

[14] There were previously two Ministries of Electrical Power until 2012. One focused on coal and hydropower while the other on power transmission and gas-fired power.

investments in the electricity sector, but do not define the licensing processes and distribution requirements (BLP 2014).

Section 5. Research, education and extension services for agricultural development

Numerous studies have shown that investment in agricultural research has a higher social rate of return than many other public investments (Beintama and Elliot 2009) though R&D expenditure is low in Myanmar. This, coupled with a centralized command and control approach has led to depleted and low quality research and extension services provision in Myanmar, which contributes to low agricultural productivity (Haggblade et al. 2013, FAO 2013 and JICA 2013). As acknowledged in the FESR (2012), increasing extension services is an important way to boost agricultural productivity and a focus of the GoM.

Spending

The level of public investment in agricultural research in Myanmar is quite low, making the existing institutions ineffective. In 2003, Myanmar spent only $0.06 of every $100 in agricultural output on agricultural research compared to $0.41 by its Asian neighbors (Haggblade et al. 2013). This low spending hampers the quality of research in many ways. Government research organizations are unable to compete with international organizations and NGOs due to low civil service salaries, thus attracting lower quality talent. At the same time, the ratio of support staff to researcher is lower than regional standards (ibid). Funding issues are not limited to the research staff, as staffing cuts in 2006 and unrealistic travel budgets have been shown, anecdotally, to impact extension workers ability to visit farmers (ibid).

In terms of private sector spending on agriculture R&D, Myanmar also lags behind. Myanmar is one of three Southeast Asian countries where plant variety rights are still not in place (Raitzer et al. 2010), which serves as a disincentive to private research investment. A study conducted in 2007 found that there was only one private company, which focuses on agrochemicals, conducting research and development in Myanmar, though some private firms were paying the government to conduct their research (Stads and Kam 2007).

The lack of investment could also be attributable to the crop preferences in Myanmar. Hybrid rice, which is popular in China, is not yet widely grown in Myanmar. Farmers instead prefer to grow improved open pollinated varieties that do not require annual replenishing of seed and have higher quality grain. Other frequently grown crops are self-pollinated, making them less appealing targets for private sector investment. In addition, research and extension for vegetatively propagated crops and fruit trees are unlikely to attract private investment and livestock and fisheries, two farm products with a great need for collective organization due to health and natural resources concerns, require public investment to raise productivity levels and to prevent disease (Haggblade et al. 2013).

Extension

Agricultural extension is an important to improve farmers' decision making and help them take advantage of more efficient technologies and farming practices. Extension services are typically delivered through a government entity or an NGO, but increasingly more extension services are offered by agro-dealers or companies engaging in contract farming. Government and NGOs offer extension services in order to increase yields and ostensibly reduce poverty and increase food security. Contract farming schemes offer extension services to improve yields and quality while agro-dealers offer them to make sure their products are used effectively and to build a relationship with farmers.

Myanmar has provided public agricultural extension since 1927. The Department of Agriculture (DoA), based under MoAI, is in charge of extension provision. The DoA is comprised of 8 divisions, with the Agricultural

Extension Division (AED) tasked with the bulk of extension delivery (Cho 2013). The AED provides several types of extension services, ranging from education camps, farmer's groups, a training and visit system, and farmer field schools. Like many developing countries, Myanmar was introduced to the Training and Visit (T&V) model of extension in the 70's through a World Bank funded project. Due to the enormous cost of this style of extension delivery, the DoA was not able to fully continue the T&V system. The national staff developed a new strategy modeled on the T&V system, called the Selected Concentrative Strategy, which still continues today (Cho 2013).

Under the current strategy there seems to be a disconnection between extension agents and the research (Haggblade et al. 2013). Extension agents rarely visit the research facilities and researchers seldom make it to the field offices and sites (Cho 2013). Extension agents are trained at the Central Agricultural Research and Training Center (CARTC), though it is unclear how much of what is learned is tied to research outside of what is produced at the CARTC. In addition to the limited exchange of information, it has been argued that tendencies to instruct rather than listen to farmers have become embedded over two generations of command and control management of Myanmar's agricultural sector (Haggblade et al. 2013). Another challenge in the policy reform process is how to re-orient the extension staff to provide balanced coverage of all important crops, not just rice, and provide market information services (FAO 2013). BASIX in India is a good example where extension services are adapted to the agro-climatic zones and are tied to inputs and credit. The extension agents played more of the role of a facilitator, working with the farmers' needs (Mahajan and Vasumathi 2010).

As mentioned above, there is also a problem with funding to visit farmers. In developing countries, where the vast majority of extension workers can be found, the ratio of farmers per extension agent is quite high, due to the large percentage of the population working in farming. Extension is a prime area to take advantage of recent advances in ICT to reduce the costs of travel and information exchange. ICT can be used for communicating crop information and exchanging crop and other data, which can maintain the quality of data while helping to reduce costs. The GoM should consider commissioning research into the role ICT can play in expanding extension access and reducing the cost per farmer reached.

Agricultural Education

Myanmar currently has three different universities that cover various aspects of agriculture and livestock production: Yezin Agricultural University (YAU) falls under the purview of MoAI, the University of Veterinary Sciences under the oversight of The Ministry of Livestock and Fisheries (MoLF) and the University of Forestry, overseen by the Ministry of Environmental Conservation. The MoAI also runs seven State Agricultural Institutes (SAIs) that provide post-secondary diploma level training.

YAU was originally located in Mandalay in 1925 and was placed under the oversight of the Ministry of Education. In 1973, YAU moved to its current location and management was transferred to MoAI in 1993. The University mainly covers crop sciences along with some fishery and animal sciences. It maintains seven regional campuses that function as research bases for the final year students. The institution is quite small, with a total enrollment of 1,930 students in the 2011-2012 academic year (Cho 2013). All five degree programs offered are taught in English and the institution grants degrees and certificates, as of 2001, all the way up to the PhD level. Prior to 2001, scientists had to travel abroad to obtain a PhD (Stads and Kam 2007). Extension education is currently not a department at the YAU, though the Department of Agronomy does offer a few courses and does conduct some research on the subject (Cho 2013).

YAU has a well-qualified staff. Approximately 42% of the teaching staff received their postgraduate degrees from abroad and some others have received specialized training overseas (Cho 2013). The University also maintains collaborations with the Korean International Cooperation Agency (KOICA), India Agricultural Research Institute (IARI) and Japan International Cooperation Agency (JICA) (Cho 2013).

The SAIs were started in 1955 and offer a 3-year post-secondary diploma in Agriculture. Graduates tend to work for the MoAI, predominantly as extension agents, or for the agribusiness industry (Haggblade et al. 2013, Cho 2013). Like YAU, few students have the opportunity to study in an SAI; approximately 200 are admitted per institute per year with a total annual admittance of 1,500 students (Cho 2013).

All seven YAU campuses and all seven SAIs are in low-land areas, covering two agro-ecological zones (Cho 2013). Given their locations, one can assume most of the practical research activities and trainings focuses on wetland and dry-zone crops. Hence the agricultural institutions do not give much attention to the differences in agro-ecological or socio-economic conditions in the planning process of their extension programs (UNDP 2008).

The University of Veterinary Science (UVS), also in Yezin, possesses well qualified academic staff for teaching and researching in terms of veterinary science. Marine science subjects are available at Maw La Myaing University (Mon State) and Pathein University (Ayeyarwady Region).

Research

Like agricultural education, agricultural research is split between three ministries: MoAI, MoLF, and MOCEAF. The largest provider of agriculture research for the GoM is the Department of Agricultural Research (DAR) in the Ministry of Agriculture and Irrigation, accounting for 40 percent of the total research staff and 30 percent of Myanmar's research expenditures (Stads and Kam 2007). The department was started in 1954 in Yangon but became a separate department under MoAI in 2004 and is currently located in Yezin.

There are six divisions within the DAR, which also oversees 7 major research centers and 17 satellite farms, focusing on staple crops, pulses, oilseeds, as well as horticulture crops (Stads and Kam 2007, FAO 2013). The Department works collaboratively with YAU, as well as international research institutes. The general mandate of the DAR is to conduct research that improves crop management, increases yields, protects against pests and weather, and develops suitable cropping systems (Cho 2013). Nearly two-thirds of researchers in 2003 focused on crop research and 25 percent of all crop research was focused on rice (Stads and Kam 2007). Out of 211 varieties released by MoAI in 2012, 99 are rice crop varieties (Cho 2013).

There are three specialized units in the Department of Industrial Crops Development (DICD), under MoAI, that conduct varietal and agronomic research focusing on industrial crops such as cotton, sugarcane, rubber and jute (Haggblade et al. 2013). In addition, there is a separate research department for vegetables and fruit called the Vegetables and Fruit Research Development Center, also under the MoAI.

Lastly, headquartered in Yangon, The Livestock and Veterinary Department under the MoLFRD focuses on biological production, veterinary medicine, artificial insemination, reproductive disorders, produces animal vaccines and provides extension services (Stads and Kam 2007). The department oversees four laboratories concentrated in the dry zone and the delta areas. Also conducting research under MoLFRD are the Department of Fisheries R&D unit and the Agriculture Research and Development Unit (Stads and Kam 2007).

Conclusion

Myanmar's research and extension system is severely underfunded and needs to do a better job of connecting research to meet the needs of all farmers. Extension provision remains top-down rather than tailored to farmers' realities while research is concentrated in certain agro-ecological zones and is heavily rice focused. To resolve these shortcomings, major investments and a realignment of priorities are needed across the research and extension system. The GoM may also consider creating an enabling environment for private sector research and development. Lastly, research into understanding the potential role of the private sector in extension service provision should be considered.

Section 6. Seed policy [15]

The shortage of good quality seed is frequently identified as a major constraint to increasing crop production in Myanmar. When combined with other modern inputs, improved cultivars can enhance crop yields and drive agricultural productivity growth (Evenson and Gollin 2003; Rosegrant and Hazell 2000; Rosegrant and Evenson 1992). The resulting productivity growth from these investments has contributed to broader agricultural development and poverty reduction efforts among both small-scale, resource-poor farmers and food-insecure consumers (Adato and Meinzen-Dick 2007; Hazell and Haddad 2001; Fan 2000; Fan et al. 2000). The proliferation of improved cultivars therefore has the potential to contribute to Myanmar's goals of reduced poverty and agricultural growth as outlined in the FESR.

Advancing seed policy is one such means of increasing the availability of improved genetic material to farmers. Currently, the vast majority of improved rice seed, the predominate crop, is sourced from government programs. It has been estimated that the current supply of improved rice seed is only around 10% of the annual national requirement with the remaining 90% sourced from farmer saved seeds from the previous seasons' harvest (Min Aung and Goletti 2013).

Public investments in cultivar improvement have also yielded high rates of return (Renkow and Byerlee 2010; Raitzer and Kelley 2008; Alston et al. 2000). However, private investment now plays a very large role in global seed technology development (Fuglie et al. 2011) and creating an enabling seed policy which generates space for private seed research and sales has been shown to improve agricultural productivity (Kolady, Spielman and Cavalieri 2012). Given Myanmar's recent woes with staffing and funding a productive research and extension system (Section 5), greater involvement of the private sector in seed development may help improve the availability of improved cultivars to farmers. Nevertheless, transitioning from government-led to private sector-led seed production systems is not easy (Tripp and Louwarrs 1997). In this section, we briefly assess Myanmar's seed sector and evaluate the measures the country has undertaken to encourage seed market development.

Sources of Seed

Prior to 1977, Myanmar farmers primarily grew indigenous crop varieties with seeds that were locally available through exchange; small amounts of improved seed were produced by research farms under the Applied Research Division and distributed to contract farmers through extension staff. Agriculture grew at a modest rate of 1.6 percent per annum during the 1960s and early 1970s, but was below the population growth rate of 2.2 percent, which resulted in decreased rice surpluses (FAO 1986).

In an effort to boost yields the Government launched the Whole Township Paddy Production Program in 1977-78 which promoted HYVs adapted from the International Rice Research Institute (IRRI-8 and IRRI-5), proper tillage, chemical fertilizers, pesticides and modern cultivation practices covering a total of 2.5 million ha. As a result, paddy area covered by HYV increased from 4 percent in 1970-71 to nearly 50 percent ten years later, resulting in a near doubling of production during this time, based on CSO data. The breadth of the program increased demand for a steady supply of quality seeds, intensifying the need for research. In 1992 the Ministry of Agriculture and Irrigation launched a second program to increase summer paddy production built on short duration, high-yielding varieties of paddy and expanded access to irrigation. Within five years an additional 1 million ha were planted with summer paddy (Table 5).

[15] This section is largely based research done by Tin Htut Oo and Tin Maung Shwe through the ReSAKSS-Asia program.

Table 4—High Yielding Varieties (HYV) in Total paddy Sown Area and Production Trend

Year	Sown Area (Ha, millions)		HYV Area (%)	Production (MT, millions)
	Total	HYV		
1970-1971	4.98	0.18	4	8.2
1980-1981	5.13	2.32	45	13.3
1985-1986	4.90	2.39	49	14.3
1992-1993	5.13	2.68	52	14.8
1995-1996	6.14	3.20	54	18.6
2000-2001	6.36	3.45	54	21.3
2005-2006	7.39	3.40	46	27.6
2010-2011	8.05	3.66	45	32.6

Source: DoA, MOAI

Table 5—Summer Paddy area and total production

Year	Rice Sown (mil ha)			Production (mil mt)	Yield (t/ha)
	Monsoon Paddy	Summer paddy	Total		
1988-1989	4.78	-	4.78	13.16	2.75
1994-1995	4.85	1.08	5.93	18.19	3.07
2000-2001	5.26	1.1	6.36	21.32	3.35
2005-2006	6.24	1.05	7.29	27.68	3.80
2010-2011	6.79	1.31	8.04	32.58	4.05

Source: Department of Agriculture Data, 2012

Seed sector reform in 2002 created a system of contract farmers and public-private partnerships called Rice Specialized Companies (RSCs), which decreased the volume of seed distributed by the public sector. In this system, registered seed produced by DoA research farms are transferred through extension agents to 4,900 RSCs in 530 villages for certified seed production, aided by the Agriculture Extension Division (AED).[16] In 2011-12, DoA produced 2400 MT of registered rice seeds from their 32 seed farms, which was grown into 15,000 MT of certified seed by the RSCs.[17] RSCs are then able to sell to local farmers or to contract farmers that produce grain. However, it has been estimated that 200,000 MT of certified seed are needed to cover 6 million ha of high potential land, which is about 70 percent of the total rice growing area. Based on this data, the current certified seed distribution system covers less than 10 percent of the estimated requirement (Aung and Goleti, 2012). Although the government has recently tried to promote the development of private seed companies by providing tax exemptions for the import of agricultural inputs, including seed, there are still few other private sector rice seed companies that produce in sufficient volumes to fill this gap; those that exist also generally rely on registered seeds from the DAR for their genetic material.

There are other nascent private sector seed companies that are emerging around vegetable seeds and hybrid maize, although the extent to which they operate in the formal sector is not well documented. A subsidiary of the Thailand-based CP Company has emerged as a key player in the hybrid maize market. Hybrid rice may also be a potential market relying on imports from China, though anecdotal evidence suggests that farmers' uptake of

[16] Department of Agriculture
[17] Seed Division, Department of Agriculture

hybrid rice has been weak (Tin Htut Oo and Tin Maung Shwe, 2014). There is still a lot of room for growth in the private seed industry, and recent laws encouraging foreign direct investment may soon help SME's develop (Byerlee et. al. 2014).

Creating room for private sector participation in the seed sector

The 2011 Seed Law stipulates the rules governing seed breeding, registration, production, and quality control. Although the Law has been enacted, the rules and regulations governing its implementation are still pending approval, despite the expiration of the two year grace period since the Law's enactment. However, the August 2013 draft of these rules and regulations signals a strong shift from government provision of seed to a regulatory system that encourages private sector provision of seeds with rules governing quality standards.

The new law also re-affirms the role of the National Seed Committee (NSC), which was established in 2004 to set the overall direction of the national seed sector, and the Technical Seed Committee, which assures the bio-safety and the quality of seeds. The NSC is chaired by the Deputy Minister of Agriculture and Irrigation (MOAI) and is generally comprised of representatives from relevant government departments, experts, and representatives from organizations; though no specific guidelines are provided on the committee's composition. In addition to setting quality standards, the NSC also administers registration certificates.

The Seed Law is not the only recent piece of legislation developed by the Government of Myanmar to create an enabling environment for private sector participation in the national seed system (Table 6). The protection of new plant varieties as a form of intellectual property is an important stimulus to private investment in plant breeding and is required to convince multinational seed companies to introduce their varieties to the market (Naseem, Spielman, and Omamo 2010; Lele, Lesser, and Horstkotte-Wesseler 2000). Intellectual property rights reform in India encouraged greater private investment in hybrid maize and millet seed development, leading to sharp increases in yield (Kolady, Spielman and Cavalieri 2012).

In Myanmar, the Plant Varietal Protection Law has only recently been drafted in accordance with obligations under the Trade Related Aspects of Intellectual Property Rights (TRIPs) Agreement and is under the process of national approval. In addition, the Government of Myanmar has been party to the Convention on Biological Diversity since 1994 and became a member of the WTO in 1995. The country is still not a member of the International Union for the Protection of New Varieties of Plants (UPOV) which provides and promotes plant variety protection with the aim of encouraging the development of new varieties of plants. However, since 2004, Myanmar has participated in the UPOV-INGER[18] workshops and continues to cooperate and seek advice on the development of national seed regulations.

Table 6—Legislations related to development of Seed Industry

Title of Law	Scope of Law	Responsible Agency	Status
Plant Pest Quarantine Law	Prevent pests from entering the country	DOA, MOAI	Enacted in 1993
The Seed Law	To produce crop with quality seed and to carry out seed business systematically	DOA, MOAI	Enacted in 2011
Farm Land Law	Liberalization of land usage rights	SLRD, MOAI	Enacted in 2012
Import- Export Law	Tariff free imports on seed and agricultural chemicals and machinery	Ministry of Commerce	Enacted in 2012
Law on Bio Safety	To manage safety of seeds and plant parts	MOAI	Drafted
Plant Varietal Protection Law	To protect breeder's rights	DAR, MOAI	Drafted

Source: Department of Agriculture (DOA)

[18] International Network for the Genetic Improvement of Rice

Two additional recent laws also encourage greater private sector participation in the seed sector. The new Farmland Law (2012) removes restrictions on farm land use, especially the requirement to sell crops to the state, giving more legal freedom to farmers to engage in the seed market, such as through contract farming for quality seed production. In addition, the recently enacted Import – Export Law removes tariffs on most agricultural goods, encouraging seed imports from neighboring countries. Myanmar annually imports about 500 tons of hybrid rice seeds (mainly from China), about 10,000 tons of hybrid maize seeds (mainly from Thailand), and an unknown volume of hybrid vegetable seeds, also from China, Thailand, Japan and Korea Republic (FAO, 2013).

Key Players

The Department of Agriculture was responsible for multiplication, procurement, storage, and distribution of certified seed until 2000. In 2000, the Department of Agricultural Research (DAR) under the MOAI took over the responsibilities for testing new varieties in their 24 research stations in order to confirm their potential yield, quality, genetic stability, local adaptability, and pest and disease resistance (DUS testing) prior to registration and approval by the National Seed Committee. The DAR is also responsible for the production of breeder and foundation seed, which is used by the Seed Division of the DoA to produce both foundation and registered seed that is further multiplied for broader distribution as certified seed.[19] The Seed Division of DoA is also responsible for seed certification although there are still no specific procedures established under the Seed Law to govern testing and some suggest that public laboratories are outdated and the capacity of research staff weak (Min Aung and Goletti 2013). The new Seed Law has a provision for the development of private seed testing laboratories, though its guidelines remain unclear.

Summary of Challenges

Myanmar is undergoing a shift from a controlled to a market-oriented economy. The seed sector has undergone some reforms, but many of these have not gone far enough to create an environment that is conducive to private sector involvement and investment. In addition, implementation of regulations stipulated in the Seed Law has been slow two years after its enactment and many companies still remain unaware of the rules and regulations. However, as the country continues to liberalize there are still important roles that the public sector can play to improve agriculture and to support a private sector led seed system.

At present, almost all seed production and distribution is handled by DAR and DoA, with a limited amount of private sector involvement. However, the official seed system struggles to produce seeds in sufficient quality and quantity and many in rural areas are underserved. The extension service, responsible for seed distribution, lacks the capacity to reach all farmers. This is exacerbated by poor infrastructure making transportation costly. The public sector has been successful in generating new varieties in part because of collaboration with international partners and must maintain this important role as research is the foundation for a strong seed sector.

The public sector must also establish a seed certification system and valid quality control mechanisms. There currently are not sufficient processing facilities to clean seeds, thus rendering policies that mandate high quality seeds futile. The few processing plants that do exist, established with assistance projects in 1980s, are functioning poorly due to a lack of maintenance and operational funds. Control should be given to the private sector so that they can invest and renovate these facilities. Meanwhile, government investment should focus on quality control by upgrading seed testing facilities to enable them to enforce the standards set out in the Seed Law.

The shortage of good quality seed is frequently identified as a major constraint to increasing crop production in Myanmar. A more harmonized public and private partnership is required that is capable of cost-

[19] There are four levels of seed production and certification in Myanmar. Breeder seed produced by the DAR is multiplied to become foundation seed and distributed for larger scale production once registered. This registered seed is then multiplied to become certified seed which in theory has a guaranteed quality and is 'certified', this case by the government, to be pure for three years for use by farmers.

effectively generating and delivering improved seed varieties to farmers. Such a system would be an important step toward ensuring a successful seed industry.

Section 7. Fertilizer Policy[20]

The Framework for Economic and Social Reform (2012) identifies increasing fertilizer usage as a key strategy to boost agricultural production, while acknowledging that the country's current utilization is very low compared to other Southeast Asian nations. Experiences from the region have shown that modern agricultural technologies such as fertilizer usage coupled with price support policies and key investments in seed technology, irrigation, roads and extension were essential to boosting productivity during the Green Revolution (Hazell 2009). This section focuses on assessing the current usage of fertilizer, understanding the policies that affect its supply and demand, and the challenges of increasing fertilizer usage.

Fertilizer usage and data quality issues

Understanding the extent to which Myanmar farmers are using fertilizers is challenging. Concerns about national data quality have been expressed elsewhere (Haggblade et al 2013) while nationally representative household survey data is limited. Aggregate fertilizer statistics from international sources indicate that Myanmar farmers apply an average of only 6.5 kg/ ha of inorganic fertilizers compared to rates above 100kg/ha for most other countries in the region and that fertilizer usage in Myanmar may be decreasing (Table 7). However, the limited survey data available indicates that in actuality fertilizer usage may be more widespread than the aggregate statistics suggest, at least in some regions of the country. A recent LIFT survey (2012) covering 4000 households in the Rakhine, dry, hilly and coastal/delta regions[21] found that on average 52% of farmers applied fertilizer to paddy in 2010 and that this percentage is considerably higher for cash crops such as sesame (78%), chilies (76.3%) and pulses (56%). Other survey data sources also suggest that national aggregates may mask pockets of higher fertilizer usage. Indeed, survey data of 600 farmers in 2013 in and around Naypyidaw suggests that farmers apply fertilizer at a rate of nearly 100kg/ha (cited by Hnin et al., 2014). Other recent papers, which included field visits and farmer interviews[22], suggest that fertilizer usage may actually be between 60 to 100 kg/ha (Denning et al. 2013).

Table 7—Fertilizer and Rice Yields in SE Asia

Country	Fertilizer consumption (kg/ha)		Paddy Yields (t/ha)	
	Average 2008-10	Average annual Change (%) 2002-10	Average 2008-10	Average Annual Change (%) 2000-10
Bangladesh	181.8	0.28	4.24	2.62
Cambodia	9.4	10.76	2.85	4.37
China	553.8	6.89	6.57	0.69
India	166.5	7.56	3.28	1.65
Indonesia	182.5	5.78	4.97	1.41
Malaysia	967.8	6.02	3.65	1.83
Myanmar	**6.4**	**-2.32**	**4.05**	**2.12**
Nepal	14.1	1.30	2.80	0.20
Philippines	126.4	-2.92	3.66	1.85
Thailand	138.2	1.71	2.93	0.82
Vietnam	339.7	0.32	5.27	2.30

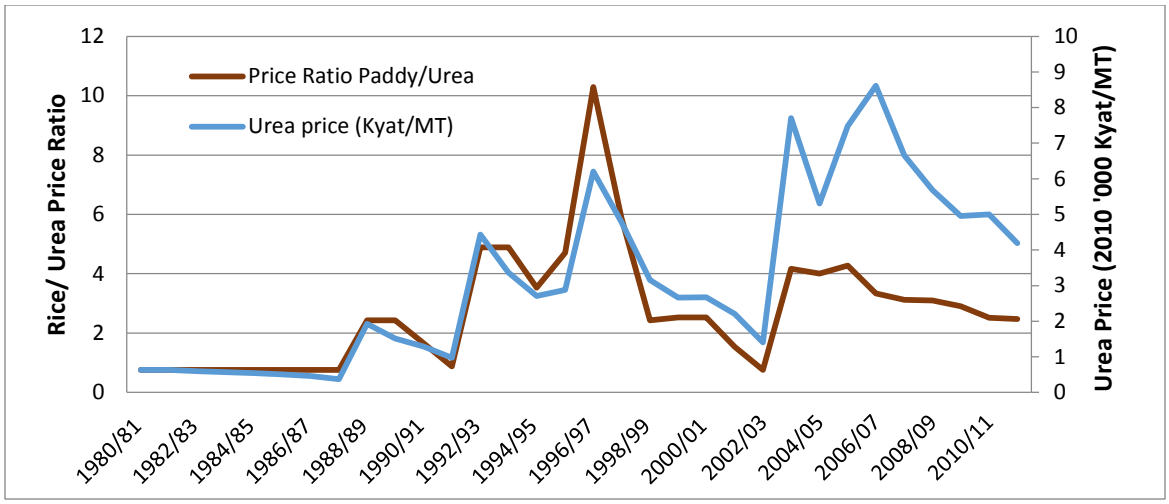
[20] This section is incorporates earlier research done by Hnin Lu Lwin through the ReSAKSS-Asia program.
[21] This included the states of Kachin, Chin, Sagaing, Magway, Mandalay, Rakhine, Shan, and Ayeyarwaddy
[22] Field visits included the following regions:, Ayeyarwady, Bago, Magway, Mandalay, Sagaing, Shan and Yangon

Source: Fertilizer consumption, WDI; Rice Yields, FAOSTAT
Notes: Average annual change is calculated based on an exponential growth rate

According to national statistics, paddy yields appear to be quite high (4.1 tons/hectare) and have been increasing in the last decade at approximately 2 percent per year. It would seem unlikely that fertilizer usage would be so low, yet paddy yields would be comparable to neighboring countries where fertilizer application is considerably higher such as Thailand and Bangladesh. US Department of Agriculture figures suggest that yields are far less than 4t/ha and that national production may be as much as 50% less than is reported (USDA, 2014). Other recent field assessments suggest that the actual average yield may be in the range of 2.5-2.7t/ha. (Denning et al., 2013).

It is plausible that fertilizer consumption is decreasing given Myanmar's transition from a state controlled agriculture sector to a free(r) market in which fertilizer prices are less controlled and state production and subsidized distribution of fertilizer has been drastically reduced. Looking at real urea price data starting from 1980, when government programs initiated subsidized fertilizer and high-yield variety distribution, we can see the variability in prices during the transition period from 1988 through 2002[23] and the subsequent jump in prices in 2002 when subsidies were fully phased out (Green line, Figure 5).

Figure 5—Urea Prices 1980/81 - 2010/11



Source: CSO data

Since 2002 the price of urea has essentially quadrupled with several peaks far higher. However, the gradual liberalization of the rice sector through the removal of government rice quotas, the reduction of rice price controls, and the partial liberalization of exports[24] has allowed for an increase in rice prices. Plotting the rice/ urea price ratio shows that while fertilizer prices have increased substantially, the relative price of fertilizer to paddy has only doubled (Figure 5). Survey data confirms that price is still an important issue with 42% of respondents in the 2010 LIFT survey identifying [high] fertilizer prices as a key barrier to improving production. More accurate price information at different markets throughout the country would be useful for understanding where and why prices are so high.

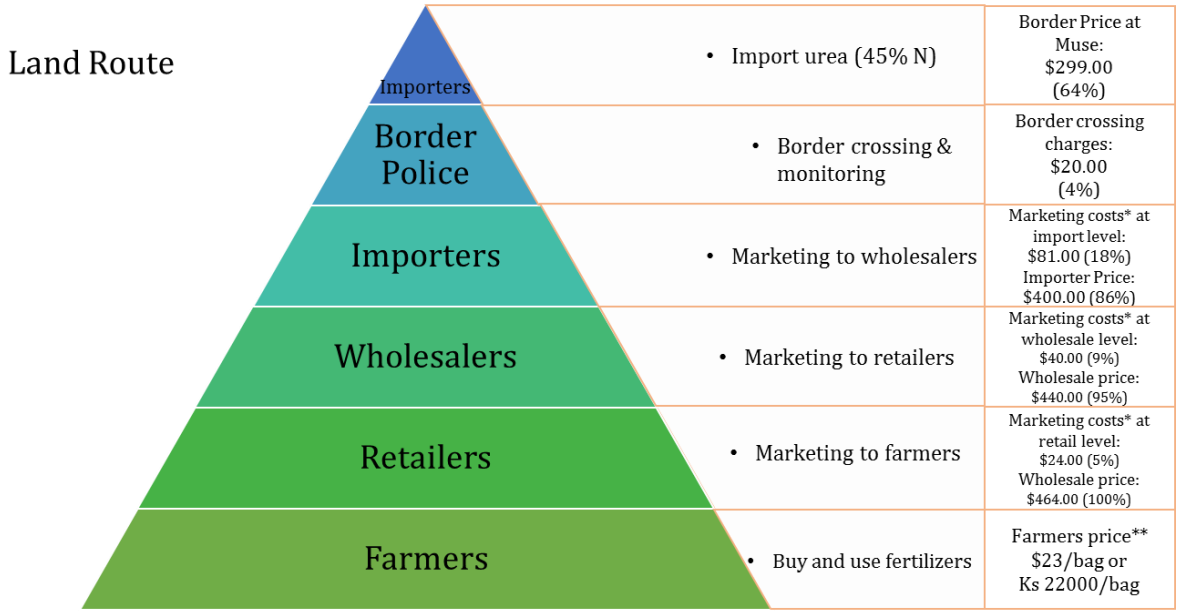
[23] For example, programs such as the Special High Yield Program which kept prices low until 1986 lost its funding only to be replaced by the Summer Paddy Program in 1991 which again subsidized prices.
[24] Rice prices are still occasionally protected through a reduction of rice export licenses which in effect bans exports.

Fertilizer availability and production

Fertilizer imports come over land from China, generally urea, and via the seaport located near Yangon (Fig 2, 3). These two routes have substantially different cost components and, respective quality issues (JICA 2013; Nay Myo Aung 2012). Although the price of Chinese fertilizers is nearly one third cheaper than those imported through Yangon, there have been complaints that they are of lower quality, fake, and unregistered. Still, farmers continue to prefer urea from China, even with an uncertain nutrient content, because of its fertilizer grain uniformity, hardness, and good appearance (Hnin et al. 2014).

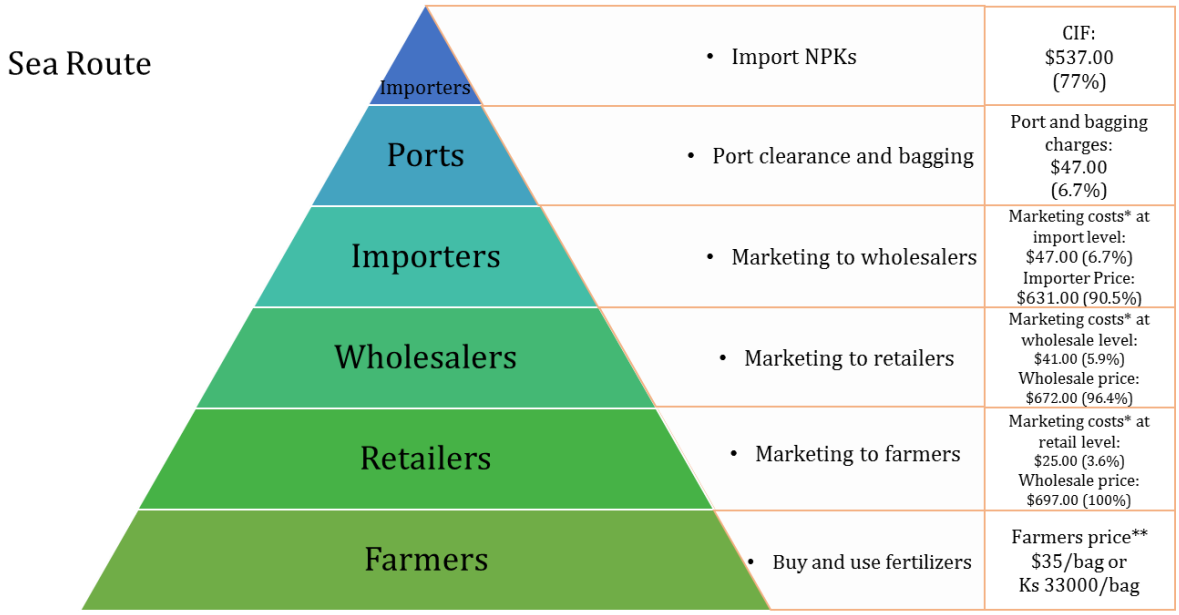
Domestic production of fertilizers, mainly urea, is currently limited to three of the five state-owned fertilizer factories, all under the direction of the Ministry of Energy. There are various reports that domestic urea production fluctuates in accordance to the availability of natural gas, which is used for both domestic use and exported to generate foreign exchange. However, EIA data shows that only about 27% of production of natural gas is used for domestic consumption with only a small portion used for fertilizer production. Myanmar has abundant natural gas reserves, around 10 trillion cubic feet (EIA 2014), and has the potential to increase the supply to meet energy demands, including those of the fertilizer industry should this be a government priority. Foreign direct investment to expand domestic fertilizer production has been limited thus far given that the majority of company ownership in joint ventures must be Myanmar citizens under the Foreign Investment Law of 2012 (Byerlee et. al 2014). Likewise, the quality issues that seem to plague imports from China appear to also apply to the domestic fertilizer production according to a recent JICA report (2013). This research suggests that the concentration of nutrients in some domestically produced fertilizer is considerably lower than international standards.

Figure 6—Supply Chain: Fertilizer Imports via Land Route --Urea from China



FOB Price: Singapore $490; insurance and freight: $47
( ) = % share in retail price
*Includes margins; numbers may not add due to rounding
** 20 bag/MT
Exchange rate: Ks 950/USD

Figure 7—Supply Chain: Fertilizer Imports via Sea Route



FOB Price: Singapore $490; insurance and freight: $47
( ) = % share in retail price
*Includes margins; numbers may not add due to rounding
** 20 bag/MT
Exchange rate: Ks 950/USD

Currently policy environment

The Fertilizer Law was enacted in 2002 and followed by the subsequent Rules and Regulations in 2007 in order to manage fertilizer utilization, production, and distribution. The law provides a framework to guide inspections and identifies the Myanma Agricultural Service (MAS) under the Ministry of Agriculture and Irrigation as the principle institution to regulate the sector through the provision of licenses and quality monitoring. The Land Use Division of the MAS is responsible for fertilizer research, providing recommendations to farmers and quality testing. This division is also responsible for operating laboratory facilities at 14 border check points recently proposed to ensure the quality of fertilizer imports.

The Law likewise creates the Fertilizer Committee, which is responsible for developing relevant policy, stipulating fertilizer specifications, developing standards for and issuing registration certificates, undertaking research and extension and coordinating between government departments, NGOs, and international organizations. The Committee is chaired by the Deputy Minister of the MOAI and the Managing Director of the Myanma Agricultural Service as well as other relevant government participants. Should a person wish to produce, import or export fertilizer, they must obtain a registration certificate from the Fertilizer Committee. Supporting the Fertilizer Committee is the Fertilizer Technical Body, which consists of technical experts and other relevant bodies. If a company wishes to compound, mix, repackage or store fertilizer for commercial purposes they must apply to the Myanma Agricultural Service to obtain a license.

The 2002 Fertilizer Law creates more space for the private sector to produce and trade fertilizer and provides the regulatory framework under which they operate. Over time, the provision of fertilizer by the government has decreased such that since 2006-07, the private sector has supplied over 90% of the market (Hnin et al, 2014). More recently, through the 2012 Import and Export Law, the GoM has also begun to encourage the importation of fertilizers by eliminating import tariffs. There are a large number of companies that import fertilizers, although the two largest firms have a combined market share of 50 to 60 percent (EAT 2014).

A recent evaluation of the agricultural sector suggests that while the progression of the policy and the rules and regulations has been positive, there are still several issues which must be addressed (JICA, 2013). First, they found that while the appropriate bodies had been identified, a proper organizational structure to perform quality monitoring has not been developed and that properly trained staff have not yet been fully deployed at the border areas. As a result, most imports and production are relatively unmonitored and poor quality fertilizers are common throughout the market. Second, while the rules and regulations specify the primary ingredients of fertilizers, they do not provide guidelines regarding appropriate the ratios. Further work is needed to clarify these rules to bring them in line with international standards. Currently, MOAI is revising the former 2007 rules and regulations. Lastly, while the fees for registering companies are quite low (90,000 Kyat for a 3 year registration period), the Fertilizer Committee is said to meet only once or twice per year and even then, only in Yangon (Hnin et al, 2014). Obtaining or renewing licenses can therefore be a slow and arduous process which may encourage informal trade.

Critical Issues

Historically, increased private sector involvement in the fertilizer sector has been shown to lead to reductions in transaction costs in other Asian countries (Rashid et al, 2013). Further investment by the private sector in Myanmar will also likely increase efficiency in the sector.

Greater dialogue between the public and private sectors is needed to continue to push through reforms and ensure a favorable environment for investment. This dialogue should focus on:

- Improving the Fertilizer Rules and Regulations to specify more precisely fertilizer standards and improving the efficiency of registration and trade procedures in order to reduce informal trade and low quality fertilizers.
- Finding the resources to improve the capacity and frequency of quality monitoring to encourage compliance with fertilizer standards and ultimately benefit poor consumers.
- Promoting supply chain efficiency through investments in transportation, infrastructure, and ports to reduce fertilizers costs.
- Providing access to credit given that farmers frequently site the costs of fertilizer as one of the primary constraints to improving production.
- Reducing government participation in the fertilizer sector by selling off state-owned fertilizer plants and ensuring that gas produced domestically is available for the fertilizer industry.

Section 8. Agricultural Mechanization

The Government of Myanmar considers mechanized farming as one of key pathways to transform agriculture, as stated by President U Thein Sein (*New Lights of Myanmar 2013*). This need is based on the premise that mechanization, along with other improved inputs, will lead to greater agricultural productivity and that increased mechanization will address labor shortages during the busiest periods of the farming calendar. That mechanization can improve productivity is not disputed (Pingali 2007; Pingali, Bigot, and Binswanger 1987), but government provision of mechanized tools and equipment has had mixed results (Diao et al. 2014; Biggs and Justice, 2014).

The need to mechanize agriculture generally arises when there is a power-bottleneck, whereby human or draught labor is no longer sufficient or economically justified and mechanized agriculture becomes profitable. Experiences from neighboring South East Asian countries has shown that it is generally small-scale equipment that is first adopted. With very few exceptions, the intensification of agriculture through mechanization has not been driven by the usage of large tractors or expansive irrigation schemes. This can be instructive for the government of

Myanmar that has ambitious goals for the mechanization of agriculture and a history of providing equipment to farmers and operating mechanization service centers.

State support of mechanization

Throughout the Socialist period, the provision of both mechanized equipment and services for agriculture occurred through the Agricultural Mechanization Department (AMD) under the Ministry of Agriculture and Irrigation. This body performs research and development of farm machinery, the production of small farm equipment, and extension to increase farmers' usage and knowledge of mechanization equipment. AMD has three factories which have produced farm machinery since 1993 and operates five centers to provide repair services. An additional 99 tractor stations around the country are operated by AMD which provides tractor hire services to farmers. (Hla Wai, 2012).

Two additional Ministries are involved with the provision of mechanized services. The Ministry of Industry manufactures tractors, threshers, power tillers and other equipment and annually produces approximately 300 tractors and 1000 power tillers. The Ministry of Cooperatives also manufactures farm equipment such as threshers, seeders, water pumps and oil extraction equipment expressly for cooperatives. However, production by both of these ministries is quite low compared to AMD, which annually produces approximately 4000 power tillers (Hla Wai, 2012). Whereas the previous socialist system relied on equipment that was manufactured domestically, it is unclear if all three Ministries still proceed with using Myanmar designs. Imports from China are steadily increasing and domestic production may constitute assembly of Chinese products rather than a fully home-grown industry.

Experience from other countries has shown that government provision of mechanization equipment and services has generally been inefficiently utilized, plagued by poor debt repayment, and has not necessarily matched the needs of farmers (Benin, 2014). Similar concerns have also been raised about AMD in Myanmar, suggesting that large power equipment does not match the needs of smallholders who cultivate between 2 to 3 ha, depending on the region (UNESCAP 2010, JICA 2013). Large land holders who generally have assets and access to credit to purchase their own equipment are best equipped to take advantage of mechanization services provided by the government. Although the new Farm Land Law (2012) has made it easier for farmer's to transfer land potentially creating larger farms in the future, the process of land consolidation has only just begun.

Myanmar can learn from Bangladesh where, up until 1988, the import and distribution of agricultural machinery were restricted to government parastatals managed by the Ministry of Agriculture while most tillage was done through draught animal power. However, when a storm devastated the livestock population, the government quickly removed restrictions on imports, thus opening the market to the import of small Chinese power tillers. At the time of the disaster there were only approximately 5,000 power tillers in the country, but in the 15 years that followed the number grew to 300,000. At present nearly 80 percent of tillage operations are mechanized (Roy and Singh 2008).

Agricultural equipment through the private sector

Myanmar appears to be going through a similar transformation to that seen in Bangladesh. Following economic liberalization in 1989, the private sector has played an increasingly significant role in agricultural mechanization (Kan Zaw et. al. 2011). Recent analysis shows that mechanized land preparation covers only 24.8% of gross sown areas, although nearly all of this (97%) is through privately held machinery while services provided by the state make up the remaining (3%). Additionally, government statistics suggest that imports of power tillers far outnumber those produced by state enterprises (Hla Wai, 2012). This shift from state to private sector provided equipment has been buoyed further by the recent Import and Export Law (2012), which exempts agricultural machinery from customs duties. Given that private sector involvement in mechanization is primarily limited to importing and distributing equipment from abroad, this policy has the potential to expand the adoption of mechanization equipment at lower costs and ensure that equipment matches domestic demand. However, the

extent to which the customs exemption covers post-farmgate processing equipment (mills, refrigeration, etc) is not clear. This is important given that recent studies have shown the poor status of the country's rice milling facilities, which lose between 15-20 percent of the value of unmilled paddy through poor quality processing and quantity losses (World Bank & LIFT 2013).

The usage of tractors and power tillers is largely concentrated in the lowland rice areas as is irrigation equipment such as hand and motorized water pumps (Table 8). Mechanization appears to be replacing draught animal power at a faster rate than in other areas.

Table 8—Distribution of Agricultural Equipment by Agricultural Zone.

	Generators	Diesel / Petrol Engines	Water Pumps	Hand Water Pumps	Ground Nut de-hullers
Lowland rice	51.2	47.4	59.1	65.2	10.5
Central Uplands Intensive	16.8	20.5	15.9	18.4	34.6
Northern Uplands Intensive	22.5	22.8	19.2	14.2	33.7
Southern Uplands Intensive	2.9	2.8	4.3	1.1	0.0
Highland Extensive	6.7	6.5	1.5	1.0	21.2
National (Total)	**150,677**	**409,123**	**246,230**	**476,383**	**10,488**

	Draught Animals	Tractors	Power Tillers	Harvesters	Rice Mills	Cooking Oil Mills
Lowland rice	39.7	56.1	48.0	82.8	30.3	19.1
Central Uplands Intensive	25.7	13.6	7.8	0.0	13.4	19.0
Northern Uplands Intensive	24.9	12.2	20.2	6.6	36.7	41.4
Southern Uplands Intensive	1.8	7.2	4.4	4.1	6.0	2.7
Highland Extensive	8.0	10.9	19.6	6.5	13.7	17.8
National (Total)	**4,810,873**	**87,793**	**210,396**	**7,909**	**82,238**	**12,037**

Source: IHLCA survey data

Financing to purchase mechanized equipment has also been identified as a constraint to increasing mechanization, with over 25% of households in the rice producing areas citing equipment cost as an issue (LIFT 2012). The provision of finance in the rural areas is still largely dominated by the State through the Myanmar Agricultural Development Bank. Of the total 570 Billion Kyat disbursed by MADB, only 13 billion (.02%) was provided as a "term" loan meant to support the purchase of farm tools and equipment that could potentially be used to support mechanized production or processing (CSO 2011). Access to finance is a priority policy issue, as it can enable farmers to purchase the equipment to enable farmers to increase productivity and move into higher value products.

However, increased mechanization is likely to depress rural wage rates, potentially marginalizing the rural landless who largely depend on agricultural labor. Creating additional economic opportunities for this group and/or integrating them into the urban economy is therefore an essential to address alongside increasing mechanization (Haggblade et al 2013).

Section 9. Output policies

Post-farmgate processing policy

A lack of sufficient processing facilities affects the quality of agricultural products and prevents Myanmar from capitalizing on its regional comparative advantage in agricultural goods and from moving into higher value markets (Byerlee et. al. 2014). Large agribusinesses are slowly becoming an important player in the agricultural

sector but small and medium size enterprises (SMEs) still remain the most important actors in value chains, especially in post-harvest processing (Byerlee et. al. 2014). These SMEs face numerous challenges, including access to post-harvest technologies, extension, regular electricity and storage facilities.

The President U Thein Sein has emphasized the importance of SME development and has created and chairs the Central Committee for Development of SMEs under the Ministry of Industry, which includes seven ministers along with business representatives. This committee is tasked with developing laws and regulations to support SMEs, linking banks to the private sector to provide financial services and credit, and improving human resources to support SMEs. Despite being hailed as a major initiative, policy development and progress has been slow (Abe and Dutta 2014).

Food Quality and Production Standards

Three laws govern food safety and quality, covering post-harvest policies such as labeling, packaging, and production and manufacturing standards, and are meant to protect consumers from harmful products. Understanding the Rules and Regulations, which is generally developed following the enactment of the Law, has been difficult without access to these specific documents.

1992 National Drug Law	Establishes the Myanmar Food and Drug Board under the Ministry of Health to: ○ Ensure genuine quality, safe and effective drugs ○ Register drugs ○ Protect consumers from poor quality food ○ Control and regulate the manufacture, import, export, storage, distribution and sale of food and drugs.
The 1997 Food Safety Law	Establishes the Myanmar Food and Drug Board under the Ministry of Health as the primary authority to: ○ Develop policy relating to the production, storage, distribution and sale of food. ○ Determine food production practices to ensure quality ○ Develop policy related to labeling ○ Make rulings on appropriate additives ○ Certify laboratories ○ Oversee food inspectors and determines their duties and procedures
2014 Consumer Protection Law	• Prohibits the production, distribution, storage, transport, sale, processing, import or export of commodities of sub-standard quality or that misleads consumers. • Prohibits the production of misleading advertisements or claims about the product without scientific proof. • Establishes a Consumer Protection Central Committee chaired by the Minister of Commerce to: ○ Resolve disputes ○ Investigate claims ○ Hand down punishments and revoke licenses • Sets basic labeling requirements

Understanding the complex and oftentimes overlapping responsibilities between ministries and administrative bodies is a challenge. The Food and Drug Administration, which resides in the Ministry of Health, is tasked with ensure the safety and quality of food and drugs, setting food standards, developing policies regarding labelling and certifying testing laboratories. At the same time, the recently created (2014) Consumer Protection Central Committee, which resides under the Ministry of Commerce, is also tasked with monitoring food and drug qualities and setting labeling standards. The Ministry of Industry also holds some responsibility setting standards for food manufacturing in processing facilities while the Ministry of Agriculture and Irrigation is responsible for

chemical residues in agricultural food products and the inspection and quarantine functions of import and export materials.

While understanding the myriad of laws and regulations is difficult, there does exist a basic system of food and drug regulation. However, the primary concern is the extent to which it is implemented effectively and enforced (Pawlita and Aung Ko Latt 2014; The Irrawaddy 2014). Several civil society organizations have developed around this cause and increasing their role and capacity to engage in the policy discussions may help improve food quality and safety.

Ensuring local transportation for the domestic market linkages

Improving transportation infrastructure has been shown to positively improve development outcomes in rural areas in multiple ways. First, improved infrastructure can lower the cost of inputs and the transportation costs associated with marketed agriculture outputs (Khandker, Bakht and Koolwal 2009), which can in turn lead to increased agricultural productivity among small farmers. For example, using pooled data from 58 countries Binswanger et al. (1986) found that a 10% increase in road infrastructure investments was responsible for an average 5.4 percent increase in agricultural output and a three percent increase in yields. A case study from India shows that road investment leads to enhanced agricultural output with an elasticity of approximately .20 with respect to investment (Binswanger, Khandker, and Rosenzweig, 1989).

Myanmar has one of lowest quality logistics and transportation systems in ASEAN (ADB 2012b). The different sub-sectors of transportation are not well integrated and years of maintenance neglect have taken their toll. The inefficiency of the system has led to comparatively higher transport costs, which inhibits trade (OECD 2014). It is estimated that travel costs by road in Vietnam are one half those of travel in Myanmar (OECD 2014). Recognizing these issues, the FESR suggests that enhanced connectivity and trade with neighboring countries should be a priority for the near future.

The Government of Myanmar lacks a comprehensive transportation sector policy at the national level to guide planning and investments (ADB 2012), though there are plans to complete one in 2014 (U Aung Ye Tun 2013). Currently there are four main ministries in charge of transport administration in Myanmar and they have overlapping responsibilities, though the subsector agencies are said to be well organized (ADB 2012). The Ministry of Construction (MoC) is tasked with the construction and maintenance of national bridges and roads in the interior of the country, whereas the Ministry of Border Affairs (MoBA) is responsible for these tasks in the border areas. Urban transport is also handled by the city development committees. The Ministry of Transport (MoT) deals with marine and air travel and, lastly, the Ministry of Rail Transport (MoRT) is charged with land and rail transport (U Aung Ye Tun 2013). The functions of these ministries are siloed, so, for example, decisions made regarding road construction are handled by the MoC and the maintenance of road safety is tasked to MoRT (ADB 2012); these activities are logically linked, thus separating them creates an incentive problem.

State-owned enterprises (SOE) operate many of the transport services in Myanmar, from freight transport to maritime cargo and rail transportation (U Aung Ye Tun 2013). There is a general lack of functional independence, with agencies holding policy-making and oversight functions, as well as operating the SOE that delivers the services. In addition, the pricing of transport services is set by the central government, discouraging private investments into transport infrastructure and also causing deficits that are then subsidized by the government (OECD 2014).

In keeping with the general trend of corporatization and privatization of SOEs, the FESR lists privatizing transport agencies as one of its goals. This process should make transportation services sector more competitive and also eliminate the conflict of interest created by having provision and oversight handled within the same institution. The GoM should also consider developing a comprehensive transportation sector policy to eliminate the bottlenecks and inefficiencies created by having four separate ministries with overlapping interests.

Strengthening of Wholesale Markets

In 2003, approximately 40% of rural farm households grew crops primarily for income generation (Haggblade 2013). Acknowledging this dependence on crop sales for livelihoods, the GoM made stimulating agriculture and rural development a key focus in the FESR, specifically calling for the removal of barriers in agricultural supply chains. The FESR recognizes the need for wholesale markets, given their fundamental role in agricultural supply chains and agricultural sector development. This section will focus on wholesale agricultural markets in Myanmar by touching on current state of affairs and the roles of the key players.

Historically, the Government of Myanmar maintained heavy control over production and marketing of agriculture. In the later years of the SLORC/SPDC regime, the government liberalized some aspects, but did not cease requiring all paddy to be sold to the government at mandated prices until 2003 (Haggblade et al. 2013). Over time "government-approved commercial enterprises" and private sector traders moved in to fill the government's role as the intermediary between farmers and wholesale markets, the latter concentrating on the less politicized agricultural commodities (ibid).

Currently, there are multiple agencies responsible for different aspects of the market system. MoAI is responsible for collecting domestic prices from wholesale markets, as well as commodity prices for the domestic and international markets (JICA 2013). The Ministry of Commerce is responsible for trade centers and export policy. The physical wholesale market buildings are the responsibility of the city municipalities (JICA 2013), while the wholesale market system is organized through the 38 various affiliated trade associations organized under the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI) (UMFCCI website). The current market sector is strong for non-perishable items, but unsuitable for fresh and perishable agricultural produce (UNDP 2008). However, the Ministry of Agriculture and Irrigation has recently stated its intention to set up a wholesale market for fruits and vegetable to facilitate cross-border trade (Hsu Hlaing Htun 2014).

Overall it appears that the private sector is filling in where the government left off. Still, there are important roles for the government such as generating a comprehensive policy to coordinate the disparate parts as well as rules and regulations to help govern the system such as the creation of standards, quality control measures, participant certification and licensing, as well as providing cold storage facilities for perishable items. In-depth research is also needed to determine how the wholesale markets are being managed and how they are linked to the export sectors, as they are a very important part of the supply chain.

Macro-trade policy

Much progress has been made with respect to macro-trade policy in Myanmar. The country abolished import and export licensing requirements on an initial selection of 1,928 non-sensitive commodities and is easing requirements on others by abolishing the withholding tax on imports. Moreover, in an effort to promote trade, the Ministry of Commerce has abolished formerly compulsory export licenses for 152 goods as well as reducing export taxes. The production, trade and export of all crops have now been liberalized, except for paddy which, as an economically and socially important crop, is still subject to some controls and restrictions. As a result, farmgate rice prices in Myanmar amount to only about 33% of rice export prices while in Vietnam the ratio is 50-60% (OECD 2014).

Big changes were also made with regards to currency stability. In 2013 the Government of Myanmar abolished foreign exchange certificates (FEC) and aligned the exchange rate (Bissinger and Maung 2014). With the passage of the Central Bank Law, the banking sector is being liberalized and financial sector strengthened with more autonomy for the Central Bank. There are currently 25 foreign banks under the review of the Central Bank's Licensing Committee (Mullins 2014).

Two recent mechanisms were put in place with the aim to facilitate trade promotion and to ensure trade benefits for poverty reduction. First, the Trade and Business Promotion Taskforce has been formed, to identify

practical solutions to policy challenges in the trade sector. Myanmar has also joined the Enhanced Integrated Framework, with an aim to make the trade sector contribute to poverty reduction efforts. It is currently at the diagnostic stage, intended to identify areas of work to help progress the country to implement changes for poverty reduction efforts. Further trade facilitation work at the macro level would include reducing non-trade barriers, exploring options for trade financing schemes, as well as improving Myanmar's bargaining power in international trade negotiations to ensure fair prices from commodity exports.

Section 10. Summary and Conclusions

Myanmar is emerging from a relatively closed and isolated period whereby both policies and institutions were wholly developed to support the command economy. As such, the usage of land for farming was dictated and largely geared toward achieving self-sufficiency in the main staple, rice. Said one scholar "It is no exaggeration to say that agricultural policy in Myanmar has been synonymous with rice policy." (Okamoto, 2007). This is not without good reason. In 1995 rice accounted for 68.4 percent of total calorie consumption nationally, and though it has decreased, still accounts for approximately 48 percent currently (IRRI 2013). It is estimated to account for 13 percent of the country's GDP and 40 percent of gross agricultural output (CSO, 2011). Rightly, the government should continue to make investments that enhance the productivity of rice as these are likely to reduce food prices impacting rich and poor alike while leading to higher incomes for rural farmers, both of which contribute to reducing poverty.

That said, both farmers and other agribusinesses are looking to take advantage of changing Myanmar diets and trade opportunities with other countries by diversifying into higher value products. Reforms liberalizing food markets allowing farmers to do so began in earnest in the late 1980s, first by loosening controls on rice prices by abolishing the state system of rice procurement and rationing in 1987, and quickly followed by lifting export controls on all agricultural products with the exception of rice in 1988 (Nyein Zin Soe 2000). Farmers have largely taken advantage of these opportunities with exports of maize, pulses, spices, and nuts all increasing dramatically since this time (CSO, 2011; FAO 2014). However, even after two decades of gradual reform, many aspects of agricultural policy and investments are still strongly biased toward the promotion of rice and the country has not done enough to support the diversification of the agri-food system such that additional policy reform is needed.

This paper has reviewed the policies affecting the agri-food system in Myanmar with an eye towards improving the productivity, efficiency, and diversity of small farmers and small agri-businesses. We have done so utilizing the FESR as a guide to understand the current policy intents of the government. We have primarily reviewed the policies governing farm inputs that largely shape on-farm decision making while also briefly addressing some aspects of policy governing farm outputs though frankly, these areas are less developed at this early stage of Myanmar's transition to a more open economy. Through there has been much progress in the last two decades, several key issues remain that bear restating.

First, free choice over production decisions are in many ways still governed by the state. The 2012 Farm-Land Law is intended to provide greater tenure security to those who use farm land, defines user rights, and initiates a system of tenure certificates. The new law also offers a means through which land can be transferred such that it can now be consolidated offering opportunities for farm expansion and greater agribusiness development. However, the Farm-Land Law still maintains the system of land demarcation which dictates the purpose of the land which, if deviated from, jeopardizes households' tenure rights. The Law is also explicit in its commitment to maintaining rice self-sufficiency stating that farmland changes are "not to affect the sufficiency of rice which is the staple crop of the State" (Chapter 10, Section 28). Changing the designation of tenured land from rice to another crop remains difficult even if potentially more agronomically suitable or lucrative. So while the law acknowledges farmers' rights to diversify production, in practice it is difficult to do so, particularly for the countries numerous paddy farmers.

Access to credit also plays an important role in crop diversification and intensification and can be crucial to helping farm businesses grow. Although private banks and other small micro-finance institutions are beginning to emerge, the Myanmar Development Bank has been by far the most common provider of credit in rural areas, reaching 1.87 million customers in 2012. Analysis of portfolio of loans provided by MADB shows that as much as 80% of the total loans given by the Bank are to small farmers engaged in paddy production and the majority of these loans are meant to cover the purchase of inputs for the following cropping season (CSO, 2011). Of the total 570 Billion Kyat disbursed by MADB only 13 billion (.02%) was provided as a "term" loan meant to support the purchase of farm tools and equipment which could potentially be used to support downstream processing (CSO, 2011). Given that recent studies have shown the poor status of the countries rice milling facilities, which loose between 15-20% in terms of quality and the quantity of milled rice, a more diverse portfolio supporting post-farm processing equipment is needed. Other studies have suggested that there are limited financial packages available for value chains investments limiting small farmers' diversification opportunities (WB & LIFT 2014).

The GoM has also long supported the improvement of rice productivity often at the expense of other commodities such as high-value vegetables and livestock. Of the 32 the Department of Agriculture farms which focus on seed multiplication for extension, 20 are solely focused on rice. Of the 12 remaining, an additional 9 focus on rice in addition to other crops. With the exception of sugarcane, sesame, and pulses (grams, chickpeas, and beans), the DoA farms appear to produce no high-value fruits and vegetables seeds or seedlings. The market for fruit and vegetable seeds is therefore almost entirely served through imports from neighboring countries such as China, Thailand, and India. While this in and of itself is fine, the lack of extension services catering towards these products leaves smallholders at a comparative disadvantage compared to their neighbors or dependent on private sector seed retailers for advice. Other sectors with the potential for high-value products such as livestock and fisheries have their own research institutes but these have little to no extension capabilities (UNDP, FAO 2008).

The general lack of intellectual property rights has so far discouraged the development of private investment in agricultural research which represent the majority of R&D investments in more developed countries at this point (Pardey et al. 2006). The seed sector is almost wholly served by the State with the exception of hybrid vegetables which are imported. Other rules governing the registration of varieties, licensing and quality control of seed have been drafted but have yet to be passed. However, fertilizer legislation which has made greater room for the private sector has largely been a success with a burgeoning number private retailers now firmly in place. While poor infrastructure still means that rural fertilizer prices are high, nationally, the real price of fertilizer has decreased since 2002 following market reforms and should continue to do so.

The bulk of investment in irrigation took place during the early 1990's with the introduction of the Summer Paddy Program of 1988. Government statistics show that during the period between 1992 and 2000 total rice irrigated area increased from 869 to 1865 thousand hectares with little increase in other crops (Fujita and Okamoto 2006). A more current look at total irrigation shows that nearly 76% of total irrigated area is occupied with paddy land while other crops, including pulses, the most prominent agricultural export, utilize the remaining 24%. A more comprehensive strategy geared toward agricultural diversification must make use of Myanmar's irrigated areas for higher value crops.

The Government of Myanmar has made significant strides in liberalizing export policies and is currently initiating reforms to allow greater crop diversification on small farms. However, other important input policies that govern research and extension, irrigation, and finance are in need of greater reform in order to take advantage of growth opportunities. Moving away from a rice-first strategy in these policy areas will encourage the development of new sectors that take advantage of the countries abundant land and water resources and the numerous opportunities afforded by greater trade integration with neighboring countries.

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