



Policies, Institutions and Processes to Support Agricultural Mechanization Development in Myanmar's Dry Zone

Funded by



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CASE STUDY

Policies, Institutions and Processes to Support Agricultural Mechanization Development in Myanmar's Dry Zone

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An Integrated Rural Economic and Social Development Programme for Livelihoods Improvement in the Dry Zone of Myanmar

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Abbreviations

AMD	Agricultural Mechanization Department
CCRDPA	Central Committee for Rural Development and Poverty Alleviation
CDZ	Central Dry Zone
CSAM	Centre for Sustainable Agricultural Mechanization
DALMS	Department of Agricultural Land Management and Statistics
DAR	Department of Agriculture Research
DOA	Department of Agriculture
DOP	Department of Planning
DFI	Direct Foreign Investment
ESCAP	Economic and Social Commission for Asia and the Pacific
FDI	Foreign Direct Investment
FGD	Focus Group Discussions
IAWUMD	Irrigation and Water Utilization Management Department
JICA	Japan International Cooperation Agency
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agricultural Development Bank
MIC	Myanmar Investment Commission
MLFRD	Ministry of Livestock, Fisheries and Rural Development
MNPED	Ministry of National Planning and Economic Development
MOAI	Ministry of Agriculture and Irrigation
MOALI	Ministry of Agriculture, Livestock and Irrigation
MOC	Ministry of Commerce
MOCs	Ministry of Cooperatives
MOF	Ministry of Finance
MOI	Ministry of Industry
MOPAF	Ministry of Planning and Finance
MSE	Microfinance Supervisory Enterprise
NLD	National League for Democracy
OECD	Organisation for Economic Co-operation and Development
PIPs	Policies, Institutions and Processes
R&D	Research and development

SMEs	Small and Medium Enterprises
SMIDB	Small and Medium Industrial Development Bank
SOEs	State-Owned Enterprises
VFV	Vacant, Fallow and Virgin
WRUD	Water Resource Utilization Department
YAU	Yezin Agricultural University

Foreword

The Dry Zone of Myanmar suffers from high levels of poverty and food insecurity. Agriculture is an important source of livelihood but rainfall is concentrated in a few months of the rainy season with an erratic duration and wide deviation in annual precipitation. This makes the Dry Zone especially vulnerable to the impacts of climate change. Climate change also exacerbates the adverse effects of land and environmental degradation leading to poor and fragile soils. This, in turn, impacts the people in the region. The most severely affected are poor, rural families who depend on agriculture for food and nutrition, as well as their livelihoods. Strengthening the sustainability and climate-resilience of agriculture in the Dry Zone, with a focus on smallholders and other vulnerable communities, is thus of critical importance for ensuring food security and income stability.

The development of appropriate policies is of paramount significance for the sustainable development and improvement of livelihoods in the Dry Zone. Policymaking and implementation, however, are complex and incremental processes that require continuous interaction between the state and civil society, including the private sector. They require information on the stakeholders involved and the activities that they are implementing on the ground, as well as an understanding of the strengths and weaknesses of existing policies, institutions, policy formulation and implementation processes, so that technical and capacity-building gaps that need to be addressed can be identified.

This report is a part of a series of case studies produced by the United Nations Economic and Social Commission for Asia and the Pacific to undertake mapping of relevant stakeholders and assessment of their interventions in the Dry Zone as well as analyse policies, institutions and processes for areas that are important for the sustainable development of the Dry Zone. Based on multi-stakeholder consultations conducted in Myanmar, the case studies have focused their attention on the following areas:

- (i) Value chains for seed development for pulses, legumes and oil crops
- (ii) Agricultural mechanization development
- (iii) Sustainable agriculture for poverty reduction.

We sincerely hope that the case studies will serve as valuable knowledge resources for practitioners and decision makers in government, civil society and the private sector in Myanmar and support their efforts to promote sustainable and climate-resilient agriculture in the Dry Zone.

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Executive Summary

This case study provides policy recommendations and action proposals that support sustainable agricultural mechanization development in the Central Dry Zone of Myanmar by identifying and analysing relevant existing policies, institutions and policy processes, with an aim to promote climate-resilient agriculture in this agroecological zone.

There are explicit national policies as well as institutional policies that support the development of agricultural mechanization nationwide. The Ministry of Agriculture, Livestock and Irrigation (MOALI), Ministry of Planning and Finance (MOPAF), Ministry of Commerce (MOC) and Ministry of Industry (MOI) are the four primary ministries that impact agricultural mechanization development in the country through their respective institutional policies and targets.

MOALI is playing a major role in the government-led efforts to develop agricultural mechanization. It formulates agricultural laws and regulations, leads a range of initiatives for the modernization of farms and provides various types of mechanization services. MOPAF oversees the import taxation on agricultural machinery, supervises microfinance and coordinates domestic and foreign investment, which holds the financial key for enabling greater private sector participation. MOC implements economic reforms and manages import licensing and processes, which impact the introduction of agricultural machinery from abroad. MOI provides financing opportunities to small and medium enterprises (SMEs) and provides technical recommendations for agricultural machinery manufacturing.

The government's objective of transforming the country's approach to agriculture from one based on manual farming to one based on mechanized farming so as to improve livelihoods, ensure food security and generate economic growth is affirmative and encouraging. Nevertheless, an examination of the relevant policies, institutions and policy processes shows that the current government-led agricultural mechanization strategy largely depends on government-provided mechanization services, which are not able to respond to urgent market needs. The policy cycle also has deficiencies and long-term sustainable development in agricultural mechanization has yet to be properly addressed.

Through referencing lessons learned and experiences from the Asia-Pacific region in developing agricultural mechanization, the government should consider adjusting its role in this domain by encouraging the private sector to establish mechanization supply systems and support services, including research, manufacturing and trade, while the government assumes a regulatory role in setting standards, testing and certification, financing public services such as training, licensing of machine operators, research and development, and

development of rural infrastructure to create an enabling environment for private enterprise investment.

Policy formulation and implementation processes related to agricultural mechanization could be improved in several other aspects, including engaging a wider range of stakeholders in policy formulation process, developing tailor-made policies and action plans based on the agroecological characteristics of the Dry Zone, and improving supporting legislation and regulations for policy implementation processes. Coordination among the existing institutions should be strengthened, particularly technical cooperation. Policy monitoring and evaluation systems should be further enhanced across institutions.

Sustainable agricultural mechanization development emphasizes balanced development across three pillars – economic, social and environmental, to ensure the long-term stability and sustainability of the agricultural sector, as well as the society in general. Due priority to considerations of social equity and environmental protection in pursuing economic growth should also be ensured while developing agricultural mechanization.

Background

This report is one of the case study documents produced under the project entitled “*An Integrated Rural Economic and Social Development Programme for Livelihoods Improvement in the Dry Zone of Myanmar*”, to address the thematic area – Agricultural engineering and farm mechanization for increased food security and poverty reduction. Under the unified focus of project activities on climate-resilient agriculture, this case study examines how policies, institutions and processes support agricultural mechanization development in the Dry Zone of Myanmar.

1.1 Objectives of the case study

The main objective of the case study is to provide to the policymakers with the most appropriate policy options in facilitating agricultural mechanization development in Myanmar’s Dry Zone that builds climate-resilient agriculture.

The subobjectives are:

- (i) To identify governance structure, institutional settings, policy framework and policies that affect agricultural mechanization development in the country
- (ii) To evaluate the policies, existing institutions and policy processes particularly in relation to the Dry Zone area
- (iii) To propose recommendations for improvement and follow-up actions.

1.2 Scope and limitations

This study analyses policies, institutions and processes (PIPs) that affect the Dry Zone area in agricultural mechanization development. However, as there are no specific policies and policy processes designed for the Dry Zone, these elements are targeted at the national level, with certain evaluations focusing on the Dry Zone region. Recommendations for improvements and proposals for follow-up actions are also largely aimed at nationwide PIPs. Field trips were conducted to Mandalay, Magway and Nay Pyi Taw. Primary feedback and surveys used in this case study are from Mandalay and Magway.

As the development of agricultural mechanization involves a wide range of stakeholders beyond the government setting, this case study does not go into details of the activities and impact of stakeholders other than government institutions.

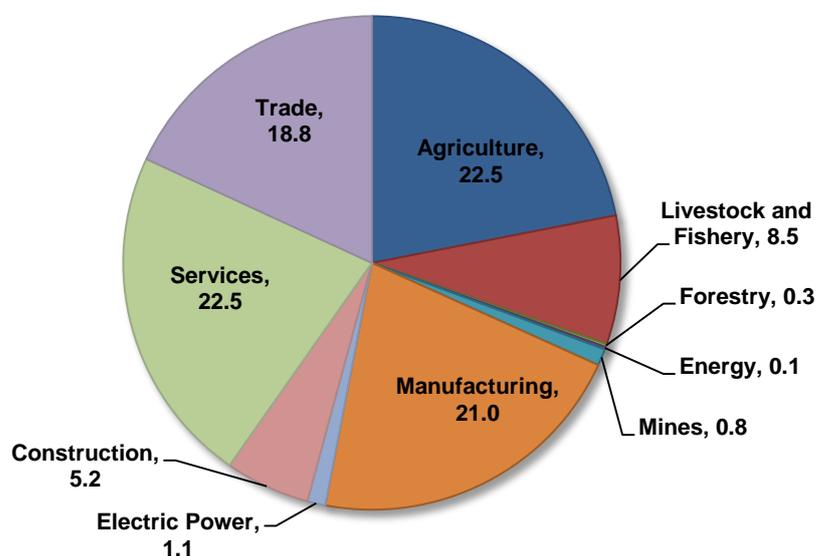
1.3 Methodology

A desk review on existing laws, reports and policies from Internet-based sources, libraries, publications and information published by relevant government and non-governmental institutions was conducted as the first step. Questionnaires were developed as a result of the initial research work. Field visits were then conducted to Magway and Mandalay to gather information from farmers, service providers, agricultural machinery suppliers, and local and regional government officials. The questionnaire-based survey was conducted through personal interviews, focus group discussions (FGD) and key informant interviews. Lastly, senior government officials from relevant ministries based in Nay Pyi Taw were approached to collect related information.

1.4 Brief overview of agriculture sector in Myanmar

Myanmar's economy is heavily dependent on the agriculture sector, with a share of approximately 23 per cent (2013/14) of GDP (not including livestock and fisheries). Agricultural revenues comprise 20 per cent of total export earnings and the sector accounts for 61.2 per cent of labour-force employment (MOAI, 2014). The agricultural sector is seen as a reliable provider of overall economic progress and poverty reduction through improving the real purchasing power of consumers, generating farm incomes and providing employment (David *et al.*, 2015). However, agricultural productivity in Myanmar remains among the lowest in Asia, which seriously limits its capacity for poverty reduction (WB & IBRD, 2016).

Figure 1.1 GDP share of different sectors in Myanmar (2013/14)



Source: MOAI (2014)

Myanmar has three main agroecological zones: the delta and coastal zone, the hill regions and the Dry Zone. The delta and coastal zone is the most densely populated, with dominant production of rice and fish. The hill regions are suitable for less intensive farming, with more trees and horticultural crops in comparison with the other regions. The Dry Zone is located in a rain shadow area, and a mix of rain-fed upland crops and paddies is grown mainly in river valleys where the access to water is easy (David *et al.*, 2015).

It is commonly agreed that Myanmar has four key competitive advantages for agriculture: abundance of land, water, labour resources and its proximity to major future food markets (David, 2015). Presently, there are about 11.87 million hectares of net sown area in Myanmar, 0.46 million hectares of fallow land and 5.28 million hectares of wasteland, which can be developed to allow the expansion of new agricultural land. Most of the agricultural land, about 3.64 million hectares, is currently cultivated by small-scale farmers. The average cultivated size of holdings is 2.21 hectares (MOAI, 2014). In the Dry Zone area, the average farm size is about 1.8 hectares, which is less than the average household size in the delta and coastal zone (4 hectares), but more than country average and in hilly areas (0.8 hectares) (FAO, 2014). Nevertheless, the individual farm size is skewed from average, with a 2014 study finding that 22 per cent of households have less than 0.8 hectares of land (LIFT, 2015a)

Water use in Myanmar differs greatly by region and season, due to different geographical conditions of the zones. As such, in the irrigated tract area in Sagaing, farmers spend US\$17-74 per hectare on the irrigation systems, while in other regions, very few farmers reported paying for the irrigation (WB & IBRD, 2016). Although the Dry Zone has lower average annual rainfall levels (960 mm) than the rest of the country, this is still considered moderate. The main restriction for rain-fed crops in the zone is that precipitation is concentrated between May and October, with an intermediate dry period in June or July. The lengthy dry period causes the local climate to become semi-arid, which is unsuitable for agricultural output development in the absence of irrigation (FAO, 2014).

In Myanmar, the labour-force pool is plentiful and inexpensive compared with many other Asian countries; this helps the country to maintain low production costs (David *et al.*, 2015). However, the overall labour productivity in Myanmar is low, reflecting the low wages and the low use of capital, rendering farm practices very labour intensive. In Ayeyarwady, farmers spend more than 100 days per hectare on monsoon paddy compared to 52 days in Cambodia, 22 days in Vietnam and 11 days in Thailand (WB & IBRD, 2016). A Japan International Cooperation Agency (JICA) report in 2010 noted that the inhabitants of the Central Dry Zone have higher educational standards and health indices than the rest of the country, and the country as a whole has a considerably higher literacy rate than other ASEAN countries, such as Cambodia, Lao People's Democratic Republic (PDR), Bangladesh and India (JICA, 2010). This is a potential advantage for all sectors of Myanmar's economy.

The top agricultural zones by productivity in Myanmar are in the areas most vulnerable to climate change. The main paddy-producing region is the coastal and delta zone, while the Central Dry Zone is an intensive mixed upland crop area. In the Dry Zone, drought risk is projected to rise, especially due to the shortening of the monsoon rains complemented by

the increased heat stress, as maximum temperatures may rise by up to 4°C from a 1971-2000 baseline to 2051-2100 (David *et al.*, 2015).

Although Myanmar has much potential for improving agricultural production with its abundant resources, agricultural development to date is limited as and largely unexploited. With climate change as one of the main threats to the agriculture sector, it is of utmost importance to identify ways to reach the potential yield increases using the abundant resources. These findings are crucial for enabling the exploration of the agricultural potential of Myanmar for future generations.

1.5 Background of the study area

The Central Dry Zone covers three regions: Mandalay, Sagaing and Magway; a total of 75,169 km², equivalent to 11 per cent of the total national territory. The total population of the study area is 14.5 million, one-third of the country's total population. Demographic density in the area is estimated to be approximately 131 persons/ km², which is above the national average. The average farm size across the region is 1.8 hectares, but 43 per cent of the households are landless (JICA, 2010).

The arid and semi-arid areas have low rainfall, which varies across sites. The annual rainfall range is between 700 and 1,000 mm. This has a significant influence on crop yields. The mean maximum temperature during the summer is 32°C and the mean minimum temperature during the winter is 20°C (JICA, 2010). The local soils are sand-rich and clay, and there is a high risk of erosion by water and wind, which can result in land degradation.

Agriculture is dependent on the south-west monsoon, as low annual precipitation unevenly distributed over time and space causes water shortages in one area, with localized flooding in another. Although the area is a 'Dry Zone', it has already become a major agricultural production area of Myanmar. The total rice production area (rain-fed and irrigated) comprises 22 per cent of the national total. In addition, this area produces 70 to 90 per cent of oil crops and 40 to over 90 per cent of pulses, except for black gram, which is mainly produced in the delta. In the Dry Zone area, the ratio of lowland to upland farm is 28:72 (JICA, 2010). Where irrigation is available, rice is the dominant crop; when it is not, the farmers usually produce pulses (chickpea, grams and pigeon pea), oilseeds (sesame, groundnuts and sunflower) and sorghum instead.

Climate change projections for the Dry Zone predict a general increase in temperature, an increase in rainfall variability during the rainy season, an increase in the risk of flooding resulting from late onset and early withdrawal of monsoon rains, and an increase in the occurrence and intensity of extreme weather events, such as cyclones/strong winds, floods, intense rains, extreme high temperatures and drought. The increasingly uneven distribution of rainfall and erratic changes of temperature will further complicate the access to water. The influence of climate change, together with the impact of extractive farming practices, is accelerating the degradation of soils and the loss of vegetative cover. Climate and environmental stress are driving labour migration, reducing the number of young male farmers and, hence, contributing to the labour shortage in the area. As a result, the demand for the gradual replacement of the labour-force by agricultural machinery is increasing.

Governance Structure, Key Institutions and Policies for Agriculture Mechanization

The current Government of the Republic of the Union of Myanmar, led by the National League for Democracy (NLD) has laid down four major economic policies, one of which is “Building a modern industrialized nation through agriculture development and all-round development of the other sectors of the economy”.

The government has also drawn a *National Policy and Development Plan* which is comprised of *National Comprehensive Development Plan (2011-2012 to 2030-2031)* and the *Fifth Five Year Plan (2011-2012 to 2015-2016)*. The agriculture development plan, listed as one sector-wise development is included in the *National Comprehensive Development Plan* developed by the Ministry of Agriculture and Irrigation following consultation workshops. The long-term (20-year) development plan and short-term plan (*Fifth Five Year Development Plan*), which both include agricultural mechanization development, were based upon the outcomes of the workshops.

In the long-term plan, major policies that contribute to agricultural mechanization development are as follows:

- Enhancement of technologies and extensions services: agricultural mechanization (reform of conventional farming to mechanized farming), promotion of irrigated farming systems (reform of rain-fed conventional farming to irrigated farming), R&D (R&D for advanced agricultural technologies in agriculture sector).
- Improving access to market: sustainable market development (high value-added agricultural products and promotion of agro-based industry).
- Agricultural laws and regulations: revised evaluation of agricultural laws and regulations. Review and evaluate existing agricultural laws and regulations in line with the current economic situation.

At present, the government is comprised of 22 ministries (President Office, 2016) through the combination of 36 previous ministries. The merging of the ministries aims to smooth overall management at the national level, but the organizational structure of the lower levels remains unchanged at present. Consequently, the newly established ministries are obliged to shoulder all duties and responsibilities of the previous ministries.

MOALI, MOPAF, MOC and MOI are identified as the four primary ministries involved in agricultural mechanization development in the country. A summary of the key relevant institutions, legislation and policy relating to this development is presented in the table below. Detailed discussion follows the table.

Table 2.1 Summary of key institutions, legislation and policies related to agricultural mechanization development

Ministries	Key institutions (some institutions/ministries are referred to under former names or structures)	Key legislation and policies	Area of impact
Ministry of Agriculture, Livestock and Irrigation (MOALI)	Ministry of Agriculture and Irrigation <ul style="list-style-type: none"> ■ Agricultural Mechanization Department (AMD) ■ Irrigation and Water Utilization Management Department (IAWUMD) ■ Department of Agriculture (DOA) ■ Department of Planning (DOP) ■ Department of Agricultural Land Management and Statistics (DALMS) ■ Department of Agriculture Research (DAR) ■ Yezin Agricultural University (YAU) ■ Myanmar Agricultural Development Bank (MADB) 	<ul style="list-style-type: none"> ■ Five Year Short-Term Plan ■ Farmland law (2012) ■ The Vacant, Fallow and Virgin Lands Management Law (2012) ■ The Myanmar Agricultural Development Bank Law (1997) ■ The Co-operative Society Law (1992) 	<ul style="list-style-type: none"> ■ Formulate agricultural laws and regulations; ■ Plan and implement related activities; ■ Conduct training and education; ■ R&D; ■ Organize the cooperative societies
	Ministry of Cooperatives <ul style="list-style-type: none"> ■ Department of Cooperatives ■ Small-scale Industries Department ■ Cooperative Export-Import Enterprise ■ Central Cooperative Society 		

Ministries	Key institutions (some institutions/ministries are referred to under former names or structures)	Key legislation and policies	Area of impact
Ministry of Planning and Finance (MOPAF)	Ministry of Finance <ul style="list-style-type: none"> ■ Myanmar Microfinance Supervisory Enterprise ■ Internal Revenue Department ■ Customs Department 	<ul style="list-style-type: none"> ■ The Law Amending the Commercial Tax Law (2014) ■ The Tax of the Union Law 2014 ■ The Microfinance Law (2011) ■ Myanmar Citizens Investment Law (2013) ■ The Foreign Investment Law (2012) ■ Small and Medium Enterprises Development Law (2015) ■ Small and Medium Enterprises Development Policy (2015) 	<ul style="list-style-type: none"> ■ Tax control; ■ Examine export and import goods; ■ Supervise microfinance; ■ Plan for national economic development; ■ Coordinate domestic and foreign investment
	Ministry of National Planning and Economic Development		
Ministry of Commerce (MOC)	Ministry of Commerce	<ul style="list-style-type: none"> ■ The Export and Import Law (2012) 	<ul style="list-style-type: none"> ■ Manage import licence & process; ■ Implement economic reform
Ministry of Industry (MOI)	Directorate of Industrial Supervision and Inspection	<ul style="list-style-type: none"> ■ Industrial Policy (2016) 	<ul style="list-style-type: none"> ■ Finance SMEs through Small and Medium Industrial Development Bank (SMIDB); ■ Provide technical recommendation for agricultural machinery manufacture
	Central Committee and Working Committee for Development of Small and Medium Enterprises		
	Industrial Development Committee		

2.1 Ministry of Agriculture, Livestock and Irrigation (MOALI)

MOALI was founded by combining three previous ministries: Ministry of Agriculture and Irrigation (MOAI), Ministry of Livestock, Fisheries and Rural Development (MLFRD) and Ministry of Cooperatives (MOCs). This newly established ministry is playing a major role in the agricultural mechanization development of Myanmar and all duties and responsibilities of the previous ministries have been carried over into the new institution. Among the three now combined ministries, MOAI and MOCs were the main players in terms of agricultural mechanization development in the country.

(a) Ministry of Agriculture and Irrigation (MOAI)

There are six departments, one agricultural development bank and one agriculture university, which were under MOAI and are now under MOALI, namely the Agricultural Mechanization Department (AMD), Irrigation and Water Utilization Management Department (IAWUMD), Department of Agriculture (DOA), Department of Planning (DOP), Department of Agricultural Land Management and Statistics (DALMS), Department of Agriculture Research

(DAR), Yezin Agricultural University (YAU) and Myanmar Agricultural Development Bank (MADB). All are related to agricultural mechanization development in their respective fields.

- *Agricultural Mechanization Department (AMD)* comprises a head office, 14 regional/state-level offices, 26 district-level offices and 117 township-level offices. The main functions of AMD include: farm services; production and distribution of appropriate machineries; land reclamation, land consolidation and land development work; implementation of upland reclamation in hilly regions; R&D and dissemination of technical knowledge.

For farm services, AMD both rents out and sells agricultural machines, with an instalment payment system operating through 100 mechanization stations throughout of the country. The renting services and distribution processes in each township are managed by township officers. The machinery AMD sells includes AMD-produced and imported plant. In addition, AMD also provides other mechanized farming services, such as transplanting, harvesting, threshing and combine harvesting.

There are two farm machinery manufacturing factories under AMD in Kyaukse Township, Mandalay Region. One produces implements and parts, while the other works on assembling machines with parts and implements imported from Korea. In addition, a factory in Kyaiklo, Yangon Region, conducts research activities, testing the imported and locally produced machines to decide whether or not they are suitable for Myanmar's conditions in terms of location, crops, soil conditions, etc. To promote the machinery trade show, AMD organizes field-day activities and agricultural mechanization exhibitions in collaboration with private companies.

There are two agricultural mechanization training centres (Meikhtilar and Phayargyi-Bago) under AMD, which conduct training sessions for farmers on operation, repair and maintenance of farm machinery with practical demonstrations. They also conduct monthly refresher courses for government staff on machinery maintenance.

- *Irrigation and Water Utilization Management Department (IAWUMD)* was formed recently by combining two previous departments: Irrigation Department and Water Resource Utilization Department (WRUD). It is the main department responsible for developing water resources through river pumping, groundwater utilization and dam and canal construction. The main objective of the department is to increase the irrigated area and percentage of crop intensification. WRUD is organized into three levels: the head office, state/region and district station levels. It provides custom hiring services of irrigation sets together with water resource supply activities across the irrigated area.
- *Department of Agriculture (DOA)* is the main and the biggest department under the ministry within the agriculture sector. The previous Department of Industrial Crops has been merged into this department in recent months. One central office is situated in Nay Pyi Taw and 14 regional/state-level offices and 66 district-level offices are located in different regions/states and districts. In addition, township-level offices are spread across almost every township of Myanmar.

The main tasks of DOA are producing good-quality seeds for crops, conducting research on scientific cultural practices, and developing and organizing training and technology extension to farmers. Together with its main tasks, DOA conducts demonstration plots to promote agricultural machines, such as seeders for planting groundnut, maize and sesame, in some areas of Dry Zone. In addition, DOA gives guidance to farmers on using machines and links farmers to input suppliers and loan providers.

- *Department of Planning (DOP)* coordinates and collaborates with other departments under the ministry, other ministries, regional organizations and international organizations. In addition, the department assists in developing and updating agricultural policies, formulating various agricultural plans, strengthening cooperation and coordination among inter-agencies, and collecting and disseminating wholesale prices of agricultural commodities.
- *Department of Agricultural Land Management and Statistics (DALMS)* is the main department for registering and recording agricultural land under the ministry. Its branches are distributed in almost every region/state and township in Myanmar. According to the Farm Land Law (2012) and the Vacant, Fallow and Virgin Land Law (2012), the Director General of this department is included in the Central Committee as a secretary member to decide on land administrative activities.
- *Department of Agriculture Research (DAR)*: DAR's main functions are to develop high-yield varieties, generate agricultural technologies and disseminate these varieties and technologies. An agriculture engineering section is under the department. Prior to 2004, this section stood as an agricultural implements research section. Today, this section not only implements research, but also farm operation activities in the research field, expanded research and farm implement production with orders from departments under the ministry and NGOs.
- *Yezin Agricultural University (YAU)* is the only agriculture university in Myanmar that trains graduates in agriculture. Among the departments, the Department of Agriculture Engineering has the most direct connection with agricultural mechanization. Students in this department study the agriculture engineering as a minor programme for 2 years. After the final year's examination, training on agriculture machinery operation is provided.
- *Myanmar Agricultural Development Bank (MADB)* is the only financial institution under the ministry. There were 15 regional/state offices and 206 township-level offices in MADB until 2013. The main functions of MADB are: lending seasonal, short-, medium- and long-term loans to farmers; collecting repayments for bank loans; and encouraging farmers to open deposit and saving accounts at MADB. Loans for purchasing agricultural machinery are also available through the Agriculture Mechanization Department.

There are five guiding policies in MOALI, four of them are closely related to agricultural mechanization development. They are (MOAI, 2016):

- To conduct training and education activities for farmers and extension staff to provide advanced agricultural techniques
- To implement research and development activities for sustainable agricultural development
- To encourage transformation from conventional to mechanized agriculture, production of crops appropriate to climate and extension of irrigated area
- To amend existing agricultural laws and regulations in line with current situation.

The ministry also has clear targets and action plans in its five-year short-term plans for developing agricultural mechanization. In its Five Year Short Term Plan (2016-2017 to 2020-2021), “To develop (5,403) hectares of systematic mechanized farming and (324) hectares of terrace farming” and “To train 1,300 mid-level agricultural technicians annually” are listed as two of the targets. In its corresponding action plan, “converting conventional farming to mechanized farming” has been listed as one of the six primary categories. Other related actions include “to implement irrigation projects” and “to support the establishment of agro-based industries”.

Three laws related to the ministry have been identified as the most relevant legislation to the development of agricultural mechanization: *Farmland Law* (2012); the *Vacant, Fallow and Virgin Lands Management Law* (2012); and *The Myanmar Agricultural and Rural Development Bank Law*.

- The *Farmland Law*, which was enacted on 30 March 2012, defined the types of land that are included under the title of farmland and has explained the rights of farmers who own the land. To sum up, the farmer who has the right to use the land can lease, exchange, pawn, inherit, donate or permanently transfer, in whole or in part, the land.
- The *Vacant, Fallow and Virgin Lands Management Law* was enacted on 30 March 2012. This set of laws aims to create job opportunities and to obtain the rights and permissions to exploit vacant, fallow and virgin lands for the implementation of agriculture, livestock breeding and other related activities for the nation’s economic development. Following the issuance of the law and upon approval of the Union Government, MOAI issued the *Vacant, Fallow and Virgin Lands Management Rules* on 31 August 2012, in accordance with the law (MOAI, 2012).
- The State Law and Order Restoration Council enacted the *Myanmar Agricultural and Rural Development Bank Law* on 6 July 1990, which established the Myanmar Agricultural and Rural Development Bank. The objectives of the established bank, as stated in the law, are to provide loans for the development of agricultural, livestock and rural socioeconomic enterprises, to promote rural banking, to encourage saving, to support socioeconomic development in rural areas, to cultivate the habit of using bank services and to develop the banking business. The types of loans are annual loans (up to 1 year), short-term loans (1-4 years) and long-term loans (4-20 years). The Board of Directors that administers the bank are members appointed by the government, MOPAF, Ministry of Agriculture and Forests, Ministry of Livestock Breeding and Fisheries, and Ministry of Co-operatives. The law gives authority to the

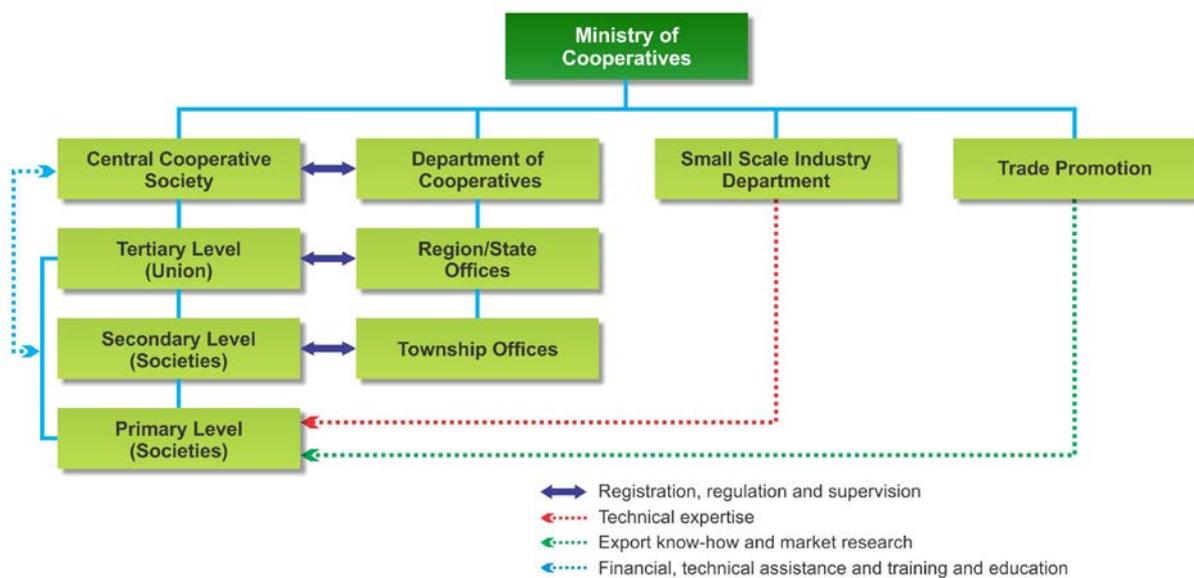
MOPAF to issue rules and procedures, and to the established bank to issue regulations, by-laws, orders and directives to carry out the provisions of the law (The State Law and Order Restoration Council, 1990).

The same legislature enacted the *Law Amending the Myanmar Agricultural and Rural Development Bank Law* on 30 January 1997, in which it renamed the previous law as the *Myanmar Agricultural Development Bank Law*, substituted the bank name with “Myanmar Agricultural Development Bank” and transferred the administrative authority of the law from MOPAF to MOAI (The State Law and Order Restoration Council, 1997).

(b) Ministry of Cooperatives (MOCs)

The MOCs was established to lead national economic development through a cooperative movement. The main responsibilities of the ministry include enhancing the country’s development of cooperatives, disseminating the awareness of cooperative spirit, principles and knowledge, and cooperating with international organizations for the development of cooperative socioeconomic activities. There were four departments under the ministry prior to its merger with MOALI: the Department of Cooperatives, Small-scale Industries Department, Cooperative Export-Import Enterprise and Central Cooperative Society. The following figure shows the structure of cooperatives movement.

Figure 2.1 Structure of cooperatives movement under MOCs



Source: Ministry of Cooperatives (2016)

Cooperative societies are organized in hierarchical levels, with the Central Cooperative Society, an NGO, standing at the highest level. The Department of Cooperatives provides organization, education and regulation to improve the cooperatives movement, formation and development of cooperative societies, and empowerment and supervision of economic activities of cooperative societies at each level of the governance structure.

The Ministry of Cooperatives has worked to transform conventional farming to mechanized farming through the economic activities of the agricultural cooperatives as follows:

- Construction of irrigation systems, soil preparation and road construction
- Access to finance, technologies and markets
- Sale of agricultural machinery through instalment systems
- Establishment of service centres and training centres for agriculture machinery.

This ministry has received support and guidance from the *Co-operative Society Law*, enacted on 22 December 1992 by the State Law and Order Restoration Council. The objective of the law is to form societies for carrying out economic and social activities to raise the standard of living of the members and member societies. The law has provisions on the by-law and formation of the society, conditions on membership, finance and liquidation of a society and procedure for solving disputes. The law authorized the MOCs to issue rules and procedures and the ministry together with the Co-operative Department to issue orders and directives to perform the provisions of the law, upon the Government's approval (State Law and Order Restoration Council, 1992).

2.2 Ministry of Planning and Finance (MOPAF)

The Ministry of Planning and Finance was established through the merger of the previous Ministry of Finance (MOF) and the Ministry of National Planning and Economic Development (MNPED). It impacts the development of agricultural mechanization in the area of taxation, export and import regulations, microfinance supervision, investment coordination and national economic development planning.

(a) Ministry of Finance (MOF)

There are three branches and one supporting department which were under the Ministry of Finance and are now under MOPAF, namely the Policy Affairs Branch, Tax and Personal Affairs Branch, Budget and Administrative Branch and International Relations Department (MOF, 2016). In addition, five financial institutions and five non-financial institutions are governed by the ministry.

Among the financial institutions, Myanmar Microfinance Supervisory provides supervision on microfinance institutions, which influences financing opportunities on machinery purchasing for either personal use or for small businesses. Among the five non-financial institutions, the Internal Revenue Department is responsible for domestic business taxation and the Customs Department regulates taxation on imports and exports. The taxation policy plays a role in agricultural machinery circulation.

The ministry has been responsible for formulating and implementing national monetary and financial policies, coordinating related activities within the ministry and coordinating and cooperating with other ministries as well as giving suggestions related to monetary and fiscal matters (MOF, 2016).

The sets of laws that support and guide the policies of the ministry that influence the development of agricultural mechanization include the *Law Amending the Commercial Tax*

Law (2014), Tax of the Union Law (2014), Microfinance Law (2011), Myanmar Citizens Investment Law (2013), Foreign Investment Law (2012) and Small and Medium Enterprises Development Law (2015).

- The *Law Amending the Commercial Tax Law* was enacted on 24 March 2014 and the *Tax of the Union Law* was passed on 28 March 2014. These laws have clarified the tax exemptions and the tax rates have outlined tax administration housekeeping. Farm equipment, farm machines and machine parts that are entitled to commercial tax exemption are given in the law.
- The *Microfinance Law* was enacted on 30 November 2011. The objectives of the law are to reduce poverty at the grass roots through cultivating saving habits, encouraging new small-scale businesses and creating job opportunities. The law has specified the criteria and procedures necessary to establish a microfinance institution as well as the process for getting a licence. Under the law, the Rural Development and Poverty Reduction Working Committee has been formed to coordinate, assist and support the Microfinance Supervisory Committee, which was also formed under the law, chaired by the minister of the ministry.
- *Myanmar Citizens Investment Law* was ratified on 29 July 2013. The law aims to encourage citizens' investment in economic activities and has provided several preferential tax conditions. Under the law, investors enjoy income tax exemptions for five consecutive years, including the year when the commercial business of manufacturing or service is started. Exemption or relief of custom duties, other local taxes or both are provided on imported machinery, equipment, tools, spare parts and apparatus.

In addition, investors may be allowed to lease land for a period of up to 50 years, depending on the type of businesses, industries and amounts of invested capital. The investment can be extended for two consecutive periods of 10 years each.

- The *Foreign Investment Law* was enacted on 2 November 2012. The law allows for 100 per cent foreign investment in land utilization, agro-based industries, assembly and manufacturing of light agricultural machinery and small farm implements, and manufacturing of agricultural inputs and related support products, input supplies and machinery.

Investors are guaranteed tax exemption or relief from the starting period for up to five continuous years, depending on the progress of the investment activities and whether or not it is beneficial to the state. The depreciation rate, as designated by the government, calculated on the machinery, equipment, buildings or other working capital may be deducted from the profit. If the product of any work is for export, tax exemption is allowed for up to 50 per cent of the profit of the exported product. If the investor is foreign, he/she can pay income tax at the same rate as citizens. Investors enjoy exemption or relief on duty, and other internal taxes on imported machinery, equipment and parts during the establishment period.

Investors also receive an initial of land-use grant of up to 50 years, as deemed to be necessary for the economic activities or the industry, depending on the type and the amount of the investment. This can be extended for two additional 10-year terms depending on the amount and the type of the investment.

- The *Small and Medium Enterprises Development Law* was enacted on 9 April 2015. This law defines the investment amount of SMEs, the registration process and the opportunities for SMEs. Based on the law, the *Small and Medium Enterprise Development Policy (2015)* was developed with the objectives to industrialize the country by placing an emphasis on agriculture-based SME, to produce value-added products, create the job opportunities, etc. Farming vehicles, machinery and equipment production businesses are included in both the short- and long-term planning of the policy as prioritized industries.

(b) Ministry of National Planning and Economic Development (MNPED)

The MNPED has been responsible for drawing national plans, laws and policies for national economic development and coordinating domestic and foreign investment.

A national workshop entitled “The National and People-centred Development Action Plan for Rural Development and Poverty Alleviation” conducted in 2011 stressed the need to reduce the country’s poverty rate. As a result, the MNPED established the Central Committee for Rural Development and Poverty Alleviation (CCRDPA). Under CCRDPA, working committees and subcommittees from various ministries in each state/region have been constituted in order to formulate and implement action plans for eight development tasks. Some of these plans have close ties with agricultural mechanization development, such as in relation to developing agricultural productivity, rural small-scale productivity, cooperatives and the rural socio-economic landscape.

2.3 Ministry of Commerce (MOC)

The Ministry of Commerce is composed of the Minister Office, Department of Trade and Department of Trade Promotion and Consumer Affair (MOC, 2016). It plays a vital role in the implementation of the economic reforms towards a market-oriented economy, especially in the trade sector. There are four aspects of the national economic policy laid down by the ministry, one of which is “sustainable development of agriculture towards industrialization and all-round development”, which can be translated into promoting sustainable agricultural mechanization.

The *Export and Import Law* was enacted on 7 September 2012. It rules on supervising and administering matters on export and import, prohibitions and offences and penalties. MOC is authorized to issue rules, regulations and by-laws in accordance with the law upon the approval of the Union Government. At the institutional level, the ministry manages the import licence process.

2.4 Ministry of Industry

The Ministry of Industry is organized into two directorates, six enterprises and one Central Research & Development Centre (MOI, 2016). Among the sectoral departments, the

Department of Small and Medium Enterprise Development under the Directorate of Industrial Supervision and Inspection plays a major role in mechanization development in promoting SMEs that operate businesses related to agricultural machinery. The Small and Medium Industrial Development Bank (SMIDB) has been incorporated as a public limited company under the auspices of the MOI to provide financial assistance to SMEs, which facilitates mechanization development.

Led by the ministry, the Central Committee and Working Committee for the development of SMEs have been formed. The Industrial Development Committee was founded for the development of the industrial sector through providing technical supervision, forging cooperation with other countries and inspecting quality, etc. The Agricultural Machinery and Equipment Manufacturing Development Subcommittee is included in this committee.

There are four primary policies formulated under the ministry, one of which directly promotes agricultural mechanization “to establish industrialized state on modernized agriculture by developing value-added agricultural products and agro-based industries”. The other three also contribute to this development as they are focusing on developing SMEs, promoting private sector development and encouraging public–private partnership (MOI, 2016). The ministry published the *Industrial Policy* in February 2016, in line with the ministerial policies to illustrate on its focus.

Examination of Policies, Existing Institutions and Policy Processes

The national economic policy on “building the modern industrialized nation through agriculture development” can be interpreted as the fundamental policy guidance on developing agricultural mechanization in the country. Policies on promoting agricultural mechanization development have been outlined at different levels and various ministries/departments have been engaged directly or indirectly in this process. The government’s determination to transform the farming approach from manual farming to mechanized farming embrace technologies in agricultural development is affirmative and encouraging. Nevertheless, the current government-led agricultural mechanization strategy largely depends on government-provided mechanization services, which are not able to respond to urgent market needs. The policy cycle also has deficiencies and long-term sustainable development in agricultural mechanization has yet to be addressed.

3.1 The market needs

(a) Government interventions in the market-oriented economic system

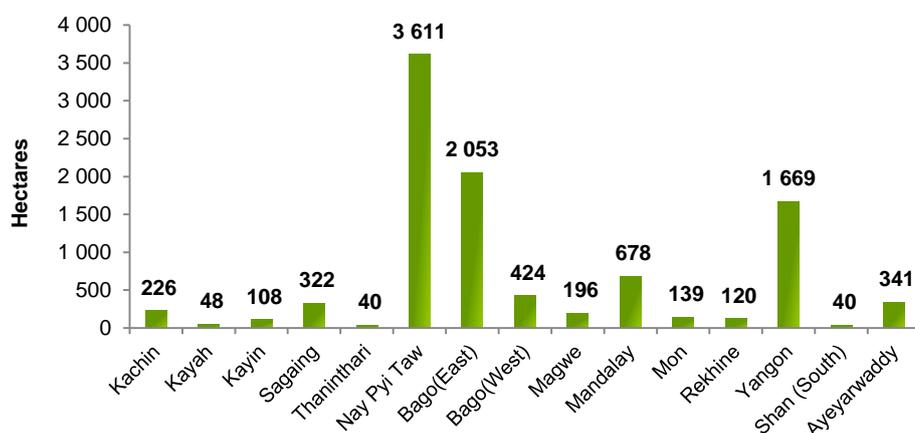
There is no doubt that a demand for increased agricultural mechanization exists in the Dry Zone, particularly from smallholder farmers. Agricultural mechanization is viewed as an efficient way to increase production of oil crops and pulses. The use of mechanical power also helps farmers to deal with labour shortages caused by outmigration, which is particularly important during the window period of critical agricultural activities in the region (LIFT Dry Zone Programme Framework, 2015a). However, the government-provided mechanization services are not able to satisfy such urgent needs.

In fact, one of the most important policy lessons learned in agricultural mechanization development worldwide is that, while political leaders and governments have actively promoted mechanization, particularly in the developing countries, its success has not been dependent on government-provided mechanization services. Instead, successful mechanization implementation is built on essential supply systems and support services through private sector initiatives, in response to the market needs (FAO, 2008). Mechanization services led by the government are not able to respond to the fast-changing market needs. Hence, such a policy approach has largely deviated from the country’s economic reform plan of 1988 of transforming towards a market-oriented economic system.

At the national level, the development of agricultural mechanization has been explicitly outlined as one of the major policies in the long-term (20-year) agriculture development plan under *the National Comprehensive Development Plan*. “Agricultural mechanization (reform from conventional farming to mechanized farming), promotion of irrigated farming systems (reform rain-fed conventional farming to irrigated farming)” and “R&D (R&D for advanced agricultural technologies in agriculture sector)” are listed as three ways to enhance technologies and extensions services. Correspondingly, MOAI placed emphasis on implementing R&D activities for sustainable agricultural development and encouraging transformation from conventional to mechanized agriculture, production of crops appropriated to the climate and extension of the irrigated area in its major policies.

From 2011 to 2014, MOAI led the development of modernized farmland in six townships in the Nay Pyi Taw area and some other states and regions. The following graph shows the area of developed modernized farms in these states and regions during the period.

Figure 3.1 Modernized farm development over 3 years (2011-2014)



Source: MOAI (2014)

A total of 10,019 hectares of model farms have been established as a result. The three regions in the Dry Zone, Mandalay, Magway and Sagaing, account for 12 per cent (1,196 hectares) of the developed area and Nay Pyi Taw, where the central government (including MOALI headquarters) is based, accounts for 36 per cent (3,611 hectares). The government-led modernized farm development is not proportionate to each region’s production requirements and farmers’ needs. Considering that the Dry Zone produces 22 per cent of the nation’s rice, 70 to 90 per cent of the country’s oil crops and 40 per cent- 90 per cent of the nation’s pulses, much of the farm mechanization focus should be given to the region.

AMD is one of the primary institutions that leads the nationwide development of agricultural mechanization. The department currently positions itself as an agricultural mechanization service provider, in addition to conducting land reclamation and consolidation. The range of services includes machinery production, custom hiring of agricultural machines, organization of occupational training and dissemination of technical information. Table 2 shows the different farm machinery distributed by AMD to the whole country and to the Dry Zone area from 2011 to 2015.

Table 3.1 Distribution of farm machinery by AMD in Myanmar

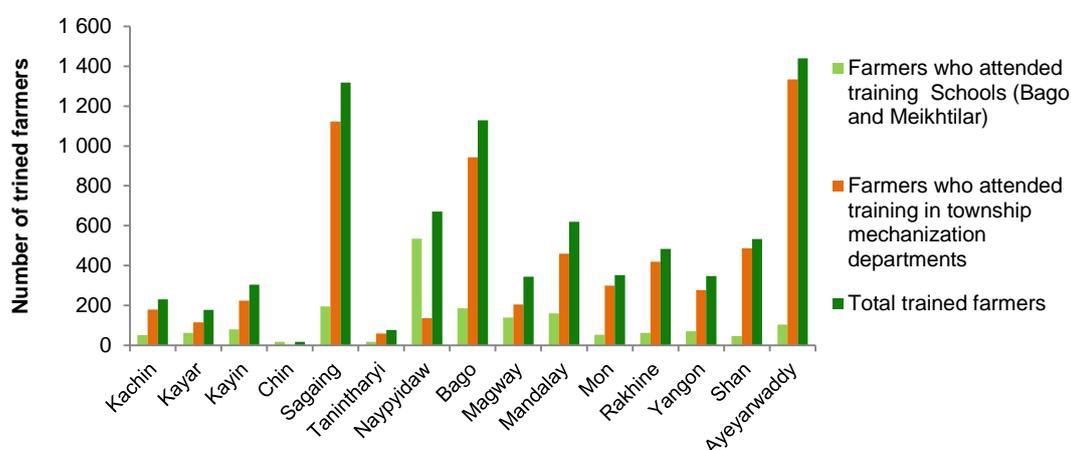
Machinery	Farm machinery distributed by AMD	
	2011/12 to 2014/15	
	Whole country	Central Dry Zone*
Tractor	331	169
Mini-tractor	31	22
Power tiller	20 661	7 839
Mono-wheel tiller	305	1
Cultivator/roller	342	10
Thresher	1 581	156
Reaper	86	16

Source: AMD (2015)

It is notable that 51 per cent of the tractors and 71 per cent of the mini-tractors have been distributed to the Dry Zone area. The distribution of power tillers to the Dry Zone also achieves the sizeable rate of 38 per cent. The machinery distributed by AMD includes both AMD-produced products and imported ones, including brands such as Sonalika (75–90 horsepower), New Holland (70 horsepower), Kubota (47 horsepower) and Zetta. Nevertheless, the average farm size in the Dry Zone is only around 1.8 hectares, which might explain the sizeable feedback from farmers that questions the suitability of the farm machines, as many are too powerful for smallholdings. Furthermore, the field survey also received feedback stating that the government-provided machines were too old and in poor condition.

Farmers' occupational training on machinery operation, repair and maintenance organized by AMD are conducted through two channels: two training schools in Bago and Meikhtilar and training sessions organized by the township-level Mechanization Department for local communities. The number of farmers in each region/state who have received the mechanization training from 2011 to 2015 is shown in Figure 4.

Figure 3.2 Number of farmers trained by AMD from 2011 to 2015



Source: AMD (2015)

Farmers from the Dry Zone were included in the training sessions; Sagaing had the second largest number of trained farmers during the period. There is no doubting the benefits of such training. Nevertheless, limits lie with the fact that machinery operation and maintenance is specific to brands and types. The applicability of such information and knowledge depends largely on the farmer's needs and choices of machinery, which AMD cannot fully cover.

Irrigation facilities, including the availability of irrigation tools such as pumps, contribute to the development of agricultural mechanization. From its establishment in 1995 until 2014, the WRUD (recently merged to the IAWUMD) constructed 327 river water pumping projects in 13 states/regions and 12,258 groundwater irrigation projects in 9 states/regions including the Dry Zone area. A total of 183 river water pumping projects (56 per cent of the total constructed projects) have been constructed in the Dry Zone and 138,678 hectares (69 per cent of the total area) has been benefited. Of the groundwater irrigation projects, 10,111 (82 per cent) are in the Dry Zone and 56,943 hectares (87 per cent of the area) has benefited (MOAI, 2014). While this development of the Dry Zone by WRUD is certainly positive, it should be noted that the majority of the irrigated area in the Dry Zone is in the lowland, accounting for 28 per cent of the total farming area, where rice is dominantly cultivated. The upland farms, which account for 72 per cent of the total area, where the migration is higher and consequently the demand for machinery is higher, remain mostly unirrigated.

WRUD also provides custom hiring services of irrigation sets together with water resource supply activities in the irrigated areas. The irrigation sets are rented on a seasonal basis. Farmers who want to hire the irrigation sets have to agree to a contract with the department, together with the signature of the village chief and 1-3 witnesses. As the department is the only operator in the market providing such services at a large scale, farmers do not have much choice but to accept the conditions and procedures set by the department. Although this service is useful for farmers, particularly smallholders, it is limited to the lowlands of the Dry Zone.

In a free market economy, the demand and supply of goods reaches equilibrium automatically. In the case of agricultural mechanization, considerations on whether or not to adopt farm machines, the choice of machines, the stages at which to use machines, etc. should be purely decided by the end users and the supply of machines is driven by such market demand. That is to say, government-provided mechanization services have an obvious disadvantage, particularly in responding to agile market needs. Past experience in implementing and providing agricultural mechanization services shows that the operation and management of mechanization supply chains, manufacturing and trade, together with research, should be dominated by the private sector, with the public sector taking a more regulatory role, such as setting standards, testing and certification (FAO, 2015).

A pure free market does not exist in reality. Authorities and governments regulate economic activities to different degrees for various reasons. This is also the case in Myanmar in the market of agricultural machines. Agricultural mechanization is demand-driven and farmers ultimately make the final decision (Rijk, 2004). The Heritage Foundation, in partnership with the *Wall Street Journal*, has created an "Index of Economic Freedom" to provide a glimpse into the degree of market freedom on countries worldwide, through measuring 10 quantitative and qualitative factors in four broad categories: rule of law, limited government, regulatory efficiency and open market. For the 2016 Index, Myanmar ranked the 158 among

186 countries globally and the 36 in the Asia-Pacific region, with data based on the second half of 2014 to the first half of 2015. The country's score is categorized as 'repressed', the lowest degree of economic freedom according to the ranking system (The Heritage Foundation, 2016).

The remarkable history of Bangladesh's mechanization process has demonstrated the important roles of the government and the private sector. Prior to 1988, agricultural mechanization development in Bangladesh remained slow and inefficient. After the country was hit by two successive cyclones in 1988, President Ershad scrapped the Standards Committee for Agricultural Machinery, which controlled the import permits. He introduced a market liberalization policy, which resulted in high importation of small machinery (Justice and Biggs, 2013). In 2010, the country had one of the most mechanized agricultural economies in South Asia.

(b) The participation of the private sector including the engagement of foreign direct investment (FDI)

In recent years, there has been increased participation from the private sector in agricultural machinery related businesses in the country. However, the availability of such services is yet to catch up with the demands from the market. At the policy level, the encouragement of private sector participation, including trying to attract FDI is necessary to respond to the market demand and lead to the rapid development of agricultural mechanization nationwide. There are firm indications that the government is trying to engage the private sector and a portion of the policies, enacted laws and policy processes are moving towards this end. However, some key issues that greatly affect the private sector's motivation to participate in this development process, such as land ownership for Myanmar nationals, limited financing options for local entrepreneurs and SMEs, and import and export business ownership under FDI, remain unaddressed. There is thus much scope to improve policies to boost the development of the private sector in agricultural mechanization.

The development of agricultural mechanization increases labour productivity and the production environment benefits from economies of scale. In the process, investments in land development, including land consolidation, are often needed to facilitate agricultural mechanization advancement. The *Farm Land Law*, enacted in 2012, specifies the land users' rights including the right to lease, exchange, pawn, inherit, donate and permanently transfer. The *Vacant, Fallow and Virgin Lands Management Law*, passed in the same year established users' rights on vacant, fallow and virgin land (VFV land), encouraging investment in these types of land to develop commercial agriculture. As of 2014, 377 private companies were granted 0.94 million hectares of VFV land in 12 states/regions for large-scale commercial farming since the law entered into enforcement. Details are shown in Table 3.2

Table 3.2 Area granted to national entrepreneurs for large-scale commercial farming

State/Region	Number of Companies	Granted Area (Ha)
Naypyitaw	6	4 126
Kachin	113	371 715
Kayin	1	409
Sagaing	30	162 626
Tanintharyi	41	126 464
Bago	14	5 758
Magwe	19	35 835
Mandalay	10	7 190
Yangon	9	5 460
Yakhine	10	45 487
Shan	65	85 427
Ayeyarwady	59	89 187
Total	377	939 683

Source: MOAI (2014)

A total of 16 per cent of the companies listed above have invested in the Dry Zone area (Sagaing, Magwe and Mandalay) and 22 per cent of the granted land is in the region. Both sets of law are an improvement on the previous laws as they give more rights to users and the law on VFV land has paved the road for local entrepreneurs to participate in the land development with modernized farming technology. However, one of the key motives that encourages the private sector, including individual farmers and farmers' associations, to rearrange their land development strategy remains unaddressed: land ownership. In Myanmar, the land belongs to the state and citizens and organizations rent the land from the state under the protection of certain laws to conduct various activities.

Such status does not create the best environment for encouraging smallholder farmers to jointly develop their land and to adopt farm mechanization technology. Although the *Myanmar Citizens Investment Law* has provided favourable conditions on custom duty and local tax exemption for agricultural machinery, the ambiguity of land tenure reduces the incentive of farmers to undertake long-term investment, such as land levelling, soil improvement and installation of irrigation and drainage facilities. In the Philippines, contiguous farming is a strategy that is similar to the concept of land consolidation and has been enforced by law. The land development process in the Philippines adheres to this strategy to encourage the organization of farmer groups to join their land together for synchronized and efficient operation of high capacity machines, such as four-wheeled tractors, hand tractors, planters, threshers, harvesters and other suitable mechanization technologies (Amongo, 2015). Land ownership, in this case, has been made available to the natural-born Filipinos to facilitate individuals' incentives to develop their land.

Another important factor that affects the development of the private sector in the area of agricultural mechanization is the availability of financing opportunities. No matter whether it is conducting a business in agricultural machinery, simply purchasing a piece of agricultural machine for self-use or servicing the local community, the source of capital is a primary consideration and constraint. Laws and formulated policies have attempted to provide more

financing options for agricultural development. However, efficient financial support has yet to be given to the private sector to facilitate the development of agricultural mechanization.

The *Myanmar Agricultural and Rural Development Bank Law* established the MADB as a nationwide loan provider in the area of agriculture development. Its seasonal loans target crop production and the term loans aim to facilitate the procurement of farming tools and equipment, including agricultural machinery. Nevertheless, MADB primarily focuses on rice production, which is only applicable in the lowland area in the Dry Zone. Further, the institution only provides loans to farmers who have land-use rights issued by the Land Record Department of MOALI, which is not applicable to landless entrepreneurs who wish to provide agricultural machinery related services. Moreover, MADB has a limit of providing a maximum loan of 100,000 kyats per acre (equivalent to US\$190 per hectare) and for a maximum of 4 hectares, which is not sufficient to cover the crop production cost. For instance, the rice production cost per hectare is around US\$475-570 (JICA, 2013).

Microfinance is one of the eight prioritized subjects in the National Comprehensive Development Plan. The Microfinance Law has given legal status to microfinance institutions (MFIs), prior to this they were operating under a memorandum of understanding. Under the law, the Microfinance Supervisory Enterprise (MSE) examines MFIs in terms of legal status, capital funds, lending and saving rates, and has the right to issue licences for lending operations. According to MSE, 118 MFIs have been granted licences from 2011 to November 2012, including 6 international NGOs, 9 domestic NGOs, 60 cooperatives and 43 domestic firms. Nevertheless, MFIs are generally not interested in supporting micro and small business development, particularly in rural areas, which has undermined the possibility of developing agricultural machinery related services by individuals or small groups of farmers (LIFT, 2015).

In fact, according to a survey on the evaluation of industrial policy focusing on SMEs published in 2014, lack of sufficient financing opportunities is a major problem for SMEs in Myanmar. Both for public- and private-owned financing institutions, there are high collateral requirements, delays in processing loans and transactions and administrative barriers (Nang Saw Nandar Hlaing, 2014). SMEs in agricultural machinery related businesses are undoubtedly facing similar difficulties.

Financing mechanization services that are of public nature, such as training, licensing of machine operators, R&D and development of rural infrastructure should remain one of the major responsibilities of the government. Creating an enabling environment for the private sector to finance mechanization investments is another aspect that the government should facilitate through its regulatory role (e.g. enacting and improving laws) (FAO, 2015).

FDI can play a very important role in facilitating agricultural mechanization development in Myanmar by engaging in trading to introduce quality agricultural machinery from abroad or by investing in related manufacturing or service businesses within the country. The *Export and Import Law* has exempted import licence fees on several commodities, including farm implements and agricultural machinery, which has shown the government's will to encourage the introduction of agricultural machinery from abroad. Nevertheless, foreign companies are not allowed to be directly involved in trading and distributing imported commodities in the

local market, thus there is little incentive for foreign investors to become involved in such business.

The *Foreign Investment Law* allows 100 per cent foreign investor ownership in agricultural machinery manufacturing related business. Nonetheless, the price of the local manufactured products will only be competitive with imported tools and machinery when the business reaches economies of scale, after a period of learning and R&D processes. Myanmar is in the initial stages of developing agricultural mechanization and such an investment can only be made based on a long-term strategy, where the investor does not expect much capital return in the first few years. This does not facilitate the best incentive for foreign investors to invest in the agricultural machinery manufacturing business. This trend can also be seen from the distribution of foreign investment in the country. In general, foreign investment in Myanmar's agriculture sector is very limited, accounting for less than 1 per cent of the total foreign investment in 2015, and the majority of the investment in the agricultural sector is in agricultural plantations including sugarcane, fruits and vegetables (Far Eastern Agriculture, 2015).

3.2 The policy cycle

Both the policy formulation and implementation processes in the country have followed a top-down approach, and different institutions and ministries follow their own objectives and design their own strategies, during which the coordination, particularly technical cooperation, is weak. The monitoring and evaluation mechanism is also incomplete, and consequently, the feasibility, efficiency and effectiveness of the policy are affected.

(a) Policy formulation and implementation process

The policy consultation and formulation process at the national level only invites experts identified by government officials and government authorized persons. The vast majority of stakeholders, such as the lower level of government staff, local communities, NGOs, the private sector and international organizations, are not involved in these processes. Farmers and the private sector are two of the most important groups of stakeholders in efforts to develop agricultural mechanization, as the former creates demand and the latter can quickly respond to that demand. Therefore, if their voices are not heard during the policy formulation processes, there is a great chance that the formulated policy will not address the most efficient and effective path for developing agricultural mechanization both countrywide and in each region/state.

In Myanmar, it is not uncommon to find that the lower levels of government staff are not aware of the laws or policies formulated by their own ministry or institutions, due to the existing policy formulation processes. Furthermore, the laws at the national level are, at times, vague in nature and detailed policy guidance and implementation processes that should be tailor-made for each region/state are often absent. In the case of the Dry Zone, some of the general policies do not fit well into specific local contexts and are not able to address precise issues on the ground. These include policies connected to the demand for agricultural machinery for ploughing and harrowing upland crops, related knowledge and information and the need for increased agricultural mechanization services during the critical window period of agricultural activities. As a result, the government staff in charge of policy

implementation often face difficulties as the formulated laws and policies have limitations in terms of solving the real situations faced.

The enactment of the *Cooperative Society Law* has resulted in the establishment of cooperative societies, which has actively contributed to increasing the number of economic activities in the production, service and trade sectors. According to the statistics from the Cooperative Department, there were 40,388 cooperatives in the country as of 31 March 2016, with 80 per cent of them (32,127) in the production sector, which includes agriculture and industrial activities. There are 9,557 cooperative societies in the agriculture sector. Microfinance programmes are available through these for farmers to buy agricultural machines through a hire-purchase system from the Korean brand Daedong Industrial Company Limited. The number of cooperative societies by region/state is listed in Table 4.

Table 3.3 Number of cooperative societies by region/state as of March 2016

No	Regions/States	Central Cooperative Society	Union of Cooperative Syndicates	Cooperative Syndicate	Primary Cooperative Society	Total
1	Kachin		1	13	691	705
2	Kayar		1	8	259	268
3	Kayin		1	15	562	578
4	Chin		1	14	555	570
5	Sagaing		1	50	5 412	5 463
6	Tanintharyi		1	16	479	496
7	Bago		1	39	6 682	6 722
8	Magwe		1	37	5 412	5 450
9	Mandalay		1	39	4 702	4 742
10	Mon		1	12	978	991
11	Rakhine		1	21	1 219	1 241
12	Yangon	1	7	78	2 736	2 822
13	Shan		2	38	2 238	2 278
14	Ayeyawady		1	70	7 321	7 392
15	Naypyitaw		1	17	652	670
Total		1	22	467	39 898	40 388

Source: Department of Cooperatives (2016)

The three regions in the Dry Zone – Mandalay, Magway and Sagaing – have been very active in this movement and have the highest number of cooperative societies after Ayeyawady and Bago. In fact, the development of cooperative societies has provided farmers with better access to agricultural machinery compared, as they are able to purchase the machines using a long-term instalment system from the cooperatives. Nevertheless, the choice of machines is limited to only one brand, therefore the production coverage is limited and sometimes not applicable to local farming systems, consequently the beneficiaries are also limited.

In the Dry Zone, 28 per cent of the agricultural area is lowland and rice is mainly planted where irrigation is available. Approximately, 72 per cent of the agricultural area is upland, with the main crops being oilseeds and pulses. Agricultural machines for land preparation,

including ploughing and harrowing, are in highest demand, followed by irrigation and harvesting machines, mainly for rice farmers. There is a need for specific policies or policy implementing processes for the Dry Zone, otherwise the effectiveness and efficiency of policies in the area will remain low. A similar situation can be seen in other national laws and policies.

The *Small and Medium Industry Law* has been formulated to support small-scale agribusiness and 40 per cent of the 40,000 small and medium industries across the country at present are small-scale agribusinesses, including rice mills and pulse processing facilities. The *Small and Medium Enterprise Development Policy* prioritizes agricultural machinery and related production industries in both the long- and short-term. The *Industrial Policy* focuses on the development of agricultural machinery factories. All of these policies aim to enhance agricultural mechanization development in the country. However, the farming communities in the Dry Zone may receive limited benefits from the development as their main concerns (land preparation related assistance) are yet to be addressed.

(b) Coordination among institutions

Another prominent factor that affects policy efficiency and effectiveness is weak coordination, including technical cooperation, among ministries and institutions. The existing coordination mechanism is mainly at the administrative procedure level. As multiple ministries and institutions are actually involved in the agricultural mechanization development process, technical cooperation and mutual support must be strengthened.

The *National Comprehensive Development Plan* and guiding policies of MOAI have both stressed the transformation from conventional farming to mechanized farming, during which land development processes, including land consolidation, are necessary. The *Farm Land Law* and the *Vacant, Fallow and Virgin Lands Management Law*, despite facilitating some improvement, have failed to support a national policy on land consolidation by providing related measures.

The *Law Amending the Commercial Tax Law* and The *Tax of the Union Law* have included imported farm equipment and farm machines and parts in the tax exempted category which is under the charge of the Ministry of Planning and Finance. The administrative procedure requires the importer to apply for an import licence from MOC with a letter of recommendation from the Agriculture Mechanization Department as proof that the products to be imported are indeed in this category. In this process, no party is responsible for providing technical evaluation of the quality and standard of the imported products. These sets of laws and related policies aim to promote the popularity of agricultural machines. However, with this lack of quality control and proper coordination, poor quality machines with weak technical performance that are operationally unsafe and hazardous to the environment might be brought into the country.

The *Myanmar Citizens Investment Law*, the *Foreign Investment Law* and *Industrial Policy* have encouraged the establishment of agricultural machinery factories. The administrative procedure requires the business owner apply for operational approval from the Myanmar Investment Commission (MIC) with a quality check from MOI. There is an obvious weakness in this process as the manufacture of agricultural machinery does not only involve basic

mechanical principles, but also measures regarding efficiency, safety and environmental friendliness.

In fact, agricultural machinery testing and standardization has been overlooked in policies and the implementation processes in the country. The *National Policy and Development Plan* has delineated “Research and development (R&D) (R&D for advanced agricultural technologies in agriculture sector)” under “Enhancement of Technologies and Extensions Services”. Nonetheless, systematic and comprehensive programmes of R&D on agricultural machinery are yet to be established in many institutions. AMD currently has one factory in the Yangon region conducting research and testing imported and locally produced machinery. It is the sole institution in the country that provides such an evaluation and it is not fully functioning. The institutional capacities cannot meet the rapid development of agricultural mechanization in the country and it is unable to test the large number of machines from the private sector.

Existing research activities mainly focus on crop production. DAR and YAU are key institutions in developing R&D activities in agricultural mechanization in the country. Their current activities in this field are, however, very limited. Agricultural engineering is taught as a minor subject in YAU and hands-on training for students focuses solely on machine operation. In-depth research on agricultural mechanization is absent in the institute. DAR, on the other hand, has given only limited attention to research on machine operation and production of farm implements, based on the department’s own research.

(c) Monitoring and evaluation

In a complete policy cycle, monitoring and evaluation should be the last policy process stage to assess the effectiveness of the policy, in terms of its perceived intentions, and the policy implementation process, in terms of its performance and results. Based on the monitoring the evaluation results, policymakers could determine whether or not the course of action is successful and make further adjustments. Unfortunately, the monitoring and evaluation mechanism in the country’s policy cycle is inadequate. An example is the performance evaluation and management system of state-owned enterprises (SOEs) in Myanmar.

A report published by the Organisation for Economic Co-operation and Development (OECD) reviewed national practices on performance and evaluation management of SOEs in 11 Asian countries, including Myanmar. It showed that Myanmar is the only country that has no established performance evaluation system nationwide. Measuring aspects include authorized agency, reference, frequency, evaluation criteria and methodology, publication or annual reports and performance incentives for CEOs and other managers and staff. In Myanmar, there is only an internal monitoring system operating under the responsible line ministry either through the relevant management committee or executive management team (OECD, 2016).

3.3 Sustainability issues

One of the most cited definitions of sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WECD, 1987). In September 2015, the United Nations passed a resolution to act on

the *2030 Agenda for Sustainable Development*, which officially calls for a convergence between economic development, social equity and environmental protection worldwide.

In the course of developing agricultural mechanization, it is essential to bring about social benefits and economic growth using environmentally sound technology to address issues related to food security and nutrition, poverty reduction and agro-enterprise development. Sustainable agricultural mechanization development, however, has not been articulated satisfactorily in current policy, institutions and policy processes in the country. At present, economic growth and increased crop production are the main goals pursued through agricultural mechanization at the policy level. Experience from other countries has shown that the social impacts and environmental effects should not be ignored while applying mechanized technologies. Feedback in the country has also revealed inadequate consideration has been given to maintaining such a balanced development.

(a) The social aspect

The land consolidation process in the country is led by government institutions, through collaboration among DOA, Department of Agricultural Land Management and Statistics, AMD and the Department of Administration according to the policy of MOALI. The established land laws lack of clarity and provide insufficient protection for smallholder farmers' rights in upland areas. According to the 2010 JICA study, 37 per cent of the farmers in the Dry Zone hold less than 2 hectares of land, and 43 per cent of the households are landless (JICA, 2010). The field study has received many complaints on 'land grabbing' from previous land owners and 'deprived income opportunities' from landless farmers, who primarily depend on providing agricultural labour. Encouraging farmers to jointly develop their land through sound policy, providing reasonable land purchasing opportunities or creating additional economic opportunities can help to balance the social aspect in the development of agricultural mechanization.

As seen in many countries in the region, the stereotype in agricultural mechanization in Myanmar is that men should be the main players, though there is no legal restriction. Following this 'understanding', men lead and perform activities related to agricultural mechanization, such as attending training sessions, acquiring related information, and purchasing, operating and maintaining machinery. Women are generally less interested in agricultural machinery as they view it as the men's task. In the Dry Zone, women spend significantly more time in agricultural labour than men, including leading or managing farm operation activities. Nevertheless, when it comes to farm machinery, women give way to men automatically and they are often left with inefficient equipment. On the institutions' side, information dissemination or knowledge-sharing related to agricultural machinery, such as training, exhibitions and trade shows, are usually targeted at men.

At a time when women have become the main contributors to farm activities and the rural youth tend to be attracted to employment opportunities in urban areas, the empowerment of women and rural youth are necessary to lead to tomorrow's modern farming. To start with, for instance, equal rights for women to register and inherit land or acquire land-use rights for VFV land should be explicitly stated.

(b) The environmental aspect

In feedback from farmers, soil degradation and disturbance are among the most raised concerns. Nevertheless, there seems to be no official channel for addressing such issues. The major environmental issues related to the development of agricultural mechanization include land degradation, water contamination, excessive machine noise and exhaust gas pollution. Efforts could be made at different stages to eliminate or minimize the negative environmental impact brought by the mechanization process. R&D, as well as testing, disseminating and promoting proper agricultural machinery and implements should be stressed, together with the implementation of related policies and facilitation of knowledge-sharing.

Findings, Recommendations and Proposals for Follow-up Actions

This section summarizes the findings from the above analysis on the PIPs by presenting their strengths and weaknesses. Recommendations for improving PIPs and proposals for follow-up actions by concerned institutions are also presented.

4.1 Strengths and weaknesses of PIPs for agricultural mechanization development in the Dry Zone

Table 4.1 Strengths and weaknesses of PIPs for agricultural mechanization development in the Dry Zone

Strengths	Weaknesses
<ul style="list-style-type: none"> ■ Agricultural mechanization development has been emphasized in the national policy and various institutions have outlined their institutional policies to promote such development. ■ In the process of designing agricultural mechanization related policies, experts were engaged in the consultation process and national workshops were organized. ■ Institutions and ministries involved have established targets and objectives, and institutional strategy has been made from the top level to align the activities of the entire organization. ■ Administrative procedures among the institutions involved are in place and duties and responsibilities of each are clear. ■ Some of the key infrastructure for agricultural mechanization development (i.e. irrigation canals) is under development in the Dry Zone. ■ There are established institutions providing academic education in agricultural engineering and conducting related research. 	<ul style="list-style-type: none"> ■ The policy formulation process on agricultural mechanization has insufficient participation from relevant stakeholders, such as government staff, local communities, farmers' associations, NGOs and the private sector. ■ Some of the policy implementation processes have not fully backed by the national policy or legislature (i.e. the land consolidation process). ■ Besides the national policy and the ministerial level policy, few policies have been outlined to meet the specific agroecological or socioeconomic needs in the Dry Zone. ■ The policy implementation process purely follows a top-down approach from the national level to the regional, state and township level. Such an approach affects the effectiveness of the policies in the Dry Zone. ■ Technical cooperation between involved institutions is weak, which has led to the absence of some key processes for the development of mechanized farming (i.e. testing and standardization of imported and locally manufactured machines).

Strengths	Weaknesses
<ul style="list-style-type: none"> ■ The government is encouraging and facilitating the participation of the private sector in the agricultural mechanization sector by improving/establishing legislation as well as providing favourable economic policies and financing opportunities. ■ Favourable policies are in place to attract FDI as well as local investors into developing agricultural mechanization in the country in the manufacturing business. ■ The cooperatives' development has brought great benefits to the Dry Zone including facilitating the mechanization process and the cooperative societies are very active in the region. ■ Sustainable development has been outlined in the guiding policies at the ministerial level 	<ul style="list-style-type: none"> ■ The mechanization services provided by the government sector are yet to become efficient due to which the market demand from the Dry Zone cannot be fully met. ■ Most of the ongoing infrastructure projects, such as irrigation systems focus on the lowland of the Dry Zone, whereas the upland areas remain largely undeveloped. ■ Academic institutions lack systematic educational programmes majoring in agricultural engineering; the research from various R&D institutions has limited coverage of agricultural mechanization. ■ The enabling environment for the private sector to finance mechanization investments, such as allowing for land ownership by Myanmar citizens and business ownership by foreign direct investors, is not in place. ■ There are limited financing opportunities from the public financing institutions in agricultural mechanization related needs. ■ The policy monitoring and evaluation mechanisms are insufficient at the national level. ■ In policy implementation processes, much of the emphasis has been given to pursue economic development, while social development and environmental protection have not been balanced well enough; advocacy for the participation and empowerment of women and youth is limited.

4.2 Recommendations for improving PIPs and proposals for follow-up actions by concerned institutions

(a) Roles of the government and the private sector

Through referencing lessons learned and experience from the Asia-Pacific region in developing agricultural mechanization, the government should consider adjusting its role in this domain. It should encourage the private sector to lead the establishment of mechanization supply systems and support services, including research, manufacturing and trade, while it assumes a regulatory role. Within this role, it should set standards, test and certify, finance services of public nature (training, licensing of machine operators, R&D, etc.) and develop rural infrastructure. This will create an enabling environment for the private sector to invest in the mechanization sector. Detailed recommendations are listed below:

- **Give further policy consideration to deepening the engagement of the private sector (including FDI) in agricultural mechanization.** Various policy options on providing more incentives to the private sector and FDI should be considered. For instance, land ownership could be delegated to natural-born Myanmar nationals to further encourage their motivation for land development and support promotion of

agricultural mechanization. Restrictions on FDI with regard to owning import and export business should be lifted to encourage the importation of agricultural machinery from abroad by foreign investors, which can provide more options to answer the market demand.

- **Develop further financing options in the public sector for agricultural mechanization development.** Financing institutions from the public sector primarily focus on production, particularly rice production. Financing options are not commonly available for farmers to purchase agricultural machines particularly for landless farmers. Farmers usually have to turn to alternative sources when purchasing agricultural machines. Limited financing opportunities from the public financing institutions do not benefit the development of agricultural mechanization in general. Hence, development of a wider and more farmer-friendly set of financing options is strongly needed.
- **Develop further infrastructure in the Dry Zone, with more focus on the upland areas.** Basic infrastructure, such as roads, electricity and irrigation facilities, should be further developed in the Dry Zone area, particularly in the upland parts, to enable the development of agricultural mechanization in this agroecological zone.
- **Establish systematic and comprehensive education and research programmes in agricultural mechanization in collaboration with international organizations.** Education and research in agricultural mechanization create intellectual value and accumulate a knowledge base for the sector's long-term development. Local research will provide information on local conditions and provide evidence-based suggestions to policymakers. International collaboration in this process could save time spent on trialling new initiatives and international resources could support local researchers/academia.
- **Establish and conduct testing and standardization for both imported and locally produced agricultural machinery and establish certification system.** Good-quality machines are necessary to ensure operational safety, reliability, environmental friendliness and efficient operation. Certification standards could be borrowed from neighbouring countries, or regional networks, such as the Asian and Pacific Network for Testing of Agricultural Machinery, or other internationally recognized standardization systems. Establishing testing standards at an early stage can also guide the local factories and pave the road for machinery export.

Proposals for follow-up actions:

- Legislation and policy on land and investment should be further improved to create more incentives for the private sector to engage in the development of agricultural mechanization. Land ownership for Myanmar citizens, cooperatives or other entities should be considered and explored by MOALI; imports of agricultural machinery should be authorized for foreign direct investors by MOC in coordination with MOPAF.
- MOALI, MOPAF and MOI should explore further opportunities to finance the purchasing of agriculture machinery for both self-usage and various modalities of sharing operations for farmers, farmer's associations, young entrepreneurs and SMEs.
- Basic infrastructure (irrigation, roads, electricity, etc.) for the development of agricultural mechanization should be further developed and the upland areas of the Dry Zone should be listed as a priority.

- R&D in agricultural mechanization should be better coordinated and deepened among various domestic research institutions with DAR or AMD taking the lead. Collaboration with international organizations should be explored and established. The coverage of the R&D programmes should be expanded to include other important subjects such as testing and standardization. Partnership between the public sector and the private sector should be explored in the area of R&D.
- YAU should further strengthen its capacity and develop courses specialized in agricultural mechanization related fields as part of a major programme, in collaboration with international institutes and organizations.

(b) Policy cycle and institutional coordination

The policy formulation and implementation process related to agricultural mechanization can be improved in several aspects. Coordination among existing institutions should be strengthened, particularly in technical cooperation. Policy monitoring and evaluation systems should be further enhanced. Detailed recommendations are listed below:

- **Engage a wider range of stakeholders in the policy formulation process for agricultural mechanization.** The consultation process should start from the bottom to the top, inviting inputs from the lower level government staff, local communities (particularly farmers of different scales) and the private sector, as well as international organizations and NGOs in this field. As such, stakeholders from different groups would be able to provide opinions from the ground and from different angles. This would also benefit policy implementation at a later stage.
- **Formulate regional/state/township action plans in agricultural mechanization according to the specific conditions of the Dry Zone area, while being aligned to national policies.** Machine requirements are specific to the local farming conditions in terms of crops, farmland conditions, agricultural activities, farming systems and available facilities. Specific needs and status in each farming community should be assessed to formulate action plans that target certain areas. The national policies and strategy in the development of agricultural mechanization should only serve to provide an overall direction to align the activities of each region/state/township.
- **Provide strengthened support in terms of enabling legislation and regulations for policy implementation activities.** Some of the key areas in developing agricultural mechanization, such as land development and land consolidation, should be backed by state legislation after thorough consideration of the social and environmental impact. In the absence of such support, the results are likely to remain scattered.
- **Improve the coordination mechanism among the institutions involved and strengthen their technical cooperation in developing agricultural mechanization.** Several institutions are involved in agricultural machinery related activities such as import, manufacturing, certification, etc. While each institution has its own specific role, technical standards and harmonious procedures should be established and/or strengthened to ensure the quality of the agricultural machines.
- **Set up regular and systematic monitoring and evaluation procedures to assess the performance and results of policy implementation in agricultural mechanization.** The monitoring and evaluation mechanism is intended to assess and provide feedback on the efficiency and effectiveness of policies. This allows policymakers to make sound decisions and/or adjustments. The current feedback

system is limited within the responsible ministry or institution. As agricultural mechanization development involves multiple institutions and their policies, cross-sector monitoring and evaluation is needed to ensure accurate and extensive feedback is obtained and utilized.

Proposals for follow-up actions:

- MOALI should invite a more broad-based group of stakeholders to participate in the consultation process while formulating policies on agricultural mechanization, such as local communities, NGOs, the private sector and international organizations. Based on the current governance structure, feedback should be collected from the bottom to the top. Different groups of stakeholders should be involved in different levels of consultation, depending on their background and scope of work.
- MOALI should design specific policies/ action plans for each region/state based on its agroecological condition and farming systems, aligning them with national policies. The number of mechanization services should be proportionate to the demand and the type of services, and the type of agricultural machines should be applicable to the local condition.
- Monitoring and evaluation as part of policy processes should be established not only within each ministry that is involved in agricultural mechanization, namely MOALI, MOPAF, MOC and MOI, but also well-coordinated and standardized across institutions.
- MOALI should lead technical cooperation among relevant institutions; for example, establishing standard operating procedures and facilities/systems for testing, standardization and certification for imported and locally produced machinery.

(c) Sustainable agricultural mechanization development

Sustainable agricultural mechanization development emphasizes the balanced development across three pillars – economic, social and environmental – to ensure the long-term stability and sustainability of the agricultural sector, as well as society in general. The main recommendation is to:

- **Emphasize social equity and environmental protection in pursuing economic growth by developing agricultural mechanization.** While social equity and environmental preservation are often overlooked aspects in the development process, in the context of agricultural mechanization, policies and activities for their implementation must be made to address these two aspects to avoid exacerbating social inequality and environmental damage.

Proposals for follow-up actions:

- The land consolidation process should be backed up by clear legislation at the national level. Sound policies on mitigating potential negative social impacts, such as land and job losses, should be considered and presented at the same time by MOALI in consultation with relevant stakeholders. Developing small-scale mechanized farming should be prioritized and appropriate strategies developed.
- The development of agricultural mechanization should take into consideration women's roles. MOALI should encourage the participation of women in training sessions,

exhibitions and trade shows, as well as in the operation and maintenance of agricultural machines more generally. The design of such activities, including the selection of machines should include women-specific considerations. Women-suitable machines should be researched in the R&D sector and their availability in the existing market ascertained.

- MOALI should disseminate information and share knowledge through existing training facilities to farmers on potential environmental impact in the case of excessive or inappropriate application of agricultural machinery. Guidelines, suggestions and standards should be drafted, adopted through a consultative process and distributed.

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A Questionnaire Sample for the Field Survey

Date of interview: -----

1. Sl. No -----
2. Respondent's name -----
3. Number of households -----
4. Name of village tract -----
5. Name of village -----
6. Township/district -----
7. Land holding size (ac) -----
8. How many custom hiring agents are working in your village?
9. Kinds of custom hiring machinery and using operation

No	Name of machineries	Import/ Local produce	Imported country	Source of custom hiring	Using operation	Custom hiring rate	Name of crops

10. How do you know about custom hiring?
11. What are the benefits of custom hiring?
12. What are the challenges/difficulties of custom hiring?
13. Which factors did you encourage to use custom hiring?
14. Which are the prevention factors to use custom hiring?
15. Which custom hiring services (government, private service, farmer rental and others) do you like most? What are the reasons?
16. Did you get help assistance/help in custom hiring from government/ private sectors/ NGOs, INGOs, etc.? (Financial or technical or others)
17. Did you receive the sharing of knowledge of technology services or maintenance services?
18. If received, who are the providers?

19. What are the evidence changes like labour usage, economic and production after using custom hiring?

Key Informants Interview

Input Suppliers

1. What kinds of machinery are you supplying?
2. Who determines the custom hiring rate?
3. If you determine the rate of custom hiring services, what factors influence the decision?
4. Do you revise the custom hiring rate very often?
5. What are the factors for revising the custom hiring?
6. What are the difficulties/challenges of custom hiring? Taxes or others?
7. What is the supplying flow of machinery?
8. Did you get any assistance or help from government?
9. Do you need to approach the government for working as suppliers? If needed, for what matter do you need to approach?
10. Can you rent your machinery all the time or depending on the cropping season?
11. Can you estimate how many input suppliers are in Mandalay Region?
12. Who are your biggest customers?
13. Depending on the land holding size (small or medium or large)
14. Depending on the operations (land preparation, ..., harvest)
15. Depending on the crops (_____)
16. Which kinds of machinery are the most popular for custom hiring?
17. Did you receive any soft loan or credits from government, banks or others?
18. What are your opinions on why farmers prefer custom hiring instead of buying?
19. (Why do they think that custom hiring is beneficial for farmers? What are their benefits?)
20. Did you receive knowledge-sharing on technology services or maintenance services?
21. If received, who are the providers?
22. Did you share the knowledge of technology services or maintenance services with farmers?

Private Rental/Service Agents

1. What kinds of machinery are you using for rental services?
2. Who determined the custom hiring rate?
3. If you determine the rate of custom hiring services, what are the influencing factors for deciding on the custom hiring services?
4. Did you revise the custom hiring rate very often?
5. What are the reasons for revising the rate?
6. What are the difficulties/challenges? Taxes or others?
7. What is the supplying flow of machinery?
8. Did you get any assistance or help from government?
9. Do you need to approach the government agencies for working as suppliers? If needed, for what matter did you need to approach?
10. Can you rent your machinery all the time or depending on the cropping season?
11. Can you estimate how many input suppliers are in Mandalay Region?
12. Who are your biggest customers?
13. Depending on the land holding size (small or medium or large)
14. Depending on the operations (land preparation, ..., harvest)

15. Depending on the crops (_____)
16. Which kinds of machinery are the most popular for custom hiring?
17. Did you receive any soft loan or credits from government, banks or others?
18. What are your opinions on why farmers prefer custom hiring instead of buying? (Why they think that custom hiring is beneficial for farmers? What are the benefits?)
19. Did you receive knowledge-sharing on technology services or maintenance services?
20. If received, who are the providers?
21. Did you share the knowledge of technology services or maintenance services with farmers?

Government agencies

1. Which government agencies are involved in custom hiring services?
2. Can you tell me the relationship between the ministries regarding agriculture mechanization?
3. Did you control the rate of custom hiring?
4. Do you have any rule or regulations related with agriculture machineries suppliers or custom hiring services?
5. Which government agencies are involved in custom hiring services?
6. Do you have any relationship with machinery suppliers? How is your relationship?
7. What are the government policies and strategies regarding the development of custom hiring services?
8. What are your opinions on the factors influencing the development of agriculture machinery?
9. What are the government plans for the development of custom hiring services?
10. What changes of farmers (income, production and economic situation, etc.) did you observe after using custom hiring?
11. What are the differences of economics benefits between custom hiring and buying their own?
12. Did you share the knowledge of technology services or maintenance services? How did you do this?
13. If it is invested in an agri-machinery factory, what are the criteria?
14. If it is imported, what are the rules and regulations and procedure?
15. Which ministries were involved for the importation of machineries and parts?
16. Which ministries took the decision-making role for these processes? And how?
17. Which current active agriculture policies can affect custom hiring of agri-machinery?
18. What are the procedures and processes?
19. Which institutions are involved for the development of mechanization? And how are they involved?
20. Who took the responsibility to ensure the applicable technology?
21. How about the research? Who (which stakeholder) takes responsibility for research?
22. What are the plans of government for the development of agriculture sector especially for mechanization?
23. Do you have the activities as a public-private partnership for agricultural mechanization? How? And with what companies?
24. How about with national and international organizations?

Focus group discussion with farmers

1. Who introduced the custom hiring? How do you know about/benefit from custom hiring?
2. How did they determine the custom hiring rate (and who determined it)?
3. Did they revise the custom hiring rate very often?
4. What are the reasons to revise the rate?
5. Did they receive any discount?
6. What are the reasons for the discount?
7. Did they get any subsidies from Government?
8. Did you receive knowledge of technology services or maintenance services?
9. If received, who are the providers?

Types of Machinery Rented by Agriculture Mechanization Department

No	Items	Company name	Horsepower	Remarks
1	Tractor	Sonalika	90 HP and 75 HP	
2	Tractor	New Holland	70 HP	
3	Tractor	Kubota	47 HP	
4	Tractor	Zetta		
5	Tractor	SH-654		
7	Harvester	Kubota		
8	Rice Planter			Using for demonstration only

Source: Survey

Number of Machines Distributed by AMD from 2011/12–2014/15

Name of machine	Tractor	Mini-tractor	Power tiller	Mono-wheel tiller	Cultivation roller boat	Thresher	Reaper
Number of machines in the whole country	331	31	20 661	305	342	1 581	86
Number of machines in Dry Zone	169	22	7 839	1	10	156	16
Percentage of machines distributed in Dry Zone	52.1%	71.0%	37.9%	0.3%	2.9%	9.9%	18.6%

Source: AMD (2014)



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