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CASE STUDY

Stakeholder Mapping for Custom Hiring of Agricultural Machines in the Dry Zone of Myanmar

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Stakeholder Mapping for Custom Hiring of Agricultural Machines in the Dry Zone of Myanmar

Developed as part of the project

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

Funded by

Livelihoods and Food Security Trust Fund

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Contents

Tables

Figures

Appendices

Abbreviations

AGDB	Asian Green Development Bank
AMD	Agriculture Mechanization Department
CDZ	Central Dry Zone of Myanmar
Cusec	Cubic feet per second (28.317 litres per second)
DoA	Department of Agriculture
GDP	Gross Domestic Product
hp	Horsepower (1 hp = 746 Joules per second)
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agriculture Development Bank
MCB	Myanmar Citizen Bank
MoAI	Ministry of Agriculture and Irrigation
R&M	Repair and Maintenance
SWOT	Strength, Weakness, Opportunity and Threat
USAID	United States Agency for International Development
USD	United States dollar
WRUD	Water Resources Utilization Department

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 study aims to map the stakeholders involved in custom hiring of agricultural machinery in the Dry Zone of Myanmar, which is mainly comprised of Sagaing, Magway and Mandalay Regions. The purpose of the mapping exercise is to assess the status of custom hiring in the Dry Zone, evaluate the strengths and gaps with regard to stakeholders' interventions, and formulate policy and programmatic recommendations to enable the full potential of custom hiring to be realized.

In the study area, wherever irrigation is available, rice is the dominant crop, but elsewhere production is generally focused on pulses, oilseeds and sorghum. Farm holdings generally range from small to medium size (1.4-2.6 ha for rice; to 3.6-5 ha for other crops). Climate and environmental stress are among the main drivers of migration of farmers for employment, thereby reducing the availability of young farmers during peak agricultural seasons. Coupled with lack of financial resources and necessary technical skills, labour scarcity in the study area serves as incentive for the farmers to participate in custom hiring of agricultural machinery. Major hiring service providers are: (i) government departments (mainly provide machinery for land preparation, tillage and irrigation); (ii) large-scale farmers (mainly provide machinery for land preparation); and (iii) private companies (mainly offer their services for harvesting activities).

The existing landscape for custom hiring of agricultural machinery is complex and site specific. However, a number of key stakeholders, representing both private and public sectors, can be identified. These stakeholders include: (i) agricultural machinery owners; (ii) entrepreneurs/service providers; (iii) private companies/machinery dealers; (iv) universities and research institutions; (v) financial/credit institutions; (vi) Ministry of Agriculture, Livestock and Irrigation; (vii) Ministry of Commerce; (viii) Ministry of Industry, and (ix) Ministry of Planning and Finance. Their work both affects and is affected by the end users of custom-hiring services (i.e. farmers).

There are contrasting criteria for selecting machines to purchase (for self-use). For instance, power tiller customers prefer brands that are relatively inexpensive, whereas of four-wheeled tractor and combine harvester customers prefer brands that are more established and considered to be reliable. There are two kinds of farming systems popularly practised in the region: rice farming and upland field-crop farming systems. Rice farmers mainly depend on custom hiring for land preparation, irrigation and harvesting activities, whereas the farmers in the upland field-crop growing areas only use custom hiring for land preparation activities, especially for ploughing and harrowing.

Custom hiring is a relatively common phenomenon in the study area. Irrespective of the farm size (small or medium) or the farming system (rice based or upland field-crop based), farmers generally utilize custom-hiring services. However, the type of machines hired greatly varies according to farm size and farming system. While both small and medium farms tend to use custom hiring at an almost equal scale, they differ in their motivation to do so. The smaller-scale farmers need to use custom hiring as they do not own machinery; and the medium-scale farmers need custom hiring as they cannot afford the machinery with a large enough capacity (along with whatever small machines they own) during the peak season, for example, in the period between the harvesting of the first crop and land preparation for the second crop.

There appears to be a general lack of up-to-date databases, repositories or comprehensive reports on the overall situation of agricultural machinery, mechanization needs catering for specific local challenges, custom-hiring statistics and users' feedback on existing hiring systems. Farmers often lack the knowledge and technical skills necessary to operate the (advanced) machines they hire, which either results in inefficient utilization or makes the farmers dependent on externally hired operators to do the job; the operators themselves also lack training. In most cases, the potential efficiencies of the machines are not realized. Appropriate training could be used as a tool to increase awareness of the various stakeholders involved in custom hiring, thus promoting climate-resilient agriculture and improved livelihoods in the Dry Zone.

The rates of custom hiring tend to fluctuate. Furthermore, the machines used are mostly old and need replacing. The machines offered by government agencies are very basic and limited in number.

Awareness of financial assistance available from different organizations is lacking among farmers in the Dry Zone, yet buying machines on instalments directly negotiated with machinery dealers is commonly reported. The ease of obtaining a loan and a quick processing time are the decisive criteria for many customers in the study area when selecting an appropriate source of finance.

Some of the key recommendations emerging from this study include:

a) The economic, technical performance and suitability of various machines for their corresponding agricultural operations need to be studied and tested in the context of the farming systems operating in the Dry Zone (i.e. farm size, type, crop, etc.).

b) In-depth market analysis of the custom-hiring environment is needed in the specific context of the Dry Zone. Such an analysis could better estimate the potential of hiring service providers, as well as the total demand for corresponding services; farmers' willingness and ability to pay the hiring tariff; and accessibility to repair and maintenance (R&M) services, among others.

c) Guidelines for maximum tariffs for custom hiring should be prepared by relevant government authorities to protect the interests of all stakeholders at least until there is a well-functioning market that is able to negotiate its equilibrium rates.

d) Different models of custom hiring should be explored and tested in the market. Selected models may be implemented at pilot scale. These pilot projects could be used as extension tools for further promotion and dissemination of custom hiring over a larger area. In addition, the role of extension personnel is crucial; better-trained

extension staff who are familiar with specific regional needs in the Dry Zone should be deployed.

e) Appropriate training modules should be designed and frequent training sessions organized for personnel involved in machine operation (operators) and those who are involved in R&M. This training can also bring about increased awareness among stakeholders of the options for climate-resilient agriculture and improving livelihoods in the study area. Training topics could include, for instance: deciding between custom hiring and owning a machine; productive, efficient and safe use of machines; preventive R&M; farm budgeting and record keeping.

f) To ensure quality of service through custom hiring, the testing and standardization of machines for agricultural use should be performed at the manufacturing/procurement/dealership stage. Regular performance checks should also be conducted through the relevant government units. This can potentially be handled, for instance, through authorized testing centres.

g) Increased investments in infrastructure (farm roads, rural electrification, rural microfinance and banking) should be undertaken to provide necessary impetus to agricultural mechanization in the region.

h) Effective coordination among various stakeholders must be promoted to keep all involved well informed. Improved coordination will help to better identify the actual needs of the farmers and the available potential of the service providers, enable a better understanding of the theoretical and practical basis of appropriate models, and facilitate the provision of necessary backstopping through extension and capacity-building support.

1

Background

This study is produced as part of 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 maps out the key stakeholders of custom hiring of agricultural machinery in the Dry Zone of Myanmar, their activities and impact.

1.1 Objectives of the case study

The overall objective of this case study is to map the current status of custom hiring of agricultural machinery in the Dry Zone of Myanmar, including the key stakeholders involved. Specific objectives are identified below.

a) To identify various stakeholders and their activities and to recognize their needs to facilitate smooth adoption of custom hiring, leading to climate-resilient agriculture and improved livelihoods

b) To determine the existing state of custom-hiring practices for different agricultural operations (land preparation → crop establishment → crop care → harvesting)

c) To review existing knowledge repositories on custom hiring of agricultural machinery, and other knowledge-sharing platforms in Myanmar

1.2 Scope and limitations

This study aims to provide an overview of the existing status of custom hiring of agricultural machineries, with particular reference to existing stakeholders in this domain. Information was mainly gathered through personal interviews and site visits. However, due to budgetary and time constraints, cases from Mandalay were sampled as representative of the Dry Zone. Furthermore, officers from selected ministries/departments in the Dry Zone were approached for information and discussions.

1.3 Methodology

After the initial desk review of relevant documents and information, questionnaires were developed. A survey was conducted involving focus group discussions, personal interviews and key informant interviews. Stakeholders at the local, regional and national level were interviewed. They included farmers, agriculture machinery dealers, suppliers, extension staff, factory managers and regional- and national-level senior government officers from the Agriculture Mechanization Department, Water Resources Utilization Department, Department of Agriculture, Department of Agricultural Research, Cooperative Department and Cooperative Societies.

The survey was primarily conducted in Mandalay.

1.4 Agriculture and use of machinery in Myanmar's context

The agriculture sector has traditionally been the dominant economic sector in the Union of Myanmar and it remains an important contributor to GDP (with the highest contribution among all sectors in 2013-2014 coming from agriculture at about 23 per cent, see Table 1.1). It employs about 61.2 per cent of the workforce and brings about 20 per cent of total export earnings. One-fourth of the country's total area is cultivable land with about 11.9 million ha of net sown area (Figure 1.1). Agriculture in the country can be characterized as smallholder agriculture, where about 3.6 million ha of agricultural land is cultivated by small-scale farmers. The average size of a holding is 2.21 ha, with about 27 per cent of the country's total sown area comprised of holdings smaller than 2.02 ha (Mrema *et al*., 2014; MoAI, 2014). Overall, agriculture plays an important role in Myanmar, both from an economic as well as social perspective.

Myanmar's diverse topography and ecosystems enable farmers to produce a wide range of cereals, pulses, horticultural products, fruits, livestock and fish. Despite its enormous potential, per capita earnings in agriculture average roughly $200 per year (USAID, 2013), which is one-half to one-third of the earnings of counterparts in other Asian countries. Poor households spend over 70 per cent of their income on food. In addition, about one-third of rural households borrow at some point during the year in order to purchase food.

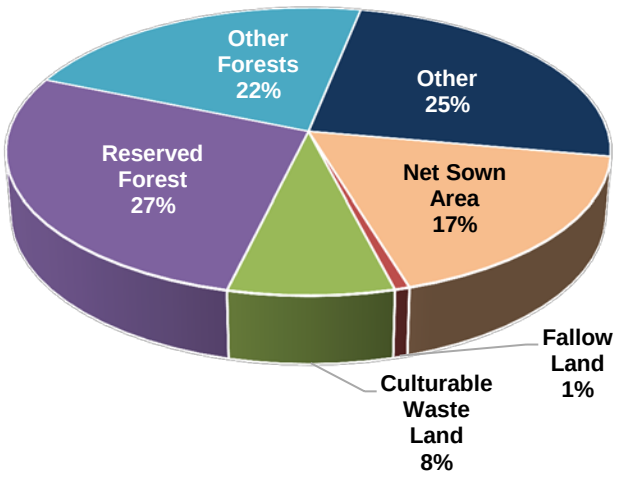
Table 1.1 GDP share of different sectors in Myanmar (2013-2014)

Sector	% share
Agriculture	22.52
Services	21.62
Manufacturing	21.02
Trade	18.82
Livestock and Fishery	8.51
Construction	5.21
Electricity	1.10
Mines	0.80
Forestry	0.30
Energy	0.10
Total	**100**

Source: MoAI (2014)

Since the colonial era, research activities on the utilization of farm machinery have been undertaken in Myanmar in order to reduce the workforce needed and the use of draught cattle. However, the objective has not been fully realized because famers lack experience and the research was not comprehensive. After independence, agricultural mechanization schemes were launched to produce and distribute appropriate farm machinery, and to develop the planned cropping area through tillage. Over the years, in addition to state-sector activities, private-sector participation has also increased in activities relating to farm machinery. Table 1.2 illustrates the increasing number of different agriculture machines in Myanmar. The number of power tillers has increased greatly (increased by almost 65 per cent from its baseline; i.e. up to 2011), making them one of the most popular machines in the country. Although the growth of combine harvesters and tractors over 50 hp is several thousand times that of the 2011 baseline, the modest number of units in service reveals that they are limited to only a small proportion of farmers. Similarly, the use of transplanters and harrows is limited to a few households, while their percentage growth is several hundred times the baseline. These statistics also confirm the fact that ease in operation, cost of purchase and local technical support are the key drivers behind adoption of mechanization.

Figure 1.1 Land utilization in Myanmar (2013-2014)



Source: MoAI, 2014

Table 1.2 Number of agricultural machines in use in Myanmar

Machine	Before 2011	After 2011				Net increased after 2011 (units)
		2011-12	2012-13	2013-14	2014-Mar 2015	
Tractor (over 50 hp)	8 972	10 490	11 119	11 839	14 265	5 293
Tractor (under 50 hp)	70	95	814	1 506	2 373	2 303
Power tiller	173 132	206 263	227 489	257 971	286 097	112 965
Harrow	2 250	4 522	4 809	5 403	6 065	3 815
Transplanter	25	67	100	122	169	144
Thresher	25 980	41 289	48 520	55 104	61 793	35 813
Combine harvester	20	200	307	668	1 680	1 660

Source: AMD (personal communication, 2015)

The estimated number of farm machines required for land preparation and harvesting in irrigated areas is shown in Table 1.3. This estimation is based on the irrigated area where both monsoon and summer paddy can be grown. These estimates again reflect the popularity of power tillers among smallholders in the country. At the same time, demand for

tractors and combine harvesters is also expected to increase, largely due to their availability through custom hiring.

Table 1.3 Estimated number of machinery required in Myanmar

Number of states/region	Irrigated area (Acre)	Tillage		Harvesting
		Power tiller (60% coverage)	Tractor (40% coverage)	Combine harvester (40% coverage)
12	1 606 329	32 127	6 425	3 213

Source: AMD (personal communication, 2015)

Most of the farmers in Myanmar are small-scale farmers and they cannot afford to buy their own machinery. Custom hiring is therefore, a dependable option for them. Furthermore, changing climate, extreme and harsh climatic events, shorter windows for completing critical agricultural activities and labour shortages due to migration are driving custom hiring. Farmers need to increase their cropping intensity to increase production; mechanization is a vital tool. Efforts have been made by multiple agencies to build the capacity of farmers through formal or informal training. Table 1.4 summarizes such efforts made by the Agriculture Mechanization Department to train farmers. Ayeyarwaddy state received the highest proportion (18 per cent) of the trained farmers. Otherwise, the Central Dry Zone's (CDZ's) combined share of training for farmers is about one-third of the total farmers trained in this programme.

Table 1.4 Trained farmers in Myanmar agriculture

	Region/state	Number of trained farmers, after 2011		
		Farmers in training school	Farmers in other informal programmes	Total
1	Kachin	51	180	231
2	Kayar	62	116	178
3	Kayin	80	224	304
4	Chin	17	-	17
5	Sagaing	196	1 122	1 318
6	Tanintharyi	17	60	77
7	Naypyidaw	535	136	671
8	Bago	186	943	1 129
9	Magway	140	205	345
10	Mandalay	160	460	620
11	Mon	53	300	353
12	Rakhine	63	420	483
13	Yangon	70	277	347
14	Shan	47	487	534
15	Ayeyarwaddy	105	1 334	1 439
	TOTAL	**1 782**	**6 264**	**8 046**

Source: AMD (personal communication, 2015)

1.5 Site description

Amid the wide diversity, three broad agroecological zones dominate the agricultural landscape: the delta, the Dry Zone and the hilly areas. The CDZ covers three regions, Mandalay, Sagaing and Magway, and encompasses about 13 per cent of the country's total area. The total population of the study area accounts for about one-third of the country's total population. In the CDZ, the average farm size is 1.8 ha. The soils are clayey and sandy-loam. This zone receives an annual rainfall between 700 and 1,000 mm. Rainfall is irregular with unpredictable distribution, resulting in both droughts and localized flooding. Agriculture in the study area is heavily dependent on the south-west monsoon.

The CDZ constitutes about 22 per cent of the country's total rice production area both under rain-fed and irrigated conditions. Furthermore, the CDZ produces about 70-90 per cent of the country's total oil crops and pulses. About 28 per cent of the CDZ's agricultural area is upland. Rice is the dominant crop wherever irrigation is available; otherwise, farmers usually cultivate pulses (chickpea, gram and pigeon pea), oilseeds (sesame, groundnut and sunflower) and sorghum. Table 1.5 presents growers and acreage of different crops according to seasons. In the field crops, rice farmers own the smallest farming area in the CDZ. Owing to their smaller farms, economies of scale do not seem to favour investments in mechanization.

Table 1.5 Percentage of growers in the Dry Zone and average farm size for each type of crop in different seasons

Crop	Monsoon		Post-Monsoon	
	% of growers	Average farm size (ha)	% of growers	Average farm size (ha)
Rice	20.4	2.6	5.9	1.4
Sesame	34.7	5.0		
Groundnut	19.7	5.9	28.0	3.6
Pigeon pea	17.5	3.3	9.9	3.6
Chilli	3.2	2.2	2.0	2.1
Green Gram			13.5	5.0
Chickpea			11.2	2.4
Onion			12.2	1.2

Source: LIFT (2012)

In response to the prevailing challenges of the Dry Zone area, utilization of agricultural machinery has been increasing.

In the Dry Zone of Myanmar, there are two kinds of farming systems popularly practised: rice farming and upland field-crop farming. Rice farmers depend on custom hiring mainly for land preparation, irrigation and harvesting activities. On the other hand, farmers in the upland field-crop growing areas use custom hiring only for land preparation activities, especially for ploughing and harrowing (Maung, 2011).

In areas where upland field crops solely depend on rainfall, farmers prefer to use custom hiring only for land preparation operations, and in areas where upland crops can access the irrigated water, they use custom hiring both for land preparation and irrigation.

In both rain-fed and irrigated rice areas of Dry Zone, custom hiring is used in land preparation, irrigation and harvesting. For the rain-fed rice, custom hiring for irrigation operations was used according to rainfall conditions.

There is an obvious difference in the level of availability of custom-hiring services between rain-fed and irrigated areas. In villages where farms have access to irrigation water for agriculture, they can successfully (and somewhat more economically) manage their crops. They also have access to a range of custom-hiring services/options. However, in villages where agriculture (especially upland field crops) depends only on rainfall, there are only a limited number of custom-hiring services/options available to farmers. Moreover, migration is higher from those rain-fed villages and, therefore, requirements for machinery are higher. In addition, these villages are further stressed because their farming systems are more time bound (with a smaller window to complete critical agricultural activities), as they need to catch the soil moisture to be able to plant the crops. Thus, the machinery requirements are the highest at that time in those areas.

Both small and medium farms tend to use custom hiring an equal amount, with the only difference being in their motivation to do so. The smaller farmers need to hire because they do not own the machinery and the medium farmers need to because they cannot afford the machinery to service their greater capacity during the peak season, such as the period between the harvesting of the first crop and the land preparation for the second crop.

2

Current State of Custom-Hiring Practices in the Dry Zone of Myanmar and Outcomes of Intervention

2.1 Custom-hiring practices: the key stakeholders

The practice of custom hiring agricultural machinery is complex and site specific. However, 10 key stakeholders supporting the end users are distinctly identified and presented in Figure 2.1. Private and public sector agencies, institutions, groups and individuals are involved in providing and/or facilitating custom hiring. These stakeholders may facilitate the process through organized or unorganized interventions.

a) Agricultural machinery owners

Machinery-owning farmers are usually large-scale (resource-rich) farmers. They buy machinery to use on their own farm, as well as rent to neighbouring farmers. They tend to own land preparation machinery.

b) Entrepreneurs/service providers

Service providers, mostly local people with some entrepreneurial skills, rent machinery for land preparation, irrigation and harvesting activities.

c) Private companies/dealers

Private companies who are engaged into custom-hiring business are more professional and organized service providers. They work across the whole country harvesting with relatively big combine harvesters. As they provide services for the whole country, they work in the lower regions of Myanmar during the harvesting period in winter there, before moving to the CDZ's for the corresponding rice-harvesting period. Some of the well-established private companies in Mandalay involved in manufacturing/repairing, sales & service, and dealership are Capital, Good Brothers, Hwai Li, Modern Farm, Shwe Bone, Shwe Tun, Thara Phyu Soe Myint and U Than Aye.

d) Universities and research institutions

The only agricultural university in Myanmar, Yezin Agricultural University, the Department of Agricultural Research and some other private research establishments/think-tanks provide inputs through research findings, case studies and knowledge-sharing.

e) Financial/credit institutions

A number of public (e.g. Myanmar Agricultural Development Bank) and private development banks provide credit facilities to both the service providers and end users involved in agricultural mechanization activities. Some of the more popular financial institutions in the CDZ are the Cooperative Department, Myanmar Citizen Bank (MCB), Ayeyarwaddy Bank, Asian Green Development Bank (AGDB) and Serisawa Power Myanmar Company.

f) Former Ministry of Agriculture and Irrigation (MoAI), now merged into the Ministry of Agriculture, Livestock and Irrigation

The Agricultural Mechanization Department (AMD), Department of Agriculture (DoA), Water Resource Utilization Department (WRUD) and Department of Irrigation and Water Management are the key units of the MoAI involved directly in custom-hiring services.

g) Former Ministry of Cooperatives, now merged into Ministry of Agriculture, Livestock and Irrigation

The Department of Cooperatives, Cooperative Export Import Enterprise and Central Cooperative Society are the relevant units within the Ministry of Cooperatives. Altogether, there are 31,576 multipurpose cooperative societies that provide, among other services, education and training in agriculture, and offer microcredit to farmers for farm inputs (including machinery). In fact, it is one of the missions of the Ministry of Cooperatives that coordinates these cooperative societies, to transform conventional/traditional farming systems into mechanized farming.

h) Ministry of Commerce

The Department of Trade and Department of Trade Promotion and Consumer Affairs of the Ministry of Commerce have an indirect role in facilitating custom hiring by attracting young entrepreneurs and machinery traders.

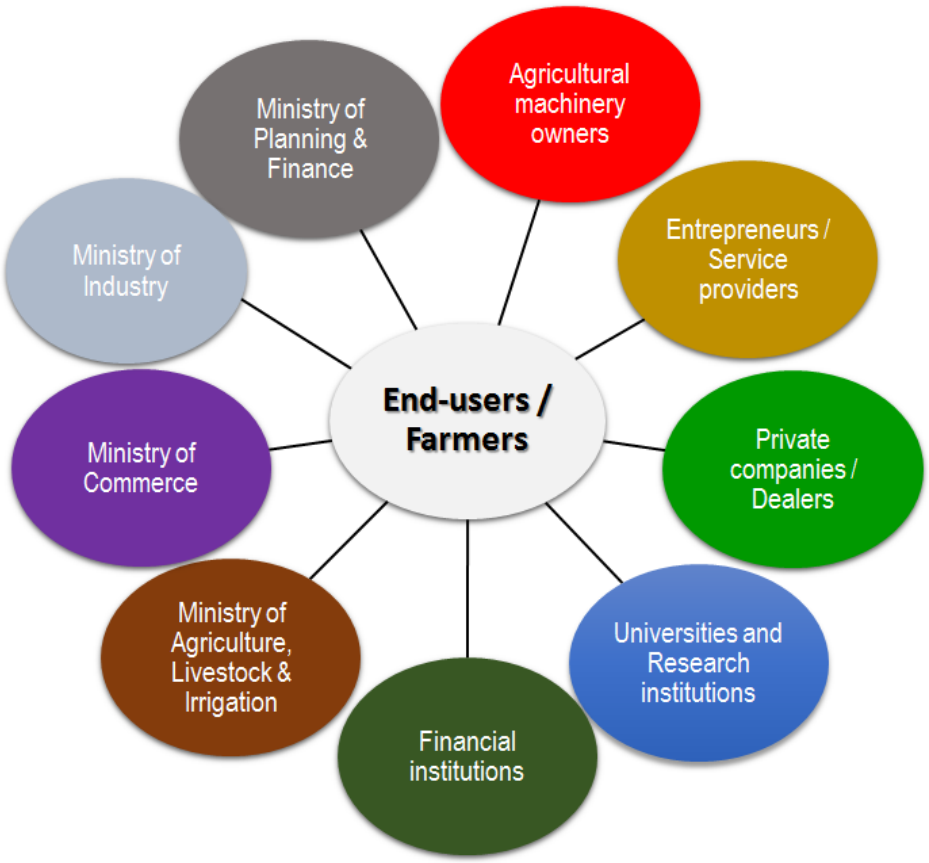
i) Ministry of Industry

The Ministry of Industry provides technical recommendations to private companies/machinery manufacturers to produce/modify the agricultural machinery. For instance, one of the private manufacturers in the surveyed area (Good Brothers, GBS Co. Ltd.) received such assistance from the Ministry.

j) Former Ministry of Finance, now merged into Ministry of Planning and Finance

Myanmar Insurance, Customs Department, and Myanmar Microfinance Supervisory Enterprise of the Ministry of Finance and Revenue regulate crediting and financing for trade in agricultural machinery (import-export and domestic sales).

Figure 2.1 Key stakeholder map



2.2 Custom-hiring practices: sources, services and rates

Some of the stakeholders are intensively engaged in providing custom-hiring services to the farmers of CDZ. While the scope of their services sometimes overlaps, this gives farmers options to choose a suitable provider, although in some areas farmers have to manage with whatever limited service is available. Farmers use lower-powered sources (35-50 hp tractors) for land preparation for upland crops than for the lowland crop (rice) (75 hp).

a) Custom hiring by the Agricultural Mechanization Department, Ministry of Agriculture and Irrigation

The Agricultural Mechanization Department (AMD) of the Ministry of Agriculture and Irrigation is involved through four key functions: (i) farm services (land preparation, cultivation, harvesting); (ii) production and distribution of farm machinery; (iii) farmland development (land consolidation for mechanized cultivation); and (iv) dissemination of technical knowledge to farmers.

AMD operates machine-hiring services as well as distributing agricultural machinery and implements. Both hiring services and distribution processes are conducted through 117 mechanization stations throughout the country (Table 2.1). More than one-third (35 per cent) of AMD mechanization stations are in the CDZ. AMD also provides other mechanized farming services, such as transplanting, harvesting, threshing and combine harvesting. Similarly, about one-third of AMD tractors (28 per cent) and AMD combine harvesters (38 per cent) are rented out in the CDZ.

Table 2.1 AMD Agricultural mechanization stations in Myanmar

	Region	No. of stations	No. of tractors	No. of combine harvesters
1	Kachin	9	72	3
2	Kayar	1	30	4
3	Kayin	2	31	6
4	Sagaing	16	219	71
5	Tanintharyi	2	18	1
6	Bago	20	522	99
7	Magway	8	155	31
8	Mandalay	17	180	67
9	Mon	4	85	13
10	Rakhine	3	57	3
11	Yangon	6	105	17
12	Shan	8	173	5
13	Irrawady	18	251	83
14	Naypyitaw Council	3	88	46
	Total	**117**	**1986**	**449**

Source: AMD (personal communication, 2015)

The number of different machines distributed by AMD and the proportion used in the Dry Zone are shown as in Table 2.2. In recent years, farmers in the Dry Zone have subscribed to more farm machinery from AMD than the rest of the country. The share of the Dry Zone in the nationwide distribution during 2011-2012 to 2014-2015 is the highest for mini-tractors (71 per cent), followed by tractors (51 per cent) and power tillers (38 per cent). However, mono-wheel tillers, roller/cultivators, threshers and reapers are not as popular in the CDZ as in the rest of the country.

Table 2.2 Distribution of farm machinery by AMD in Myanmar

Machinery	Farm machinery distributed by AMD, during two time periods			
	1993-94 to 2010-11		2011-12 to 2014-15	
	Whole country	Central Dry Zone*	Whole country	Central Dry Zone*
Tractor			331	169
Mini-tractor			31	22
Power tiller	64 713	19 871	20 661	7 839
Mono-wheel tiller	476	3	305	1
Cultivator/roller	820	53	342	10
Thresher	1 090	59	1 581	156
Reaper	420	104	86	16

* Central Dry Zone includes Sagaing, Magway and Mandalay regions
Source: AMD (personal communication, 2015)

Both AMD-produced machinery and machinery procured from other companies are distributed by AMD. AMD buys machinery from agricultural machinery companies through a bidding process and re-sells them to farmers. The bidding and decision-making processes are controlled by head office of AMD. AMD sells the machinery, giving farmers a 2-3 instalment payment system option (e.g. payment in three instalments within two years). One-third of the value has to be paid as the first payment, one-third as the second, one year later, and the remaining third must be paid after two years. A cash-down payment is required for implements. AMD have linked with Myanmar Agriculture Development Bank (MADB) to provide the instalment selling system. MADB offers loans to farmers for purchasing machinery from AMD.

Hiring services and distribution in each township are managed by township officers. AMD is responsible for the hiring and selling services, and producing machines at two farm machinery factories in Kyaukse Township, Mandalay Region. One of these factories produces implements and parts, while the other assembles Korean machines. In addition, one research facility, in Kyaikka Lo, Yangon, conducts research activities. This factory tests the imported and locally produced machines in the field.

AMD has offered custom hiring services for approximately 50 years through the agriculture mechanization camps throughout the country. The machinery currently offered for hire by AMD is listed in Table 2.3.

Table 2.3 Types of machinery offered by AMD

No	Items	Model/Make	Power rating (hp)	Remarks
1	Tractor	Sonalika	75-90	
		New Holland	70	
		Kubota	47	
		Zetta		
		SH-654		
2	Harvester	Kubota		
3	Rice planter			Used for demonstration only

Source: AMD (personal communication, 2015)

AMD manufactures/assembles farm machinery in its own factory located in Mandalay, following MoAI guidelines. There are reported to be about 100 tractor centres throughout the nation, of which 19 are in Mandalay. These centres play a pivotal role in the interaction with farmers when it comes to direct sales or custom hiring of agricultural machinery. Table 2.4 gives the sales price of agricultural machinery manufactured/assembled at the farm machinery factory. Power tillers assembled by AMD are available to farmers at a better price (about 10-20 per cent cheaper) than average market prices. As can also be seen from Table 2.2, this could be a reason for the popularity of this type of machine, especially in the CDZ. For other machinery, market prices are either better than AMD's price, or the dealers make attractive financing/loan offers to the farmers.

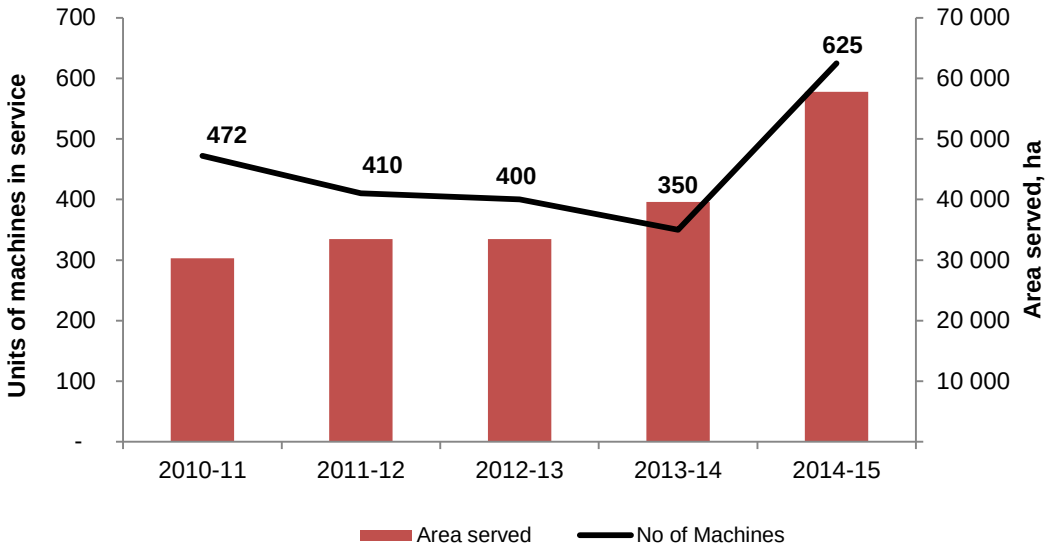
Table 2.4 Prices for agricultural machinery from the AMD factory during 2009-2010

Machinery	Price at AMD (kyats)	Average price in Market* (kyats)
Leyar power tiller (16 hp)	1 090 000	1 190 000 to 3 350 000
Leyar power tiller (22 hp)	1 550 000	
Upland power tiller	800 000	1 150 000-1 200 000 (22hp Dong Feng: 1.7 million)
Gyro power tiller	1 600 000	
Mono-wheel tractor	570 000	395 000-610 000
Cultivating roller boat	650 000	
Steering type power tiller	1 950 000	
Power reaper	860 000	
Thresher	1 200 000	
Combine harvester	7 500 000	6 000 000-8 500 000
Farm truck	2 170 000	2 300 000-2 450 000
Farm trailer	720 000	
Mono-wheel trailer	850 000	
Diesel engine (16 hp)	320 000	300 000-400 000
Diesel engine (22 hp)	475 000	
Gasifier	550 000	
3-disc rotary plough	300 000	370 000-400 000
2-disc plough (for upland power tiller)	110 000	180 000
Moldboard plough (for upland power tiller)	60 000	
Rake (for upland power tiller)	40 000	
Puddler (For upland power tiller)	110 000	

Source: AMD (personal communication, 2015)
*Price quoted by private companies for compatible models of nearest specifications, 1 USD = 1,200 kyats (approx.)

Figure 2.2 shows the number of all machines offered for hire by AMD, and area served in the Dry Zone each year. Despite the declining trend in custom-hired units up to 2013-2014, this number reached its highest level in 2014-2015 since 2010-2011. This may reflect the significantly higher area served recently using mechanization.

Figure 2.2 Custom hiring by AMD in the Dry Zone of Myanmar



Source: AMD (personal communication, 2015)

The hiring rates (Table 2.5) are determined for the whole country by the head office of AMD. The following factors are usually considered:

- Prevailing rates of private sector
- Government budget
- Engine oil, lubrication oil, fuel (e.g. diesel) consumption for each operation
- Maintenance cost
- Value of machines (purchase cost, depreciation, interest rates, etc.)

Table 2.5 Rate of custom hiring from AMD

No	Machines	Model/make	Draught implements	Operation	Hiring rate**
1	Tractor	Sonalika, New Holland, Kubota	3,4,6 and 7 discs	Ploughing	15 000 kyats/ac/pass
2	Tractor	Sonalika, New Holland, Kubota	16 and 18 discs	Harrowing	7 500 kyats/ac/pass
3	Rotavator/rotary tiller (Khway Kote)		-	Tilling	15 000 kyats/acre/pass
4	Combine harvester	Kubota, Daedong	Kubota, Daedong	Harvesting	45 000 kyats/acre

1 USD = 1,200 kyats (approx.)
*AMD takes care of regular and accident repair and maintenance (R&M) of these machines through their own budget.
**These rates are inclusive of machine operator, fuel and R&M.
Source: AMD (personal communication, 2015)

The prevailing prices for new tractors are 4,200,000 to 9,000,000 kyats, in addition a farmer would need to buy the matching implements separately and would have to also pay for fuel and other expenses. This makes custom-hiring prices attractive to the farmers. However, the economics of custom hiring also depend on the acreage and annual usage.

b) Custom hiring by Water Resource Utilization Department (WRUD), Ministry of Agriculture and Irrigation

The Water Resource Utilization Department (WRUD) develops water resources to supply irrigation water and safe drinking water through two main strategies, river pump irrigation and groundwater utilization. The mission of WRUD is to increase the irrigated area to promote crop intensification. WRUD aims to supply about 302,760 ha through pump irrigation projects and 101,185 ha through groundwater tube wells, 403,945 ha in total. The volume of water needed for irrigated areas is 6-9 cubic feet per acre for one season of summer rice and 4-7 feet per acre for one season of the monsoon rice. The costs for irrigated water are; 6,000 kyats per acre for monsoon rice, 9,000 kyats per acre for summer rice and 3,000 kyats per acre for other crops.

WRUD hires out pump sets (engine + pump) to help farmers irrigate their fields throughout the cropping season. If a farmer wants to rent a machine from WRUD, s/he has to sign a simple contract with the competent officer at the pumping station, chair of village administration and one witness. The agreement reads that s/he has to return the set in the same working condition as it was at the time of borrowing from the department. The hiring rates (Table 2.6) are determined according to the capacity (flow rate, discharge head) of the machines. The government supports the machines, diesel and maintenance costs from the government budget.

Table 2.6 Hiring rates of irrigation pumpsets in WRUD

No	Pump set type		Capacity		Hiring rate per cropping season (Kyats)
	Engine	Pump	Gallon/hour	Cusec	
1	Zinzing	12-inch Zinzing	173 000	7.7	30 000
2	Zeca	12-inch KaSaLa	200 000	9	30 000
3	Zeca	6-inch KaSaLa	45 000	2	15 000
4	Zeca	6-inch KaSaLa (with 2 pumps)	90 000	4	20 000
5	Wuling	3-inch Wuling	22 500	1	9 000
6	Wuling	3-inch (with 2 pumps)	45 000	2	12 000
7	Wuling	6-inch Soe Phoe	45 000	2	15 000
8	ZinTan	4-inch	18 000	0.8	5 000
9	Siema	4-inch Siema	18 000	0.8	5 000
10	Jinma	4-inch Jinma	18 000	0.8	5 000
11	Kubota	4-inch Kubota	18 000	0.8	5 000

Source: WRUD (personal communication, 2015)

c) Custom hiring by private sector

Table 2.7 shows that the private sector has played an important role in development of agricultural mechanization in Myanmar. Among other machines, small tractors and combine harvesters have gained significant popularity among farmers of Myanmar. The number of power tiller machines has grown by about 65 per cent since 2011.

Table 2.7 Agricultural mechanization development by public and private sectors in Myanmar

Agriculture machine	Number of machines					
	Before 2011			After 2011		
	Public	Private	Total	Public	Private	Total
Tractor (> 50 hp)	1 120	8 972	10 092	1 979	14 265	16 244
Mini-tractor (< 50 hp)		70	70		2 373	2 373
Power tiller		173 132	173 132		286 097	286 097
Combine harvester	15	20	35	382	1 680	2 062
Transplanter	15	25	40	15	169	184
Thresher		25 980	25 980		61 793	61 793

Source: AMD (personal communication, 2015)

Most of the companies that provide custom-hiring services rent out combine harvesters for rice-harvesting activities. They cover the Dry Zone and the Lower Myanmar regions, especially Ayeyarwaddy. They provide services around rice-growing areas depending on the harvesting season (Field survey, 2015).

Service providers only work for custom-hiring services in their own specific locations and most of them are local people. Usually, a service provider rents only one or two kinds of machine. They provide for different operations, such as land preparation, irrigation and harvesting.

A few large-scale farmers buy machinery for two purposes: to use in their own field activities and to rent out to neighbouring farmers to provide extra income. Most of these farmers buy power tillers, mid-size tractors and pumpsets.

All the service providers determined the hiring rate through comparison with the neighbouring village's hiring rates, price of diesel and maintenance charges. The hiring rate of agriculture machinery is shown in Table 2.8. These rates are, in general, 30-70 per cent higher than those offered by the public sector (e.g. AMD, WRUD), but since the operators of private-sector custom-hiring services reportedly offer a better quality of work, they could justify their higher tariff.

Table 2.8 Custom hiring of agriculture machineries by companies, service providers and large-scale farmers

No	Machine	Source	Operation	Hiring rate
1	Tractor	Good Brothers, Kubota	Land Preparation (upland)	12 000 kyats/hr or 25 000 kyats/acre/pass
2	Power Tiller	Good Brothers Company, AMD	Land Preparation (rice)	12 500-15 000 kyats/acre/pass
3	Combine Harvester	Kubota, Good Brothers	Harvesting (rice)	35 000-50 000 kyats/acre
4	Stand-alone Engine (25/35 hp)	Good Brothers	Irrigation	25 000 kyats/24hr

Source: Field survey (2015)

With the growing awareness and attractiveness of custom-hiring services, the tariffs for custom-hiring machines are becoming lower, favouring end users. For instance, during the field survey undertaken as part of this study, a private custom-hiring service provider in the rice-harvesting business, who had previously enjoyed a monopoly, recalled that three years ago the tariff was about 50,000 kyats/acre; it is now around 35,000 kyats/acre because of the increasing number of entrepreneurs in this business. With increasing competition, one can expect more farmer-favourable tariffs with a range of options in terms of tariffs and work quality.

2.3 Custom-hiring system: the farmers' perspective

Farmers remain at the centre of the stakeholders map (Figure 2.1). Their interaction with one or many stakeholders varies greatly across the CDZ, and it is influenced by several factors. It is indeed a complex relationship. A general observation suggests that owners of farms bigger than 4 ha tend to own agricultural machines, whereas smaller farms do not have the economy of scale for those farmers to own such machines.

There are contrasting criteria for selecting machines for purchase (for self-use). For instance, power tiller customers prefer brands that are relatively inexpensive (usually fitted with single cylinder), that can be supported by local repair/spare-parts shops and that are distributed by local manufacturers/dealers. Whereas, buyers of four-wheeled tractors and combine harvesters prefer brands that are more established and considered reliable, even though they are more expensive than other brands. The reason for this seems to be that these brands offer more efficient harvesting (low waste, hence more recovery of grains), while also being more durable, resulting in lower R&M costs.

Farmers are restricted to selecting a custom-hiring service provider from those available in their vicinity. In several cases this selection is based on the skill-level of the operator (i.e. quality of work done by the operator along with accompanying machine), and not on the brand or age of the machine itself. The physical characteristics of the machine become selection criteria only when operators have similar skills. Without a reputable operator (with proven track record), a new and sophisticated machine may not attract farmers to hire it. For instance, in ploughing or rotavating, the private-sector tariff is approximately 25,000 kyats/acre/pass (Table 2.8), while the AMD rates are only 15,000 kyats/acre/pass, but since the private-sector operators are thought to offer better quality of work, the farmers choose them. The farmers argue that only one pass of a skilful private-sector operator is sufficient, but an AMD operator has to make two passes, thus increasing the total cost. Therefore, to be attractive to farmers, the AMD must combine low costs and skilful operators.

Agricultural machinery owners, who have a good quality tractor with rotavator and disc ploughs, and offer custom-hiring services besides using them on their own farm, usually recover 50 per cent of their investment (of about 50 million kyats) within 2-4years. Usually the purchase of a new powerful tractor (>90 hp) costs about 40 million kyats in three instalments, including interest. Whereas, a medium-sized tractor (60-75 hp) costs about 25 million kyats when paid in full at purchase.

Farmers in CDZ do not seem to be well aware of all the existing finance options, yet buying machines through instalments directly negotiated with machinery dealers (but not linked to

banks) is commonly reported. Sometimes, the processes (both information and documentation) of obtaining financial assistance are not clearly understood by customers and, thus, they tend to prefer a financing source that can quickly process their loans, even if this means compromising on other lower interest rate offers.

The ease of obtaining the loan and quick processing time were found to be the decisive criteria for many customers in the study area when selecting an appropriate source of finance. For instance, financial support from the Cooperatives Department in purchasing machinery is very favourable, yet farmers have to pass through a relatively intense documentation process and this takes time. Farmers using the AMD's machinery support system experience similar issues. Even some renowned brands offer instalment support at low interest rates, yet they are not popular because of lengthy (cumbersome and time-consuming) processes, including verification of land ownership or other property-related certificates.

Farmers mostly prefer financial services offered by private banks, which are directly linked to machinery dealers/companies. These banks claim to complete the loan process in as little as a day, with very few documentation requirements. Machinery dealers/companies often help farmers by processing loans through their network of private banks. However, the interest rates charged by these sources are significantly higher than that by governmental sources of financing.

3

Assessment of Outcomes of Interventions

During the survey, stakeholders were asked to share their experiences of the existing mechanisms/programmes related to custom hiring. This exercise was conducted to identify specific issues, and analyse gaps and duplication in respect of types of interventions, deployment and coverage.

3.1 Duplication

a). There is more than one finance agency that offers financial support to farmers as well as the service providers to acquire agricultural machinery. Among other agencies, MADB, cooperative societies, private banks, Myanmar microfinance, are prominently cited by respondents of the survey. Stakeholders opined that there should be a uniform financial arrangement in terms of loan options and rates of interest.

b) In addition to MoAI, the Ministry of Industry also provides machinery. The Ministry of Industry provided power tillers and large tractors (above 80 hp) until 2011. The ministry sold directly to farmers, not through MoAI/AMD. Stakeholders opined that there should be more coordinated effort to provide a comprehensive menu of agricultural machinery instead of duplicating the type of machines from different sources (departments and ministries).

3.2 Gaps

a) The stakeholders unanimously expressed that there is a general lack of specific policies, laws, rules and regulations that guide custom-hiring mechanisms in the country.

b) They also stated there is a lack of specific guidelines for custom-hiring service providers and users.

c) Farmers very strongly wish to receive custom-hiring services in a timely manner. Due to lack of service providers and adequate numbers of machines, or other factors, the farmers are deprived of receiving a timely service.

d) Users complained that the quality of machines they received through custom hiring was generally poor. The machines were either quite old or inefficient.

e) Service providers do not wish to invest in buying advanced (and expensive) machines; they prefer used or re-conditioned machines.

f) Farmers wish to receive brands and models of their preference from custom-hiring services; their preferences change from place to place and from crop to crop. However, they do not always get the machines they prefer.

g) Not all farmers are eligible for loans, despite their willingness to adapt to mechanization.

h) There is still no concrete provision in the current mechanisms, allowing repayment of loans to be relaxed in cases of crop failure or other such unforeseen circumstances that constrain users' ability to pay their dues in time.

i) Under the heavy influence of fluctuating market prices of crops, farmers are discouraged from investing to acquire custom-hiring services.

j) While there is demand for custom-hiring services, still there are some conservative farmers who do not wish to adapt to mechanization as they fear that they will lose their investment.

k) The government tariff for custom hiring is usually lower than the private service providers, but farmers have to pay the full amount in advance. Therefore, the private sector providers are more popular.

l) The farmers who are far from water sources are usually not able to pay for custom hiring at the same rate as others, but there is no provision for considering this factor while determining custom hiring tariff.

m) Farmers are largely unaware of the relevant policies, programmes and projects.

4

Status of Knowledge-Sharing and other Linkages among Stakeholders

While it was noted that the role of formal knowledge-sharing mechanisms was limited, farmers in the Dry Zone depended on informal channels to a great extent. In the survey, none of the respondents referred to any print media or brochures/flyers for making decisions on whether to opt for custom hiring. The same was true for information on sources of machines (i.e. service providers) or the type of machines (i.e. specific horsepower rating or particular specifications). Farmers relied on the experiences of their friends, relatives and neighbouring farmers. Very few farmers consulted with the local agricultural office for information on custom hiring, which was limited to the particular machines offered by government departments.

Respondents could not recall any trade-shows or promotional campaigns by either governmental agencies or by the custom-hiring service providers. When asked, the service provider respondents confirmed that their businesses were too small to consider any formal channel of information sharing. Most of these service operators are not full-time entrepreneurs; they offer machines for hire usually as a secondary business. They recruit operators from the village itself, which allows them to get services on an 'as-required' basis, and promote the services by word of mouth among the fellow villagers. None of the service providers interviewed claimed to have any skilled or formally trained operators.

Government agencies have some literature on the specifications of the machines they rent out; but they realize that it is too technical to be understood by an unskilled user. Moreover, these details do not usually include the best practices to operate those machines efficiently and productively.

4.1 Linkages among farmers, machinery suppliers and private loan providers

There is a workable linkage between machinery suppliers and private loan providers that tends to promote development of mechanization in Myanmar. This linkage is created by suppliers who want to distribute their machinery. They contact banks to make loans available to farmers, and at the same time receive a commitment from borrowers. A farmer who wants to purchase machinery using an instalment system, has to submit documents, such as his or her national identity card, family registration certificate, recommendation of village head and

police station, and ownership certificate with one witness, to the machinery supplier. Based on these documents, the machinery suppliers recommend that the private banks issue a loan. When the bank disburses the loan to the farmer, the supplier and the farmer have to pay 1 per cent of the value of the machine each as a service fee. The remaining amount has to be returned with 7 per cent annual interest rate to the banks.

4.2 Linkages among farmers, machinery suppliers and government departments

The Department of Cooperatives sells machinery and supports loans through a hire-purchase system. A farmer can purchase a machine from anywhere with this system; the machinery suppliers are connected to the Department of Cooperatives. A famer who wants to buy a machine under the hire-purchase system must be a member of a cooperative society. In addition, he/she needs to apply for a loan with the recommendation of Township Officer from the Cooperative Department, Chief of the Cooperative Societies, and one witness. Then, he/she needs to return the money according to the rules and regulations of the department.

5

Conclusions and Recommendations

Based on the mapping exercise, a strengths, weaknesses, opportunities and threats (SWOT) analysis of the status of custom hiring of agricultural machinery in the Dry Zone of Myanmar is presented below and lessons learned are drawn. Finally, a set of recommendations and proposals for improvement are outlined.

5.1 SWOT analysis

The following table presents the SWOT analysis for custom hiring of agricultural machinery in the Dry Zone.

Table 5.1 SWOT analysis of custom-hiring services in CDZ, Myanmar

INTERNAL FACTORS				
	STRENGTHS	**Concerned stakeholder**	**WEAKNESSES/ CONSTRAINTS**	**Relevant stakeholder**
1	Platform and network is in place for manufacturing and procurement (import) of basic agricultural machines,	G	Available platform and network for custom hiring is quite basic and does not meet the growing needs of the Dry Zone	G
2	Test protocols (basic tests) and test-facilities for evaluating basic machines also in place	G	Inadequate extension support to address specific issues of custom hiring (for both service providers and end users)	G
3	Existing network for distribution of agricultural machinery	G	Lack of local manufacturing capacity for advanced agricultural machines, especially combine harvesters and tractors	P, U, G
4	Custom hiring of agricultural machinery is usually welcomed by farmers in the region	O, E, P, f	Limited and weak dealership network	P
5	The Dry Zone has relatively low heterogeneity/diversity in cropping systems	O, E, P, f	R&M are not organized/coordinated by service providers	P
6	Basic irrigation facilities (pumps) have been made available over a sizeable area	G, f, O	Farmers mostly get information informally and make decisions about custom hiring from their neighbours' experience; they do not have clear idea of the economics of custom hiring	f, G, E, P
7	Local workshops commonly available have basic technical skills and equipment, which can be upgraded and utilized for maintaining agricultural machines	E, P	Small and fragmented holdings increase the set-up costs for service providers	O, E, P, f
8			Poor infrastructure (such as paved roads, electricity, fuelling stations, etc.) makes the movement of heavy machinery difficult	G, O, E, P
9			Lack of agricultural engineering/farm mechanization related institutes of higher learning (universities, vocational courses) in the Dry Zone	G, U
10			Lack of strong network of academia, R&D institutions and manufacturers for human resources development, R&D and extension	G, U, P
11			Poor liaison with industries/agricultural machinery manufacturers for R&D and commercialization	G, U, P, C
12			Trained personnel for R&D in agricultural engineering are limited	G, U
13			Poor quality machines being rotated for custom hiring	G, P, C, f
14			Almost no formal feedback/knowledge-sharing system on collecting/reviewing experiences of service providers and users on custom hiring	G, P, E, f
15			Lack of standardization and quality control of agricultural machinery	G, C, P, E

O: Agricultural machinery owners **P**: Private companies/dealers **C**: Finance/credit institutions
E: Entrepreneurs/service providers **U**: Universities and research institutions **G**: Ministries/government departments

EXTERNAL FACTORS				
	OPPORTUNITIES	Concerned stakeholder	THREATS	Concerned stakeholder
1	The available basic platform for custom-hiring services has ample scope for upgrading (infrastructure, capacity-building, technology advancement, etc.) and eventually expansion of its services	G	Farmers may be overexploited in the absence of government-led regulatory/guiding mechanisms, or in case of low levels of market competition (too few service providers) for custom-hiring options	G, f
2	Farmers in the Dry Zone seem to be convinced/aware of benefits of custom hiring; extension services may tap this opportunity to accelerate this initial momentum	G	If not managed well, the custom-hiring service providers may dominate in farming decisions (e.g. crop type or variety selection, calendar, agricultural practices, farm management, etc.) to suit the machinery they have to offer for custom hiring	G, f
3	Increasing number of service providers may help to introduce new designs of machines from a variety of manufacturers; thereby increasing competition, which is healthy for the marketplace	O, E, P, C	Farmers may overlook the potential benefits of custom hiring in the absence of frequent/adequate extension counselling; Similarly, the service providers may sometimes knowingly or unknowingly promote wrong/misfit agricultural machinery, leading to loss of operational efficiency and environment damage	G, U, f
4	Increasing trend of urbanization favours custom hiring; in future, it is likely that mainly the old-aged and women farmers will manage the farms, which favours custom hiring for almost all major agricultural activities	O, E, P, C, f	Slow replacement of machinery if imperfect marketplace exists for farmers (too few service providers) may lead to unsustainability in the production system	G, C, P
5	With projected mechanization of the entire value chain, custom hiring may go much beyond the current selected agricultural operations; it could lead to the establishment of a well-coordinated value chain for commercial supply, transport and marketing of agricultural produce	O, E, P, U, f	In the absence of local manufacturing, the service providers and farmers may be inclined to use substandard and inefficient machinery	G, P, C
6	The Dry Zone may experience increased demand for custom hiring for various farming operations as well as farming systems, including postharvest operations, marketing, horticultural or vegetable crops (high value crops)	f, O, E, P	Lack of good R&M will be detrimental for sustainability of custom hiring in future	E, P, G
7	In future, if convinced enough, farmers in the Dry Zone may team up in smaller groups to pool required resources to buy selected agricultural machinery for their shared use; or even to act as service providers when those machines are not in use (especially for off-farm use of tractors in transportation).	f, O, G, C		

	OPPORTUNITIES	Concerned stakeholder	THREATS	Concerned stakeholder
8	Postharvest loss reduction, eco-friendly agriculture (e.g. conservation agriculture, precision agriculture) promotion can be achieved through efficient and productive use of agricultural machinery in custom hiring	G, f		
9	There is significant opportunity to increase the cropping intensity, irrigated land coverage by introducing water-saving technologies (microirrigation set up) through custom hiring	G, f		
10	Reducing yield gaps and increasing productivity can be enabled through appropriate agricultural mechanization	G, f		

O: Agricultural machinery owners
E: Entrepreneurs/service providers
P: Private companies/dealers
U: Universities and research institutions
C: Finance/credit institutions
G: Ministries/government departments
f: End users/ farmers

5.2 Lessons learned

The following lessons for custom hiring can be learned from the field observations and discussion with various stakeholders in the Dry Zone conducted as part of this study:

a) *Observation*: Lack of adequate awareness of end users about different custom-hiring services available in the region.
Lesson learned: Awareness campaigns/information dissemination programmes should be more frequent and should be presented in simple way (without much technical jargon).

b) *Observation*: Lack of comparative analysis of custom-hiring services; end users do not understand the decision-making process when it comes to whether or not to opt for custom-hiring services. Similarly, the service providers do not know what the different models of custom-hiring services are and which model works better under given conditions.
Lesson learned: Farmers learn quickly from other farmers. Success stories of selected custom-hiring service models should be disseminated.

c) *Observation*: Lack of coordinated efforts. There are several stakeholders involved in custom-hiring services, but mostly their efforts are made in silos.
Lesson learned: Provision of a common formal/informal platform where all relevant stakeholders could interact and identify opportunities for collaboration and expansion, may strengthen the mechanism of custom-hiring services in the region.

d) *Observation*: Untrained operators are recruited by custom-hiring service providers or sometimes unskilled farmers opt to operate the hired machine on their own.
Lesson learned: Unskilled/untrained operators reduce the effectiveness of custom-hiring services by increasing inefficiencies in the system. Therefore, availability of a trained workforce is as important as access to the machines.

e) *Observation*: There are contrasting criteria for selecting machines for purchase (for self-use). The power tiller customers prefer brands that are relatively inexpensive, whereas buyers of four-wheeled tractors and combine harvesters prefer brands that are more established and considered reliable.
Lesson learned: Availability and cost of spare parts, R&M service centres, and reliability of machines are key determinants of machine selection. Therefore, emphasis should be given to these determinants when proposing/procuring machines.

f) *Observation*: Farmers in CDZ have limited awareness of all the options existing, yet buying machines on instalment directly negotiated with machinery dealers is commonly reported.
Lesson learned: Ease of obtaining a loan and fast processing time are the decisive criteria for many customers in the study area when selecting an appropriate source of finance.

g) *Observation*: Not all farmers are eligible for loans, despite their willingness to adapt mechanization.

Lesson learned: Care should be taken to study whether farmers in real need of access to loans are excluded. Special financial instruments could be devised to bring them into the circle of beneficiaries.

5.3 Recommendations and proposals for improvements

The following recommendations and proposals for improvement emerge from the current study

Recommendations

a) Stakeholders, especially the end users, should be made aware of tariffs of custom hiring in advance, at least prior to the start of a cropping season.

b) The popularity of custom hiring can be increased by increasing awareness. Stakeholders, especially the end users, should be able to witness success stories of the farming systems in conditions similar to their own. Increased awareness will increase demand for mechanization of farming operations, while attracting more service providers, creating a competitive marketplace for custom hiring.

c) Personnel involved in machine operation (operators) and those involved in repair and maintenance (R&M) need to be trained for efficient farming operation and machine maintenance.

d) The quality of custom-hiring services largely depends on the machine performance itself. Measures should be put in place to ensure that only good quality machines are available through custom-hiring services.

e) There should be adequate infrastructure (e.g. farm roads, electricity, R&M facilities, service centres and training schools) available in the region to support custom-hiring services.

f) Lack of coordination among relevant stakeholders results in duplication and gaps. The need for better coordination should be addressed through a holistic approach.

g) Care should be taken ensure farmers in real need have access to loans. Special financial instruments should be devised to bring them into the circle of beneficiaries.

h) Processing of the loan should be quick and easy to understand.

i) Emphasis should be given to availability and cost of spare parts, R&M service centres and reliability of machines when proposing/procuring machines.

Proposals (*relevant stakeholders are given in parentheses*)

a) Economic and technical performance of various machines for their corresponding agricultural operations must be studied and tested in the context of the systems' characteristics (i.e. farm size, type, crop, etc. prevailing in the Dry Zone).
(Universities and research institutes)

b) In-depth market analysis for the custom-hiring environment is needed in the specific context of the Dry Zone. This analysis should assess the potential of hiring service providers and the total demand for corresponding services, farmers' willingness and ability to pay and accessibility to R&M services, among others.
(Finance and credit institutions, private companies, dealers)

c) Guidelines for maximum tariff of custom hiring should be prepared by relevant government authorities to protect the interests of all stakeholders – at least until a competitive marketplace with many players develops and is able to achieve equilibrium rates.
(Government departments and ministries)

d) Different models of custom hiring should be explored and tested in the market. Selected models may be implemented at pilot scale. These pilot projects could be used as extension tools for further promotion and dissemination over a larger area. In addition, the role of extension personnel is crucial and better-trained extension staff who are familiar with specific regional needs in the Dry Zone should be deployed.
(Universities and research institutes, government departments and ministries)

e) Appropriate training modules should be designed and frequent sessions should be organized to train the personnel involved in machine operation (operators) and those involved in R&M. Training can also bring about increased awareness among various stakeholders about options for climate-resilient agriculture and improved livelihoods in the study area. Training topics could include, for instance, choosing between custom hiring and owning a machine; productive, efficient and safe use of machines; preventive R&M; farm budgeting and record keeping, etc.
(Universities and research institutes; government departments and ministries)

f) To ensure quality of service through custom hiring, testing and standardization of machines for agricultural use should be conducted at the manufacturing/ procurement/dealership stage. Regular checks of the performance could also be done through the concerned government units. This can be potentially handled, for instance, through authorized testing centres.
(Universities and research institutes, government departments and ministries)

g) Increased investment in infrastructure (farm roads, rural electrification, rural microfinance, and banking) should be promoted to provide the necessary impetus to the agricultural mechanization in the Dry Zone.
(Government departments and ministries, finance and credit institutions)

h) Effective coordination among various stakeholders must be promoted to keep all involved well informed. Improved coordination will help in better identifying actual needs of the farmers and the available potential of the service providers, enable a better understanding of the theoretical and practical basis of appropriate models, and facilitate the provision of necessary backstopping through extension and capacity-building support.
(Government departments and ministries, private companies, dealers, entrepreneurs, universities and research institutes)

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Questionnaire

(Original in Myanmar language)

A multi-stakeholder survey on custom hiring of agricultural machinery

PIPs and Stakeholder mapping to support custom hiring of agriculture machinery:
A Case Study in Dry Zone, Myanmar

Date of interview: ----------

1. Form number
2. Respondent's name
3. Number of households
4. Name of village tract
5. Name of village
6. Township/district
7. Landholding size
8. How many custom-hiring agents are working in your village?
9. Kinds of custom-hiring machines and using operation

No	Name of machine	Imported/locally produced	Country of origin	Source of custom hiring	Used in which operation	Custom hiring rate (Kyat or percentage of crop) (per hour or per acre)	Name of crops

10. How did you learn/know about custom hiring?
11. In your opinion, what are the benefits of custom hiring?
12. What are the challenges/difficulties of custom hiring?
13. What factors encouraged you to use custom hiring?
14. What factors prevent you using 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 assistance/help in custom hiring from government/private sectors/NGOs, INGos, etc.? (Financial or technical or others)
17. Did you receive information on technology services or maintenance services?
18. If received, who are the providers?

19. What is the evidence of benefits/changes like labour saving, economic and production benefits, opportunities for off-farm income, after using custom hiring?

Key informants interview

Input suppliers

1. What kinds of machines are you supplying?
2. Who determines the custom-hiring rate?
3. If you determine the rate of custom-hiring services, what are the factors influencing you to choose custom-hiring services?
4. Did you revise the custom-hiring rate very often? What is the frequency of revision?
5. What are the factors for revising the custom-hiring rate?
6. What are the difficulties/challenges of custom hiring? Taxes or others?
7. What is the supply flow (process of custom hiring) of machines?
8. Did you get any assistance or help from the government?
9. Do you need to approach the government to work as suppliers? If needed, why did you need to approach?
10. Can you rent your machines all the time or depending on the cropping season? [What percentage of time in a year is your machinery rented out?]
11. Can you estimate how many input suppliers there are in Mandalay Region?
12. Can you estimate how many repair and maintenance shops/technicians/workshops there are in Mandalay region – who can fix your machinery when broken?
13. Who are your biggest customers?
    a. Depending on the landholding size (small or medium or large)
    b. Depending on the operations (land preparation to harvest)
    c. Depending on the crops (_____)
14. Which kinds of machines are the most popular for custom hiring? [type, size hp, brand, etc.]
15. Did you receive any soft loan or credits from the government, banks or others?
16. What are your opinions on why farmers prefer custom hiring instead of buying?
17. (Why do you think that custom hiring is beneficial for farmers? What are the benefits?)
18. Did you receive information on technology services or maintenance services?
19. If received, who are the providers?
20. Did you share your knowledge of technology services or maintenance services with farmers?

Private rental/ service agents

1. What kinds of machines are used for rental services?
2. Who determined the custom-hiring rate?
3. If you determine the rate of custom-hiring services, what are the factors influencing choice of custom-hiring services?
4. Did you revise the custom-hiring rate very often?
5. What are the reasons to revise the rate?
6. What are the difficulties/challenges? Taxes or others?
7. What is the supply flow of machines?
8. Did you get any assistance or help from the government?
9. Do you need to approach government agencies to work as suppliers? If you did, for what matter did you approach?
10. Can you rent your machines 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 landholding size (small, medium or large)
14. Depending on the operations (land preparation to harvest)
15. Depending on the crops (_____)
16. Which kinds of machines are the most popular for custom hiring?
17. Did you receive any soft loan or credits from the government, banks or others?
18. What are your opinions on why farmers prefer custom hiring instead of buying? (Why do they think that custom hiring is beneficial for farmers? What are the benefits?)
19. Did you receive information on technology services or maintenance services?
20. If received, who are the providers?
21. Did you share information on 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 rules or regulations related to agriculture machineries suppliers or custom-hiring services?
5. Which government agencies are involved in custom-hiring services?
6. Do you have any relationship with machine suppliers? How is your relationship?
7. What are the government policies and strategies regarding the development of custom-hiring services?
8. What factors influence the development of agricultural machinery?
9. What are the government plans for the development of custom-hiring services?
10. What changes in farmers (income, production and economic situation, etc.) did you observe after using custom hiring?
11. What are the differences of economic benefits between custom hiring and buying their own?
12. Did you share information on technology services or maintenance services? How did you share it?
13. What are the criteria for investing in agri-machinery factories?
14. If machinery is imported, what are the rules, regulations and procedures?
15. Which ministries are involved in the importation of machineries and parts?
16. Which ministries took a decision-making role in these processes? And how?
17. Which current active agriculture policies can effect custom hiring of agri-machinery?
18. What are the procedures and processes?
19. Which institutions are involved in the development of mechanization? And how are they involved?
20. Who is responsible for ensuring the technology is applicable?
21. How about the research? Who (which stakeholder) is responsible for research?
22. What are the plans of government for the development of agriculture sector, especially for mechanization?
23. Do you have any public-private partnerships for the agriculture mechanization activities? How? And with what companies?
24. How about with national and international organizations?

Focus group discussion with farmers

1. Who did the custom hiring introduce? How do you know/benefit from custom hiring?
2. How was the custom-hiring rate determined, and who determined it?
3. Do they revise the custom-hiring rate very often?
4. What are the reasons for revising the rate?
5. Did they receive any discount?
6. What are the reasons for the discount?
7. Did you get any subsidies from the government?
8. Did you receive information on technology services or maintenance services?
9. If received, who are the providers?

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