Rakhine is the second poorest state in Myanmar with 44 percent of its population living below the poverty line (MNPED et al., 2011). It was hit by Cyclone Komen and associated flooding in 2015 and then by drought in 2016.

During the 2015 floods, more than 116 000 people were affected and 225 000 acres of farmland destroyed (FAO, 2017a). Smallholder farmers lost their rice seeds for the following season as well as grains and vegetables for household consumption and markets. In addition, the state has witnessed violent confrontations since 2012 causing loss of life, destruction of farms and infrastructure and forced people to displace (FAO, 2017b). Meanwhile, the population who remain in the villages remain vulnerable to hazards with limited support and services (FAO, 2017b).

In Rakhine, agricultural production is concentrated in the flatland. Rivers, cracks and mountains dominate the landscape. The main cropping pattern is rain-fed rice during the monsoon season\(^1\). Most of the land is fallow during the dry season, yet farmers with access

\(^1\) Monsoon season from June until October.

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### Mechanization services in rural communities

Enhancing the resilience of smallholder farmers and creating job opportunities

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### What is Resilience?

In simple terms “resilience is the ability of people, communities or systems that are confronted by disasters or crises to withstand damage and to recover rapidly.”


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### Rakhine: brief agricultural context

The population of Rakhine is about 3.3 million. It has 18 townships, 2 082 village tracts and 7 720 villages. More than 80 percent of the population lives in rural villages. Agriculture, fishery and aquaculture are the main livelihoods in Rakhine. However, 60 percent of the population is landless. These landless farmers have access to land through leasing. The main crops grown include rice and legumes. There is also a lack of irrigation systems that limits the agricultural production during the dry season. There are two major religious groups (Buddhist and Muslim) which are further characterized by ethnicity. Rakhine state has witnessed recurrent natural disasters and violent conflicts since 2012. These have resulted in displacement of people and unavailability of labourers for farming. Limited or no use of agricultural land has affected the food security in Rakhine.

Source: FAO, 2017b
to fresh water and pumps grow maize, legumes (cowpea, green gram, and peanuts), vegetables (bitter ground, yard-long bean, radish, chili, coriander) for household consumption and markets.

During the main rice season, smallholder farmers face labour shortages and limited availability of draught animals (the traditional source of power). Farmers’ capacity to recover after hazards and re-plant their crops is threatened by the challenges described above. The timely provision of mechanization services for land preparation, planting and harvest increase resilience of smallholder farmers faced with erratic weather, hazards and reduce losses. For instance, a delay in land preparation for planting rice during the monsoon season may lead to yield losses and even crop failure. Similarly, timely post-harvest operations such as drying, milling and storage also increase resilience and reduce losses. Even though the Government provides mechanization services for a fee, the staffing is low and the only station in the state is poorly equipped (FAO, 2019b). Some farmers are also providing mechanization services with two-wheel tractors, combine harvesters and mills in Rakhine, but demand remains higher than the supply.

**Increasing the availability of small farm machinery was recommended for long-term recovery from the 2015 cyclone and building resilience in Rakhine state**

**Source:** FAO and WFP, 2016

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# The response

In response, The Food and Agriculture Organization of the United Nations (FAO) together with the Government of Myanmar commenced a one-year project (2016-2017) funded by the Government of Japan. Its goal was to improve household food security and increased resilience of smallholder farmers in conflict- and natural disaster-prone areas. Among the project components, FAO in close collaboration with the Agricultural Mechanization Department (AMD) under the Ministry of Agriculture, Livestock and Irrigation (MoALI) increased the availability of small farm machinery such as two-wheel tractors and water pumps. The mechanization activities were rolled out in seven townships and 73 villages affected by flood and conflict in Rakhine.

The direct beneficiaries of small farm machinery were existing farmer groups in the targeted villages. The criteria for selecting the farmer groups were (i) their willingness to provide mechanization services to farmers in their village in the long term; (ii) their existing capacity to provide mechanization services.

To ensure the sustainability of the intervention, the project team assessed the availability of these farmer groups and their technical capacity. In addition, the project team prepared guidelines for the use and maintenance of the machinery. Besides, a contract including general rules and procedures for the provision of mechanization services was signed between the members of the farmer groups.

50 farmer groups (of 5-7 members each mostly men) were equipped with two-wheel tractors and water pumps to provide land preparation and irrigation services to farmers in the targeted villages.

A total of 55 two-wheel tractors and 94 water pumps were handed out. Training on the use and maintenance of the small machinery was provided as well as a brief capacitation on how to provide mechanization services as an agri-business. In addition, 146 village members were trained as tractor operators.

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2 The townships were Mrauk-U, Kyauktaw, Minbya, Ponnarkyun, Buthidaung, Ramree and Tangpu.

3 Farmer groups have the right to use the machinery and the commitment to provide the mechanization services to farmers in their village in the long term. However, they have no rights to sell the unit within the five-year life span.
The results from the mechanization intervention

The results are based on group discussions with the farmer groups as well as meetings with officials from the AMD, field reports and observation. The sample is small and the information is mostly based on farmers’ recollection. However, the results can stimulate further interest in conducting more detailed studies and inform the benefits and limitations of sustainable agricultural mechanization to enhance resilience and create jobs in rural communities.

The land preparation using two-wheel tractors is done 7 times faster than using draught animal (the traditional way). The timely performance of land preparation translates into increased resilience as farmers have a better capacity to cope with the erratic weather, labour shortages and respond to hazards.

The net income of the farmer groups providing land preparation services for rice fields varied from 50 000 to 280 000 MMK\(^4\) (approx. 35–185 USD\(^5\)) for one season. The variation depended on the acres covered and the cost associated with the repair and maintenance of the two-wheel tractors. The cost-benefit analysis served to guide the farmer groups on the number of acres to be covered per season to make the provision of mechanization services profitable.

Farmer groups provided different mechanization services throughout the year to maximize the use of the two-wheel tractors and increased their income by providing transport and threshing services to farmers.

When comparing the cost of land preparation between animal and mechanical power (in this case with a two-wheel tractors) the farmers using two-wheel tractors can save at least 6 000 MMK per acre (≈ 4 USD per acre).

Some farmer groups planned to use the profits from the provision of mechanization services to invest in one more two-wheel tractor to cover more land and benefit more farmers. Other groups have reinvested the profit in the community (e.g. repairing roads).

146 community members including young people were trained as tractor operators, generating additional income and creating jobs. The local average wage of tractor operators is 3 000 MMK one pass per acre. Depending on the surface of land prepared with the two-wheel tractor, an operator can gain 360 000 MMK (240 USD) in one month. This is higher than a wage for unskilled labour which is 150 000 MMK per month (100 USD). However, operators reported that they cannot rely only on this source of income as it is limited to a short period of the year. The training for the operators only lasts two to three days. Operators suggested to increase the number of days of training and have more in-depth information.

The provision of irrigation services during the dry season supported the cultivation of legumes and vegetables, for household consumption and markets.

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\(^4\) MMK is the code for the currency in Myanmar called kyat.

\(^5\) Conversion rate 1 USD equals 1 515 MMK (2019).
For future interventions, the promotion of small farm machinery in Rakhine should target youths, women, landless people and casual labourer as mechanization operators and/or service providers.

The participation of women in the training on the use and maintenance of the small farm machinery was lower compared to the number of men. A more equal number of women and men in the farmer groups providing mechanization services is encouraged.

It is important to continue building the technical capacity of national and local institutions on sustainable agricultural mechanization. Follow-up sessions to reinforce the knowledge of farmers and operators are paramount.

The development of general rules and procedures for the provision of mechanization services should be participatory and include the views of the people who will provide the services in the field.

The agri-business capacitation provided was limited and short. This skill needs to be strengthened in the members of the farmer groups so the provision of mechanization services can be as profitable as possible.

Other small machinery such as dryers, threshers and reapers have the potential to impact positively on increased resilience of smallholder farmers while creating rural job opportunities and reducing work burden. The selection of one technology ahead of another depends on the local context and needs assessment.

As stated in the special report made by FAO and Word Food Programme (WFP) (2016), the availability of technical support services, repair and maintenance shops and technicians in the villages or surroundings is critical for the sustainability of the mechanization services. The report also pointed out the limitations associated to high investment of small machinery and poor roads. Micro-finance schemes or other financial tools in support of smallholder farmers should be in place together with technical support and close follow-ups in the field.

References

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