

Farm Mechanization in Thailand

Hnin Ei Win
Center for Applied Economics Research
Thailand

Introduction

Agriculture is the main economy of Thailand. About 46.6% of the total population relies on the agriculture sector for their livelihood. Crop production plays an important role as one part of agriculture. In Thailand's gross agricultural output the contribution of the agriculture sector was about three-fifths (61.8%) while livestock, fisheries, forestry and others sectors were 15.6 %, 22.4%, 0.02% and 0.18%. respectively by 2010 (Thepnet, 2015). According to the data from Thailand's Board of Investments (2016), the area under agricultural production accounted for about 50% of the total area in 2014. According to the cultivated area and value of production, there are five most important crops in Thailand: rice, maize, sugarcane, cassava and soybean. The coverage areas under these crops are 10.75, 1.11, 1.14, 1.03 and 0.16 million hectares, respectively. Among them, rice, maize and sugarcane are important in the domestic and foreign markets. Rice growing area occupies about half of the total agricultural area while field crops, horticultural crops and other crops occupy 21.5%, 21.2% and 7.5%, respectively (Thepnet, 2015). Therefore, rice is the core sector in the development of socio-economic aspect of the country (Titapiwatanakun, 2012).

In Thailand, mechanized farming has been initiated since 1955. Generally, farm mechanization has been practiced in rice production to reduce the labor requirement and improve the country's agricultural productivity. It is mainly used in the field operations such as water pumping, land preparation and harvesting in rice cultivation (Sutthiwaree and Yang, 2015).

Two wheel tractors made in Thailand were firstly developed in the late 1950s reported by William Chancellor in 2011. In the early 1980s, the use of two-wheel tractors increased quickly under rainfed agriculture in the Northeast region of Thailand. During the past 20 years, the number of two-wheel tractors increased over 31 times in 2003. In other words, the ownership of farming households increased from 2 to 47%. About 90% of households were using two wheel tractors and also starting hired services in 2003 (Grandstaff *et. al*, 2008).

In the central plains and lower part of the northern region, four wheel tractors of 40 HP with rotary implements are used instead of two wheel tractors in rice cultivation. There is a labor shortage problem during harvesting periods of rice and sugarcane in the central plain region. Therefore, the demand for an appropriate and efficient harvester increased (Thepnet, 2015). But the requirements for power tillers, irrigation pumps and power threshers have not changed in the central plain region. Conversely, the demands for power tillers have increased rapidly and Thai-made rice combine harvester in other regions (Chamsingl and Singh, 2000).

Across the country, farm mechanization has been moving from labor intensive machines towards control intensive machines such as planting machines, irrigation system machines, powered sprayers, combine harvesters, dryers using biomass fuel, silo and storage handling, advanced and high quality rice mill machines etc. In Thailand, most of the agricultural machineries are locally produced such as tractors, power tillers, disc ploughs, disc harrows, water pumps, sprayers, threshing machines, reapers, combine harvesters, cleaning equipment,

dryers, rice milling machines, and processing equipment, etc. (Thepnet, 2015). However, the four wheel tractors are imported from other countries and are mostly second-hand units (Chamsingl and Singh, 2000). Agricultural machineries (especially water pumps, tractor vehicles and parts and mechanical sprays) are mainly imported from Japan, China and Malaysia while the major export countries for Thai agricultural machineries are Cambodia, Myanmar, Indonesia and Saudi Arabia (Thailand Board of Investments, 2016).

According to the data from the Agricultural Engineering Research Institute, the major agricultural machineries used in Thailand are described in Table 1.

Table 1. Major products of local manufacturers in Thailand in 2001

Machine	Production in units per
Two wheel walking tractors	80,000
Large tillage implements	3,000
Small tillage implement	90,000
Threshing machines	2,000
Combine harvesters	600
Sprayers with hand-operated	60,000
Irrigation pumps	55,000

Source: The Agricultural Engineering Research Institute

In 2009, the number of industries producing agricultural machineries which are produced and repaired are shown in Table 2.

Table 2. Number of Agricultural Machinery Industries in 2009

Type of Machines	No. of Industry
Walking tractors	275
Tillage equipment	329
Planters	16
Sprayers	447
Harvesting machines	386
Others	164
Repair and maintenance	1,192

Source: Department of Industrial Work

In 2008, the agricultural machineries particularly used in rice production are listed as shown in Table 3.

Table 3. Specifications of agricultural machineries for rice production in Thailand in 2008

Items	Quantity (Unit)	Price (Baht/unit)	Value (Million/Baht)
Tractors	287,226	302,557	86,902.237
Power tillers	2,644,982	30,256	80,026.575
Irrigation pumps	1,430,984	4,500	6,439.428
Combine harvesters	41,143	1,411,932	58,091.118

Source: Office of Agricultural Economics (2008)

Depending on the soil conditions, there is a difference in the utilization of farm machines. If its dryland cultivation, large four-wheel tractors with disc tillers are mainly used for land preparation. For the wetland cultivation, power tillers (8-12 hp) made locally are used for land preparation. In maize and soybean cultivation, farmers used the rolling injection

planters. Combine harvesters have been widely used for harvesting of rice as well as in sugarcane and corn in custom service since 1995 (Thepnet, 2014).

In the early 1960s, small-scale farmers has been innovated to adopt the new cultivation technology such as high yielding varieties (HYVs) and chemical fertilizers. The farmers can make more profits from the increase of crop productivity and rice cropping intensity. Nevertheless, because of labor shortage and high labor wages, the farmers adopted to change their farms from manual to mechanized farming to save on labor problems. This is because mechanized farming saves labor shortage as well as labor wage costs. Across the country, farm mechanization can be operated with reasonable costs and it can make the lower production costs compared with operating with hired labor wage (Isvilanonda, 2012). Moreover, in mechanized farming, the farmers can practice double cropping and triple cropping systems according to the findings of Chamsingl and Singh (2000). Therefore, mechanized farming plays a vital role in agricultural production of Thailand. In the coming ten years, the demand for agricultural machineries will increase significantly (Thepnet, 2015).

Policies for agricultural mechanization

Agricultural mechanization is one part of the overall agricultural development policies. Therefore, there is no clear policy and strategy for agricultural mechanization in the National Development Plan (Thepnet, 2015). However, Sutthiwaree and Yang (2015) stated that the government supported the agricultural sector to conduct the research project on crop variety development, water resource improvement and management including machinery technologies development in the first National Economic and Social Development Plan (1961). For the development of agricultural mechanization, the basic policy was set up at the national level in the 6th National Economic and Social Development Plan (1978-1991). In that policy, agricultural production have to be increased efficiently as well as the total agricultural production costs which have to be decreased in order to compete in the international markets.

In the report of Thepnet (2015), the general national objectives for agricultural mechanization policies are stated as follows:

- (a) to produce agricultural machineries at reasonable prices which are affordable to the farmers;
- (b) to produce good quality and labor saving agricultural machineries with regard to prices and maintenance costs; and
- (c) to produce suitable agricultural machineries for any farm topography and soil conditions of the country.

Besides the basic national policy, the policies and strategies relating to agricultural mechanization development are declared by the government in terms of immediate, short and long-term priorities. In the immediate policy, the government focused on research and development, local manufacture, agricultural credit and extension of agricultural machineries. The major emphasis for short-term policy include institution development, operation efficiency development, standardization of product quality and training. The long-term policies are focused as follows:

- (a) Market distribution and pricing of farm machinery and equipment;
- (b) Prices of farm machinery and equipment;
- (c) Management of farm utilization;

- (d) Management of farm machinery utilization;
- (e) Custom hired services;
- (f) Machinery maintenance and repair;
- (g) Land development and irrigation; and
- (h) Long term institutional development

The role of research and development concerning with agricultural machines were added in the 7th National Economic Development Plan (1992-1996) that includes physical characteristics of farmers, improved production quality and development of new machines suitable for farm conditions in Thailand. There was no clear policy concerning with the agricultural mechanization development in the 8th and 9th National Economic Development Plan (1997-2006).

Today, agricultural machineries are used in two forms—as owner and hiring service depending on the size, type, and price of machines. Two-wheel tractor, water pump and sprayer, etc were afforded by most of the farmers because they are small and not expensive. However, farmers owned 6.4% of four-wheel tractors and 6% of power threshers of total machines. Smallholder farmers and those farmers from remote areas cannot afford to buy agricultural machineries and cannot be hired because of their very small production.

Constraints in the agricultural machineries sector

In the past, the government did not support the development of farm mechanization and still less until now. There is a shortage of appropriate technologies for the operation of machines at the farm level as well as under development in the production technology for agricultural machineries. Collaboration in terms of government support is also lacking . Farmers cannot buy agricultural machineries because they don't have access to credit. Moreover, the price for some machineries are high because they are imported from other countries. The farm sizes are rather small to generate farm machines for field operations. The involvement of family members is less in farm activities which cause labor shortage. As a result, custom service was observed for most of all farm activities. Although farmers under rainfed agriculture for rice and sugarcane production owned the farm machines which were not necessary for their farm works, they had to pay for the custom service work. It made high costs in their crop production (Thepnet, 2015).

Conclusion

The agriculture sector in Thailand occupies a dominant position in the development of the national economy. Among the five major crops, rice plays an important role in the socio-economic development of the country. In rice cultivation, labor shortage and high labor wages are challenges for the farmers especially in the harvesting period. Therefore, agricultural machineries have been widely used in rice production to save on labor cost as well as in corn and sugarcane production. In Thailand, farm mechanization started in the central plain area of the country and soon expanded to other areas. In the early days, the government did not support the development of the farm mechanization. However, the basic policy concerning farm mechanization was laid out in the 6th National Economic and Social Development Plan. But to date, there is still inadequate government support regarding farm mechanization.

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