

COUNTRY REPORT

Agricultural Machinery and Mechanization Situation in Thailand

By

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This report contains three parts. Part one is about general background of Thailand such as land area, climate, population. And it also covers cultivated area, crop, soil, Irrigation and drainage system, cultivation system, production condition, exporting & importing conditions. Part two is about policy, administrative systems and those activities or services and existing situation. And part three is about agricultural machinery in Thailand.

1. General background

(1) General

a. Area

Thailand is situated in the Southeast Asia at latitude from north 5°35" to north 20°30" and longitude from east 97°30" to east 105°27". It has the total of land area 513,115.02 km².

b. Climate

Thailand has 3 seasons:

1. Hot season (start from January to April)
2. Rainy season (start from May to August)
3. Winter season (start from November to December)

Thailand has maximum temperature about 42°C in April and has minimum temperature about 8.3°C in December. Average temperature is about 27.1°C and annual precipitation is about 1,500 mm.

c. Population

The total population of Thailand is about 61,278,000 and approximately 60.4% (37,011,912) live in the rural areas and most of them earn their living by farming.

d. Industry

Although Thailand is an agricultural country but it has many industrial sections. And they are developing now such as car industry, metal industry, electric power, agricultural processing, textile and garment industry, constructions etc.

e. Social, economic condition

The official language of Thailand is Thai language and the second language is English language. The religion that government recognizes is Buddhism.

Thailand started the first National Economic and Social Development Plan (NESDP) in 1961. Currently the country is in the Ninth Plan (2002 - 2006). From the First to Third Plan (1961 -1976), the goals for increased agricultural production were achieved by cultivated area expansion. During the Fourth to Fifth Plan (1977-86), the agricultural policies were changed to increase agricultural production by development and use of appropriate technology, increased production per unit area, improved cropping system and livestock production.

In Sixth Plan (1987 -1991), the national agricultural mechanization policy was included with the general objective of developing the agricultural sector to increase productivity. In accordance with the general objective, the activities involved were expected to achieve the following :

1. Farmers will have machineries for their production at low cost.

2. Agricultural machineries must be good quality in terms of price and maintenance cost

3. Agricultural machineries must be appropriate for use under various conditions in the rural areas.

In the Seventh Plan (1992-96) the policy added some specific objectives such as the R&D in agricultural machineries to consider the physical characteristic of farmer, improve production quality and develop new machines suitable for farm in Thailand.

In the Eighth Plan (1997-2001), the mechanization policy is not explicitly stated like in the previous two Plans. The general objective of developing the agriculture sector is to improve the capacity to compete in agricultural production by promoting the replacement of human labor by agricultural machineries.

(2) Agriculture

a. Cultivated area

Thailand is one of the world supplier in agricultural production. Approximately 41% of the total area (210,377.16 km²). of the country is under agriculture.

b. Crops

Rice is the most important crop of the cultivated land and as the staple food for Thai people. And Thailand has other important crops such as rubber, maize, sugar cane, cassava, oil palm etc.

c. Soil

There are several soil conditions in Thailand. Most Cultivated rice soil is Alluvial soil that hold water long time. Under different physical geography in Thailand, we can divide soil conditions 3 types:

1. Ground water soil is in Bangkok, Ayuttaya, Prathumtani, Suphanburi and Pragenburi that are important cultivated areas of the country.

2. Upland soil is in Lopburi, The part of Chiangmai, Lumpang, Nan, in fan terrace complex area and intermountain basin. It is dry and not wealth.

3. Intermediate soil is in the part of Suphanburi up to Sukothai.

d. Irrigation & Drainage system

Administratively as well as geographically, Thailand is divided into four regions, namely; the Northeastern, Northern, Central plain and Southern regions. Rice is grown in all regions with different rice growing environments. Approximately 75% of rice is grown in rainfed areas and only 25% is in the irrigated areas. About 11.7% of irrigated rice area is in the Central plain region, with 6.4, 5.0 and 1.4% in the Northern, Northeast and Southern regions,

respectively. Irrigated areas and pumping irrigation areas for rice cultivation are shown in Table1.

The major source of water is surface and ground water utilized through diesel or electric pumps. Most common irrigation methods are flooding irrigation, sprinkle irrigation and dripped irrigation.

Table1. Irrigated area and pumping irrigation area for rice cultivation

Region	Irrigated area (ha)	Pumping irrigation area for rice cultivation	
		Major rice (ha)	Second rice (ha)
North-Eastern	792,784	60,538	14,219
Northern	1,222,881	30,610	24,315
Central Plain	2,151,712	46,662	6,384
Southern	474,706	859	9,838
Total	4,642,083	146,402	54,757

Source : Office of Agricultural Economics

e. Cultivation system

- The survey conducted by Office of Agricultural Economics in 1995 to 1999 indicated that average farm size declined from 4.2 to 3.71 hectare/household (Table2). The farmers in the Central plain region had the highest farm size, followed by farmers in the Northeast, the South, and the North. Farmers in the Northeast have the highest owner operated holding area per farm, followed by farmers in the Central Plain, the South, and the North. Farmers in the Central Plain have the highest rented holding area per farm. Thus, the problem facing each region are different. Problems of land rent mostly occur in the Central Plain. Most farmers in the Northeast have their owned land, but , they face problems of poor soil conditions and high risks from climatic variations.

Table2. Average farm size in Thailand

Year	Farm Size (hectare/household)
1995	4.2
1996	4.0
1997	3.96
1998	3.91
1999	3.71

Source : Office of Agricultural Economics

- Two crops a year is a common practice in rice cultivation in the area under irrigation. Some area in the central plain utilized under ground water can accomplish five crops in 2 years.

- In the past time water buffalo and cow were draft animals popularly used in cultivation system for land preparation. Nowadays they are found very few and only in the remote rural area. Almost of cultivation system is under mechanized. Various kinds of tillage implements are used differently in land preparation depending upon crop, tilling purpose and area. For paddy field in the irrigated area, disk plow equipped to two-wheel tractor or small four-wheel tractor is generally used at present and followed by rotary tiller. Moldboard plow is also used but in a declining number. For field crop, disk plow, disc harrow, spring-loaded cultivator, and rotary tiller are used, commonly equipped to big tractor. There are several methods of rice planting depending upon area and labor condition. Transplanting methods is a major practice for seasonal crop. While broadcasting and direct seeding are general practices in high land or rain-fed area. Every methods are most done manually.

- From the AERI survey in crop year 1999-2000, it shows that paddy was harvested by manual using sickle 57.2%, by combine harvester 35.2% and by reaper 7.6%. Threshing are mostly done by using power thresher about 88.3%. After harvest, farmers usually sell their product immediately at high moisture content. Sun drying is still a prevailing method for paddy drying. However, as an increasing number of combine harvester in a past few year, it burdens large amount of high moisture paddy to market at peak in a short period especially in the second crop. This leads to an increasing number of dryer to solve the problem.

f. Production condition

Rice is the important crop of the cultivated land that is produced approximately 25,608 metric ton in 2001/2002. Other crops are showed in Table 3.

Table3. Planted Area, Production and Farm Price of major crop during crop year 1998 to 2001

Crop	1998/99			1999/2000			2000/01		
	Area s	Prod.	Price	Area s	Prod.	Price	Area s	Prod.	Price
Rice	10,032	22,999	5,756	10,311	24,172	4,679	10,502	25,608	4,621
Maize	1,441	4,617	3,690	1,248	4,286	4,290	1,259	4,367	3,790
Cassava	1,071	15,591	1,260	1,152	16,507	910	1,185	19,064	630
Sugar Cane	918	50,332	470	945	53,949	446	867	49,070	491
Mungbe	303	226	12,7	322	249	11,1	304	233	12,5

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Sorghum	98	146	2,56 0	88	142	3,65 0	92	148	3,06 0
Soybean	235	321	9,75 0	232	319	8,63 0	234	324	9,23 0
Groundnut	89	135	12,1 70	90	138	11,1 00	88	135	11,2 40
Oil palm	-	2,46 5	3,37 0	-	3,51 2	2,20 0	-	3,25 6	1,66 0
Rubber	-	2,16 2	23,0 60	1,54 8	2,19 9	18,0 50	1,56 3	2,23 6	21,5 20

Source : Agricultural Statistics of Thailand Crop Year 2000/01,
Office of Agricultural Economics.

Note : Areas = x1000 ha ; Production = x1000 ton ; Price = Baht/ton

g. Exporting & Importing conditions

Thailand has the value of total exports 2,888,936 million baht in 2001 that is the value of agricultural and products 676,677 million baht (Table 4). Rubber and products is the first agricultural export with value 109,481 million baht. Other agricultural exports are shrimps and products, rice and products, fishes and products etc (Table 4). And Thailand has the value of total imports 2,756,656 million baht in 2001 that is the value of agricultural and products 316,868 million baht (Table 5). Wood pulp, Paper and products is the first with value 37,277 million baht and other agricultural imports are fish (fresh, chilled and frozen), animal feed, para rubber and products etc (Table 5).

Table 4. Value of principal agricultural exports, 1997-2001

Unit : Million baht

Items	1997	1998	1999	2000	2001
Value of total exports 1/	1,800,83 2	2,242,5 43	2,209,4 58	2,764,3 52	2,888,9 36
Value of agricultural and products 1/	484,847	585,687	550,116	626,286	676,677
Top five of principal agricultural exports					
1. Rubber and products	82,644	91,642	77,871	105,004	109,481
2. Shrimps and products	75,714	95,841	87,610	107,932	98,732

3. Rice and products	67,583	89,440	76,403	68,473	71,021
4. Fishes and products	40,286	51,530	48,221	45,266	56,738
5. Wood and products	20,963	28,443	33,908	42,777	44,390

Remark : 1/ Excluded re-export

Source : Office of Agricultural Economics

Table 5. Value of principal agricultural imports, 1997-2001

Items	1997	1998	1999	2000	2001
Value of total imports	1,924,263	1,774,050	1,907,391	2,494,133	2,756,656
Value of agricultural and products	228,831	226,234	228,097	275,459	316,868
Top five of principal agricultural imports					
1. Wood pulp, Paper and products	26,630	25,818	27,970	39,521	37,277
2. Fish (fresh, chilled and frozen)	18,268	25,795	21,090	18,747	29,805
3. Animal feed	19,025	15,245	16,524	19,580	25,354
4. Para rubber and products	13,665	13,533	15,303	19,923	22,416
5. Cotton row and linters	14,702	18,601	15,034	19,033	21,892

Source : Office of Agricultural Economics

2. Agricultural machinery and mechanization

(1) Policy

- Mechanization plays more important roles in the present Thai agricultural production system. Therefore, Thai government has enhanced the mechanization development plan which had firstly been included in the past Seventh National Economic and Development plan (1992-1996) and also emphasis in the Eighth National Economic and Development plan (1997-2001) and the Ninth National Economic and Development plan (2002-2006). With the scope of the plan number of programs and activities have been launched by both public and private sector to achieve the appropriate use of farm machines. In the paddy field, policies for agricultural machinery are:

- Appropriate agricultural machinery to be generally available to farmers at reasonably low price.

- Agricultural machinery to be suitable for operation under varied local territory and soil conditions of rural area.

(2) Administrative systems and those activities or services

a. Governmental organizations

The government agencies involved in agricultural machinery and mechanization are:

- Agricultural Engineering Research Institute, Department of Agriculture is responsible for research and development on agricultural machinery and agricultural processes and providing technologies as well as technical services to government and private agencies involves

- Agricultural Engineering Operating Centers are responsible for providing training to farmer groups and corresponding agricultural extension officers from the Department of Agriculture.

- Farm Mechanization Sub-Division of the Department of Agricultural Extension is undertaking about extension activities.

- Office of Agricultural Economics is responsible for collect statistic data of agriculture and agricultural economic. Then, analyze data and report to government and public.

- Thai Industrial Standards Institute is responsible for standardization of agricultural machinery

- Bank of Agriculture and Agricultural Cooperatives is responsible for loan extension to agricultural cooperatives and farmers

b. Research organizations

Thailand has research organization of agricultural both governmental organizations and Universities

- Governmental organizations : Agricultural Engineering Research Institute, Rice Research Institute, Horticulture Research Institute, Field Crops Research Institute, Rubber Research Institute, Biotechnology Research and Development office, etc.

- Universities: Kasetsart University, Chiangmai University, Khonkaen University, King Mongkut's Institute of Technology (Ladkrabang, Thonburi, North Bangkok) and collage of agriculture in sector of Thailand

c. Extension organization

In Thailand, the Department of Agricultural Extension is leader to extend about agriculture. And extension agricultural machinery is responded by Agricultural Engineering Operating Centers

(3) Existing situation

a. Specifications of agricultural machinery commonly used

At present agricultural machinery is wildly used among Thai farmer. There are many companies research themselves and import farm machinery from overseas such as China, Japan, Korea and Europe. Farmers have tendencies to use agricultural mechanization in their works due to lack of farm labor. The list of

agricultural machinery in Thailand in the Year 2000 especially for rice production is shown in Table 6.

Table 6. Specification of agricultural machinery for rice production in Thailand Year 2000

Items	Specification	Country	Price (baht/unit)	Quantity (Unit)
Tractor	< 45 hp	Japan, Europe	800,000	150,383
	> 45 hp	Europe	1,300,000	183,704
Power Tiller	9-12 hp	Japan, Thailand, China, Korea	50,000	1,753,639
Irrigation Pump	5-8 hp	Thailand, Japan, China	4,500	2,317,392
Thresher	1-2 ton/hr	Thailand,	180,000	76,386
Combine harvester	0.76 ha/hr	Thailand	1,500,000	3,000

Source : Office of Agricultural Economics

b. Extension situation, utilization, machinery holding by farmers

Mechanization will play very important role in the present agricultural production of Thailand. Labor shortage and necessity to reduce production cost have obviously shown off. Undoubtedly, demand for agricultural machinery will remarkably increase during next ten years. However, need of machines will differ from region to region. Sophisticated control-intensive machines such as harvesters, transplanters, planters and powered sprayers will be highly needed by farmers in more progressive regions such as the central plain and the lower part of the north. At the same time labor intensive machines such as single axle two-wheel tractors, water pumps and manual operated sprayer will keep expanding in the north and northeast. Percent regional distribution of farm machinery is shown in Table 7.

Table 7. Percent Regional Distribution of Farm Machineries

Item	Region								Whole Kingdom (Total, Unit)
	Northern		North - eastern		Central Plain		Southern		
	Unit	%	Unit	%	Unit	%	Unit	%	
Power tiller	818,028	47	243,321	14	413,643	23	2,78,376	16	1,753,368
4 Wheel tractor	47,471	26	20,032	11	111,278	60	4,923	3	183,704
Irrigation pump	566,129	25	355,846	15	1,281,849	55	113,568	5	2,317,392
Engine powered sprayer	65,316	15	25,483	6	332,888	77	9,080	2	432,767
Hand operates sprayer	4,519,791	37	3,330,606	27	2,794,099	22	1,755,691	14	12,400,187
Thresher	7,002	9	25,745	34	4,0497	53	3,142	4	76,386

Source : Office of Agricultural Economics

At present there are two forms of utilizing agricultural machinery as machine owner and/or machine hiring service. The ratio of machine owner to machine hiring service depends on size, type and price of machine or equipment. Most farmers own the small and inexpensive machine such as two-wheel tractor, water pump and chemical sprayer etc. For four-wheel tractor and power thresher, only 6.4% and 6% of total machines were possessed by farmers. However, there still are a number of small farmers who have small holding area or in the remote rural area, they are unable not only to possess farm machinery and also can not call for the hiring service because their production is too small.

c. Conditions of operation maintenance and repairing

In general most agricultural machinery owners have their machines repaired and maintained by themselves. If they are unable to do it, they will bring the unit to a local repairing or welding shop nearby their houses for repairing. Spare parts are normally available in the provincial or region dealers or agencies. However, it is quite difficult to get the spare parts especially in the remote areas. Thus they usually modify the spare parts that are not available. In Thailand, the tractors, power tillers and paddy threshers generally last for 10 years each, diesel engines 7 years, power sprayers and irrigation pump sets about 6 years each.

d. Conditions of research, development and production

The conditions of research, development and production of agricultural machinery are limited by government . But some private sector can research and development themselves.

During this period of economic crisis farm mechanization still has important role in improving agricultural production. The research and development aims to these activities:

1. Collaboration among researchers from government sectors, educational institutes and manufacturers are important aspects to ensure that the research works will be continuously implemented to marketing production.

2. Cost reduction in manufacturing by using standard part among different manufacturers. Standard parts will be benefit to not only cost reduction for manufactures but also more convenient for farmers to buy spare parts. Power tiller standard parts (gear box) project is the example of a successful project. This project, supported by the Thai research fund (TRF), is a collaboration among AED and 13 local manufacturers.

3. Production value-added by improving machinery for postharvest technology and processing.

4. Researches under government fund are grouped into project. Each project must be evaluated by the National Research Council and researchers must propose the project concerning government policy.

e. Situation of factory

In the present, Most of the agricultural equipment used in Thailand is locally produced such as tractor, power tiller, disc ploughs, disk harrow, water pump, sprayer, threshing machine, reaper, combine harvester, cleaning equipment, dryer, rice milling machines, and processing equipment etc. However local machines produced from small manufacturer, is not standardized in quality, efficiency and durability. Some agricultural machines are import from overseas by companies for Thai agricultural productions.

The information in Table 8 was obtained from survey of the top 70 agricultural machinery factories in Thailand.

Table 8. Major products of Local manufacturer in Thailand

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

Source: The Agricultural Engineering Research Institute

3. Agricultural machinery studied and developed by the Agricultural Engineering Research Institute

The research outputs of the Agricultural Engineering Research Institute that have successfully been disseminated to farmers, manufacturers, and public are noted as:

- power tiller rotavator, rolling injection planter, inclined-plate planter, transplanter, powered weeder,
- rice reaper, soybean reaper, maize dehusker, cassava digger, potato digger, fruit picker, cashew nut husker,
- multicrop thresher, wheat thresher, maize sheller,
- farm trailer, grain dryer, cabinet dryer, coffee roaster, coffee huller, coffee dryer, fruit juice extractor, etc.

4. Reference

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