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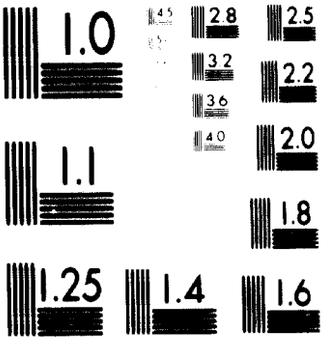

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COUNTRY STUDY REPORT

on the

STATUS OF AGRICULTURAL MACHINERY INDUSTRY

in

THAILAND

Information compiled
during
a fact finding survey.

UNIDO, Vienna
January 1969

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* Note: The opinions expressed in this document do not necessarily reflect the views of the Secretariat of ECAFE or that of UNIDO.

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THAILAND

SUMMARY OF COUNTRY STUDY

I. General Pattern of Agriculture

Thailand has around 11 millions ha of arable land of which 9,4 millions are cultivated. Total production is 315 millions with 70% engaged in agriculture and population pressure is rather small: 3,3 per ha cultivated - resulting in possibility of export of food production. Main crop is rice for above 60% of the cultivated area, but maize and other cash crops are becoming popular on uplands. Number of holdings is around 3,000,000 with an average size of 4 ha, 800,000 of them have more than 5 ha and appear to might be conveniently mechanized.

II. Pattern of Farm Mechanization

Although more than 6,000,000 draft animals are yet used power mechanization is becoming popular with 28,000 tractors and 2,000 power tillers in use. Existing market for 4 wheel tractors is about 3,000 a year and is expected to increase to 6,000 by 1975. Most of them are 50/60 hp used by contractors.

Power tillers are becoming popular but demand is still low (850 in 1968 - expected 1,500 in 1970 and 3,500 in 1975) due to insufficient performances in large paddy fields. Other main farm equipment needed are: irrigation pumps, engines diesel and gasoline, paddy threshers, (and harvesting combines in the future), paddy hullers, tractors implements which are economically manufactured by small shops, power sprayers. Sales are limited by lack of finance ability by the farmers and insufficient help by loans at low rate of interest.

/III. Manufacturing

III. Manufacturing Industries and Ancillary Facilities

Two tractor companies have assembly plants but they include in their products a small percentage of local contents. Plans are underway for a third one with the aims to a higher proportion of local production. Production of power tillers is started on a small scale by the Engineering Division of the Rice Department which is manufacturing other farm implements for paddy cultivation under his own design and has plans for greater expansion. Other implements manufacturers are of very small scale except 1 of them which is producing in significant volume.

Facilities exist in the country for castings and for supply of locally made tyres and batteries but raw material and all other components have to be imported.

IV. Policy towards Farm Mechanization

By the way of Industrial Promotion Act, the Government of Thailand is giving important incentives for the development of industrialization. Foreign or local companies are offered good facilities for setting up, running and supplying new plants. Government assistance is also given to the farmers towards development of farm mechanization with subsidy prices of main crop, credit facilities, help to setting up co-operatives, expansion of governmental irrigation systems.

V. Conclusions

Due to his agricultural potential, Thailand is expected to become in the near future a significant market for farm equipments and namely for powerful 4 wheel tractors, power tillers and implements for rice cultivation.

/Plans

Plans must be provided to match most of these requirements and setting up new manufacturing facilities is to be studied for:

4 wheel tractors in the range of 55/65 hp

Power tillers

Diesel engines

Sprayers

and meanwhile for improving the actual local manufacturing of implements.

Section I

GENERAL PATTERN OF AGRICULTURE

Thailand is expanded from 6° to 20° latitude north upon a total area of 51.4 millions of ha.

Total population is 31.5 million persons (1966) of which 78% are interested in agriculture.

1. Land utilization

a) Land distribution by nature

From 52.2 million ha of land area 11.2 million ha are arable land and 27.1 forest land. It was reported in 1964 2.06 million ha irrigated about the 9.45 millions cultivated.

b) Land distribution by crops

The planted area of different crops is given in Table 1.1. Planted area of various crops in different zones of Thailand is given in Table 1.2. The distribution of major crops as of 1965 is as follows:

Table 1.1

Crop	(Area in 000 ha)
Upland food crop	850
Oil seed	435
Fibre crops	550
Fruits and garden crops	365
Rubber	540
Tobacco	70
All crops except rice	2,910
Rice	6,545
All crops	9,455

/Upland

Upland food crops are maize, mung beans, cassava, sugar cane, vegetables, fruits and edible seeds, oil seeds are castor beans, ground nuts, soy beans, sesame seeds. Fibre crops are cotton, kapok, kenaf, ramie, kenaf and jute.

From the above table, it is seen that rice area commands 69% of total planted area. The zonewise distribution of crops in 1965 is given in table 1.2

Table 1.2

Zonewise Distribution of Crops 1965

(000 h.a.)

Major crops	North	North East	Central Plain	South	Total
Rice	430	2500	3100	515	6545
Upland food crops and tobacco	182	192	800	31	1205
Oil seeds and coconut	49	78	350	129	606
Fibre crops	19	435	82	4	540
	680	3205	4332	679	8896

From this it can be seen that northeast and central plains command 30% and 48% of total planted area in the country.

c) Land distribution by size of holding

The average size of farm holding is 3-5 ha per family which averages 5 to 6 members. In a typical rice farming family, 50% of the members are usually fully employed on the farm while the rest, comprising mostly of small children and old people, help out occasionally.

During the past ten years there have been several large farms established along new highways. These farms range in size from 10 to 100 ha and are mostly

/for

for maize, sorghum, and some well-known fruits. These farms are usually worked by tractors and are mostly provided with deep-well water.

It must be mentioned here that roughly 75% of the population of the country, i.e. about 20 million, are farmers. Considering 3,087 thousand farm holdings and assuming about 3.2 ha per average holding, the total farm area will amount to about 11 million ha.

Table 1.3 gives estimated size distribution pattern of holdings.

Table 1.3

Average Size of Farm Holdings

(in hectares)

Approx. Size of holding (ha)	No. of Holdings	Percent
Total	3,087,141	100.0
0.3 - 1	467,876	15.2
1 - 2.5	944,526	30.6
2.5 - 5	884,411	28.5
5 - 8	422,710	13.7
8 - 9.5	193,262	6.3
9.5 - 23	163,183	5.3
23 and over	11,173	0.4

2. Cattle population

Employment of animals for work in farms

Cattle and water buffaloes are the only animals widely used in rice farming in Thailand. The population of cattle and water buffaloes in the country in 1965 is 6.69 million. It is not known exactly how many of the cattle and water buffaloes are being used in farming.

/3. Farm

3. Farm income

The country's 3.2 million farms generate a third of its gross national product, provide 80% of its exports and employ 80% of its work force. However, the crop yields from the 11.2 million ha under the plow are quite low and an additional 8 million ha of land lies fallow. The most significant factor contributing to the existing pattern of agriculture is the purchasing capacity of the farmer is very low and it is recognized that unless the purchasing power of the rural community is substantially increased, it will be impossible to tap the huge dormant potential of the domestic market for industrial products.

4. Farming practices

a) Fertilizer usage

For the present chemical fertilizers are applied in only 20-30% of the total cultivated land in Thailand. However, the imports of fertilizer has substantially increased from the past couple of years rising 17-20% yearly; and has reached more than 100,000 tons a year.

It is reported that paddy yields can be boosted by 50% through use of chemical fertilizer costing US$ 5.60 to 12.00 per acre. The present use of $2.4 per acre is considered to be too low and it is estimated that under ideal conditions the country is capable of absorbing 650,000 tons of fertilizers annually, in 3 years time and it is predicted that Thailand will consume around 321,000 tons in 1971.

5. b) Irrigation

In order to have a reliable water supply for agriculture, the Government has spent at least a billion dollars into construction of dams and reservoirs. Some of the giant irrigation projects executed in the first 5 year plan are Bhumiphol, Ubolratna, Nampung, Kang Krachan and Mae Tang covering an irrigation

/area

area of 1.88 million ha. Similar projects scheduled for implementation in the current five year plan are Nan, Uttaradit, Phitsanulok, Greater Mae Klong, Prachuabkirikhan, Chiengmai and Sakon Nakhorn. Although, plan's target is to raise the watered area to about 6 million areas by 1971, it will still be less than 25% of the total area under cultivation.

c) Hybrid seeds (paddy)

Experiments and extension work are being carried with respect to Taichung (Native I), Taiwan-3, Peta, Tjera Mas, Tangkai, Botaw and Chiavmeng. However, no significant area is under hybrid variety of rice yet.

Paddy is transplanted by 75% and broadcast seeded by 25%.

Appendix I-a

Planted Area of Principal Crops by Group 1963-1965

(From Agricultural Statistics of Thailand)

	Upland food crops	Oil Seeds	Fibre crops	Garden Crops	Fruits	Rubber	Tobacco	All crops excl. Rice	Rice	All crops
1963	5049	3534	1766	775	1691	3272	255	14957	41256	56113
1964	5751	2515	2159	731	1440	3305	320	16221	42672	58736
1965	5878	2675	3380	730	1511	3324	447	17945	40491	58436

Upland foodcrops: Maize, Mung beans, cassava, Sugar Cane, Vegetables, Fruits, Edible Seeds

Oil Seeds: Castor beans, Ground nuts, Soy beans, Sesame seeds.

Fiber crops: Cotton, kapok and bombax, ramie, kenaf, jute

Area in 1,000 rai (2.5 rai = 1 acre)

Appendix I-b

Zonewise Planted Area of Various Groups of Rice - 1965 (Thailand)

Figures in 000 Rai (6.25 rai = 1 ha)

	Group	Crop	Total	North	North East	Central Plain	South
1	Rice	Rice	47,491	2,679	15,173	19,391	3,239
2.	Upland crop	Maize	3,605	84	290	3,100	66
		Mung	753	15	24	707	8
		Cassava	1,850	744	585	481	80
		Sugar cane	893	41	244	590	18
		Tobacco	447	260	102	73	12
3	Oil seeds	Castor	225	6	87	131	1
		Groundnut	621	157	164	276	24
		Sesame	162	16	43	102	1
		Soy bean	1,117	39	4	1,074	-
		Coconut	1,650	60	195	630	755
4	Fibre crop	Cotton	471	62	122	287	-
		Kapok & Bombax	450	55	221	152	22
		Jute	49	1	14	34	-
		Kenaf	2,401	2	2,365	32	-
		Ramie	9	-	3	6	-

Section II

PATTERN OF FARM MECHANIZATION

1. Farm machinery population

In late 1967 a survey project on farm machinery was conducted jointly by the Ministry of Industry and the United States Operation Mission to Thailand, with the assistance of several other governmental organizations. The report of this survey is expected to be published soon. Beside this survey, studies have been made by the Engineering Division of the Rice Department of the Ministry of Agriculture, and Agricultural Development Council. It is also known that the U.S. Trade Centre and the Japan Trade Centre have done some studies for their respective trade missions or study missions but their reports are not available for the present.

However considering the imports and estimated local production or assembly, the following table gives the estimated farm machinery population in Thailand.

/Table 2.1

Table 2.1

Estimated Population of Farm Machinery in Thailand (1968)

	Actual imports	Estd. balance imports upto date (Dec 68)	Estd. local assembly and or production 1963-68	Estd. total population Dec. 1968
Riding tractors	19,000 1/	3,000	6,000	28,000
Crawler tractors	2,917 2/	1,200	-	4,250
Power tillers	2,000 1/ 4/	800	-	2,800
Plows-General	59,678 3/	25,000	15,000	100,000
Harrows	23,478	20,000	15,000	50,000
Cultivators	168	100	100	500
Seed distributor	104	100	-	250
Fert. Dist.	44	100	-	150
Harvesting M/c	37	50	-	90
Threshing M/c	130	100	-	250
Pullers & Shellers	57	25		100
Winnowing M/c	130	150		300

1/ Imports 1957-1967 (Dec)

2/ Imports 1963-67

3/ Imports all other items 63-68

4/ Assumed about 70% of imports from Japan are power tillers

2. Imports and production of farm machinery

The following table gives import of farm machinery to Thailand.

/Table 2.2

Table 2.2

Import Statistics of Farm Machinery to Thailand (Units)

		1963	1964	1965	1966	1967
1)	Tractors (Riding wheel type (include power tillers)	1922	3446	3647	3662	4036
2)	Tractors (crawler type)	1	418	473	677	1348
3)	Plows general	12158	5966	15176	20378	
4)	Harrows	230	5600	733	15869	
5)	Cultivator	107	22	18	21	
6)	Seed distributors	2	6	64	31	
7)	Fertilizer dist.	6	8	1	29	
8)	Harvesting machinery	1	3	21	12	
9)	Threshing machinery	12	53	24	41	
10)	Hullers & Shellers	31	3	19	3	
11)	Straw & Fodder Presses	2	4	21	4	
12)	Hay & Cross Mower	2060	3189	3119	4287	
13)	Winnowing and similar machines	3	1	5	121	

/The

The following table gives import of tractors from 1957 to 1967 based on the country of origin.

Table 2.3

Countrywise Import of Tractors to Thailand
1957-67

U.K.	13,042
U.S.A.	758
Japan	3,057 (includes power tillers)
West Germany	1,121
Italy	419
Finland	373
U.S.S.R.	329
Czechoslovak	218
Austria	269
Others	-
Total	20,021

The details of originwise imports to Thailand is given in Appendix IIA.

3. Demand, sales and usage of farm machinery

There has not been any extensive marketing survey of agricultural machinery by any governmental organization. The Engineering Division of the Rice Department has undertaken investigation in this field, but findings are expected to be released soon. The forthcoming report of the survey which has been conducted by the Ministry of Industry and the U.S. Operations Mission to Thailand with the co-operation of several other governmental

/organisations

organisations will cover some of the marketing aspects of the farm machinery manufacturing industries.

a) Tractors

It is estimated that at present the supply of farm tractors is from 3,200 to 3,600 units a year but the actual annual sales may be somewhere between 2,800 to 3,000 units. It is difficult to obtain the actual number of tractors sold each year for not all of them are registered with the licencing authority and it is not possible to ascertain the number of tractors in stock at the end of each year.

(i) Horse power breakdown

The provisional report of the Private Enterprise Division of USOM reports the following distribution pattern.

Table 2.4 Horse-power Distribution Pattern of Tractors registered in Bangkok and Thonburi (Nov. 1967)

Horse power	Total number
0 - 9	7
10 - 24	19
24 - 35	39
35 - 39	245
40 - 49	318
50 - 59	2,527
60 - 69	1,538
70 - 79	111
80 - 89	144
90 - 99	37
100 and above	425
Others	25
	5,435

/Based

Based on the above sample survey the percentage distribution pattern of horse-power range on a broad classification is as follows:

Table 2.5

Horse power	
Less than 49 hp	11.6%
50 - 69	76.0%
70 - above	12.4%

b) Usage and sales practices

Thus nearly 76% of tractors are in the horse-power range of 50-74 hp. The main reason for this demand for higher horse-power is due to contract farming usage. According to an estimate, the distribution of tractors sold from the past few years are as follows: 80% to contractors, 10% to farmers and 10% to government and industrial enterprises. 90% of the tractors sold are on credit and only about 10% on cash basis. The credit payback period is from 16-24 months with 1% interest charge per month. It is reported that about 10% of the tractors sold are claimed back by the dealers from the contractors due to non-payment of loans. As the Agricultural Cooperative Banks are not very active, the individual farmers' capacity to purchase the tractor is limited.

Contractors use the tractor for about 4 months a year on a 24 hours/day basis for tillage operations and during the balance period, it is used for transport and miscellaneous operations. The tractor owned by contractor may log 2,000 hours per year. As the tractor is used for full capacity with largest size possible implements, the tractors trend to have a large number of spare parts requirements within a short period. The existing pattern and facilities available with the dealers appears to be not sufficient to meet the requirement.

/The

The estimated usage of tractor on an average - according to the provisional report of the survey by Agricultural Development Council - is 720 hours/year. The tractor normally works on custom basis on an average of 644 hours/year covering 111 ha/year. 70% of the tractors in the country are used for custom work.

Considering the usage of riding tractors on paddy cultivation, normally 20" wide cage wheels and 3 botton disc plows are used. It is interesting to note that the Engineering Division of the Rice Department, Ministry of Agriculture, first introduced a tractor called "Iron Buffalo" which was a locally designed tractor with an 8 hp imported engine. As the horse-power was found to be not sufficient, the next design of the tractor had a higher horse-power engine (13 hp) and about 650 tractors manufactured by East Asiatic Company and Agricultural Engineering Company, Bangkok, were introduced. Now about 200 units of a 25 hp tractor with 4 cylinder water cooled engine costing 45,000 Baht manufactured by Toyota Company of Japan has been introduced by the Engineering Department and the Mechanised Company Ltd. is expected to go into local production at a later date.

b) Power tillers

For the present, Honda, Mitsubishi, Iseki, Kubota and Yanmar power tillers with 20, 19, 15, 12 and 17 number of dealers operating in Thailand is being used. It is estimated that the total population of power tillers may be between 2,500 to 3,000 units. Total imported to Thailand from Japan in 1967 is about 700. The present demand is expected to be around 1,000 units per year. A small number of power tillers are also made by

/local

local manufacturers operating on a very small scale. It is interesting to note that these power tillers are used on cash crops mainly. A sample survey indicates the following pattern of distribution:

Type of crop	Crop	Estimated % in Use
Dry lands	a) cotton	39%
	b) pineapple	15%
	c) beans sugarcane sesame garlic watermelon, etc.	23%
	d) rice	23%
		100%

Thus it is seen that more than 75% of the existing power tillers are mostly used on dry cash crops and vegetables and maximum population appears to be in cotton area. Most popular horse-power ranges are 5 hp and 7.5 hp. Hp ranges in usage are 2.5, 5, 7.5, 9 and 10 hp, both petrol and diesel. Most of the sales are through hire purchase on one year payback period with 15-20% interest rate.

c) Other farm machinery

i) Included implements for tractors. Most popular implements are: mounted disc ploughs, cage wheel and disc harrows. A few of them are imported but most of them are made locally at lower price by small manufacturers.

ii) There is a great demand for pumps for irrigation (centrifugal and lift propeller), engines (gasoline or diesel) for operating the same and control equipment.

/iii)

iii) Regarding all other operating such as harvesting, threshing of paddy, no machin ry on a significant scale is used.

4. Future demand and trends in designs

a) Riding tractors

The present potential is estimated to be about 4,000 tractors per year with a growth rate of 5-10% per year in the next 5 years to come. The demand for riding tractor is expected to go up further, if corn production is increased. It is interesting to note that the corn production which was almost negligible a few years back has now reached about 1 million tons a year.

The demand will be also largely dependent upon the availability of favourable credit terms by the Agricultural Cooperative Banks and other rural credit agencies, and strengthening of the existing 3,000 cooperative farmers associations. Presently the private money lenders and tractor dealers are financing the purchase of tractors. It is reported that recovery of amount by dealers is difficult and the interest rates are high.

Considering the future trend, taking into account the existing and future pattern of agriculture, although contract farmer will still prefer 50-75 hp range tractors, it is expected that if favourable credit terms are made available to the farmers, individual farmers would like to own 20-35 hp tractor for personal usage and limited contract farming and for paddy cultivation if price difference is significant.

b) Power tillers

As said before most of the power tillers are used in upland crops, vegetables and cash crops. However now there appears to be a significant interest by the farmers regarding usage of power tillers in the paddy areas.

/More

More extension work and demonstrations are necessary to popularize these units for this important use.

Appendix II-a

Originwise Tractors imported into Thailand (1957-67)

Countries	Years										
	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
U.K.	193	331	368	685	1256	1035	1359	2403	1813	2403	1165
U.S.A.	24	19	8	25	15	22	125	134	172	126	98
Japan	-	3	2	109	115	230	232	336	238	659	1112
West Germany	4	5	3	26	30	40	112	283	411	101	105
Sweden	-	-	-	-	-	-	-	-	2	65	-
Italy	-	-	-	-	11	5	42	74	174	60	53
Finland	-	-	-	-	-	-	-	-	-	103	210
Australia	-	-	1	-	-	-	25	3	2	38	2
U.S.S.R.	-	-	-	-	-	-	-	2	122	104	101
Czechoslovakia	1	-	-	-	-	19	20	60	80	58	-
Austria	-	-	-	-	4	-	15	75	45	10	120
France	-	-	-	-	-	2	-	-	-	1	-
Poland	-	-	-	-	-	-	-	-	-	6	2
Yugoslavia	-	-	-	-	-	-	-	1	-	5	34
Canada	-	-	-	-	-	-	-	-	-	1	-
New Zealand	-	-	-	-	-	-	-	-	-	1	-
Hong Kong	-	-	1	1	-	-	-	-	-	-	-
Penang	-	-	-	7	19	-	-	-	-	-	-
Singapore	12	2	15	1	36	-	-	-	-	-	-
Denmark	-	-	-	-	1	-	-	-	-	-	-
Rumania	-	-	-	-	-	-	1	5	7	-	-
Laos	-	-	-	1	-	-	-	-	-	-	-
Total	234	360	418	855	1497	1353	1922	3443	3447	3853	4035*

* Up to December 1967 only.

Appendix II-b

Tractors registered in Bangkok & Thonburi - November 1957

Brand Name	Total	Horse Power Break Down											
		0-9	10-24	25-34	35-9	40-9	50-9	60-9	70-9	80-9	90-9	100	X-I
	5,435	7	19	39	245	318	2527	1538	111	144	37	425	25
1. Ford	752	1	3	6	38	23	221	439	19	-	-	2	-
2. Massey Ferguson	1,233	-	1	4	132	11	1073	6	-	-	-	1	-
3. I-H.	741	-	-	3	42	158	398	55	5	9	5	41	25
4. Caterpillar	207	-	-	1	-	7	28	1	18	22	20	110	-
5. David Brown	527	1	-	1	26	23	471	-	1	2	-	2	-
6. Nuffield	121	-	-	-	-	4	1	116	-	-	-	-	-
7. M.F.	290	-	-	-	-	-	1	288	-	-	-	1	-
8. Case	31	-	-	-	-	3	8	15	1	2	-	2	-
9. Zeter	148	-	-	3	2	-	13	127	1	-	2	-	-
10. Komatsu	88	-	1	2	-	4	5	9	-	29	-	38	-
11. Mitsubishi	95	-	-	-	-	-	-	1	-	2	-	92	-
12. Hitachi	42	-	-	-	-	-	-	-	-	-	-	42	-
13. John Deere	201	-	-	1	-	20	154	8	2	15	-	1	-
14. Hanomag	418	-	-	1	-	22	3	321	21	46	-	4	-
15. All others	541	5	14	17	5	43	146	152	43	17	10	89	-

Section III

MANUFACTURING INDUSTRIES AND ANCILLARY FACILITIES

1. Farm machinery manufactures

The agricultural machinery manufacturing industries in Thailand, like many other engineering industries, are still in the early stage of development. At present there are two firms which assemble farm tractors from imported components. Several firms are known to be making centrifugal or tube-pumps, and four firms are engaging in the manufacture of attachments for tractors and some other farm implements. Most of these firms are small and located up-country and are active for only part of a year. There are some firms which manufacture maize threshers, and rice hullers, but again they only produce mostly to customers' orders.

a) Farm tractors

The two firms which now assemble farm tractors are the Thai Motors Industries Co. Ltd. and the Louis T. Leonowens (Tractors) Ltd. Their total production is now about 2,000 units per year. This is still far below their present combined capacity which is about 4,000 units per year. Before the end of this year, two more firms, will start assembling tractors from imported components. The Mechanical Equipment Co., Ltd. will assemble farm tractors at an expected production rate of 250 units a year, and the Thai Machinery Industries Co., Ltd. will start with a capacity of 200 farms tractors per year.

Tractors assembling is a promoted industry, but since the import duty for tractors is only 5% of their value there is not much advantage for

/being

being promoted industry. Fortunately the firms which assemble tractors now are also importers of the same. It is a general policy that import duty for tractors as well as many other farm equipment will be as low as possible to encourage agricultural production.

In fact, all agricultural machinery or equipment whether they are for farming or fishing, are virtually duty-free if the Customs Department can be satisfied that they are for agricultural purposes only. The import duty of 5% for tractors or 2% for fishing nets are imposed because local production has started. Marine engines for trawlers or combine harvesters are at present import duty excepted.

Details of the industries engaged in assembly and manufacture of tractors and farm equipment are given below:

i) Thai Motor Industries

This firm is engaged in assembly of Ford tractors model 2,000 & 5000. The assembly division has 18 men. The present production rate is about 1,000 units per year. The plant also assemble 1,500 - 2,000 cars per year.

Regarding the tractor assembly, only local tyres are used. Complete sub-assembly of engine, transmission etc. in C.K.D. - C_1 state is imported. There are no immediate plans for expanding the assembly operations. The import duty pattern is on tractor C.K.D. - C_1. Sub-assembly component 5%, spare parts 30%, C.K.D. - C_2 (fully knocked down components) 0%. All matching implements are 'Kansone' implements which are imported.

ii) Louis T. Leonowens (Tractors) Co., Ltd.

This firm is the distributors for Massey Ferguson Tractors and are engaged in assembly of MF 135, 165, 175 and 178 models. The imported components are procured in completely knocked down C-2 C.K.D. state. The

/local

heir promoted industry. Fortunately the firms which assemble tractors now are also importers of the same. It is a general policy that import duty for tractors as well as many other farm equipment will be reduced as possible to encourage agricultural production.

In fact, all agricultural machinery or equipment whether they are for farming or fishing, are virtually duty-free if the Customs Department can be satisfied that they are for agricultural purposes only. The import duty of 5% for tractors or 2% for fishing nets are imposed because local production has started. Marine engines for trawlers or coastline harvesters are at present import duty excepted.

Details of the industries engaged in assembly and manufacture of tractors and farm equipment are given below:

i) Thai Motor Industry Co.

This firm is engaged in assembly of Ford tractors model 2, 3 & 5000. The assembly division has 70 men. The present production rate is about 1,000 units per year. The plant also assemble 1,500 - 2,000 cars per year.

Regarding the tractor assembly, only local tyres are used. Complete sub-assembly of engine, transmission etc. in C.K.D. - C_1 state is imported. There are no immediate plans for expanding the assembly operations. The import duty pattern is on tractor C.I.P. - C_1. Sub-assembly component 6%, spare parts 30%, C.K.D. - C_2 (fully knocked down components) 6%. All matching implements are 'Ransome' implements which are imported.

ii) Louis T. Leonowens (Tractors) Co., Ltd.

This firm is the distributors for Massey Ferguson Tractors and are engaged in assembly of MF 135, 165, 175 and 178 models. The imported components are procured in completely knocked down C-2 C.K.D. state. The

/local

local components are cast iron wheel and front end weights, tyres and tubes, board plate for steering. Although local battery is available, the latter is not used due to dimensional difference. Considering the production of various horse-power range, model 165 of 60 hp was 90% a couple of years back. Recently model 175 of 65 hp is about 60%. It is expected that model 176 of 74 hp which has been recently introduced will be most popular in future.

The firm has 28 dealers and has a comprehensive training programme for dealers, service engineers and mechanics. All tractors sold is financed by the firm with three years payback period in monthly instalments.

As the firm imports fully knocked down components and is registered under the Board of Investments, the company is exempted from payment for a five-year term, the 5% tariff imposed on imported C.K.D. tractors.

The production rate is 900 - 1,000 tractors per year and may reach 1,500 in 1969.

iii) Thai Machinery Industries Co., Ltd.

This firm was established recently with 30 million Baht capital of which 30% is by the Government and 70% by Bank of Bangkok and public. The future activities on assembly and production of

(a) Steyr (Austria) 56 hp tractors

(b) Wisconsin gasoline engine 3.1/2 hp and 6 hp

(c) Southern Cross (Austria) diesel engines 3.1/2, 6 and 12 hp

(d) Southern Cross water pumps.

The factory is 12 ha plot with about 15,000 square meters of covered area. The present staff of 65 including 50 skilled workers is expected to

/be

be increased to 250 including 120 skilled workers by 1969. The existing facilities including 3 sheds for warehouse and 4 sheds for assembly, fabrication and machine shop, machine shop and service shop and foundry. Most of the machinery has been ordered and a few have been installed.

For the present only tractor assembly is undertaken. The projected manufacturing plan consists of assembly of 200 units in 1968 and 1,000 each with 100% imported fully knocked down parts and reaching a maximum capacity of 5,000 units a year by 1973 with 20% local content.

Regarding Wisconsin gasoline engine, the plan consists of assembly of 100 units and to attain a maximum capacity of 2,500 units by 1975 with 50-60% local content. It is expected that even by 1973, items such as spark plug, magneto, cullen, pistons, bearings, forgings of cam shaft, hardware, gaskets will be imported. Machinery of cam shaft, flywheel, piston rings, crankshaft and other components will be locally made.

Regarding Southern Cross diesel engine, it is expected to import 500 units of 3 models in the first stage and attaining 1,500 units capacity (1,000 - 3.1/2 hp, 500 - 6 hp, 300 - 12 hp) by 1973 with 50-60% local content.

Production programme of gasoline, diesel engines and pumps have not yet been started. The firm has a central sales department with 10 dealers in North-east and North Thailand.

iv) Mechanized Equipment Co., Ltd.

The share capital is 45 million baht subscribed by all the 250 municipalities of Thailand. The activities are:

/(a) Manufacture

(a) Manufacture of all items required by municipalities such as trailers, tanks, concrete mixers, etc.;

(b) Manufacture of farm machinery and equipment which are designed and tested by the engineering division of the Rice Department;

(c) Import of engines for farm machinery and equipment;

(d) Marketing of farm machinery and equipment both on cash and instalment basis. Instalment sales to be met through farmers institutions such as (i) 3,000 farmers groups; (ii) irrigation associations; instalment sales to be on 10% down payment and payback period not exceeding 3 years with 6.3/4% interest.

Presently the company manufactures only paddy low lift pumps, barges, pumps and rice hullers. The firm has proposed a plan to manufacture the following items per year:

(1)	Low lift propellor pump	3,000 units
(2)	Grass cutting machine	1,000 "
(3)	Rural turbine generator	500 "
(4)	Small centrifugal pump	500 "
(5)	Heavy centrifugal pump	80 "
(6)	Knapsack sprayer	800 "
(7)	3-4 disc plow	500 "
(8)	Disc plow-2F	200 "
(9)	7 disc harrow plow	50 "
(10)	8-9 disc paddy	100 "
(11)	16 disc harrow	100 "

/(12) Paddling

(12) Puddling equipment 200 units

(13) Puddling machine 500 "

(14) Hand tractor (power tiller) 500 "

The proposed plan is being studied by the Asian Development Bank regarding feasibility and possible assistance.

The present plant layout and machinery may have to be substantially altered and balancing equipment and machinery installed in order to start the above programme.

Presently the firm is importing Toyota model 20P - 25 hp model tractor from Japan. Implement and cage wheels are only manufactured by the plant.

Considering the above manufacturing plans of 4 companies, table 3.1 gives the estimated production of tractors in Thailand.

Table 3.1 Estimated Production of Tractors in Thailand

No.	Name of Firm	Model	Specification	Installed capacity	Production 1969	Remarks
1	Thai Motor Industries	Fordson 2000	35-40 hp)	1,[illegible]	[illegible]	Complete sub-assemblies are imported. No immediate plans for further expansion.
		5000	77 hp)		[illegible]	
2	Louis T. Leonowens (Tractors) Co., Ltd.	Massey Ferguson				Emphasis on model 175 and 178 which is expected to cover 75% of production. Fully knocked down components imported.
		135	45 hp)			
		165	60 hp)	3,000	1,500	
		175-5	67 hp)			
		178	74.5 hp)			
3	Thai Machinery Industries Co., Ltd.	Steyr 56	56 hp	500	200	Further imports to be in fully knocked down condition
4	Mechanized Equipment Co., Ltd.	Toyota 2F2-25	25 hp	250	-	Presently tractors are imported from Japan already cape wheels and tyre units are made here
			Total	5,750	2,700	

b) Power tillers

A few numbers are made locally by small manufacturers with imported engines.

c) Diesel engines

No diesel engines are presently manufactured.

d) Pumps

Axial pumps and small centrifugal pumps have been locally manufactured and sold widely in the local market. The stump-tail pumps which have been developped by the Engineering Division of the Rice Department still have limited production. Pumps of bigger capacities are imported. There is as yet no engine manufacturing or assembling plant in the country, and therefore the pump makers have to depend on engines which are usually imported by the pump importers. It is estimated that there are about 30 one-room workshops manufacturing propeller pumps, of which 1 or 2 are of medium size manufacturing about 40-50 pumps a day for a period of 3 months. The rest may make a few per day for a period of 3 months.

There are several small foundries in Bangkok and Thonburi areas. Some of them produce pump cases and propellers for the pump manufacturers. The cases for small centrifugal pumps are usually made of aluminium. It is estimated that out of about 20 foundries, about 15 are very small foundries. The foundries work 3 months a year and total production may be about 300-400 numbers per year of 6-10" size and about 1000-2 000/year of 2" size by each of 4 or 5 medium size foundries.

e) Farm implements

Four firms are known to manufacture iron ploughs and disc harrows. They are small enterprises and are located up-country. The one in Chonburi

/is

perhaps the biggest among them. As late as 1967, this firm manufactured about 3,000 iron ploughs per year, but now the firm produces only disc harrows. This firm has direct contact with tractor distributors in most parts of the country and therefore it has enough orders to keep its factory busy at the present time. According to the firm, the discs are imported from Australia, and the steel castings required come from the foundry of the Siam Iron and Steel Co. in Saraburi.

f) Sprayer and duster

No power operated knapsack sprayers are manufactured. However, about 5-6 small firms are manufacturing hand sprayers with a total capacity of about 1,000/year.

g) Rice milling machines

i) The Engineering Division of the Rice Department has introduced a centrifugal rice huller and polisher with a maximum output capacity of 400 kg of white rice per day.

ii) The Rice Milling Industry Co., Ltd. manufactures 'Yanmar' rice mills with a capacity of 24-30 tons per 24 hours. The integrated rice mill is run by a 60 hp slow-speed diesel engine and the following is the normal distribution pattern of milling as tested.

Paddy		
Head rice 100%	54.78%	
Small broken rice A1	10.81	
broken rice C1	1.79	
broken rice C3	0.38	
Sample paddy kept	0.50	26.28

/Grain

Grain	3.59	
Fine grain	2.35	
Polished fine grain	1.82	7.76
Grain dust	1.06	
Paddy left in machine	0.68	
Foreign matter	0.08	
Husk and not useful rice	22.26	23.98
	Total	100.30

Cost of the plant is 400,000 baht. This type of plant is designed by the Company for cooperative usage for 3,000 tons to 12,000 tons of paddy area. The firm has built 3 units for cooperative farmers groups. The firm also makes 5 other models with 10-15 tons, 15-20 tons, 25-30 tons, 40-50 tons and 75-100 tons/day capacity.

The firm has both ferrous and aluminium foundry, machine shop and fabrication shop. It also produces centrifugal pumps.

b) Grain dryers

No manufacture is yet undertaken although research in this field is done by the Engineering Division.

2. Ancillary Industries and raw materials

a) Raw materials and casting

There are many small foundries in Bangkok - Thonburi area but only a few of them specialize in farm equipment.

At present, no steel sections, sheets, or plates are being produced in the country. Only round reinforcing bars used in building construction are produced locally. Raw materials available locally for the foundries industry are scraps, steel ingots and some simple fabricated parts from

/other

other local factories. Many of the finished steel products required still have to be imported.

b) Machine tools

All machine tools and machinery is to be imported as there is no local production of the same.

c) Tyres and tubes (automobile)

For the present, Firestone is producing automobile tyres. Two more firms including one from Japan may start soon. The combined capacity of all the three plants is expected to be 1.5-2.0 million tyres of all tyres.

d) Battery

Locally made battery are available. However they are not used by the existing tractor units due to dimensional variations.

3. Other allied industries

a) Steel

The inauguration of the U.S. Steel Mills in Samut Prakarn Province is a major step forward in the development of iron and steel industry in Thailand. This is a joint Thai-Japanese undertaking involving an investment of about US$13 million in plant and equipment. During the year another enterprise, the Siam Iron and Steel Co., Ltd., has finalized its plan to install a new integrated plant to expand its foundry facilities at an estimated cost of US$15 million. Its production of iron and steel castings will in two years be increased to 10,000 tons annually. Three major Japanese business houses have recently signed a preliminary agreement with Thai interests to establish a US$30 million iron and steel plant. Another steel

/undertaking,

undertaking, the Bangkok Steel Industry Company Ltd., has proposed to construct in the next two years another steel mill in Prajuabeng which will produce 24,000 to 30,000 tons of round bars annually.

b) Fertilizer

Thailand has also made considerable progress in fertilizer industry. A first batch of 5,000 tons of locally produced ammonium sulphate was shipped to the Philippines last year and another shipment of 5,000 tons is expected to follow this year. In the field of natural resources development, several international oil companies have been given rights to undertake offshore oil exploration during last year.

Section IV

POLICY TOWARDS FARM MECHANIZATION

1. Incentives by the Government for farm machinery industries

a) Level of priority

The farm machinery industries have been given promotional status by the Board of Investment. The industries have been classified into three categories as follows:

Category A: 1. Tractor producing or assembling industries
2. Agricultural machinery industry
3. Water pump industry

Category B: 1. Agricultural machinery assembling industry
2. Water pump assembling industry

Category C: 1. Agricultural tool and implement industry
2. Modern rice mill industry

The Board of Investment can add more industries to the list of industries eligible for promotional privileges either on their own justification or by requests of potential investors. Several firms have been granted promotional certificates since the establishment of the Board in 1959. Many of these firms, however, have not yet started operation. There are also firms which are producing farm machinery or implements without receiving promotional privileges from the Board of Investment.

b) Budget allocated to the farm machinery industries

The Government has no intention to invest in farm machinery industries and therefore no allocation from the national budget is made directly for these industries. There is however a small fund allocated for the development of the industries through the research and development work of the Division

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of the industries through the research and development work of the Division of Engineering of the Rice Department.

c) Measures to attract national as well as foreign capital into the manufacture of agricultural machinery

The most effective measure used to attract capital into the agricultural machinery industry so far is the Industrial Promotion Act which is administered by the Board of Investment. Although the main incentive provided by this Act is import duty exemption or reduction, the existing import-duties on agricultural machinery and equipment are so low that the incentive offer does not give much advantages to promoted enterprises in this field. Moreover, present import duties for some raw materials, such as steel products or finished components still required for agricultural machinery industry are higher than those for some completed or built up agricultural machinery.

Several firms which pioneered in manufacturing of farm equipment are not eligible for promotion privileges because their operations are small or the investment for projected expansion is below the limit set by the Board. At the same time rapid expansion of these firms in the near future is not likely in view of the smallness of the local market. The firms which now assemble tractors still operate far below their designed capacities. Many firms which have already been granted promotional privileges to manufacture farm machinery or assemble diesel or petrol engines still have not started any operation.

2. Incentives by the Government for promoting the use of farm machinery

a) Farmers Aid programme

The Government has instituted the Farmers Aid programme. Each year the Government allocates a certain amount of money to buy tractors, pumps,

/sprayers,

sprayers, and sell them to the farmers under the aid programme and on a three-year installed payment plan. This measure, however, has not been very effective. The more serious problem is that the Government does not have sufficient funds to fulfill the needs of all farmers who ask for it, and therefore, only farmers who are under the aid programme are eligible to buy tractors, pumps, or other equipment or materials under the plan.

b) Credit facilities

Most commercial banks extend credit to farmers with conditions similar to that of the Bank of Agriculture and Agricultural Cooperatives. There are some private money lenders, mostly middlemen, who offer credits to farmers and in return purchase their crops at dictatedly low prices. In cultivating their lands, most farmers have to borrow money either to buy animals or to hire workers. They have to pay interest rate as high as 20% per annum and in some areas an interest rate of 30% per annum is not uncommon. This is in very sad contract to the credit available to the industrial manufacturers. The Industrial Finance Corporation of Thailand charges an interest rate of 9.5% per annum and the Loan Office for Small Industry sets the interest rate at 9% per annum. Nonetheless many small industrial manufacturers still have to pay in some cases a discount rate of as high as 3% per month.

Legally the commercial banks can charge manufacturers an interest rate of upto 15% only.

In 1966 the Bank for Agriculture and Agricultural Cooperatives was established to succeed the Bank for Agriculture and the Bank for Cooperatives. In 1967 the Farmers Aid Committee arranged to provide the Bank with 80 million baht for use as credit to farmers in the Farmers Aid Programme.

/c) Management

c) Management of farm equipment by co-operatives

Farm cooperatives have a long history in Thailand. The Government recognizes its role in the development of rural areas as well as in increasing efficient utilization of labour and capital resources in agriculture. At one time there was Ministry of Cooperatives but this has now been reduced in status to a department within the Ministry of National Development. Considering that the Farmers Groups and the Farmers Irrigation Associations are also operating in the form of cooperatives, there are therefore several thousand cooperatives in the country. An immediate and direct advantage of the farm cooperatives is that they increase farmers' creditability in the purchase of farm equipment and allow the farmers to use this purchased equipment more efficiently. At present the Government's Aid is channelled to the farmers through the three farmers institutions, i.e. the Farmers Groups, the Farmers Irrigation Associations, and the Farmers Cooperatives.

3. Incentives by the Government towards rural development

a) Farmers Aid Committee

In 1965 the Government set up the Farmers Aid Committee to find ways and means to assist rice farmers. This Committee has decided on three major programmes assistance to be given to our rice farmers:

(1) Encouragement for increase of rice production

(2) Provide minimum price guarantee

(3) Provide adequate agricultural credit

The Government has channelled its aid to the farmers according to the priority of these programmes through the following officially recognized farmers institutions:

/(1) The

(1) The Farmers Groups: The Farmers Groups have been encouraged to form in all parts of the country under the project of the Rice Department of the Ministry of Agriculture.

(2) The Farmers Irrigation Associations: This is the project of the Department Local Administration of the Ministry of Interior.

(3) The Land Development Cooperatives: This is the project of the Land Cooperatives Department of the Ministry of National Development.

According to the projects of the three farm institutions, the types of material assistance from the Government which the farmers request most are according to the following priority:

(1) Fertilizers

(2) Water pumps

(3) Pesticide sprayers

Although the Farmers Aid Committee was set up in September 1965, it could not start any programme of operation through the three institutions until 1966. In that year 30 million Baht was allocated for the programme of increasing rice production, and 6,487tons of fertilizers were sold to the farmers at the cost of 12.5 million Baht. The condition of the sales was that the farmers had to pay back at the end of the crop year. Seventeen hundred units of tube-pumps and centrifugal pumps were sold at the cost of 7.2 million Baht. The farmers had to pay back by three equal amounts at the end of each crop year. Nineteen hundred sprayers were sold at the cost of 2.69 million Baht. There were only 50 tractors sold through

/the

the Farmers Irrigation Association at the cost of 4.0 million baht. The payment for these tractors as well as other farm equipments had to be made in three equal amounts at the end of each of the three successive crop years.

Pesticide has been provided free by the Government and 3.7 million baht were appropriated for this in 1966.

In 1967, 50 million baht was made available to the three institutions to be used in the aid of the farmers in the programme of increasing rice production. Twenty-nine million baht was used on fertilizers, 16 million baht on pumps, and 4.86 million baht on pesticide sprayers and other equipments. There was no provision for tractors. The reason was that the Government could not provide sufficient funds for tractors or similar heavy machinery or equipment and the Government wanted to concentrate its effort on pumps and pesticide sprayers which had been given higher priority. Nonetheless the Farmers Aid Committee had arranged with the Bank of Agriculture and Agricultural Cooperatives for assistance to farmers who wanted to use credit facilities of the Bank. The farmers could also purchase tractors directly from private trading companies which offer flexible terms of payment, than what the Government can arrange.

b) Government floor and subsidy prices for selected crops

At present, rice is the only crop which the Government has established guaranteed minimum price. Guaranteed floor prices for maize and kenaf have at times been under consideration, but there are not expected to be put into effect in the near future. The guarantee of minimum price for rice is under the supervision of the Ministry of Economic Affairs and several operational organizations are assigned to carry out the work in different areas of the country. The Sub-Committee responsible for this work will designate the

areas where the minimum price is guaranteed. Farmers who belong to Farmers Institutions have priority to sell their rice at the guaranteed price before other farmers.

c) Irrigation systems

The first irrigation systems in the country started as far back as 50 years ago. The Government has up to now spent several thousand million Baht on irrigation and multipurpose dams. Yet the existing farmer system still seems far from adequate. Agricultural production in many parts of the country has still to depend on rainfall; hence the estimated growth rate in the economic development plan of the country has to be adjusted annually to the actual amount of rain during the year.

d) Use of pesticides

When the Thai farmers started to diversify their crop several years ago, one serious and unexpected problem was the amount of pests which they had never before experienced. Pest control in most areas of the country at the present time is generally adequate but farmers in some very remote rural areas still have to do the best they can with advices from the Ministry of Agriculture. The Government's assistance in this case is to supply pesticide-sprayers and sometimes the necessary pesticides.

e) Use of fertilizer

Import of fertilizers is virtually tax-exempted, while some chemicals, such as uren with more than 45% of N_2, is moderately taxed. Fertilizer industry is a promoted industry and several firms have already been granted promotional privileges. So far only one firm is producing ammonium sulphate and urea. Since the middle of 1968, the Ministry of

/Economic

Economic Affairs, in its effort to help the local fertilizer producers has restricted the import of ammonium sulphate.

Despite campaigns, demonstrations, and efforts to encourage the use of fertilizers, the Thai farmers still have more obstacles than their counterparts in other Asian countries. The Thai farmers have to pay the full price for their fertilizer whereas farmers in many other Asian countries have to pay only half the price.

4. Research and testing

The research and development work of the Engineering Division of the Rice Department of the Ministry of Agriculture has developed many agricultural equipments suitable for local conditions. It is reported that the Division has been allocated only a small sum for this research work each year (about US$100,000 in 1967-68) of which 60% is for wages and salaries. Hence it is explained that it has been difficult to demonstrate the effectiveness and capability of the developed equipments on a nation-wide basis in order that they will be accepted and become popular among the farmers. At present there is no manufacturing firm which mass-produces these equipments. The Government has however supported the establishment of the Mechanized Equipment Co., Ltd. and the Thai Machinery Co., Ltd. with the hope that these firms will eventually manufacture the machinery developed by the Engineering Division.

Section V

CONCLUSIONS

The future of farm mechanization programme in Thailand appears to be dependent on the following factors:

(a) Availability of credit on favourable terms to farmers and contractors.

(b) Availability of different horse power tractors with significant price difference and encouragement of farmer ownership of tractors.

(c) Re-enforcement of rural credit agencies and farmer cooperative organizations. The present loan by banks to individuals is up to 5,000 baht.

(d) Better price support to farmers. It is interesting to note that in Thailand, farmer pays an export tax on rice, whereas in Japan and other countries, a subsidy is paid to farmer for growing paddy. Thailand exports about 1-1½ million tons of rice per year.

(e) There is a need to encourage farmer ownership of farm machinery and hence there is a need to make available equipment within reasonable price level.

Considering the existing manufacturing programme, the following are the remarks:

(a) There is a need to encourage existing tractor industry which have been already established to reach the full capacity and encourage higher indigenous contentment.

/(b) It is

(b) It is necessary to encourage establishment of organized indigenous ancillary industry.

(c) There is a need to emphasize more extension work regarding the usage of power tillers.

(d) As the annual demand of centrifugal and rotary pumps is estimated to be between 15,000 to 20,000 units with 5-10% growth rate annually, it is necessary to make concentrated effort to produce the same on a large-scale commercial basis.

(e) There is a need to manufacture and popularize plant protection equipment on a significant scale.

(f) There is a necessity to introduce power threshers and drivers for rice. Research and extension work is necessary.

(g) Apart from encouraging the existing implement manufacturers, there is a great need to introduce seeding and fertilizer application equipment and levellers, and paddy puddling equipment.

Thus it can be concluded that Thailand offers a good scope for manufacture and usage of farm machinery and there is a great need to emphasize research, manufacture and extension in the field of farm machinery and equipment.

Appendix A

References

1. "Background of the Agricultural Machinery Manufacturing Industries in Thailand" - Country Report prepared for UNIDO Survey Team by Counterpart in Thailand.

2. Census of Agriculture 1963, National Statistical Office.

3. Department of Customs - Import Statistics Annual Report.

4. Provisional Data regarding Tractors Registered in Bangkok and Thonburi (November 1967) and Tractors imported to Thailand - through the courtesy of Private Enterprise Division, UNIDO.

Appendix B

Persons and Organizations visited

1. United Nations Development Programme in the Far East
   P.O. Box 618, Bangkok
   a) Mr. Peter Aylen
      Regional Representative

2. Ministry of Industry
   Government of Thailand, Bangkok
   a) Mr. Jaral Intarangsi
      Industrial Engineer & Management Consultant
      (Counterpart)

3. F.A.O. Regional Office
   Bangkok
   a) Mr. S.H. Prakoso
      Deputy Regional Representative
   b) Mr. Yamada

4. Private Enterprise Division
   Agency for International Development
   United States Operations Mission to Thailand
   Bangkok
   a) Mr. Donald C. Marsden
      Industrial Adviser
   b) Mr. Ong-Arj Kriengkripotch
      Industrial Engineer

5. Engineering Division
   Rice Department, Ministry of Agriculture, Bangkok
   a) Mr. M.R. Debridhi Devakul
      Chief of Division

6. Lert Chai Yonta
   Pra Buchha Bat, Saraburi, Thailand
   (Manufacturers of "Samsons" Brand Implements)

7. International Harvester Dealer
   Pra Buchha Bat, Saraburi

8. Nuffield Tractor Dealer
   Saraburi

9. Massey Ferguson Dealer
   Saraburi

10. Fordson Dealer
    36, Paholyo Thin
    A. Praputa Bat, Saraburi
    a) Mr. Prasart Porn Teplin

11. Louis T.Leonowens (Tractors) Co., Ltd., Bangkok
    Thailand
    (M.F. Dealer & Assembly of Tractors)
    a) Mr. Hans Vil
       Manager, Agricultural Division

12. Thai Motor Industries
    Ford Assembly Plant
    Samrong Tai, Suat Prakarn
    a) Mr. Somsai Suvanapinpa
       Plant Manager

13. The Rice Milling Industry Co., Ltd.
    76/2 Soi Sukantharam
    Rama V Road, Bangkok
    a) Mr. Sawang Charusorn
       Chairman
    b) Mr. Sigh Charusorn
    c) Miss Valee Charusorn

14. National Economic Development Board
Krung Kasem Road
Bangkok
a) Mr. Snoh Unakul
Director
b) Mr. Staporn Kavitanon

15. Asian Honda Motor Co., Ltd.
604, Anglo-Thai Lane
Yanawa, Bangkok
a) Mr. Kiyoshi Sekiguchi
Asst. Gen. Manager

16. Thai Machinery Industry Co., Ltd.
Pan Lane, Tambon Bang-pa-in
Ayudhya Province, Thailand
(Assembly of Styer Tractors)
a) Mr. Prayad Sethaputra
Plant Manager

17. Mechanized Equipment Co., Ltd.
Bangkok, Thailand
a) Mr. Chai Soodsuansri
Plant Manager
b) Mr. Vira Krachangnej
Costing Manager
c) Mr. Vichien Voraprecha
Managing Director's Assistant
d) Mr. Hiroyasu Inami
Production Manager

18. Ministry of Industries
    Bangkok

a) Mr. Porn Srichamara
   General Adviser to Ministry of Industry

b) Mr. Pauhna Sarpayowant

c) Mr. Jarel Intarangsi
   Industrial Engineer and Management
   Consultant

19. Mitsui Co., Bangkok

a) Mr. Yutaka Watanabe
   Resident Representative of Iseki in Thailand

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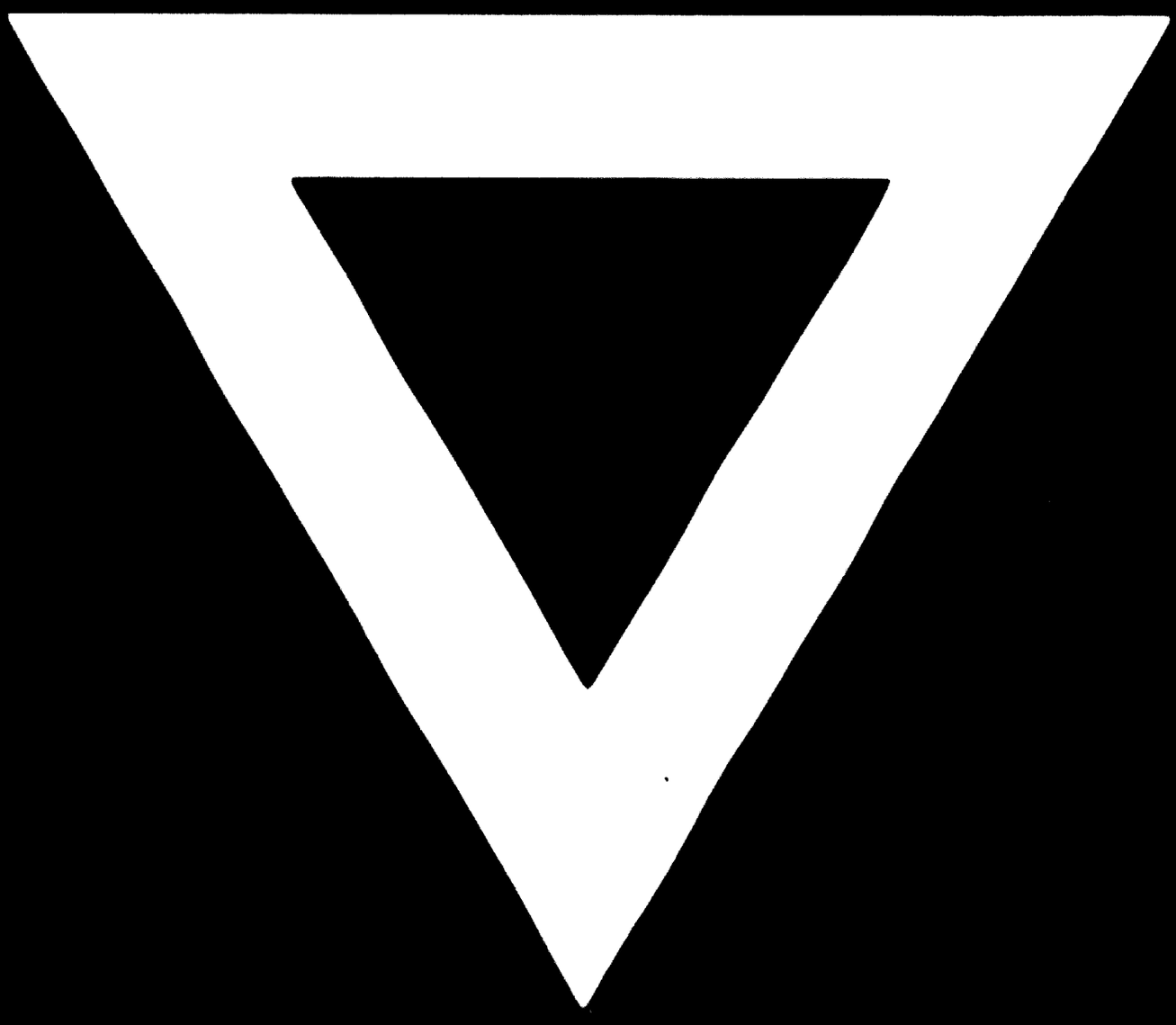

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