

3. PRESENT SITUATION AND FUTURE PROBLEMS ON FARM MECHANIZATION IN INDONESIA

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Foreword

(1) A short history of development of Farm Mechanization in Indonesia

The use of 4 wheel tractors was introduced in 1914 but this is restricted only in some estates in Indonesia. In 1951 wheel tractors were also introduced on farmers' land in the production of food crops sponsored by the Farm Mechanization Division of Agricultural Extension Service. In 1958 the Government had established a contracting agency as Government enterprise to assist farmers in land clearing and tillage by using 4 wheel and crawler tractors in order to open new farmland. Two years later the use of smaller tractors, known as power tiller, was introduced specially in doing the tillage of wet paddy fields, and since that time the use of these power tillers is still growing. A more remarkable increase was also made in the demand of using rice-milling unit, irrigation pumps and crop protection equipments.

(2) In the beginning, the farm mechanization was understood as only a matter of land preparation by tractors, but at present time, the judgment of the public opinion was already changed, that farm mechanization also covers the use of equipment in all agricultural operations starting from soil tillage to processing of the harvested product.

This change of opinion was also a result of the first National Symposium on Farm Mechanization that was held in the middle of 1967. This Symposium has also helped us to make a better base for the development of Farm Mechanization in Indonesia.

The Farm Mechanization target covers the following:

- 1) to increase the efficiency of the manpower,
- 2) to raise the farmer's standard of life,
- 3) to assure the quality as well as quantity of the agricultural product,
- 4) to make possible the establishment of a certain type of commercial farming from a substantial farming, and
- 5) to accelerate the transition of farmers from agrarian to industrial type.

The following activities will be tackled by the Agricultural Mechanization:

- 1) soil water conservation,
- 2) crops processing,
- 3) agricultural electrification,
- 4) farm structure, and
- 5) soil tillage

The problem to be solved

(1) Technical problem

The efficiency and the difficulty to get the spare parts for imported agricultural machinery caused the most hazardous problems for the development of the usage of agricultural machinery. The factors that affected the rise of different technical problems are the type and texture of the soil, rice field plot, topography and the operators conditions. The interference for the usage of the agricultural equipment usually involved:

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- 1) Lack of power efficiency, farm, material and slippage in the case of hand tractor.
- 2) On crop protection equipments, the difficulty occurs in the leakage of the tank, wornout thread, belt, and spraying characteristic becomes coarse, etc.
- 3) On the crop harvesting equipments, the difficulty arises during the operation, since the rice is harvested when the soil is still in wet condition caused by poor drainage.
- 4) The weeds that become a problem is *Imperata cylindrica* which often grows in a large area. So far there is no special weeder available to overcome the spreading out of the weeds.

(2) Social economy problem

The distribution of the population and the limited land holding of an average of 0.5 ha are the main problem, especially in the island of Java. The distribution of the agricultural equipment is still lacking compared with the need.

On the other hand, the number of people outside Java is still small, while the holding is larger. Here the use of agricultural machinery is mainly for extensification, for example using wheel tractors, crawlers, power tillers etc. Outside Java is a large area still available in the form of forests which make it possible to increase the farm area by using modern agricultural equipment.

The shortcoming of the skill or the technical know-how of the farmer and the agricultural extension, caused the ignorance of proper maintenance, and repair. Another obstacle in the social part of view is the farming type, (subsistence with small scale area), bad transportation and the distribution of the labor.

Economical shortcoming in agricultural equipment application involved:

- 1) The average income of the people is low, while the supply of credit for the farmers to buy agricultural equipment is not sufficient.
- 2) The ability to buy is low, caused by the low price of yield, that is why majority of the farmer don't have enough capital to buy agricultural equipment.

Evaluation and improvement of farm machinery, especially of those made in Japan

Taking into consideration the size of farm house-holds and the type of farming in Indonesia, most of the Japanese made farm machinery can be used. Some modifications, however, should be made in the design and construction of these machinery to match the specific condition in Indonesia, such as weight and wheel shape for power-tiller, rubber and other parts for processing machinery and some other items. Investigation and research work in this work in this field should be intensified in cooperation with the manufacturer to determine the most suitable construction.

Table 1. Distribution of Japanese made agricultural equipment in Java 1969

Items	Quantity (unit)
Hand tractor	282
Hand sprayer	6,413
Power tiller	1,543
Duster	10,063
Water pump	152
Hulling unit	1,228
Threshing unit	47
Drying unit	47

Also the quality of material used for these equipment needs more attention to guarantee a longer life time with a minimum consumption of replacement parts. Our small holders cannot afford to lose their investment in equipment in 3 or 4 years, because this may cause a serious financial disaster. We have to provide them with the equipment that can be operated simply and safely and still last for at least 6 or 7 years.

Technical improvement:

Since condition in Indonesia in many aspects is quite different from where the machinery are originated, in this case Japan, some in improvement should be made as follows:

- 1) Soil condition is mostly heavier due to a heavier clay and lesser sandy content. In general, the rice field areas are deeper and have poor drainage condition. To overcome these problems, the weight of the tillage equipment and the shape of the wheels should be made accordingly.
- 2) In using the crop protection equipment especially power sprayers and speed sprayers we still face the difficulty caused by the irregular size of the rice field plots.
- 3) As far as the rice processing equipment is concerned, since the Indonesian rice varieties, known as *Indica sp* which have a higher silicon content, cause a higher consumption of spare parts, such as the rubber parts, and other parts that are continuously touched by flow of rice husk, should be taken into consideration. A higher hardness of rubber rolls and better quality material that resist the grinding action of the husk should then be used.

These cases illustrate only a few technical problems that need improvement. This calls for further investigation and research work on the spot. The organization and the infra structure concerning the spare parts distribution are not well organized yet. The supply of the flow of the spare parts will be much smoother and sufficient if some of the spare parts could be produced in Indonesia with the help and in cooperation with the manufacturer abroad. For your information the domestic private industries have potential capacity to cooperate with the manufacturer abroad to produce these spare parts.

Socio-economic problems related to farm mechanization (Statistical data is provided as appendix.)

Policies for farm mechanization in Indonesia

As emphasized in the First Five Year Development, more equipment and farm machinery will be introduced to support the general program for the increase of production of food stuff. The introduction of machinery will be selected and restricted to machinery which give a quick yielding and a direct profitable effect to the farmers and which can be borne by them. In this case, processing unit, crop protection equipment and pump set will have a higher priority than tillage equipment.

But according to the local condition this priority can differ from one place to another. To carry out this program an intensive training to increase their ability and skill is necessary and especially a smooth and sufficient supply of spare parts should be guaranteed. As already mentioned above it is the policy of the Government to provide spare parts that can be produced locally with the cooperation of the manufacturer abroad.

Gradually the domestic production of equipment and machinery will be stimulated. Manufacturers from abroad are invited to make a joint production with our manufacturers to reach this goal.

Conclusion and recommendation

- (1) Agricultural machinery play an important role in modernizing the farms, especially to change the type of farming from subsistence to commercial farming.
- (2) Machinery can be used for the extensification program outside Java where new land is still available, as well as the intensification program in Java.
- (3) Most of Japanese made farm machinery can be used in Indonesia but need some modification in design and construction.
- (4) More research work in technical and socio-economical problems should be done.
- (5) The supply of spare parts needs more serious attention and the domestic production of these parts should be stimulated.
- (6) Manufacturers and private dealers must take part in the research to develop the farm mechanization.

Appendix 1. Soil type & texture in Indonesia

No.	Type	Texture	Area (ha)	areal % age from overal area in Indonesia
1.	Podzolic redyellow	Clay-clay loam lampung		
2.	Organosol	Clay	5×10^6	27 %
3.	Latosol		28×10^6	15
4.	Moditerm		17×10^6	9
5.	Margalit	Dusty clay	7×10^6	4
6.	Andosol		—	3
7.	Padzoline	Crude	5×10^6	2
8.	Regosol	Clay	3.3×10^6	1.8
9.	Grumesol	"	1×10^6	0.6
10.	Rensina	Sandy clay	0.8×10^6	0.48

Appendix 2. Distribution of farm machinery until 1969

Type	Java	Outside Java	Total
Hand tractor	266	79	345
Crop protection equipment	16,994	11,576	28,570
Processing machinery	2,205	3,566	5,771
Irrigation pump	502	82	584

Note: Limited to the regions that had been surveyed, as follow: West Central and East Java, North and South Sumatra, Lampung, South Sulawsi, Bali and Lombok.

Appendix 5. Agricultural machinery & equipment in 1968—1969

Type	Quantity (unit)	
	1968	1969
Hand tractor	—	285
Sprayer	—	13,260
Duster	—	17,772
Water pump	110	618
Dryer	—	79
Thresher	—	79
Huller	1074	—

Appendix 6. Program of agricultural machinery & equipment requirement incl. bimas in Java 1969—1973

Equipment	Year				
	1968—1969	1969—1970	1970—1971	1971—1972	1972—1973
Air-craft sprayer	—	2	3	3	3
Hand sprayer	300	750	1,000	1,500	1,500
Motor sprayer	50	1,325	1,775	100	100
Water pump	224	317	247	250	284
Unit huller	1,411	625	635	—	—

Discussion

E. Ezaki, Japan: What type of machines is the most important for the mechanization of paddy-fields? Riding type tractors or small tillers or animal drawn type tools, for instance?

Answer: For wet paddy fields, power tillers are better technically than animal drawn plows because of the deeper plowing and better puddling of the mud. Up to now we are not yet able to use riding type tractors because they bogged down into the mud even with an extension wheels (paddy wheels) except in dry condition if the soil is not too heavy.

T. Takenaga, Japan: According to your article, when you use the crop-protection equipments, you face the difficulty caused by the irregular sizes of rice field plots. But here in Japan we use various sizes of pest control machinery to any size of plots. Would you explain the difficulty in more detail?

Answer: In the case of the use of power sprayers with a long hose, we are facing the following difficulties: 1) the small boundries of our rice plots form an obstacle to move the equipment into the field; 2) since most of this equipment is not equipped with jet nozzles, we still have to enter into the field; and 3) because of the irregular shapes of the plots, we have to pass with the hose the paddy plants, and this may damage the plants. Laying out the hose on the border is sometimes difficult because of the irregular shapes.