

4. PRESENT SITUATION AND FUTURE PROBLEMS ON FARM MECHANIZATION IN WEST MALAYSIA

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Introduction

Malaysia is a developing country and like all developing countries, her economy is essentially dependent on agriculture. The agriculture of the country is expected to continue as a dominant industry in the foreseeable future although industrialization has made satisfactory progress and in-road in the overall economy. The Government in its First & Second Malaysian Plans is giving priority and emphasis on agricultural development because of its significance in generating opportunities for employment and increasing the national income. One of the important aspects of agricultural development is the mechanization of the Malaysian agricultural industry.

Background information

Agricultural mechanization has its first beginning in Malaysia soon after the end of World War II. But progress has been rather slow until the 1950s, when the Government decided to introduce 2 crops of rice per year instead of the normal single crop. It was soon realized that a double cropping program would rely heavily to mechanization. Since then the pace of farm mechanization in Malaysia has accelerated at a very rapid rate.

With double cropping, time becomes critical. Farming operations which before could be done at a more leisurely pace, now have to be done according to a very tight schedule. Labor and power requirements become intensive but because the requirement is only for very short durations, it cannot support a permanent farm labor population. As a result, even though, there is a general surplus of labor in the country, the farming sector cannot attract it without offering excessive wages. Even if the farming sector could pay the wage, there is just not sufficient labor to cope within the very limited time schedule available. Certain operations, such as land preparation, require intensive power rather than labor. Thus, no amount of labor could physically perform this operation manually.

Malaysia is pursuing a policy of self sufficiency in rice production. At the same time, she is also trying to raise the standard of living of the rural populace. Double cropping of rice appears to be the answer to both these aspirations. It is with this in view, that the Government has embarked on such schemes as the gigantic Muda Irrigation Schemes covering more than $\frac{1}{4}$ million acres and the smaller though no less important Kemubu, Besut and Trans—Perak Irrigation Schemes. But these schemes cannot be effective without mechanization.

The Malaysian Government is also putting an emphasis on crop diversification. This will no doubt put a further strain on labor and power requirements. Here lies another scope for mechanization. Mechanization is thus a very important factor to be considered in the overall planning of Malaysian agriculture. The success of such project as the Muda Scheme depends to a large extent on how mechanization problems are approached and resolved.

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Technical problems on farm mechanization

(1) Problems concerning introduction of machines

As can be expected, the introduction of machinery brought to light certain technical problems that needed to be solved. These problems require both time and effort to be solved. Some of the problems, especially concerning tillage, have been overcome, at least partially. Specific problems still outstandingly concern transplanting, harvesting and in-field transportation. Below, the problems are outlined in their more general terms.

1) Suitability

One of the nagging problems is to acquire the right kind of machines to suit the local conditions. Size has been the dominating factor in this respect. Though there may be a number of machines available from America, for example, to do a specific job, often, they are too large and too clumsy for use in the small plots which are characteristic of the Malaysian farms. In other cases, for example transplanting, the available machines are very inefficient and its use is only justified in areas where labor cost is excessive. Certain crops such as tapioca have not yet found world wide interest. There are therefore no machines manufactured specifically for the cultivation of such crops.

This problem of suitability will become less and less important as technology advances. In some cases machines designed for one crop could be modified and adapted for another. For example sugarcane planter has been adapted for planting tapioca with a fair degree of success.

2) Soil condition

The main problem however, is the soil condition. Rice, the main crop under mechanization, is grown in the lowlands and is under water for most part of its growing period. The soil is soft up to a foot or more in certain places. Tractor wheel sinkage results in a drastic reduction in tractive efficiency. Quite often, the tractor is unable to pull itself out. The introduction of rotary type cultivator as opposed to the pull type ploughs has greatly helped the matter as the rotary cultivator is driven by the tractor engine and does not constitute a pull on the drawbar. In fact, it is believed that the rotary cultivator helps to push the tractor along. Even so, some sort of traction aids are necessary to avoid the tractor bogging down. The types of traction aids needed vary with the different conditions. In an area where the problem is purely traction, the aid is made of simple strakes attached to the tractor wheels but in peaty areas, the strakes are not sufficient, as the tractor would need aid to buoy it up as well to effect floatation. The use of such aid in conjunction with the rotary cultivators has almost completely solved this particular problem in most areas. In the less developed areas, especially on peat soil, sunken tree trunks can pose a problem too. This, however, is becoming increasingly rare.

3) Accessibility

Access to many farms are still only through small country paths and the only bridges over the numerous streams are made from fallen tree trunks. Such farms are hardly accessible to tractors, especially the larger ones normally used on American or European farms. In many cases the situation has improved but accessibility to large machines such as combine harvesters still poses a problem even in the better established areas.

4) **Water control**

Good water control is necessary for successful mechanization. Malaysia in the past few years has come up with a number of large irrigation schemes such as the newly completed Muda Irrigation Scheme. Such schemes enable the farmers to be less and less dependant on rainfall. However, there is still the problem of drainage. These large schemes usually have well laid out drainage cannals as well, but the trouble is with the erratic rain that falls in Malaysia. In a really heavy shower, the field would be completely flooded in a matter of a couple of hours and there is no drainage system in the world capable of coping with such a situation.

(2) **Present situation and future aspect of research activities on development, improvement and utilization of farm machines**

1) **Extent of mechanization**

Farm mechanization in Malaysia, as pointed out earlier is limited almost exclusively to rice. Even here it is further limited to tillage operation only. This is because tillage requires too much raw power to be sufficiently met by human labor. Whereas water buffalo have for a long time been the main power source for this job, it is much too slow, especially for a double cropping program. Other operations such as transplanting and harvesting are time consuming too, but as they are not so demanding on power, there has not been, up till now at least, an urgent need for mechanization.

The extent of mechanization in terms of acreage mechanized is still very low. In fact the tractor trade is largely dependant on the large rubber and oil palm estates which use tractors mainly for haulage. Kedah, the main rice growing area has just over 600 tractors to cover a total area of 300,000 acres. The most highly mechanized states are Penang and Selangor. This is significant as these two states also produce the top yield in the country, the farmers being the most advanced. However, in terms of acreage the two put together account for less than 10% of the total rice area of the country. It is seen from table 2 that Selangor relies largely on power tillers. This is because the peaty soil there is unsuited to the use of the conventional tractors. Another interesting point is that almost all of the tractors in Selangor is owned by the farmers themselves.

Table 1. Acreage of various crops planted

Crop	Acreage
Rubber	4, 457, 237
Rice	994, 471
Coconut	518, 421
Oil palm	505, 245
Pineapple	61, 717
Tapioka	14, 407
Maize	2, 757

But with double cropping playing a more and more important role in Malaysian farming, timeliness is becoming increasingly more critical in the other operations as well. Lately, attention has been focused away from tillage and onto harvestings. In the past, cheap migrant labor has been plentiful. Many of these migrant labor are farmers from southern Thailand, but with double cropping it would mean that one of

the seasons is bound to coincide with their own. There would thus be a shortage of migrant labor which would leave the Malaysian farmers with no other choice but to mechanize their harvest.

Drying of rice is another field which is going through a process of mechanization. This again is brought about by double cropping. A reference to the cropping pattern (graph 1) will show that the off-season crop is harvested in the middle of the rainy season. Sun drying which is possible for the main season crop is no longer feasible in this case.

In the last year or two, Malaysia has put an emphasis on crop diversification. This has given an impetus to mechanization in crops other than rice. Many specialized machines such as seeders, planters and harvesters are now making their first appearances

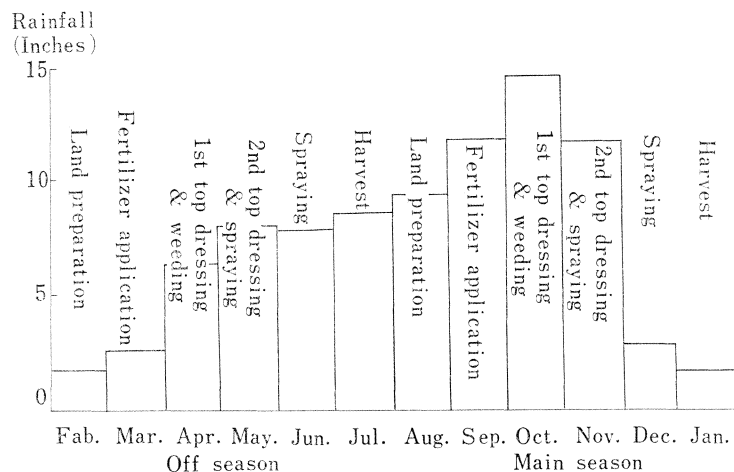
Table 2. Regional distribution of rice acreage and farm tractors

State	Acreage	No. of 4-wheel tractors	No. of power tillers	No. of acres* per tractor
Perlis	65,631	94	152	485
Kedah	295,090	314	312	708
Kelantan	188,871	240	165	640**
Trengganu	92,432	131	104	550
Penang	40,308	132	299	170
Pahang	59,937	112	65	450**
Perak	126,369	254	100	440**
Selangor	47,713	66	551	190
Melaka	33,100	45	33	590
Negri Sembilan	31,831	47	49	508
Johore	16,181	83	73	150

* 3 power tillers are taken as equivalent to 1 tractor as a power tiller's capacity is approx. 1/3 of the large tractor.

** In many states, the tractors are used for other crops beside rice. But the No. of tractors used exclusively for other crops is not included.

Graph 1. Double cropping pattern in the Muda Scheme



on Malaysian farms. Doubtless, in a few years these machines will be just as familiar as the tractors are, today.

2) **Research facilities**

Agricultural mechanization has been given an increasing prominence in Malaysia. However, very little research has been carried out in this field. Available facilities are rather limited. The Department of Agriculture has only small agricultural engineering section. Neither the university nor the college of agriculture runs agriculture engineering courses though both institutions lay special emphasis on the subject.

Whatever research that has been carried out, were limited in the main, to field investigation and cost evaluation. More extensive research could be possible but for the lack of suitably qualified personnel. In fact, in the whole country, there are only a handful of agricultural engineers and even among these few the majority is involved with research work.

3) **Future approach**

In the past the approach was to develop small machines suitable for small holdings. This approach, however, has now been abandoned. The present and future trend is to go in more for testing and modifying available machines to suit local conditions on one hand, and on the other, to work out the best methods to utilize these machines, either through new farming methods or through improved organization of farm management.

This approach is particularly suited to Malaysia because Malaysia does not manufacture its own farm machine. Development research would not thus be able to find an outlet easily. Considering the cost involved and the shortage of qualified people Malaysia would do well to rely on more advanced countries for this type of research, at least for some years yet to come. This does not mean development research will be ignored completely. Some amount of development work must be done to cater for problems which are peculiar to this country or region alone.

4) **Utilization**

Tractors in Malaysia are owned either by individual farmers, farm co-operatives or by contractors who are not themselves farmers. Individual ownership is limited in the main to the power tillers because the majority of farmers are small holders. Usually these farmers also do custom work for their neighbours. Co-operative ownership had an early start but up till now has not yet been fully established. The bulk of the large tractors in the country is owned and operated by contractors. These contractors travel over large areas taking advantage of the slight differences in season in different parts of the region. By so doing they are able to get maximum utilization out of their machines.

While the contractors provide excellent service at reasonable cost, it is felt that farmers should be more involved with at least the primary functions of farming, such as tillage. Studies are therefore carried out to find out if the co-operative system could be improved to enable farmers to own their machines. Fortunately the farmers in Malaysia have been organizing themselves into farmers' association based on the system found in Taiwan. The idea of the association is to provide essential services such as credit and marketing facilities. As the association grows in stature, it is envisaged that it will add mechanization as another one of its facilities available to its members. This facility is to be made available to the members for a fee. In fact, the only difference from the usual contract work is that in this system the farmer has a share in the machine and thus in the profit.

Table 3. Tractor ownership

Ownership	4-Wheel tractor	Power tiller
Farmer	388	1,568
Contractor	859	177
Co-operative	62	59
Govt. agency	219	119
Total	1,529	1,923

Evaluation and improvement of farm machines

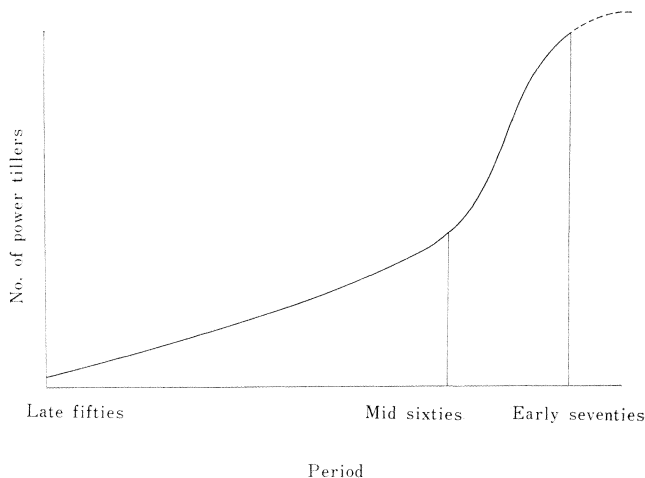
1) Past work

The first priority in mechanization in Malaysia was tillage of rice fields. A number of different types of ploughs and harrows were tried but none was successful. This was because the tractive load imposed by these implements tended to pull the tractors into the mud. Even traction aids could not improve tractive efficiency sufficiently to deal with such loads. Further improvement of traction aids resulted in extra weight which consumed a fair chunk of the tractor power.

The introduction of the pto driven rotary type cultivator revolutionized rice cultivation in Malaysia as it must have done elsewhere in South East Asia.

2) Conventional tractor vs. power tiller

The rotary cultivator comes either as an implement attached to the conventional tractor or as the power tiller. Since its introduction in the late fifties, the number of power tillers has steadily increased through the years. Then in the mid sixties, a number of large irrigation schemes were started to enable more acreage to be double cropped. This brought a sharp rise in the sales of the power tiller and local manufacturers started the idea of assembling them locally. At the same time, however, the large tractors were also in great demand as more people were turning to contract work. As the economics of the large tractor is far superior to the power tiller, it is expected

Graph 2. Growth of power tiller usage

that the swing will be towards the larger machines. It is now believed that the power tiller market would have reached its saturation limit in a year or two from now. Sale figure for 1970 has so far shown a slight decline from 1969 figures. Besides the economics, the power tiller cannot match the conventional tractor in either the quality of work or speed. Needless to say, there will always be a small market for the power tiller as many farmers still prefer to have their own machine rather than to depend on someone else.

3) **Harvester trials**

The other farming operation that is causing concern in Malaysian farm circles is harvesting. The conventional combine has been tried and found to function reasonably well in Malaysian conditions. However, the problem of accessibility and transportation has caused considerable difficulty in introducing them. Ease of transportation is a necessity because, these machines could only be owned by contractors who need to travel from place to place.

Smaller, Japanese type harvesters have also been introduced. They function just as well as the large machines and are not faced with problem facing the larger combines. However, they are much too slow and the cost of harvesting comes out to only slightly less than by the present method. A number of different concerns, however, including IRRI are developing a new type of harvesters which could reduce the size of the combine considerably without a loss in capacity. Proto types of these machines are now undergoing field trials in Malaysia.

4) **Future development**

Another development that we in Malaysia are looking into is the possibility of developing an all-purpose tractor especially designed for rice cultivation. The conventional tractor is designed mainly for drawbar work on dryland. What is envisaged is a power unit that can literally float on the soft mud and capable of channeling that power to either a rotary cultivator or a specially rigged harvesting unit. A number of such power units are now available and undergoing tests but are still a long way from the ideal concept. It is hoped that this approach would overcome the problem of small farm size without having to compromise economic size of tractor.

Socio-economic problems

Introduction of farm machines into Malaysia has not met with any great opposition from any quarter. The farmers have long accepted the idea of using machines. In spite of this, mechanization has gone at a very slow rate. Some of the difficulties are technical but many others are not. Even the technical problems sometimes require solutions which are not technical. The problems in transplanting can be eliminated by drier seeding or broadcasting instead. But this would introduce a lot of social problems. They include the difficulties in bringing about change to the lack of capital among the farmers.

1) **Resistance to change**

Quite often it is desirable to change farming methods or technique to allow for successful mechanization. But when changes to time honoured rituals are involved, farmers become sceptical, unless the advantages of the new method is glaringly obvious. In many cases, the cumulative advantage to the individual change is only marginal. As the changes can only be affected one at a time, the advantage gained is very often obscured. It needs extensive and persuasive extension work to persuade the farmers. But because of shortage of qualified personnel, Malaysia does not yet have extension

service specializing in farm machinery. In any case, the cost needed to bring about a complete change would be too much, even if it is possible to carry out the change in one sweep.

2) Small acreage

The average size of rice farm is around 3-4 acres. A few larger ones may go as high as 10-15 acres but many are as small as one acre or less. Even though rice farming is the main occupation of most farmers, in many cases, it is not the sole occupation. Their other sources of income include rubber tapping, odd jobs and petty trading.

Such small farm size makes it almost impossible for most farmers to have their own machines. Even when the machines are owned by co-operative or contractor, the small size plots are still a hinderance as the machine has to complete one plot at a time thus making many more turns and stops than are necessary. This results in great reduction field efficiency of the machine. Table 4 shows the distribution of farm household in the Muda Scheme. Though not entirely representative, it gives a fair picture of the farm household in the whole country.

Table 4. Rice acreage and No. of farm household in the Muda Scheme

District	No. of Household	%	Acreage	%
Kugang Pasu	12,216	24.5	53,100	26.6
Kota Star North	9,360	18.8	37,400	18.7
Kota Star South	11,934	24.0	44,600	22.4
Yen	6,922	13.9	28,800	14.4
Parlis	9,340	18.8	35,500	17.9
Total	49,772	100.0	199,400	100.0

3) High cost of machinery

The initial cost of the farm machine is high by any standard. In Malaysia this is aggravated by the fact that the exchange rate of Malaysian currency is much lower than the currency of any of the manufacturing countries. On top of that there is the cost of insurance and freight to be paid for to say nothing of the handling charges and local taxation. Initial cost is of greater importance to farm machines than to any other machine, as they are used only for a few months of the year. In spite of this, there has been a rapid increase in the number of tractors in the last few years as is shown in table 5.

The answer would appear to be in the smaller Japanese made machines. But even these are still beyond the pocket of the average farmer. In any case, the only real reduction affected by the reduction in size is the horse power, but horse power is

Table 5. Changes in the approx. No. of tractors in the last 10 years

Years	61	62	63	64	65	66	67	68	69
4-Wheel tractor	312	464	634	721	835	960	1095	1244	1529
Power tiller	204	309	430	464	534	636	892	1446	1923

Figures from 1966 onwards are taken from census by the Department of Agriculture. Earlier figures are estimates based on total No. of tractors into the country.

about the cheapest thing in a tractor. As an example, a 10 hp tractor is only about half the price of a 50 hp tractor.

4) Labor problem

Malaysia has a fairly large labor surplus. As a result, wages are relatively low especially in the agricultural sector. Besides the unemployed, there are many more who are under-employed. These are the members of farm family who, having no other job to go to, helps around the farms.

Survey in Penang and Kedah shows that about 60% of the labor required on a rice farm is hired. The rest is family labor. Family labor is used for maintenance work such as repair of bunds, weeding and spraying. Hired labor is used for those jobs that need to be completed within a set interval of time such as tillage, transplanting and harvesting. There are no permanent laborers. They are only hired as needed during the short peak periods lasting only a few weeks each time. Payment is usually in kind though sometimes cash is given. It is impossible to give an accurate wage rate as there is no standard rate available.

Labor shortage during the peak period is filled in mainly by migrant labor. The local unemployed labor force made up mainly of school leavers are not interested in the short seasonal job which pays very poorly anyway. They prefer to go into the towns and wait for the better paying and more steady factor jobs.

This labor problem is especially damaging, because, whilst it affords some people with the excuse to oppose mechanization, the farming sector is not able to tap this source of labor. Anyway, labor availability apart, no amount of human labor can supply the amount of concentrated power needed for some farm jobs.

5) Lack of skill

Machines need trained operators and mechanics to maintain them. In a society hitherto unconcerned with anything mechanical, it would take a long time and a great deal of effort to train the people for these jobs. In many cases, it is difficult to find the people with the right inclination. Therefore a lot more people need to be trained than actually required to allow for the eventual dropouts. Such training requires expensive facilities and trained instructors. Many of these instructors have to be trained overseas or expatriate personnel brought in to train them.

6) Policies for farm mechanization

The Government of Malaysia is pursuing a policy of self-sufficiency in rice for the country. In its endeavor to achieve this objective the approach is towards greater production from existing rice producing areas rather than opening up new land. This means that besides increasing yield, the farming system and practices have to be more intensive. For this purpose, the Government is encouraging greater use of machinery on the farms. This encouragement comes in the form of setting up centres for training of farm operators and mechanics, sending instructors in farm mechanics for training overseas and having credit schemes for the purchase of machinery and a host of other measures.

It is also the Government's policy to create more jobs in the country and towards this end it has embarked on an industrialization program which includes the assembly of tractors, and farm machines. Manufacturers are encouraged to set up assembly plants in the country with favorable tax and other incentives.

Conclusion

Mechanization has taken a comparatively slow pace in Malaysia. The main hinder-

ance to a faster growth is the smallness of the farm size. But recent changes in farming pattern mainly in the form of multiple cropping has accentuated the need for greater use of the machine. This had resulted in an accelerated increase in the use of the machine in the last few years.

In spite of the present surplus of labor, there will be a shortage of labor as soon as more and more labor is required in the many factories now growing up under the country's industrialization program. The next few years will thus see an even greater development in farm mechanization in the country.

Farm machinery need not only be functional. Even more important is its economics. Where farm holdings are small this is highly critical. For this reason, in future, size of the machine will not play a very significant part. The main thing is that the machine should be multi-purpose to effect maximum utilization on a small farm.

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