Factors Inhibiting Rate of Mechanisation in Oil Palm Estates

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ABSTRAK


INTRODUCTION

The degree of mechanisation in oil palm estates measured as continuous variables for the following operations: cutting of FFB, infield collection, mainline loading, mainline transport, weeding, fertiliser application and pest and disease control in 1995 was 0%, 19.8%, 41.9%, 100%, 49.9%, 37.3%, and 13.3% respectively. The composite degree of mechanisation was 37.5% (Malek et al., 1996). The labour-land ratio found was one man to 11.2 ha (1:11.2). Another study in 1991, using five dichotomous variables consisting of cutting, infield collection, weeding, mainline loading and fertiliser application indicated that the degree of mechanisation was 0%, 35%, 59%, 36% and 29% respectively. The average degree of mechanisation of the five variables was 24.1% (Abd Rahim et al., 1991). Strictly the two sets of figures are not directly comparable. The labour-land ratio in 1991 though not available is estimated to be 1:10. Over the period, it is generally believed that the degree of mechanisation in oil palm plantations has improved. This may be concluded from the concerted efforts of mechanisation undertaken by PORIM, PORIM’s Mechanisation Committee and the industry. This improvement has been made during a period of labour shortage faced by the oil palm industry since 1980’s (UPAM, various years). The improvement has been seen in the increase sale and use of the mini-tractor, mini-tractor grabber and other machines in the market. The country also saw during the period an increase in the immigrant undocumented labour population (Immigration Department, Kuala Lumpur).

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This study concerns with factors inhibiting mechanisation in the advanced sector of the oil palm plantations. Many reasons have been cited for the lack of implementation in mechanisation. One reason is the availability of cheap undocumented immigrant labour; another is terrain was not suitable. Even though the national agriculture policy promotes mechanisation as one of the ways to adopt labour-saving technologies, adoptions of mechanisation of field operations in oil palm cultivation is far from satisfactory. By activity only one of the field operations cannot yet be mechanised i.e. cutting of FFB. However by labour requirements, after taking into account current practices in mechanisation, this constitutes more than 50% of total labour required.

With the above background, the objective of this paper is to highlight the factors inhibiting mechanisation in the oil palm plantations. The data of the study refer to that of Malek et al., 1996.

**CONTRIBUTING FACTORS TO INHIBITING MECHANISATION**

Fifteen factors inhibiting mechanisation had been identified based on a study by Feder et al., 1985 and discussions held with estate managers and corporate managers at their premises (Table 1). These factors are:

- Absence of suitable equipment (1)
- Chaotic supply of inputs (2)
- Inappropriate transportation infrastructure (3)
- Worker’s union attitude (4)
- Managers’ attitude (5)
- Presence of cheap labour (6)
- No corporate will (7)
- Terrain not suitable (8)
- Purchasing of machines controlled by HQ (9)
- High fixed cost (10)
- Limited access to information (11)
- Aversion to risk (12)
- Inadequate farm size (13)
- Inadequate incentive (14)
- Insufficient human skill (15)

The figures in brackets refer to the coded reasons shown in Figures 1 to 6. For clearer presentation, the inhibiting factors are also reported in Table 1.

It is observed that five reasons stand out. These were as follows:

- Absence of suitable equipment
- Terrain not suitable
- Inadequate incentives
- Insufficient human skill
- Presence of cheap labour

The operations are now discussed one by one.

**Cutting/Harvesting of FFB**

*Figure 1* shows the factors inhibiting mechanisation is cutting/harvesting of FFB in 145 estates in Peninsular Malaysia. The five most popular reasons given were:

- Absence of suitable equipment (51.7%)
- Terrain not suitable (31.0%)
- Workers’ union attitude (11.7%)
- High fixed cost (11.0%)
- Insufficient human skill (11.0%)
### TABLE 1. MAJOR FACTORS INHIBITING MECHANISATION IN OIL PALM PLANTATIONS BY PERCENTAGE RESPONSE.

<table>
<thead>
<tr>
<th>Reasons inhibiting mechanisation</th>
<th>H/C</th>
<th>IC</th>
<th>ML</th>
<th>MT</th>
<th>W</th>
<th>FA</th>
<th>P&amp;DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Absence of equipment</td>
<td>52</td>
<td>17</td>
<td>19</td>
<td>–</td>
<td>8</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>2. Terrain not suitable</td>
<td>3</td>
<td>55</td>
<td>23</td>
<td>–</td>
<td>30</td>
<td>54</td>
<td>17</td>
</tr>
<tr>
<td>3. Inadequate incentive</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>–</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>4. Inappropriate transportation infrastructure</td>
<td>3</td>
<td>20</td>
<td>7</td>
<td>–</td>
<td>5</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>5. Presence of cheap labour</td>
<td>10</td>
<td>5</td>
<td>8</td>
<td>–</td>
<td>9</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>6. Insufficient human skill</td>
<td>11</td>
<td>21</td>
<td>8</td>
<td>–</td>
<td>12</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>7. Workers’ Union attitude</td>
<td>12</td>
<td>24</td>
<td>8</td>
<td>–</td>
<td>3</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>8. High fixed cost</td>
<td>11</td>
<td>15</td>
<td>17</td>
<td>–</td>
<td>4</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>9. Inadequate farm size</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>–</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Notes:-
H/C = Cutting  
IC = Infield Collection  
ML = Mainline Loading  
MT = Mainline Transportation  
W = Weeding  
FA = Fertiliser application  
P & D C = Pest and Disease Control

![Diagram](image)

**Figure 1. Factors Inhibiting Mechanisation in Harvesting/Cutting in Estates.**
Absence of equipment was the main inhibiting factor to mechanisation. To promote mechanisation, PORIM and the industry have tested more than ten prototype machines; in fact PORIM is now in the process of designing its own machine.

The present mechanical mind-set used to invent harvesting machines displays little potential to solve the industry's problem of labour shortage. With the current manual cutting of FFB, the speed of man is many times faster than any harvesting technology available or potentially available in the pipeline to harvest FFB (Bek-Nielsen, 1995).

Non-suitability of terrain was reported by 31% of the respondents. Non-suitability of terrain would also refer to unprepared harvesting paths for eventual implementation of harvesting technology. Flat terrain especially in coastal areas can also give rise to problems especially during rainy season: tractor-trailers can be stuck in mud along harvester paths.

The attitude of workers' union was cited as a factor inhibiting mechanisation by 11.7% of the respondents. The MAPA/NUPW agreement 1993 in fact explains those detail agreements on wage remuneration, prior to implementation of labour-saving technology, should be discussed by the management of the estate with the in-house local union. It would seem that one point of contention is 'recovery factor.' This refers to a percentage sum of 8-15% deducted from workers' gross earnings to pay for variable and fix cost of machine uses for in-field collection of FFB. The initial fear and resistance of workers (manual cutters and mechanised in-field collectors of FFB) are usually allayed through discussion (Malek and Yaakob, 1989).

High fixed cost and insufficient human skill were reported by 11.7% of the respondents respectively. Similar to the arguments used under the workers' union attitude, there is no harvesting technology yet commercially in practice.

### In-field Collection of FFB

In-field collection of FFB refers to the act of collecting FFB and loose fruits and transporting these from palm bases to roadside collection points.

The technology in in-field collection is available. To name a few: mini-tractor, mini-tractor grabber, super-crawler, mechanical buffalo and many more.

The five most commonly cited factors inhibiting mechanisation of in-field collection were:

- Terrain not suitable (55.7%)
- Workers' union attitude (24.1%)
- Insufficient human skill (20.7%)
- Inappropriate infrastructure (20.0%)
- Absence of suitable equipment (17.2%)

(see Figure 2)

Most oil palms were planted during the times of labour surplus. The management system reflects manual operations. Consequently, it is not now easy to change mid-stream to a mechanised in-field collection system. Nearly 56% of the respondents replied that terrain was not suitable for mechanisation. This is especially so for the hilly terrain. For the undulating areas, harvesting paths still have to be created.

Workers' union attitude was reported as an inhibiting factor by 24.1% of the respondents. Under MAPA/NUPW agreement the detail arrangements of implementing a labour
sensitive technology must be discussed and solved by the management and local union together. Experience from other work indicates that workers are not happy with the recovery factor. In an earlier study, when mini-tractors were used to collect FFB and loose fruits, 8-15% of the gross earnings of workers were deducted to pay for the running and repairs of the machines (Malek and Yaakob, 1989).

Twenty-one per cent of the respondents cited insufficient human skill as a factor inhibiting mechanisation. This underlines the fact that in order to make a mechanisation programme successful, proper attention should be given to training of staff and workers.

Inappropriate infrastructure was cited by 20.7% of the respondents for not mechanising. This is about less than the figure quoted for non-suitability of terrain. It indicates that non-suitability of terrain could be improved to make way for mechanisation.

Absence of suitable equipment is quoted by 17.2% as a factor inhibiting mechanisation.

**Mainline Loading of FFB**

Mainline loading of FFB refers to the act of loading FFB and loose fruits onto a trailer, lorry, etc. at a roadside collection point. It is normally done manually with a spike (FFB) and rake (loose fruits).

The normal machine used in mainline loading is a tractor-crane with net system. Of late, a trailer equipped with elevated discharge mechanism can unload the FFB and loose fruits into a waiting container.

The six commonly cited factors inhibiting mainline loading were:
• Terrain not suitable (23.4%)
• Absence of suitable equipment (18.6%)
• High fixed cost (16.6%)
• Presence of cheap labour (8.3%)
• Inadequate farm size (8.3%)
• Insufficient human skill (8.3%).

(see Figure 3)

Not all areas in an estate are amenable to mainline loading of FFB. In this case terrain not suitable would be cited as a factor inhibiting mechanisation; 23.4% of the respondents replied that non-suitability of terrain was a factor for not mechanising.

A smaller number (18.6%) gave the reason of absence of suitable equipment. Sixteen point six percent cited high fixed cost was a reason for not mechanising. A tractor-crane system would cost about RM100,000. Presence of cheaper labour, inadequate farm size and insufficient human skill (8.3% respectively), all three show as factors inhibiting mechanisation.

Some estates would include operations of loading into ramp as part of mainline loading. Inadequate farm size was given as a factor inhibiting mainline loading. This means that an estate that is amenable for mainline loading should be more than 500 hectares.

**Mainline Transport**

Mainline transport is always done by lorries, tractors and in some places (not included in survey) by rail.

**Weeding**

Weeding is done 3 to 4 times a year manually. In a mechanised or semi-mechanised system the methods used are motorised knapsack, CDA or tractor and sprayer.

The reasons given by respondents for factors inhibiting mechanised weeding were:

• Terrain not suitable (30.0%)
• Insufficient human skill (12.4%)
• Presence of cheap labour 9%
• Absence of suitable equipment (7.6%)

(see Figure 4)

Hilly areas or uneven undulating areas where harvesting paths are not cleared would be a factor inhibiting mechanisation in weeding. The tractor-drawn system cannot go to areas which are not road-worthy. Some skill is needed to use control droplet applicator or the motorised knapsack.

Mechanised weeding in estates does not seem to be a big issue as it is an easy operation to do. However training is still required as it was cited a factor inhibiting mechanisation.

**Fertiliser Application**

Fertiliser application is normally undertaken three times a year, amounting to 1 tonne of fertiliser of N, P, K and Mg per hectare. Tractor mounted spreader is commonly used for fertiliser application in oil palm estates. Fixed-wing aircraft and helicopter are also being used for fertiliser application.

The five commonly cited factors inhibiting mechanisation were as follows:

• Terrain not suitable (53.8%)
• Inadequate incentive (50.3%)
• Inappropriate transportation infrastructure (21.4%)
Figure 3. Factors Inhibiting Mechanisation in Mainline Loading in Estates.

Figure 4. Factors Inhibiting Mechanisation in Weeding in Estates.
• Insufficient human skill (9.0%).
• Absence of suitable equipment (3.4%)

(see Figure 5)

Applications of fertiliser through aerial means have been undertaken by fixed-wing aircraft or helicopters and organisations such as Felda Plantations, Sime Darby and Guthrie are among the users. In areas which are not big enough for aerial application or the terrain not accessible to mechanical spreader, the fertilizers are applied manually.

Fifty-three per cent of the respondents cited non-suitability of terrain as a factor inhibiting mechanisation. Secondly, inadequate payment structure cited was as an inhibiting factor (50.3 %). The average wage of a manual fertiliser applicator used to be RM 250 a month in 1988. This has gone up slightly under the MAPA/NUPW 1993 Agreement. Less than 12% cited inappropriate infrastructure and lack of human skill respectively as factors inhibiting mechanisation.

Aerial application did not enter the mind-set of 53.8% of the respondents. They were obviously in the mind-set of land-based machinery.

Pest and Disease Control

The occurrence of pest and disease problem is very low in the estate. Treatment is usually done by injecting the diseased palms with a chemical to eliminate the palm. If the rate of incidence is low, it could also mean that mechanisation in pest and disease control was low because there was no need for it. In fact only one manager replied very low incidence of pests and diseases in his estate under the others category.

The main reasons for not mechanising pest and disease control were:
• Inadequate incentive (50.3%)
• Absence of suitable equipment (21.4%)
• Terrain not suitable (16.6%)
• Insufficient human skill (6.2%)

(see Figure 6)

CONCLUSION

There are several policy conclusions that can be drawn from this study:

• Terrain should be prepared to accommodate mechanisation where feasible.
• Rate of payment for workers in fertiliser application and disease control need to be reviewed.
• The percentage of deduction from workers wages to pay for running and repair cost of the vehicle particularly for FFB collection should be restudied.
• Training and retraining should be undertaken in preparation for mechanisation.

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Figure 5. Factors Inhibiting Mechanisation in Fertilizer Application in Estates.

Figure 6. Factors Inhibiting Mechanisation in Disease Control in Estates.
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