Labour Productivity in the Malaysian Oil Palm Plantation Sector

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ABSTRACT

This study attempts to measure oil palm labour productivity based on land-labour ratio by job category, region and estate size; and based on output-labour ratio by job category and region. It culminates by suggesting action plans for improving labour productivity and reducing labour requirement. Primary data collected through an online survey were used in the study, while the calculation of labour productivity was done using Microsoft Office Excel and SPSS. From the study, it was found that the ideal land-labour ratio for oil palm plantations in Malaysia is 10:1. Currently, the ratio set by the government for oil palm estates hiring foreign workers is 8:1 (i.e. *8 ha to one worker). To reduce the number of foreign workers in oil palm plantations, the current ratio needs to be increased from 8:1 to 10:1. To increase labour productivity, it is suggested that estate owners practise mechanisation, especially for harvesting (when palm height is less than 8 m) and in-field collection of fresh fruit bunches (FFB). By using a motorised cutter for harvesting, productivity per worker can be increased from 0.99 t per day to 2.24 t per day. For in-field collection, a mechanised FFB transport system (MFTS) can reduce the required number of workers and lower the cost of transportation as well as cost of production.*

Keywords: labour, productivity, land-labour ratio, output-labour ratio, mechanisation.

INTRODUCTION

Malaysia is well-known in the world's oil palm industry because it is the second largest producer and exporter of palm oil after Indonesia. The Malaysian palm oil industry plays an important role in agricultural development as well as the economic development of the country. The industry continues to provide significantly to the national economy through its contribution to Gross Domestic Product (GDP), Gross National Income (GNI), foreign exchange and employment. Its average contribution to GDP, ranging from

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RM 786 billion to RM 835 billion, is about 5% to 7% per year, while in 2009, it contributed about RM 53 billion to GNI.

Malaysia has decided to focus on 12 National Key Economic Areas (NKEA) to boost her economy and to achieve a high income status by 2020. Currently, the palm oil industry is the fourth largest contributor to the national economy. Under NKEA, the oil palm industry is targeted to contribute about RM 178 billion to GNI by 2020. In achieving this, an additional 41 000 jobs will be created, of which 40% will be high-skilled jobs fetching an average monthly income of RM 6000 (JPM, 2013).

Over the last five years, the industry has contributed on average about RM 65.3 billion per year to export revenue. The highest contribution was in 2011, totalling RM 80.4 billion. Due to lower prices for palm oil products as compared with the previous year, the contribution to export revenue by the industry decreased to RM 71.4 billion in 2012 and to RM 61.3 billion in 2013. In 2014, export revenue contributed by the industry was RM 63.6 billion.

The Malaysian oil palm industry has been a major player in poverty eradication and in mitigating migration of the labour force from rural to urban areas. It has created jobs, built infrastructure and contributed to social stability (Basiron, 2008). In 2008, there were 610 000 workers in the palm oil industry (Faizah, 2010) while currently an increasing figure has been estimated.

It was estimated that a total of 451 507 labourers worked in the oil palm plantation sector in 2014 (*Table 1*). Out of this total, 38.6% or 174 472 workers were hired as fruit harvesters and collectors while 35.3% or 159 203 workers were hired as field workers. These two job categories represented 73.9% of the total workforce in oil palm plantations. On a regional basis, Peninsular Malaysia engaged the largest workforce due to its higher oil palm area, *i.e.* 180 850 workers (40.1% of total workforce), followed by Sabah with 166 879 workers (37.0%) and Sarawak with 103 778 workers (23.0%).

Oil palm plantations in Malaysia are too dependent on foreign workers, notably from Indonesia. Out of the 451 507 workers, 78% or 352 330 were foreign and worked mainly as fresh fruit bunch (FFB) harvesters and collectors. Lack of interest due to the 3D perception (dirty, dangerous and difficult) of these jobs by locals is one of the reasons why estate owners employ foreign workers to work in their plantations. This scenario, as well as the booming economy, has attracted a huge influx of foreign labour into the country. The influx of foreign workers into Malaysia reached a record high as the country began to embark on industrial development, particularly in the construction, manufacturing and services sectors. At the same time, a large number of the rural workforce had moved to the urban areas or cities to take up employment opportunities. As a consequence, the agricultural sector including the plantation sector was left with a shortage of labour and eventually this had led to the current dependency on foreign labour (Arif, 2010). In 2000, there were only 807 096 foreign workers making up 8.5% of total employment in Malaysia (*Table 2*). However the number increased by more than double to about 2 million foreign workers, or 17.2% of the total, by 2007.

In Malaysia, producers of oil palm can be grouped into four categories, namely private estates, government schemes, state

TABLE 1. TOTAL WORKFORCE IN OIL PALM PLANTATIONS IN MALAYSIA, 2014

Job category	Peninsular	Sabah	Sarawak	Malaysia
Field				
General mandore	4 953	4 288	2 668	11 909
Harvesting mandore	4 837	3 949	2 849	11 635
FFB harvester and collector	75 334	61 354	37 784	174 472
Field worker	58 293	62 035	38 875	159 203
Other field worker	21 784	25 077	13 167	60 028
Sub-total	165 201	156 703	95 343	417 247
Office				
Executive	4 500	2 725	1 969	9 194
Staff	11 149	7 451	6 466	25 066
Grand total	180 850	166 879	103 778	451 507

Note: FFB - fresh fruit bunch.
Source: MPOB (2015).

TABLE 2. TOTAL EMPLOYMENT IN MALAYSIA, 1997-2007

Year	Local workers	Foreign workers	Total employment	% of foreign workers
1997	8 411 174	627 426	9 038 600	6.9
2000	8 701 504	807 096	9 511 600	8.5
2005	9 475 262	1 185 238	12 290 500	16.1
2006	9 675 291	1 869 209	11 544 500	16.2
2007	9 754 001	2 021099	11 775 100	17.2

Source: Arif (2010).

schemes/government agencies and independent smallholders (*Figure 1*). In 2014, private estates represented about 62% of the total oil palm planted area (5 392 235 ha), government schemes (such as the Federal Land Development Authority, Federal Land Consolidation and Rehabilitation Authority and Rubber Industry Smallholders' Development Authority) made up about 17%, state schemes/ government agencies 6% and independent smallholders 15%.

Among the producers, private estates especially estates under public and private limited companies produce the highest FFB yield, *i.e.* more than 25 t/ha/ yr compared to the others, because they operate on a larger scale and are better managed. At the national level, the average FFB yield has fluctuated over the last 18 years (1995-2013). The highest national average was recorded in 2008 (at 20.08 t/ha/yr) while the lowest yield was in 2002 (at 17.97 t/ha/ yr). In 2014, the national average was 18.63 t/ha/yr; thus, to achieve the national target of 26 t/ha/yr by 2020, the plantation sector needs to increase FFB yield by 39.5% or 7.37 t/ha/yr.

One of the programmes under NKEA is to increase labour productivity. Productivity is commonly defined as the ratio of a volume measure of output to a measure of input use (OECD[1], 2001). Among other productivity measures, such as multi-factor productivity or capital productivity, labour productivity is particularly important in the economic and statistical analysis of a country. Labour productivity is a revealing indicator of several economic indicators as it offers a dynamic measure of economic growth, competitiveness, and living standards within an economy. It is a measure of labour productivity (and all that this measure takes into account) which helps to explain the principal economic foundations that are necessary for both economic growth and social development.

Labour productivity is the amount of goods and services that a worker produces in a given amount of time. It is one of the several types of productivity that economists measure. Workforce productivity can be measured for a firm, a process, an industry, or a country. Measured labour productivity will vary as a function of other input factors as well as the efficiency with which the factors of production are used (total factor productivity). So two firms or countries may have the same total factor productivity (productive technologies) but because one has more capital to use, its labour productivity will be higher. Output per worker corresponds to the 'average product of labour', and can be contrasted with the marginal product of labour, which refers to the increase in output which results from a corresponding (marginal) increase in labour input.

Malaysia aims at raising the oil palm industry's contribution to GNI from RM 63.4 billion (2014) to RM 178.0 billion by 2020. To achieve this target, eight entry point projects (EPP) have been implemented. Among these is an EPP that focuses on

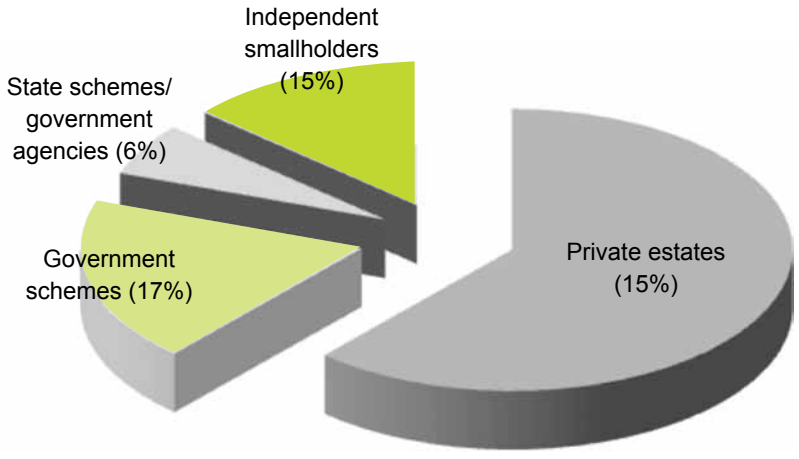

Figure 1. Oil palm planted area by category, 2014.

[1] Organisation for Economic Co-operation and Development.

improving worker productivity (EPP 3). Worker productivity is very important in any industry. The measurement of labour productivity can help in explaining the principal economic foundations that are necessary for economic growth and social development.

The Malaysian oil palm plantation sector is heavily dependent on manual labour because the sector is labour intensive. This scenario provides avenues for foreign workers to work in the plantation sector. In 2014, it was estimated that there were 451 507 employees in the oil palm plantation sector, and that, out of the total, 352 330 or 78% were foreigners. Foreign workers were employed mainly in those operations with high labour demand, such as harvesting, field work and other general work (Azman, 2013).

Nowadays, it is difficult to hire workers from Indonesia as they prefer to work for plantations near their hometowns because they are able to be paid a similar salary and can continue to live with their family. This scenario makes the labour shortage issue more critical, especially for FFB harvesting and collection as these activities require experienced workers.

Raising labour productivity, therefore, seems to be the only way to solve the problem of a tight labour market because the supply is not able to fulfil the demand for labour in the oil palm plantation sector. In the oil palm industry, and especially in the plantation sector, monitoring labour productivity is most crucial in ensuring that the industry remains competitive in the global market and continues to be among the main contributors to GNI. Therefore, a study to examine labour productivity in oil palm plantations needs to be undertaken.

In many production processes, labour and input costs represent a substantial proportion of total cost and a rise in labour cost ordinarily alters many economic decisions with respect to technological changes and obsolescence of techniques (Rasyid, 1989). An economy experiencing a rapid increase in its labour cost would lose its competitive edge in the world market unless its rate of increase in labour productivity compensates at least the increase in the labour cost. Improvement in labour productivity is measured as the amount of output per unit of labour which leads to a more competitive production process.

The oil palm plantation sector is labour intensive. Increasing labour productivity is very important to ensure that the industry remains competitive with other commodities in the global market. In a survey of manufacturing growth and performance in Britain, it was found that the factors affecting labour productivity or the performance of individual work roles are of broadly the same as those that affect the performance of manufacturing firms as a whole (Zavadskas *et al.*, 2008). As productivity is very important, this article attempts to measure labour productivity based on the land-labour ratio by job category, region and estate size, without and with labour shortage; and to measure labour productivity based on the output-labour ratio by job category and region; as well as to suggest action plans for improving labour productivity and for reducing labour utilisation.

METHODOLOGY

The study used primary data which were collected through an online survey system known as e-labour. The main information collected by the system were the number of workers as well as labour shortage by job category. This information was used to calculate labour productivity according to category by using Microsoft Office Excel and SPSS. In this study, labour productivity was measured based on land to labour (land-labour) ratio and labour to output (labour-output) ratio.

For labour productivity based on the land-labour ratio by job category and region, two scenarios were considered, namely without labour shortage and with labour shortage. Without labour shortage means that in calculating the land-labour ratio, total labour used did not include total labour shortage (as reported by the oil palm plantations) and the opposite was true for the scenario with labour shortage. To obtain the land-labour ratio, total land (planted area) for each estate (*i.e.* those estates which responded to e-labour) was divided by total labour for each job category. From there, the average land-labour ratio can then be obtained and used as the final figure for the land-labour ratio. In addition, the output-labour ratio was also used as an indicator for labour productivity. In order to obtain the output-labour ratio, total FFB produced by each estate was divided by total labour used by the estate.

RESULTS AND DISCUSSION

Labour Productivity Based on Land-labour Ratio by Job Category and Region

Without labour shortage. In the oil palm plantation sector, there are five main job categories, *i.e.* general mandore, harvesting mandore, FFB harvester and collector, field worker (for fertiliser application, weeding and pruning) and general

worker (driver, security personnel, *etc.*). Due to the difference in job specifications, labour productivity based on land-labour ratio is expected to be different among the job categories. From the study, it was found that in 2014, the land-labour ratio (over all the job categories) in oil palm plantations was 10.57:1. The highest ratio was recorded in Peninsular Malaysia at 11.83:1, followed by Sarawak at 10.96:1 and Sabah at 8.56:1 (*Table 3*). Without taking into account labour for office work, the land-labour ratio for field work in Malaysia in 2014 was 11.96:1, and Peninsular Malaysia recorded the highest land-labour ratio as compared with the other regions. The land-labour ratio in Peninsular Malaysia was 13.54:1, followed by Sarawak with 12.24:1 and Sabah with 9.50:1.

By job category, on average, one general mandore (to supervise field operations such as fertiliser application and weeding) in oil palm plantations in Malaysia oversaw 379.43 ha of oil palm. On a regional basis, one general mandore in Sabah only supervised 271.78 ha of oil palm compared with 421.87 ha and 516.32 ha in Peninsular Malaysia and Sarawak, respectively. On average, one harvesting mandore oversaw 332.87 ha oil palm. Sabah recorded the lowest land-labour ratio for this job category at 266.79:1 compared with Peninsular Malaysia at 358.12:1 and Sarawak at 404.97:1.

At the field level, most estate owners were concerned about the land-labour ratio for a FFB harvester and collector as this job category covers the main activity in an oil palm plantation. On average, the land-labour ratio for a FFB harvester and collector in Malaysia in 2014 was 25.81:1. The highest ratio was in Sarawak (27.94:1) followed by Peninsular Malaysia (27.69:1) and Sabah (22.41:1). Due to high FFB yield and prevailing topography, estate owners in Sabah had to employ more labour compared with their counterparts in Peninsular Malaysia and Sarawak. This is the main reason for the low ratio in Sabah.

With labour shortage. By considering the shortage of labour as reported by the participating plantations, labour productivity based on the land-labour ratio for each region and job category was found to be lower than the land-labour ratio when there was no labour shortage. In other words, the land-labour ratio, taking into account labour shortage, can be considered to be the ideal ratio. This ratio can be a benchmark for the oil palm plantations when hiring labour to work in these plantations.

On average, the ideal land-labour ratio for oil palm plantations in Malaysia in 2014 was 9.97:1 (*Table 4*). This means that for every 9.97 ha of planted area, an estate required one worker. The highest ratio was in Peninsular Malaysia (11.01:1), followed by Sarawak (10.29:1) and Sabah (8.25:1). Thus, to reduce labour, oil palm plantations in Sabah need to increase the ratio; in other words, they need to increase labour productivity. Mechanisation is the best way to increase labour productivity, especially for FFB harvesting and collection activities.

Labour Productivity Based on Land-labour Ratio by Job Category, Estate Size and Region

In this study, estates were grouped into three sizes, namely below 1000 ha, 1000-5000 ha, and above 5000 ha. To obtain the land-labour ratio, total land was divided by total labour (with labour shortage). Overall, the land-

TABLE 3. LAND-LABOUR RATIO IN OIL PALM PLANTATIONS WITHOUT LABOUR SHORTAGE, 2014

Job category	Peninsular	Sabah	Sarawak	Malaysia
Field				
General mandore	421.87:1	271.18:1	516.32:1	379.43:1
Harvesting mandore	358.12:1	266.79:1	404.97:1	332.87:1
Fresh fruit bunch harvester and collector	27.69:1	22.41:1	27.94:1	25.81:1
Field worker	54.62:1	31.66:1	38.99:1	44.11:1
Other field workers	157.60:1	80.14:1	144.80:1	126.83:1
Land-labour ratio for field	13.54:1	9.50:1	12.24:1	11.96:1
Office				
Executive	447.92:1	375.34:1	605.91:1	446.52:1
Staff	185.13:1	178.69:1	221.53:1	187.94:1
Land-labour ratio for field and office	11.83:1	8.56:1	10.96:1	10.57:1

TABLE 4. LAND-LABOUR RATIO IN OIL PALM PLANTATIONS WITH LABOUR SHORTAGE, 2014

Job category	Peninsular	Sabah	Sarawak	Malaysia
Field				
General mandore	414.48:1	268.41:1	502.61:1	373.82:1
Harvesting mandore	347.89:1	263.43:1	383.40:1	323.91:1
Fresh fruit bunch harvester and collector	25.66:1	21.35:1	25.64:1	24.14:1
Field worker	49.09:1	30.41:1	36.51:1	40.75:1
Other field workers	157.10:1	78.75:1	141.36:1	126.29:1
Land-labour ratio for field	12.50:1	9.10:1	11.41:1	11.19:1
Office				
Executive	444.94:1	373.38:1	607.88:1	444.95:1
Staff	186.06:1	178.66:1	218.60:1	188.05:1
Land-labour ratio for field and office	11.01:1	8.25:1	10.29:1	9.97:1

labour ratio in Malaysia according to estate size was quite constant. For instance, the land-labour ratio for estates with a planted area below 1000 ha, 1000-5000 ha and above 5000 ha in 2014 was 9.88:1, 10.14:1 and 10.04:1, respectively (*Table 5*). At the field level (without executive and office staff), the land-labour ratio was also quite close in value, with the highest ratio (11.30:1) recorded by estates below 1000 ha in size.

Table 6 shows the land-labour ratio according to estate size in Peninsular Malaysia in 2014. By combining jobs for field and office, the highest ratio was 11.45:1, which was recorded by an estate size above 5000 ha. In terms of land-labour ratio at the field level, the highest ratio was 12.63:1 which was recorded by an estate size below 1000 ha. It shows that an estate of this size generally had difficulty in getting workers, especially foreign ones, because they now tended to be very choosy.

In Sabah, at the field level, estates with the smallest size (below 1000) also had the highest land-labour ratio compared with other estate sizes. Land-labour ratio for an estate size below 1000 ha was 8.40:1 whereas land-labour ratio for estate size of 1000-5000 ha and above 5000 ha was 7.82:1 and 7.75:1, respectively (*Table 7*). If we assume that all three estate sizes had sufficient labour, we can conclude that the labour who worked in an estate below 1000 ha in size was the most productive compared with the other estate sizes.

In Sarawak, the scenario was different from that of Peninsular Malaysia and Sabah as shown in *Table 8*. An estate size above 5000 ha had the highest land-labour ratio (at the field level), *i.e.* 12.26:1,

TABLE 5. LAND-LABOUR RATIO ACCORDING TO ESTATE SIZE IN MALAYSIA, 2014

Job category	Estate size (ha)			
	<1 000	1 000-5 000	>5 000	Overall
Field				
General mandore	219.41:1	565.61:1	835.56:1	373.82:1
Harvesting mandore	210.87:1	431.33:1	498.92:1	323.91:1
Fresh fruit bunch harvester and collector	23.48:1	25.33:1	23.66:1	24.14:1
Field worker	37.89:1	45.01:1	43.86:1	40.75:1
Other field workers	98.25:1	159.38:1	170.71:1	126.29:1
Land-labour ratio for field	11.30:1	11.01:1	10.99:1	11.19:1
Office				
Executive	251.39:1	692.38:1	618.00:1	444.95:1
Staff	158.35:1	227.69:1	219.61:1	188.05:1
Land-labour ratio for field and office	9.88:1	10.14:1	10.04:1	9.97:1

TABLE 6. LAND-LABOUR RATIO ACCORDING TO ESTATE SIZE IN PENINSULAR MALAYSIA, 2014

Job category	Estate size (ha)			
	<1 000	1 000-5 000	>5 000	Overall
Field				
General mandore	240.35:1	635.76:1	1 938.87:1	414.48:1
Harvesting mandore	214.32:1	477.59:1	1 514.72:1	347.89:1
Fresh fruit bunch harvester and collector	24.84:1	27.03:1	28.60:1	25.66:1
Field worker	44.14:1	55.86:1	112.19:1	49.09:1
Other field workers	119.93:1	197.22:1	405.75:1	157.10:1
Land-labour ratio for field	12.63:1	12.26:1	12.26:1	12.50:1
Office				
Executive	269.04:1	692.58:1	684.88:1	444.94:1
Staff	152.22:1	233.73:1	322.62:1	186.06:1
Land-labour ratio for field and office	10.88:1	11.26:1	11.45:1	11.01:1

TABLE 7. LAND-LABOUR RATIO ACCORDING TO ESTATE SIZE IN SABAH, 2014

Job category	Estate size (ha)			
	<1 000	1 000-5 000	>5 000	Overall
Field				
General mandore	194.21:1	425.34:1	446.14:1	268.41:1
Harvesting mandore	201.74:1	361.76:1	296.05:1	263.43:1
FFB harvester and collector	21.72:1	20.40:1	20.60:1	21.35:1
Field worker	29.98:1	32.47:1	20.33:1	30.41:1
Other field workers	73.52:1	91.23:1	67.93:1	78.75:1
Land-labour ratio for field	9.36:1	8.38:1	8.34:1	9.10:1
Office				
Executive	224.09:1	633.91:1	614.04:1	373.38:1
Staff	161.08:1	213.83:1	192.69:1	178.66:1
Land-labour ratio for field and office	8.40:1	7.82:1	7.75:1	8.25:1

Note: FFB - fresh fruit bunch.

TABLE 8. LAND-LABOUR RATIO ACCORDING TO ESTATE SIZE IN SARAWAK, 2014

Job category	Estate size (ha)			
	<1 000	1 000-5 000	>5 000	Overall
Field				
General mandore	222.09:1	563.40:1	909.75:1	502.61:1
Harvesting mandore	244.10:1	402.89:1	494.03:1	383.40:1
Fresh fruit bunch harvester and collector	23.31:1	27.05:1	24.44:1	25.64:1
Field worker	39.67:1	32.83:1	46.42:1	36.51:1
Other field workers	104.88:1	147.55:1	185.37:1	141.36:1
Land-labour ratio for field	11.85:1	10.98:1	12.26:1	11.41:1
Office				
Executive	245.18:1	764.73:1	608.10:1	607.88:1
Staff	196.71:1	228.81:1	216.18:1	218.60:1
Land-labour ratio for field and office	10.41:1	10.06:1	11.09:1	10.29:1

followed by an estate size below 1000 ha, while an estate size of 1000-5000 ha recorded the lowest land-labour ratio (10.98:1).

Labour Productivity Based on Output-labour Ratio by Job Category and Region

Apart from the land-labour ratio, the output-labour ratio can also be used to measure labour productivity. *Table 9* depicts the labour-output ratio by job category and region. On average, one worker in the plantations (at the field level) in Malaysia produced 174 t FFB per year. On a regional basis, labour in Peninsular Malaysia was more productive as compared with the other regions. One worker in Peninsular Malaysia produced about 199 t FFB per year compared with 161 and 156 t per year in Sarawak and Sabah, respectively. A FFB harvester and collector in Peninsular Malaysia produced a total of 437 t FFB per year, higher than in the other regions.

TABLE 9. OUTPUT-LABOUR RATIO IN OIL PALM PLANTATIONS BY JOB CATEGORY AND REGION, 2014

Job category	Peninsular	Sabah	Sarawak	Malaysia
Field				
General mandore	6 653:1	5 703:1	5 740:1	6 105:1
Harvesting mandore	6 812:1	6 192:1	5 375:1	6 249:1
Harvester and collector	437:1	399:1	405:1	417:1
Field worker	565:1	394:1	394:1	457:1
General worker	1 513:1	975:1	1 163:1	1 211:1
Sub-total for field	199:1	156:1	161:1	174:1
Office				
Executive	7 323:1	8 974:1	7 778:1	7 908:1
Staff	2 956:1	3 282:1	2 368:1	2 901:1
Total (field + office)	182:1	147:1	148:1	161:1
FFB yield (t/ha)	18.23	21.34	16.13	18.63
Mature area (ha)	1 807 549	1 145 890	949 408	3 902 847
Total fresh fruit bunch (t)	32 951 618	24 453 293	15 313 951	72 710 040

Factors Affecting Labour Productivity for FFB Harvesting and Collection Activities

In an oil palm plantation, the combined FFB harvesting and collection activity requires more labour than for the other job categories. Most of the oil palm plantation owners were very concerned about labour productivity for this job category. A change in working system and adoption of mechanisation are found to be the two main factors which can affect labour productivity. Working system for FFB harvesting and collection refers to the way of working, either by an individual or a group. For an individual, a harvester needs to harvest, collect and evacuate the harvested FFB to the collection platform. Most owners of large estates (more than 5000 ha) prefer their workers to work in a group which consists of a minimum of two workers (one harvester and one collector). By working in a group, productivity can be increased. By practising mechanisation, labour utilisation can be reduced, thus increasing labour productivity. Based on a survey, it was found that harvesting with a motorised cutter can increase the number of harvesting rounds and productivity per worker. On average, the number of harvesting rounds in Malaysia when using a motorised cutter is 2.53 compared with 1.95 for manual harvesting, and productivity per worker increased from 0.99 t FFB per day to 2.24 t per day (*Table 10*). Based on the survey, the highest worker productivity when using the motorised cutter was in Peninsular Malaysia at 2.56 t FFB per day, whereas the lowest was in Sabah at 1.00 t FFB per day because oil palm plantations in Sabah hired more harvesters and collectors compared with the other regions.

TABLE 10. COMPARISON BETWEEN MANUAL AND MECHANISED HARVESTING IN TERMS OF HARVESTING ROUND AND PRODUCTIVITY

Region	Harvesting round	
	Manual	Motorised cutter
Peninsular Malaysia	1.96	2.51
Sabah	2.01	2.74
Sarawak	1.94	2.00
Malaysia	1.95	2.53
Region	**Productivity (t/day)**	
	Manual	**Motorised cutter**
Peninsular Malaysia	1.14	2.56
Sabah	0.79	1.00
Sarawak	0.93	2.48
Malaysia	0.99	2.24

Action Plans for Improving Labour Productivity and Reducing Labour Utilisation

Mechanisation. Mechanisation plays an integral part in easing labour intensive farm operations and dependency on migrant labour. Thus, mechanisation will relieve growers and ageing farmers, as the younger generation of locals is less keen on farming. Productivity and yield in farms and plantations can be improved through mechanisation which helps to lower production cost, and to achieve timeliness in scheduled operations, better precision and optimal performance of agricultural inputs. In oil palm plantations, mechanisation especially for FFB harvesting and collection as well as for in-field collection has been proven to reduce labour utilisation and increase labour productivity.

To increase labour productivity, oil palm plantations are encouraged to practise mechanisation especially for harvesting (when the palms are less than 8 m in height) and for in-field collection. For in-field collection, the conventional method needs to be replaced with a mechanised FFB transport system (MFTS) as shown in *Figure 2*. In the conventional method, normally FFB will be evacuated by a wheelbarrow and dumped at a collection point or platform. FFB are then loaded manually into a lorry and unloaded onto a ramp. From the ramp, the FFB are transported to the mill. For MFTS, a multipurpose tractor will be used to evacuate FFB into a bin and to transport them to the mill. MFTS will reduce the number of workers and reduce the cost of transportation as well as cost of production.

Working system. The working system, *i.e.* working in a group, can increase labour productivity because this system is based on specialisation. It is suggested that oil palm plantations which practise mechanisation for in-field collection, such as using the Rhyno and the Beluga transporters, need to form a group of eight workers. Four workers will be required to cut FFB and two workers to stack fronds, trim bunch stalks and align FFB (*Table 11*). One worker will be required to operate the machine and the remaining worker will collect loose fruit. By practising this working system, labour productivity can be increased and labour requirement reduced.

CONCLUSION

The oil palm plantation sector faces a labour shortage problem. It was estimated that the shortage in 2014 was about 32 352 workers, mostly for FFB harvesting and collection activities. Increasing labour productivity is one of the ways to reduce the labour shortage problem. By increasing labour productivity, the labour requirement can be reduced. The study found that the ideal land-labour ratio (taking into account labour shortage) in oil palm plantations is 10:1. As a consequence of locals not being interested to work in plantations, especially oil palm plantations, estate owners have been employing

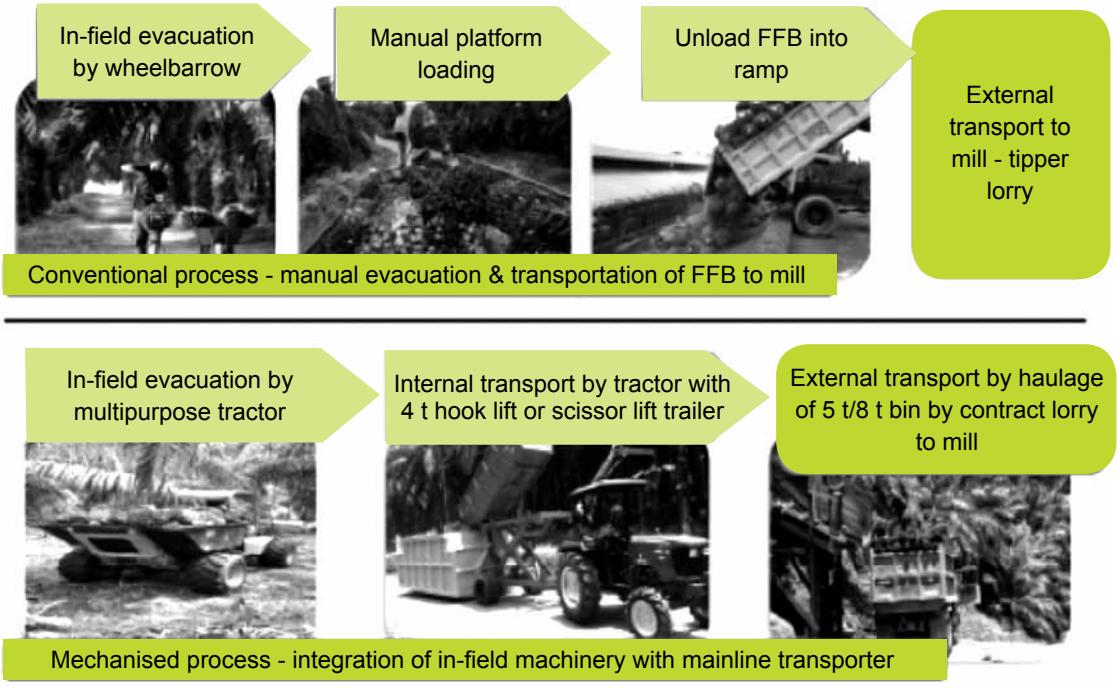

Figure 2. Migration from conventional to mechanised fresh fruit bunch transport system (MFTS).

TABLE 11. CLASSIFICATION OF LABOUR DUTIES (harvesting and in-field collection)

Labour duty	No. of workers	Classification of duties
Cutter	4	Cutting fresh fruit bunch (FFB)
Frond stacker	2	Stacking fronds, trimming bunch stalks and aligning FFB
Machine operator	1	Collecting FFB and unloading at internal roads
Loose fruit picker	1	Collecting loose fruit in bags and bringing them to platform
Total	8	One team for in-field FFB evacuation

foreign workers to work in their estates. This demand for labour has attracted a huge influx of foreign labour into the country. Currently, the ratio set by the government for oil palm estates hiring foreign workers is 8:1 (8 ha to one worker). To reduce the number of foreign workers in oil palm plantations, the current ratio needs to be increased from 8:1 to 10:1. To increase labour productivity, it is suggested that estate owners need to practise mechanisation especially by adopting MFTS, and to change the working system from using individuals to forming groups.

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