

Original Research Article

Evaluation on TVET Assessment in Oil Palm Operation Focuses on Mechanized FFB Harvesting and Collecting

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Abstract: Technical Vocational Education Training (TVET) is a work-based education and training process with a strong emphasis on industry practice. This paper aims to study whether TVET in the oil palm industry can produce a competent trainee in Fresh Fruit Bunch (FFB) harvesting and collecting. A competent trainee must have knowledge and skill to do the job successfully. A qualified harvester cuts the ripe FFB to maximize Oil Extraction Rate (OER) and prunes the optimum frond number. The same goes for a trained collector picking FFB and lose fruit within 24 hours to minimize Free Fatty Acid (FFA). By studying National Occupational Skills Standards (NOSS) used, Pusat Latihan Sawit Malaysia (PLASMA) standard practice, and analyzing trainee's examination results, this study shows PLASMA capable and able to train skilled workers in the oil palm industry. Several recommendations and suggestions have been highlighted to ensure the improvement of the PLASMA quality and maintain its value and standard in the future and to the oil, palm plantation company to take serious action for hiring the TVET trainee as their skilled workers.

Keywords: Technical Vocational Education Training (TVET); National Occupational Skills Standards (NOSS); Pusat Latihan Sawit Malaysia (PLASMA); Fresh Fruit Bunch (FFB); Average Bunch Weight (ABW); Free Fatty Acid (FFA); Oil Extraction Rate (OER)

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1. Introduction

1.1 Oil Palm and Palm Oil

Malaysia is one of the biggest palm oil producers. In 2019, 5.90-million-hectare oil palm planted with Fresh Fruit Bunch (FFB) yield at 17.18 Tonnage/Hectare and 20.21%

Oil Extraction Rate (OER). 19.86 million Tonnage Crude Palm Oil (CPO) produced from around 101.36 million tonnage FFB (17.18 Tonnage/Hectare x 5.9 million hectare) (MPOB, 2020). If the Average Bunch Weight (ABW) is 15 kg, it is estimated that 6.76 million FFB has been harvested and collected. From the marketing and selling CPO viewpoint, it is better the harvested and collected FFB in the highest OER and lowest Free Fatty Acid (FFA) to acquire an acceptable quality of CPO. OER can be understood as a fraction of palm oil extracted from oil palm bunch (Idris, 1999). Naturally, if the rate is 20%, out of 100 kg of FFB, 20 kg of palm oil can be produced.

1.2 TVET and PLASMA

As one of the large world palm oil production, Malaysia is expected to increase production and give rise to the high demand for skilled workers in the oil palm industry, particularly FFB harvesters and collectors. Lately, the Government has promoted and encourages everyone, especially the youth, for Technical Vocational Education Training (TVET). TVET is a work-based education and training process with a strong emphasis on industry practice. It is also the training designed to equip trainees with skills and knowledge in a particular field to adapt to work and as a formal education platform that requires technical skills (Razali, 1996). Department of Skills Development (DSD), Ministry of Human Resources has granted Pusat Latihan Sawit Malaysia (PLASMA) as a TVET center to train oil palm plantation operation trainees from level two to four. This paper will discuss and study whether level two trainee as the oil palm mechanisation operator can successfully be the FFB harvester and collector in future skilled workers for the oil palm plantation sector.

At the first point, why does the author believe the answer for the problems of no skilled harvesters and collectors in Malaysia is by TVET process? It is principally as the setting for TVET is copying every detail in real job task and pasting it in an actual training process. For example, a harvester has to cut FFB stalk by a chisel attached with an aluminium pole, so do a TVET trainee doing the same job task intensively. After this intensity cycle in definite dated, the unskilled trainee slowly adapting and adjusting the nature of a harvester duty and then be transformed into a skilled trainee. Last but not least, the skilled trainee shall be working in the oil palm plantation sector if the benefits (pay especially) between the employer and employee are equivalent in a win-win state. The workers boost their productivity, and the companies acquire their profit.

Sometimes, it is worth appreciating the harvesters and collectors as the elite team rather than ordinary workers or the labor force. This is caused by their particular task (cut and collect FFB) that physically converts a bunch to a Ringgit Malaysia (RM). A million

bunches gathered equal to a lot of RM accumulated. Consider a dissimilar between a Special Weapon and Tactical (SWAT) team and a typical police team in the Hollywood movie industry. Figure 1 suggesting where to place the elite team of harvesters and collectors in the plantation sector.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) describes TVET as those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences; acquisition of practical skills and attitudes; and understanding and knowledge related to occupations in various sectors of economic and social life (UNESCO, 2002). Meanwhile, TVET helps students prepare for occupational fields by acquiring broad knowledge and generic skills applicable to various occupations. TVET, through its orientation toward the world of work and the acquisition of skills, plays an essential role in promoting a country's economic growth and poverty reduction, ensuring the social and economic inclusion of marginalized communities. TVET helps learners acquire the skills, knowledge, and attitudes needed to develop professional careers and enter the world of work and active citizenship, and lifelong learning (Bakar, 2011).

This evidence and from our experiences in PLASMA that the training must be held in combination (30:70) of both theoretical (30%) and practical components (70%) make the author confident, TVET in the oil palm industry can produce a competent trainee.



Figure 1. A suggestion where to place the elite team of harvester and collector in the plantation sector hierarchy.

Table 1. TVET in Oil Palm Plantation by level.

OIL PALM PLANTATION OPERATION			
LEVEL/ AREA	OIL PALM NURSERY	PLANTATION	MECHANISATION
LEVEL 5	<i>OIL PALM NURSERY MANAGER</i>	<i>OIL PALM PLANTATION MANAGER</i>	<i>OIL PALM MECHANISATION MANAGER</i>
LEVEL 4	<i>OIL PALM NURSERY ASSISTANT MANAGER</i>	<i>OIL PALM PLANTATION ASSISTANT MANAGER</i>	<i>OIL PALM MECHANISATION ASSISTANT MANAGER</i>
LEVEL 3	<i>OIL PALM NURSERY SUPERVISOR</i>	<i>OIL PALM PLANTATION SUPERVISOR</i>	<i>OIL PALM MECHANISATION OPERATION SUPERVISOR</i>
LEVEL 2 Malaysia Skills Certificate Level 2	<i>OIL PALM NURSERY MANDORE</i>	<i>OIL PALM PLANTATION MANDORE</i>	<i>OIL PALM MECHANISATION OPERATOR</i>
LEVEL 1	<i>OIL PALM NURSERY OPERATOR</i>	<i>OIL PALM PLANTATION WORKER</i>	<i>NO LEVEL</i>

Source: JPK (2022)

2. Materials and Methods

The method of this study is by document analysis methodology grounded on National Occupational Skills Standards (NOSS) used Pusat Latihan Sawit Malaysia (PLASMA) standard practice and evaluating trainee's examination results.

2.1 NOSS and PLASMA Standard Practice Study

National Occupational Skills Standards (NOSS) is a document that outlines the skill required of an employee working in Malaysia at a certain level of employment to achieve specific skills. The NOSS is developed for various occupational areas.

Table 2. The guideline of NOSS Level 2, Competency Unit (CU) and PLASMA standard practice for harvesting operation from the Department of Skills Development, Ministry of Human Resources, Malaysia

<p>Malaysia Skills Certificate Level 2:</p> <p>Competent in performing a significant range of varied work activities, performed in a variety of contexts. Some of the activities are non-routine and require individual responsibility and autonomy.</p>
<p>CU4 - MECHANISED HARVESTING OPERATION</p>
<p>The trainee is responsible for planning and operating various types of machines to ensure the harvesting and collection mechanization operation are smoothly carried out. The competent person shall identify harvesting mechanization operation requirements, plan harvesting mechanization operation, perform harvesting machine operation and report harvesting mechanization operation activities. The outcome of this competency is to ensure that all activities involved in harvesting mechanization operations are smooth and safely carried out. PLASMA Curriculum</p> <ol style="list-style-type: none"> 1. Company's standard on harvesting activities obtained 2. Company's SOP on machinery's operation obtained 3. Work instruction from superior obtained 4. Harvesting area determined 5. Number of workers per group confirmed 6. Harvesting team determined 7. Harvesting round determined according to company procedure 8. Harvesting and ripeness standard confirmed following company's procedure 9. Type of machine, implements, and materials required confirmed 10. Type of PPE requirement identified according to OSHA 11. Types of harvesting machines determined 12. Harvesting machine functionality checked according to manufacturer's manual 13. Frond to be cut determined 14. Number of ripe bunches confirmed following company's standard 15. Harvesting machine operated according to manufacturer's manual 16. Frond cutting activities executed according to harvesting procedure 17. Pruned fronds stacked 18. Ripe bunches harvested according to ripeness standard 19. Loose fruit collected according to the company's SOP 21. Harvesting activities outcome recorded according to company's format Harvesting performance checked based on production target 22. Record of mechanized harvesting operation compiled 20. Record of harvesting operation submitted to superior

Source: JPK (2022)

Table 3. The guideline of NOSS Level 2, Competency Unit (CU) and PLASMA standard practice for collecting operation from the Department of Skills Development, Ministry of Human Resources, Malaysia.

CU5- MECHANISED COLLECTING OPERATION
<p>The trainee is responsible for operating various machines to ensure the collecting mechanization activities are smoothly and safely carried out. The competent person shall prepare to collect mechanization operation requirements, prepare safety and health requirements for collection activities, perform infield collection machine operation, perform external transport activities, and report collection activities. The outcome of this competency is to ensure all activities involved in collection mechanization operations are smoothly and safely carried out according to superior instruction.</p> <p style="text-align: center;">PLASMA Curriculum</p> <ol style="list-style-type: none"> 1. Company's standard on collection activities obtained from superior 2. The company's SOP on machinery's operation obtained superior 3. Work instruction from superior obtained 4. Collection area determined according to work instruction 5. Number of workers per group confirmed according to work instruction 6. Collection team determined according to work instruction 7. Collection round determined according to company's procedure 8. Collection standard confirmed according to company's procedure 9. Type of machines, tools, equipment, and materials required confirmed according to work assignment 10. Machines, tools, and equipment checked according to manufacturer's manual and company's requirement 11. Personal Protective Equipment (PPE) used in collection activities determined according to OSHA and the company's requirement 12. Personal Protective Equipment (PPE) availability check according to work assignment 13. First aid kits availability checked according to OSHA and company's requirement 14. Infield collection machine operated according to manufacturer's manual and company's procedure 15. Harvested bunches transported to platform/ collection point/ bin following company's SOP 16. Loose fruits collected according to instruction 17. Number of harvested bunches collected recorded following company's SOP 18. External transport operated according to manufacturer's manual 19. Collected bunches transported to platform/ collection point/ bin following company's SOP 20. Loose fruits collected according to the company's procedure 21. Numbers of tonnage recorded following company's SOP requirement 22. External transport activities recorded according to the company's standard format 23. Collection activities record compiled according to company's requirement 24. Collection activities record submitted to superior

Source:JPK (2022)

PLASMA has been using the NOSS since 2006. It is the required document as the primary curriculum for conducting the training. The trainees in PLASMA were evaluated and assessed in the middle and final training period to determine and conclude their quality and level of achievements.

Table 4. Ten PLASMA standards practice for FFB harvesting & collecting during five months of training at Block 20, Phase 3, MPOB Keratong, Pahang D.M

No.	FFB Harvesting & Collecting Standards (Idris <i>et al.</i> , 1999).
1.	Minimum Ripeness of FFB — at least one loose fruit detached or by screening *fruitlet cross-section color: orange at *mesocarp
2.	Harvesting around between two to three per month (10–12 days cycle — it depends on highest and lowest FFB yield)
3.	Harvesting supervision
4.	Incentive or fine to harvester and collector
5.	No double handling or minimum contact on FFB
6.	< 24 hours FFB delivery to mill
7.	Optimum numbers of harvester and collector
8.	Systematic FFB pre-grading before delivery to mill (> 90 % Ripe + < 10 % Under-Ripe + 0 % Long Stalk (< 5cm))
9.	Loose fruit collecting — to maximize OER and minimize Volunteer Oil Palm Seed (VOPS)
10.	Maintain pruning standard — no over-pruning or not pruning 1–3 years — Prune only old frond 4–7 years — Keep 48–56 frond 8–14 years — Keep 40–48 frond 15 years > — Keep 32–40 frond

Source: Idris (2012)

2.2 Trainee's Examination Results Analysis

This paper examined the final examination results for random 30 trainees from 2015 to 2019 years. The level of trainee's achievements is divided into three categories. These final results have been validated and verified by the Department of Skills Development personnel, Ministry of Human Resources, Malaysia. In fact, in 2019, Yang Berbahagia, Dr. Zulkifli bin Abdullah, was their representative during the level two final examination.

Table 5. The level of trainee's achievements by categories.

Level of Trainees Achievements	Final Examination Result Marks (%)
EXCELLENT	80-100
PASS	60-79
FAILED	0-59

Source:JPK (2022)

The examinations for the CU4 and CU5 have been conducted by evaluating the trainee's theoretical knowledge and hands-on skills based on the integration of the PLASMA

curriculum (Table 2 & 3) and ten PLASMA standards practice (Table 4). In addition, the format and standard of the examination were from the Department of Skills Development, Ministry of Human Resources, Malaysia. It was done throughout the training period (continuous assessment) and then at the end of the training (final examination). Table 6 defined further how the test been conducted and completed.

Table 6. The evaluation methods on how the trainee has been tested in the CU4 and CU5.

CU4 - MECHANISED HARVESTING OPERATION- test how well the trainee cut the FFB and pruned the frond.			
CU5- MECHANISED COLLECTING OPERATION- to test how well the trainee collects the FFB and loses fruits.			
Continuous Assessments		Final Examinations	
Knowledge Assessment (Theory test)	Performance Assessment (Skill test)	Final Knowledge Assessment (Final theory test)	Final Performance Assessment (Final skill test)
<ul style="list-style-type: none"> ➤ Five objective questions ➤ 5 Correct-Wrong questions ➤ 5 Matching questions ➤ 5 Fill In The Blank questions ➤ Usually, minimum 20 questions. 	<ul style="list-style-type: none"> ➤ 60% for the critical items in making product or service ➤ 25% for the steps in making product or service ➤ 10% for the finished product or service ➤ 5% for safety 	60 objective questions from CU1 to CU7	Four hands-on skill stations included CU4 & CU5.
Pass – 10/20 and above	Pass – 60%	Pass – 45/60 and above	Pass – 60%

Source: JPK (2022)

3. Results & Discussions

Figure 2 exhibits the average results from 2015 to 2019. This slight downward trend shall be a wake-up call and might be the explicit or implicit signal to the trainer and the trainee to improve their quality of teaching and learning. Commonly, the trainer will have the up-skilling and re-skilling programs when the downtrend in trainees results.

After level 2, the trainee should either be working in the plantations industry or continuing into level 3. From our experiences, excellent level trainees tend and be selected to continue in training, meanwhile pass level trainees will be suitable for the operation workers (harvesters, collectors, etc.) or be the self-working (harvesting and collecting contractors) in oil palm industry. This suitability is accomplished when the Sime Darby,

IOI, KLK, TH, FGV, and other oil palm plantations companies suit them with valued wages- payments, home, and others life necessary.

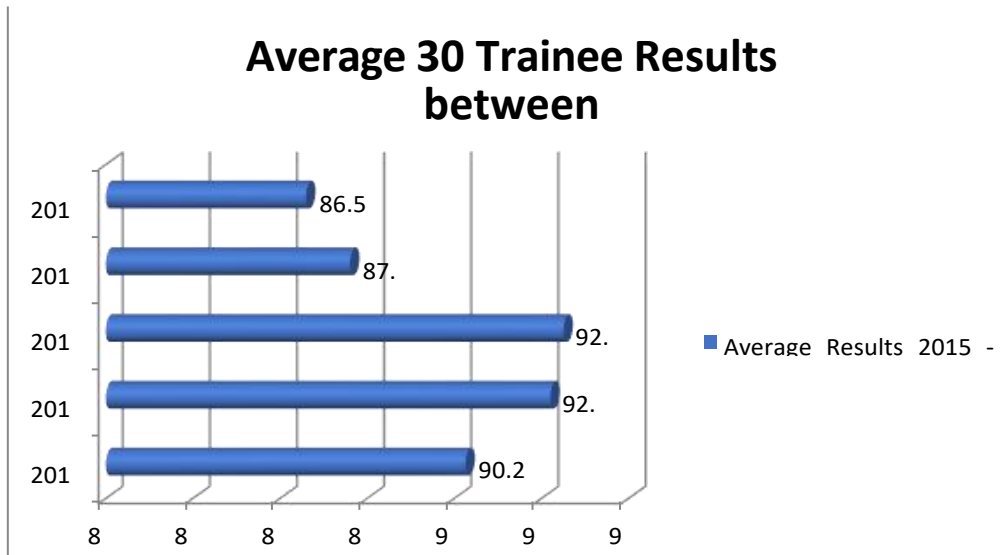


Figure 2. Average trainee examination results from 2015 to 2019

In addition, if a question arises, what way TVET can produce a capable oil palm worker to harvest and collect FFB? Then the answers are based on how long a future worker consumed time (30:70) practicing the job task. As a harvester and a collector are skilled workers. TVET had been equipped the skilled workers for 70 days practical (outdoor) - doing FFB harvesting and collecting plus 30 days theoretical (indoor) – studying FFB harvesting and collecting. However, in a reverse way, 70 days studying and just 30 days doing the job task is not sufficient to be thoroughly skilled workers compared to the TVET process. In other words, working in 70 times harvesting is better than 30 times.

To contribute to the body of knowledge (BOK) in TVET in oil palm, FFB harvesting, and collecting in Malaysia, the reader should link to the Department of Skills Development (DSD), Ministry of Human Resource for further information. As the author assumed, it is enough for the general or foundation subjects such as Mathematics, Science, etc.

5. Conclusions

TVET process will help improve the quality and efficiency of every trainee to be the oil palm skilled workers. Some studies prove that the quality trainee will provide and offer a positive impact on organizational performance. Uplift in trainee productivity and output increases their income and gives a significant contribution to improving organizational

performance. This paper reveals and tells that plantation company should consider these trainees as their skilled workers in the future, particularly for FFB harvesting and collecting. Bear in attention, in 2019 it was about 6.76 million FFB had been cut and collected (if ABW = 15 kg). It is a considerable sum of FFB had been gathered. Do we prepare and harvest and collect the FFB if yield will double for this year, 2020, or even on 2030 far ahead? Lately, the Crude Palm Oil (CPO) price has recorded in a rising spot. In conclusion, the man-machine-method-material (the 4M) should be answered as the mechanization is applied in a conducive oil palm environment.

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