INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 8, Issue 11, (2018) E-ISSN: 2222-6990

An Empirical Study on Infield Collection system in Oil Palm Estate: A Case Study

Syahrizan Syahlan, Farahida Zulkefli and Muhammad Aliuddin Bakar

Faculty of Plantation and Agrotechnology Universiti Teknologi MARA (Melaka) Malaysia

To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v8-i11/5339 DOI:10.6007/IJARBSS/v8-i11/5339

Published Date: 11 December 2018

Abstract

Shortage of workforce either local or foreign in oil palm plantation especially harvesting is a well-known fact. This investigation compares three different infield FFB collection method namely: [1] manual (wheelbarrow) with harvesting pole, [2] Mini Tractor With Grabber (MTG) with harvesting pole and [3] mini tractor without grabber (MTWG) with SmartCUT (motorized cutter). A field study of this integrated FFB harvesting and evacuation was governed at Sabah oil palm estate. The total area for this case study was 3000 ha with oil palm age about 10 to 14 years. Through this study, the harvester's productivity (t/manday) means for MTG, MTWG and manual are 1.35, 0.93 and 0.54 mt respectively. The MTG has a higher output per machine and is highly significant compared to MTWG with SmartCUT. The benefit cost ratio (BCR) are RM4.33 for MTG, RM3.24 for MTWG with SmartCUT and RM2.73 for using manual. Nevertheless MTG has the highest BCR, it has to be tested with other cost benefit analysis. From this findings of study, I would recommend MTG as one of the mechanization for infield collection.

Keywords: Oil Palm Harvesting, Infield Collection, Economic Evaluation, Productivity And Mini Tractor With Grabber.

Introduction

Malaysia's palm oil industry is the fourth largest contributor to the national economy and currently accounts for RM1,889 (8 percent) of the national GNI per capita (ETP 2011). One major problem currently faced by the palm oil industry is the unavailability of adequate labour supply for the handling of heavy and strenuous tasks such as the harvesting of fresh fruit bunches on oil palm plantations. This problem is caused mainly by the migration of labour to urban areas.

This manpower shortage has caused the plantation sector to lose a substantial amount of income. Malaysia has a very high percentage ratio of agricultural labour to total population with 34 percent of the labour force in the agriculture work sector in Malaysia compared to 11 per cent in Japan and five per cent in the United States (New Sabah Times, 2010). Plantation

sector has to resort heavily on foreign workers to do the maintenance, harvesting and also fresh fruit bunches (FFB). Figure 1 shows that harvesting, infield collection and loose fruits collection are still the area of concern. Whereas, the quality of FFB were affected.

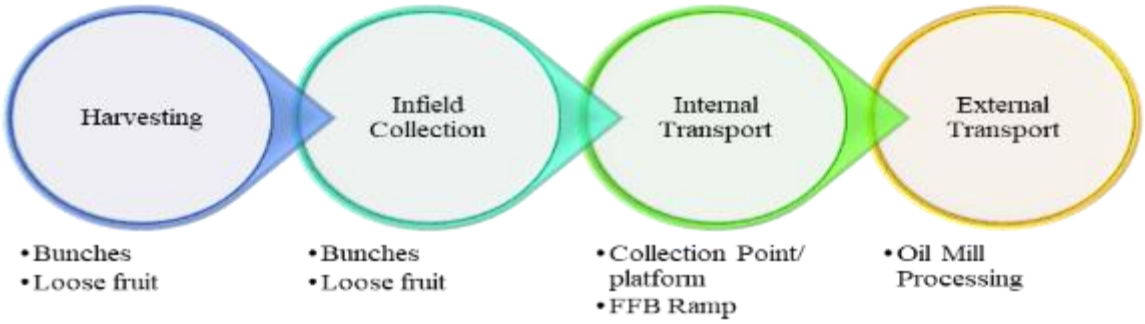


Figure 1 : Harvesting operation in oil palm plantation (Syahrizan S.2018).

According to Farahida Z. in her study in 2017, the fruit quality from the contributing estates significantly affects the OER performance of the mill. Significant reduction in OER will result in monetary losses for the company. A gross overview shows that for a 1% reduction in OER is equivalent to a loss of RM 350,000 per month in revenue, based on its average monthly production capacity at the average market price of Crude Palm Oil at RM 2,500.00 per tonne (Farahida et.all, 2017). The contributing estates will be affected as well, in terms of lower oil per hectare and higher production cost (per ton of palm product) .There have been attempts at mechanization and encouraging progress has been made in the estate sector. Overall, the research objectives are: [i] To analyze the performance of MTG, MTWG with SmartCUT and manual operated systems in-field collection of FFB in term of productivity. [ii] To evaluate the cost management for this three FFB evacuation systems.

Materials and Methods

Theoretical Framework

Based on objectives and previous literature on this study, a theoretically framework was developed. Figure 2 represents a schematic diagram for the conceptual framework for factors contribute to harvesting performance. This research will provide further insight as to what extent can three variables influence the effectiveness of harvesting performance.

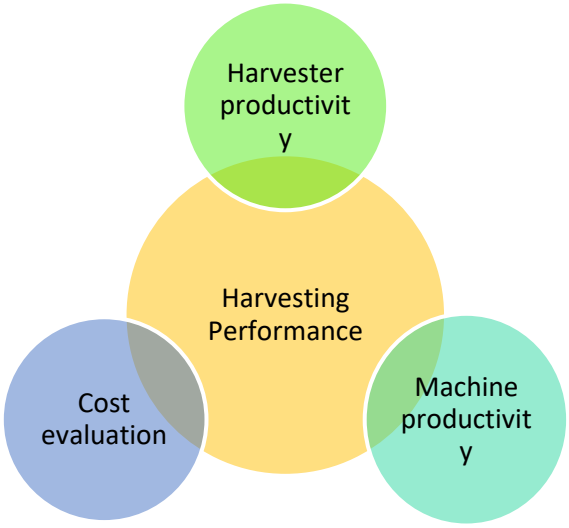


Figure 2: Factors contribute to harvesting performance (Syahrizan S., 2018).

Data Collection

The total area of this case study was 3000 ha with oil palm age about 10 to 14 year. Data obtained from Sabah estate were harvester productivity, machine productivity, machinery cost for MTG, MTWG with SmartCUT and manual. All the data have already been sorting and re-enter again to a new paper form according to objectives of the study.

Results and Discussion

Comparison of Harvester Productivity (T/Manday)

From Figure 3, comparison of means between harvesters (t/ manday) data, there is a high significant difference in this three different infield collection systems. The means value for MTG, MTWG and manual are: 1.35, 0.93 and 0.54 t respectively. This due to that the harvesters with MTG can focusing for harvesting only while the MTG driver or operator collect the FFB.

On the other hand, the MTWG with smartCUT and manual still have to load the fruit manually into the trailer or wheelbarrow. In addition, the harvesters found the difficulties using SmartCUT compared to manual pole due to new technologies adaption and not effectives enough in the bigger scale area.

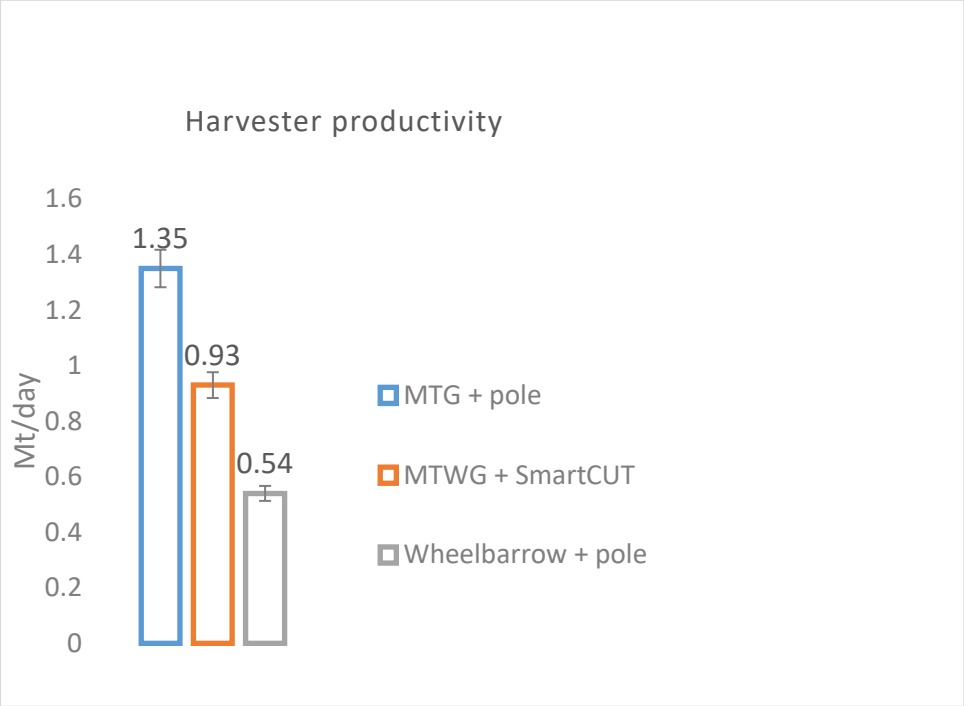
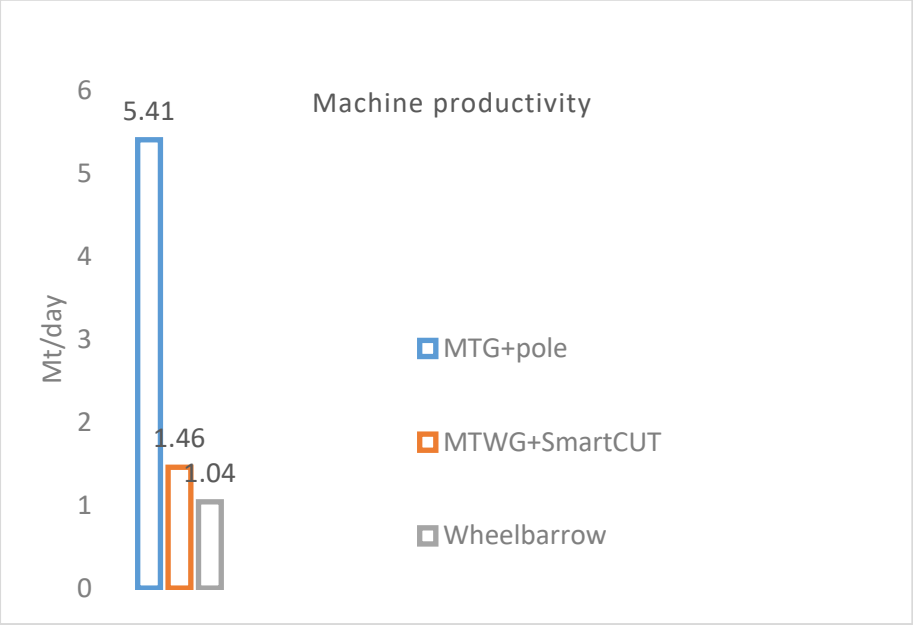


Figure 3: Harvester productivity for three types of FFB infield collection.

Comparison Of Machines Productivity (T/Machine)

Figure 4 shows that the t/machine means of MTG, MTWG with SmartCUT and manual infield collection systems are 5.41, 1.46 and 1.04 respectively. The mini tractor has a higher output per man-day. This is due to the ability of the operator to master the grabber efficiently. Despite operator or driver required a quite of time to fully understand the mechanical control level. Once the operator skilful enough, the productivity rose tremendously.

It is obvious that productivity per machine basis was highest for the MTG. MTG can be loaded with FFB until 1.5 in a short time compared with MTWG. However, the performance is actually below the normal standard for a mini tractor that can evacuate up to 20 t per day, but in this study it only manages to get eight tonnes per day for per unit machine. One of the factors is, the machine had already operated 10 years and had a consistent breakdown.



Benefit Cost Ratio Analysis

Table 32 shows all three in-field collection systems B:C ratio more than 1. The highest is by using MTG, followed MTWG with SmartCUT and manual operated systems. This indicates that the investment in mechanisation for in-field collection of FFB is profitable and the estates are getting RM4.33 for MTG, RM3.24 for MTWG with SmartCUT and RM2.73 for using manual operated system. Although the MTG can be considered substantial and economically justifiable compared to MTWG with SmartCUT, it has to be tested with other cost benefit.

Table 1.
Benefit cost ratio analysis for MTG, MTWG with SmartCUT and manual operated systems in-field collection of FFB

		MTG	MTWG + SmartCUT	Manual (wheelbarrow)
Total revenue	**RM**	**3,354,582.00**	**8,142,288.00**	**11,840,861.34**
Variable cost				
Machinery cost	**RM**	12,901.00	1,349.20	160.00
Weeding		12,902.23	41,856.66	72,171.87
Pest and disease		2,580.45	10,464.16	18,042.97
Manuring		303,202.45	983,631.40	1,696,039.05
Pruning and sanitation		8,967.05	29,090.38	52,324.61
Road and bridges		12,902.23	41,856.66	72,171.87
Drainage and irrigation		7,289.76	42,693.79	73,615.31
Soil and foliar analysis		580.60	1,883.55	3,247.73
Survey,fences and boundaries		130.25	419.24	721.72
Harvesting And Collection		116,120.09	376,709.90	649,546.87
Management and supervison		19,353.35	62,784.98	108,257.81
Labour and amenities		12,902.23	60,692.15	104,649.22
Manufacture /Processing Cost		70,962.27	230,211.60	396,945.31
Despatch/Transport CPO & Cess		64,511.16	209,283.28	360,859.37
Total		**645,305.12**	**2,092,926.94**	**3,608,753.72**
Opportunity cost				
20% of total variable cost	**RM**	**129,061.02**	**418,585.39**	**721,750.74**
Total variable cost	**RM**	**774,366.14**	**2,511,512.33**	**4,330,504.46**
Gross margin	**RM**	2,580,215.86	5,630,775.67	7,510,356.88
Benefit Cost Ratio		**4.33**	**3.24**	**2.73**

Conclusion

The using of MTG and MTWG with SmartCUT has dual effects, resulting in the lower cost of production for the plantation and the increased income for the harvesters. On small estates and organized smallholders, it is economically competitive and will tend to increase productivity by making harvesting easier and faster. Due to the serious labour shortage in plantation, a producer should seek for an opportunity by taking advantage and fully utilizing

the available harvesting technology in order to improve the efficiency of harvesting application in the field. It is recommended that the Sabah estate should increase the areas for MTG to overcome the labour shortage.

Corresponding Author
Syahrizan Syahlan, Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA (Melaka) Malaysia. Email: syahrizan@rocketmail.com

References

Abd, R. S. (2009). Technologies for Oil Palm Harvesting, Evacuation, and Loose Fruit Collection, Malaysian Palm Oil Board

Ahmad, H., Ariffin, D., and Jalani, S. (1995). Mechanical in-field collection of fresh fruit bunch. "The Way Foward" PORIM. Kuala Lumpur.

Boardman, A. A., Greenberg, D. H., Vining, A. R., and Weimer, D. L. (2006) Cost – Benefit Analysis: Concepts and Practice . (3rd ed.) Upper Saddle River, N.J.: Prentice Hall

Darius, E. P. and Yahya, A. (2013). Mechanized System for infield Oil Palm Fresh Fruit Bunch Collection- transportation. *Agricultural Mechanization in Asia, Africa and Latin America vol.44 No 2.*

Desa, A. (1996). The Design and Development of an Oil Palm Fresh Fruit Bunch Cutting Device. *Proceedings of the Inernational Conference on Agricultural Machinery Engineering* 12 – 15 November. Seoul, KOREA.

Donald, E. B. (1974), FMO: Fundamentals of Machine Operation: Tractors John Deere Service Publications

Edward, W. (2009). Farm machinery cost management. Retrieved April 28, 2014 from http://www.extension.iastate.edu/agdm/crops/html/a3-29.html

Farahida, Z., Syahrizan, S., and Muhammad Aliuddin, B. (2017). Fresh fruit bunch quality and oil losses in milling processes as factors that affect the extraction rate of palm oil. *International Journal of Agriculture, Forestry and Plantation,* Vol. 5 (June) p. 99 - 103

Jayaselan, H.A.J and Desa, A. (2011). Development of a mechanization selection system for oil palm plantation with alternative planting patterns. *Journal of oil palm research vol 23 april 2011 p. 990-998.*

Jelani, A.R., Maji M.N, Shuib A.R, Mohamed A.T, Din A.K, 2010. An Improved Oil Palm Motorized Cutter - CANTAS Mark II. MPOB information series

Malek. M. (1993). Economic of mechanization in oil palm cultivation in Malaysia. *Paper presented to the Technical Advisory Committee. 6-7 December, PORIM.* Kuala Lumpur.

Ming, K.K., Chandramohan, D. (2002). Malaysian Palm Oil Industry at Crossroads and its Future Direction. [Journal]. *Oil Palm Industry Economic Journal,* 2(2).

Yee, N. G., Tamrin, S.B.M., Ippei, M. and Zailina, H. (2013). Ergonomics Observation: Harvesting Tasks at Oil Palm Plantation. *J Occup. Health*. 55, 405–414.

Razak, J., Desa, A., Ahmad, H., and Johari, J. (1998). Force and Energy Requirements for Cutting Oil Palm Frond. *Journal of Oil Palm Research*. Volume 10, Number 2, 10 – 24.

Wan Ishak, W. I. (2010). Research And Development Of Oil Palm Harvester Robot At Universiti Putra Malaysia. *International Journal of Engineering and Technology,* Vol. 7, No.2, pp. 87-94

Yusof, B. (2007). Palm oil production through sustainable plantations*. Eur. J. Lipid Sci. Technol.* 109,289–295.