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Fostering Sustainable Settlers' Income at Felda Bukit Tajau: Harnessing Industry 4.0 in Oil Palm Plantation

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Abstract

Malaysian agricultural sectors especially in palm oil industry have encountered massive challenges due to recent global climate and Covid-19 pandemic. This sector has been facing raging phases yet still managed to be a significant sector in Malaysia. FELDA recognized as the front-runner in Malaysia's with its unique method in managing its own plantation and settlers' plantation. Meanwhile, Felda Plantation Management Sdn Bhd (FPMSB) is the wholly owned subsidiary of FELDA acting as the plantation operator has served significantly in ensuring the management, the income and yield of oil palm plantations are at the highest quality. This study highlight varies difficulty occurred such as climate change, labour shortage, border closure, inadequate raw materials, low yield, reschedule or delay delivery of agricultural inputs, these has caused inconsistency in settler's monthly income deduction (cost) hence leads to inconsistency in the FELDA and settler's income. This paper emphasizes the need of incorporating technology as part of robust strategies in harnessing Industry 4.0 in oil palm plantation through implementation of mechanization and Global Positioning System (GPS) Tracking in harvesting operation in Felda Bukit Tajau and indirectly promotes settlers' income sustainability. For future research, it is advised to strengthen by expanding both quantitative and qualitative studies to have precise and clear views before providing alternatives to help enhance plantation management, establishing sustainable income for all stakeholders. These steps are crucial to promote holistic advancement in the efficacy of harnessing Industry 4.0 in oil palm plantation through implementation of mechanization and GPS Tracking in harvesting operation.

Keywords: FELDA, Palm Oil, Fresh Fruits Bunch, Global Positioning System, Industry 4.0,Sustainability

Introduction

Malaysia has notably benefited greatly from the palm oil business and known as among largest palm oil producer and exporter after Indonesia. The agriculture sector in Malaysia,

specifically palm oil, provides roughly 37.9% of the country's GDP (GDP DOSM, 2019). Mohamad et al (2014) and Wade (2020), reported that Malaysia's global agricultural trade reached $59.4 billion in 2021, with exports of $36.1 billion and imports of $23.3 billion despite facing enormous obstacles. Undeniably, palm oil has been called "a miracle ingredient in everything" (Tullis 2019). Hence, Malaysia economic transformation program through agriculture sector, oil palm business related was able to play a vital role in the development of modern Malaysia economy. This sector continues to prove itself to be dynamic and sustainable in terms of contribution to the Gross Domestic Products (GDP), employment and export earnings, as well as providing higher living standards for the rural population (Barau & Said, 2016).

FELDA and settlers owned large agricultural lands and has appointed Felda Plantation Management Sdn. Bhd. (FPMSB) as plantation operator to manage it. The appointment was aimed to ensure the plantations management at the best and highest quality and directly improve the yield and then raise FELDA and settlers' monthly income. This initiative is also as part to reduce the income gap between urban and rural areas (FELDA,2016). To improve productivity and competitiveness of agriculture sector, farmers are encouraged to fully utilize modern technologies in the plantation. At present, there are currently a significant number of FELDA households with low income (Government of Malaysia, 2019). This could be due to a combination of unproductive plantation activities, commodity market volatility, a lack of reform strategies, high debt, and a variety of other issues related to relying on labour-intensive methods of managing plantations, which have resulted in inconsistency in the settler's monthly income deduction, resulting in inconsistency in the FELDA and settler's income.

Furthermore, the increased cost of plantation also affected by various factor such as higher fertilizer cost, pesticides cost and insufficient plantation workers (Nikkei Market Report, 2022). This situation has caused FPMSB battling to cope to an acute workforce shortage caused by the Covid-19 pandemic, as well as significantly increased recruitment expenses, as they respond to charges of forced labour. Besides that, Malaysia's Government decision to raise minimum wages beginning in January 2022 has also increased production costs for palm oil operators including FPMSB, who normally rely on labour-intensive methods to harvest fresh fruit bunches.

In this context, adoption of industrial revolution 4.0 (IR4.0) technology by FELDA and settlers in the oil palm plantation could offer many benefits, especially in minimizing the production costs and improving the quality of products (Mat Lazim, Mat Nawi N, Masroon MH, et al., 2020). As for Settlers of Felda Bukit Tajau, like those in other FELDA schemes, are individuals or families who were resettled as part of the government's initiative to develop rural areas and reduce poverty.

They primarily earn a living through agricultural activities, specifically by cultivating and managing oil palm plantations. Over the years, some settlers may be getting older, and some also engage in additional activities like shop keeping or take up employment outside the settlement to supplement their income. This diversified approach to income generation reflects the evolving economic landscape and opportunities in rural Malaysia. For those who stay in the scheme, their plantation being managed by FELDA through its plantation arm and

its wholly owned subsidiary namely Felda Plantation Management Sdn Bhd (FPMSB). As a managing agent, FPMSB responsible to manage the plantation as main source of income for the settlers. To provide a sustainable income for them, FPMSB must evolve to engage in technology IR 4.0 in the plantation.

Literature Review

The Need of Using Technology in Oil Palm Industry

As most businesses commercialise new ideas and technology through their revenue model. Income model innovation with technology is widely identified as a critical component for achieving higher social and environmental sustainability in the industrial system, including the oil palm industry and agriculture sector (e.g., Lüdeke-Freund, 2010). The palm oil industry has expanded, most the industry players use a wide range of technology, including planting supplies, field machinery, fertilizers, and industrial equipment. Technology is the consequence of man's creativity, allowing and simplifying his actions (SENAWI, 2019; A, 2018). Scholars agree technology cannot be separated from everyday life as it plays a major influence into the daily routine. Technology comprises a wide range of features, including machines, innovations, and all the modifications (et al., 2022; A, 2018). Currently, oil Palm Plantation managers and plantation operators are now permitting modernity through technology advancement (Abdul-Hamid et al., 2021). Not only that, the industry players also are eagerly adopting technologies as part of reshaping the plantation operation by promoting and incorporating the idea of a digital plantation.

Mechanization

Economic development and production of palm oil yield involved by multi-phases series of activities which influenced greatly by the provision infrastructure and transport or mechanization services (et al., 2022). Although, improvement of the productivity and quality of oil palm in operation is one of the toughest challenges for the oil palm operators. Yet, by incorporating technology into oil palm operating it will significantly provide betterment in term of quality, productivity, and incomes for the settlers. The palm oil business is critical to the country's economy and has experienced continuous growth. Its progress has benefited from research input over the years, and the results of such research have been enjoyed by industrial players through technology transfer. Various scholars defined mechanization as the use of mechanization tools/ machinery to replace humans or animals' energy implementation of plantation operations (Abdul-Hamid et al., 2021; Zahid, 2018). In this research, Felda Bukit Tajau was introduced to mechanization for harvesting activities to improve efficiency, cost reduction, as to promote stability income for settlers.

Harvesting through Mechanization

Harvesting is an important process in oil palm plantation especially the main objective is to get fresh fruit bunches (FFB) with excellent oil content and quality and can get the maximum profit. The worker need mechanization to assist in collection of oil palm bunches (Zahid, 2018). Therefore, through mechanization the need of extensive manual labour could be reduce indirectly lower labour costs. Over time the investment in mechanization should lead to overall cost savings in the harvesting process. On top of that, mechanization harvesting could lead to more consistent and potentially better crop process. Improved harvesting and timeliness in harvesting could results in higher yields.

In addition, setting up mechanization could lead to a significant decrease in the time required to harvest crops. The volume of crops harvested in each period soul increase due to improved efficiency through mechanization. Mechanization may reduce the need for extensive manual labour costs. As well as labour costs, the mechanization may reduce the need for extensive manual labour, leading to lower labour costs. A common fallacy is that mechanization is all about reducing labour dependency (Abd. Rahim. Shuib, 2010). Eventually, the investment in mechanization should lead to overall cost savings in the harvesting process.

Additionally, mechanized harvesting can result in more consistent and potentially higher crop quality where the productivity is highly dependent on cultivation level, plantation geography, and operator skills. (Jelani, 2008). As oil palms continue to mature, their yield increases and they generally reach peak production between their 7th to 18th years of growth (Muhamad, 2018). Hence, by using mechanization, it may improve efficiency as well as timeliness in harvesting could result in higher yields.

Global Positioning System (GPS) Tracker

Nowadays, the combination of GPS and GIS turn out to be as valuable tool in managing the plantation operation. GPS and GIS serve as data storage where all the data collected can be handled, manipulated, analysed, and interpreted with more flexibility. These technologies were welcomed by plantation management, as a dependable basis on which to make decisions as Methods are practical, straightforward, and cost-effective, appropriate, feasible and effectively utilized in the plantation operation (Nordiana et al., 2008). Global Positioning System or famously known as GPS, is a tracker device used to monitor and track the whereabouts of a person or a certain object. It can install the device in your vehicle to prevent any risk or crime. The location and whereabouts can easily be known through a mobile phone or laptop that connected to this GPS device. By installing GPS tracking technology into harvesting machinery is to enhance operational efficiency, reduce costs, and improve yield management. GPS tracking capable of collect and analyse data regarding operational efficiency, resource utilization, as well as enables precise navigation and operation of mechanized equipment, leading to more efficient harvesting. It can improve management of resources like fuel, and labour due to precise tracking and deployment. Consequently, management system technology such as GPS provides an important tool for the management of plantations (Mohamad Khairil Mohamad Razi, 2011).

Enhanced Operational Efficiency and Cost Reduction

GPS tracking enables precise navigation and operation of mechanized equipment, leading to more efficient harvesting. Increasing machine productivity can be achieved through optimizing effective field capacity (Hanna, 2001). The GPS can have optimized resource utilization and improved management of resources like fuel, machinery, and labour due to precise tracking and deployment. By using the GPS technology, it eventually increases operational field efficiency of farm machinery as well as improve governmental farm machinery system. Precision agriculture mapping enables farmers to optimize resource utilization by applying fertilizers, pesticides, and water precisely where they are needed. These can potentially reduce waste, save costs, and minimizes environmental impact. The purpose of using GPS tracker is to link farm machinery with operating station electronically by GPS tracking system. By doing so, it leads to decrease labour hours, fuel consumption, lubrication, and spare part cost for machinery. Plantation machinery cost is an important

factor which reaches about 20% to 30% of total agriculture costs (Benchmark, 2009). Using a GPS tracking system is to determine machine tracks in the field, field size, shape, topography, row length, and row end turning space which contribute on decrease actual time consumption. Beyond that, it can reduce operational costs and efficiency gains from GPS tracking can lead to a decrease in fuel consumption and other operational expenses. Also, improved budget allocation is one of major thing using GPS tracking system. The better data from GPS tracking aids in more accurate budgeting and resource allocation.

Moreover, installation GPS tracker into plantation machinery/mechanization possibly optimize the yields performance. GPS technology allows for detailed accurate mapping of yields, helping identify problems and areas for improvement. The ability to pinpoint areas demanding specific attention, such as fertilization or pest control, based on GPS data will enable to identify which areas with high or low productivity within their fields. Furthermore, GPS tracking enables real-time data collection on crop health, growth stages, and yield potential. This can detect problems early on, allowing for timely interventions.

Sustainable Agribusiness

Porter and Kramer (2011), indicated that sustainable business strategies established and implemented within the context of a sustainable organisational culture assist organisations in connecting their success to the well-being of the communities they serve (Natalie, 2019). Paying attention to environmental, social, and governance (ESG) concerns is becoming more important for the sustainability of all firms across all industries (Schaltegger et al., 2012). Simply expressed, sustainability is a business strategy for producing long-term value by considering how an organisation works in its ecological, social, and economic contexts. The concept behind sustainability is that establishing such measures promotes firm lifespan. Companies are recognising the need to act on sustainability as corporate responsibility requirements rise and transparency becomes more widespread.

Discussion

The literature contains multiple topics that contribute to the essential principles of harnessing industry 4.0 in oil palm plantation. It clearly shows that there is a need for intervention of technology into oil palm plantation operation to be applied which is sustainable, profitable, and independent as part of mechanism to increase and improve the profit and performance especially for those business related to the oil palm industry and agriculture sector. Hence, through this research, to improve productivities and competitiveness of agriculture sector, farmers or the settlers are encouraged to fully utilize modern technologies in the plantation.

In this context, adoption of industrial revolution 4.0 (IR4.0) technology by FELDA and settlers in the oil palm plantation could offer many benefits, especially in minimizing the production costs and improving the quality of products. Not only that, by adopting technology through combination mechanization, GPS and GIS provide value added to the current system of managing plantation operation as it promotes sustainability in the long run while offer higher productivity and quality.

Nonetheless, despite the clear benefits, the transition to mechanization and GPS technology also faced initial resistance. Convincing settlers about the long-term benefits of these technologies required extensive discussions and demonstrations. This highlights the

importance of stakeholder engagement and the need for clear communication strategies to overcome resistance to change. Additionally, to ensure the successfulness, the transition to mechanization and GPS technology require comprehensive training programs for both workers and settlers which demands continuous effort. Besides, ensuring proficiency in operating new technologies and maintaining equipment posed challenges, emphasizing the need for ongoing support and education.

Conclusion and Future Studies

Harnessing industrial revolution 4.0 (IR4.0) technology by FELDA and settlers in the oil palm plantation could offer many benefits, especially in minimizing the production costs and improving the quality of products. As for Settlers of Felda Bukit Tajau, like those in other FELDA schemes, are individuals or families who were resettled as part of the government's initiative to develop rural areas and reduce poverty. Nevertheless, beyond the technological aspects, the future studies underscored the need for a holistic approach that considers economic, social, and environmental dimensions. This includes addressing the economic viability of new technologies, their social acceptance, and their impact on sustainable agricultural practices.

In addition, it is advised to strengthen by expanding both quantitative and qualitative studies to have precise and clear views before providing alternatives to help enhance plantation management, establishing sustainable income for all stakeholders. These steps are crucial to promote holistic advancement in the efficacy of harnessing Industry 4.0 in oil palm plantation through implementation of mechanization and GPS Tracking in harvesting operation.

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