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AGRICULTURAL MECHANIZATION TECHNOLOGY TOOLS IN PADDY FIELD IN SEKINCHAN SELANGOR

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ABSTRACT

Rapid development of technology has encouraged the use of agricultural mechanization technology in agriculture sector. The effective adoption of mechanization technology is important to improve management capacity and productivity among farmers. Thus, the purpose of this study is to investigate the usage of mechanization technology tool among farmers, explore the acceptance of mechanization technology and investigate influencing factors and risk of using mechanization technology tools among farmers in paddy industry. In this qualitative research, semi-structured interview was conduct with 3 farmers in Sekinchan. The finding of this study show the high usage of mechanization technology tools in paddy cultivation process. The finding also found that factor influence the use of mechanization technology which including factor from high cost of maintenance and modification, land consolidation system, advanced services, facility and infrastructure and human capital factor. The results show that an effective use of mechanization technology by farmers in Sekinchan. Government should actively give an effort to strengthen the functioning of mechanization technology to help achieving the goal of domestic rice supply.

Keyword: Agricultural, paddy industry, mechanization technology, qualitative research, technology acceptance

INTRODUCTION

Agricultural mechanization is an important tool for sustainable development. Farmers can improve in various aspects such as lowering production costs, increasing labor, and enhancing land productivity when mechanization technology is implemented effectively in the processing product rice (Rahmat et al., 2019). With the rapid development of agricultural machinery, agricultural operations are relatively easy and convenient. According to Kavya (2019), the transition from traditional methods to modern technological management has allowed many people to see that the prospects for agricultural development are still great. The government has designated the agricultural sector as the main source in the national economy and income. The government is making efforts to develop the agricultural sector through the implementation of the 'Dasar Pertanian Negara' such as the land consolidation farmers, 'Agropolitan', Permanent Food Production Parks (TKPM), etc (Abdullah et al., 2013). Thus, it can show that the development of the agricultural sector is also very important to our country.

While favorable growth in rice output, paddy production has numerous problems connected to economic, social, technological acceptance, and compliance to field infrastructure, and some others. In these remarks demonstrate the technology aspects cannot be avoided, and this is true in paddy-growing areas as well. Also, the younger generation are reluctant to join the agricultural sector (Abdullah et al., 2013) has led the shortage of workers in agriculture sector especially in Malaysia. Malaysia also lacks comparative advantage in paddy production compared with neighboring countries like Thailand and Vietnam, which means Malaysia had to rely on imported rice from other country (Munusamy et al., 2017). It ability to find that domestic paddy production in Malaysia not enough to serve the rice consumption year by year. According to Che Omar et al. (2019), the usage of modified or inappropriate machinery has resulted in yield loss as well as physical damage to farm roads in paddy fields. This can result in long-term damage to paddy fields, road damage, and increased post-harvest losses. Lacking of training among farmers also another problem that cause impact to usage of mechanization technology tool in paddy industry (Ghopa, 2021). Therefore, this research objective is investigating the usage of mechanization technology tool among farmers, explore the acceptance of mechanization technology and investigate influencing factors and risk of using mechanization technology tools among farmers in paddy industry.

LITERATURE REVIEW

Malaysia is a country that is rich in natural resources which makes it easier to carry out various agricultural activities. The agricultural sector has been the main generator of the country's economy since governed by the British (Che Omar et al., 2019). The government's commitment to developing the country's agricultural sector has started since Malaysia's independence. Otherwise, commitment is beginning through the existence of various policies such as "Dasar Pertanian Negara" from first to third, infrastructure construction as well as the establishment of agencies responsible (Ahmad et al., 2014). Nowadays, agricultural sector was being listed as on the 12 National Key Economic Areas that been identified as potential contributed directly to the country economic growth (Ahmad et al., 2014). Furthermore, the paddy agricultural sector is significantly important and cannot be neglected. Paddy cultivation is an important food agricultural sector for the country because rice is a staple food for the people in Malaysia and nearly 3.5 billion people worldwide (Ahmad et al.,

2014). Besides this, rice is also a basic ingredient in the production process of other food products such as noodles, baby food, and other health food product in line with changes in consumer diet.

Historically, Malaysia's paddy production is increasing year by year. As mentioned by Che Omar et al., (2019), Malaysia has certified 1.2 million hectares of paddy field occupied area across the country. Therefore, agricultural mechanization has been playing a significant role in enhancing the agricultural production and improvement of farmer's productivity (Hagazy et al., 2020). The term mechanization can be defined in a variety of ways, including the use of machines instead of humans or labor, energy, or a machine that can replace all of a craftsperson's handwork. It is virtually always used to control mechanized processes by a computer. Farmers have reaped several benefits from the technological transformation of agriculture (George, 2021), such as time management, saving labor costs (Udimal et al., 2017), reducing health hazards, and reducing human resources (Bako et al., 2018). Although agricultural mechanization can bring many benefits, it is not immune to the risks of use (George, 2021) which include the high costs of mechanization technology tools (Pradhan & Jayasuriya, 2016), the risk of layoffs workers (LocalBuyx, 2021), the disintegration of the soil structure and environmental problems (Killebrew & Wolff, 2010).

Malaysia is working hard to boost its productivity advantage through technological and innovative advancements. Malaysia Agriculture Research and Development Institute (MARDI) is one of the government agencies established to help the agricultural sector grow and advance. The agencies described their performance targets as improving cutting-edge technologies for rapid growth in the agriculture industry. MARDI not only provides technical assistance but also plays a vital role in technology transfer (TOT). The agricultural sector gained a bigger boost as a result of the Ninth Malaysia Plan (2006-2010), which placed an emphasis on "New Agricultural" (Nordin, 2014). Large-scale commercial farming, the application of advanced technologies, and the advancement of biotechnologies were among the new major areas, all of which prompted to reach out to farmers.

METHODOLOGY

The research method is to collect and analyze data which that it is indispensable to run any project. In this study, the qualitative method has been applied to conduct the research. According to Khan (2014), qualitative research is an inquiry strategy that is based on a unique methodological tradition. Supported by Goundar (2019), it brought the advantage to the researcher's ability to change the setting or the variable and quickly adjust questions if useful insights are not working. In this study, the researcher has interviewed respondents who are selected, paddy farmers. The semi-structured interview session has been conducted using 2 methods because there is a limitation during the pandemic Covid-19 situation. The researcher has considered using the voice call method and face to face when it situation is allowed. Before conducting an interview session, the researcher has prepared the interview protocol to guides and help the interview session keep on the right track. Analyses data has been carried out once the data is gathered from the respondents. The researcher has transcript the voice recording and notes into the word form. All are done manually without using any application software. This method is good and relevant to use because of respondents for this study less than five. However, for studies with a large number of respondents, it is recommended to use any suitable software to facilitate the data analysis process.

DATA ANALYSIS

This study was conducted at Kampung Kian Sit in Sekinchan. There were 3 respondents who were involved in this study. All respondents are farmers over 55 years old. They are two male rice farmers and a female rice farmer. All respondents had experienced more than 10 years as rice farmers. The respondents come from two categories which are non-clusters farmers and clusters farmers. The concept of clusters farmers is the farmers' rice farms are consolidated and centrally managed. On the contrary, non-cluster farmers are ownership by themselves.

Acceptance of Mechanization Technology

The finding of the study shows that all respondents used agricultural mechanization technology during working in the paddy field. Thus, the existence of mechanization technology tools has provided well perform to manage their paddy cultivation operation. However, the respondent also explained still have some problems with using this kind of technology. The positive effects of the usage of mechanization technology for rice farmers are in terms of productivity, time, labor, and the environment. Firstly, the use of mechanized technology can increase productivity and influence paddy yield directly. The application of agricultural mechanization technology has well-perform in shorter time consuming compared to the traditional paddy cultivation way and increase the harvest cycle season from once to twice a year. Thus, it provides farmers to get the opportunity to grow rice fields by one more round. In addition, the use of mechanization technology can effectively make up for the shortcomings of insufficient labor or workers. It can overcome the shortage of workers due to the young generation being uninterested in sector agriculture. The development of agriculture in terms of technology also brings opportunities to reduce air pollution. Basically, rice straw will often be burned and it has led to air pollution problems. However, with using mechanization technology, it is able to collect the straw without burning it. The use of machines can provide benefits of rice straw for livestock as food for animals such as cows and goats.

Apart from this, respondents also stated some problem in the use of mechanization technology which is soil structure condition and health hazard problem. The respondent has expressed the risk of injuries by using mechanization technology among farmers is high. This problem led to the risk of work safety in the occupation of farmers. Moreover, paddy farmers explain that structural soils that often experience compression will reduce the permeability in paddy soils. This will affect the output of rice.

The farmers in Sekinchan have long been using agricultural machinery. The use of technological mechanization is quite important to complete certain works efficiently. This can analyze the existence of mechanization technology tools that have provided well performance to manage their paddy cultivation operation. Although the negative impact has increased the risk of using the agricultural mechanization technology tools the overall reflection in using this kind of technology is a more positive impression. Thus, the acceptance level of using the agricultural mechanization technology among farmers has indeed a more positive impact.

Usage of Mechanization Technology

Basically, the agricultural activities of rice farmers basically start with land preparation. Rice farmers need to clean up the hay before turning the soil. After that, rice farmers will start plowing activities. The site preparation process requires the use of tractors and additional equipment such as rotary tillage machine, box leveler machine, and slasher. After finishing the plowing operation, the rice farmers will start the planting operation. Rice farmers will use rice seedling planting machines when planting. Next, farmers need to ensure that paddy fertilization is carried out systematically after completing the planting seeding task. Respondent stated that the rate of fertilization is dependent on the nursery used. Therefore, the fertilization rate for each farmer is different because the nurseries used are also not the same.

In the crop care process, farmers always use a knapsack power sprayer. In recent years, Sekinchan's rice farming has gradually begun to use drones irrigation machines for irrigation operations. Once the rice is ripe, farmers will harvest the ripe rice. In the harvesting process, farmers in Sekinchan always use the harvester combine machine. Next, farmers need to dispose of straw waste. There are two methods for farmers to dispose of straw waste, one by burning it, and the other by turning the collected straw into rolls and sending it to the livestock industry as feed for cattle and sheep. The second technique for processing straw requires a hay baler rolling machine to complete this task. Based on the findings of the study, farmers stated from start to finish, the use of technological mechanization is quite important to complete certain works effectively and efficiently. Table 1 shows that the paddy farming process was applied machinery in each rice cultivation process. Farmers in Sekinchan show a considerable frequency of using agricultural mechanization technology. Thus, it displays the level of use of technological mechanization is very high.

Table 1

Mechanization technology tool utilized in each step of rice cultivation treatment

Rice Cultivation Treatment	Applied Machinery
Land preparation	Tractor with Slasher
	Tractor with Rotary Tillage Machine
	Tractor with Box Leveller Machine
Planting	Rice Seedling Planting Machine
Crop Care (Fertilization, Pests and Diseases Control)	Knapsack Power Sprayer
	Drone Irrigating Machine
Land Irrigation	Tractor with Water Pump Machine
Harvesting	Harvester Combine Machine
Straw Management	Tractor with Hay Baler Rolling Machine

Factor Influenced the Use of Mechanization Technology

Paddy farmers in Sekinchan have to consider the income to bear the cost of using any related mechanization technology. The expenditure in the maintenance and modification cost is very

high and makes the farmers uninteresting to possess mechanization technology tools. Also, farmers' land consolidation system has indirectly affected among farmers the opportunities to use agricultural machinery. Paddy farmers under the project of the group of farmers have a high opportunity to use mechanized technology tools because can manage activities in a concentrated manner.

However, the existence of advanced services related to technology mechanization can increase the willingness to use mechanization technology tools among rice farmers. The services for using agricultural technology tools, including machinery rental and maintenance and modification services, have been fully developed in the Sekinchan. Furthermore, the planning of infrastructure including roads and irrigation systems also affects the use of agricultural technology tools by local farmers. Complete facilities and infrastructure can increase satisfaction among paddy farmers as it facilitates paddy farmers to use mechanization technology. Finally, the human capital in the factor considered by paddy farmers was the aging farmer population and the number of family members. Older farmers have more relevant knowledge and experience, they can able to more effectively evaluate and use the appropriate agricultural technology to benefit them than young persons who have recently entered the field. While a large number of family members are more encouraging to have mechanized technology tools compared to a small number of family members due to having more sufficient sources of funds.

Thus, overall, farmers' use of the agricultural mechanization technology tools has influenced by the cost, land consolidation system, advanced services, facility and infrastructure, and human capital factor. In conclusion, the degree of development in agriculture has provided farmers easier and more convenient by using this kind of technology. Hence, the performance of local development is crucial for sector agriculture, especially in the paddy industry.

CONCLUSION

In summary, the finding of the study has expressed a more positive impression of acceptance of mechanization technology among farmers, especially in Sekinchan Selangor. Paddy farmers show high usage of agricultural mechanization technology. Moreover, the researcher has also raised the factor influence of using the mechanization technology tool. The impact from external factors is crucial for the use of mechanization technology among farmers in sector agriculture, especially the paddy industry. This study gives positive implications to the farmers where it can increase farmers' awareness of the use of agricultural technology. In addition, government encouragement and assistance are highly expected to further strengthen the increasing use of mechanization among farmers. This is because agricultural mechanization technology is an important tool in the paddy industry. A highly supporting role from government and related agencies can strengthen the functioning of mechanization technology to help achieve the goal of domestic rice supply.

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REFERENCES

- Abdullah, F. A., & Samah, B. A. (2013). Factors Impinging Farmers' Use of Agriculture Technology. *Asian Social Science*, 9(3). <https://doi.org/10.5539/ass.v9n3p120>
- Ahmad, N. A., Hamid, K. A., & Othman, Z. (2014). Potensi Penerima Guna Inovasi Pertanian di Kalangan Petani. *PROSIDING PERKEM Ke-9*, 9(2014), 311–320.
- Bako, S., Bitrus, B., & Jacob, D. N. (2018). Agricultural Mechanization: A Tool for Diversifying Nigerian Economy. *Naaf 2018*, 44–49. <https://www.researchgate.net/publication/337448770>
- Che Omar, S., Shaharudin, A., & Tumin, S. A. (2019). The Status of the Paddy and Rice Industry in Malaysia. *Khazanah Research Institute* (pp. 1–28). Retrieved from http://www.krinstitute.org/assets/contentMS/img/template/editor/20190409_RiceReport_FullReport_Final.pdf
- George, F. (2021, October). Advantages and disadvantages of farm mechanization. Retrieved from Fabioclass: <https://fabioclass.com/advantages-and-disadvantages-of-mechanization/>
- Ghopa, W. A. (2021, August 30). Statistik Kemiskinan Pekerjaan Melibatkan Jentera Berat di Malaysia. *Jurnal Kejuruteraan*, 33(3), 773-783. doi:[https://doi.org/10.17576/jkukm-2021-33\(3\)-35](https://doi.org/10.17576/jkukm-2021-33(3)-35)
- Goundar, S. (2019, May 11). Chapter 3-Research Methodology and Reserch Method. Retrieved from ResearchGate: https://www.researchgate.net/publication/333015026_Chapter_3_-_Research_Methodology_and_Research_Method
- Kavya R. (2019). A Study on Farmers Perception and Attitude towards Modern Farm Mechanization in Paddy Cultivation. *International Journal of Innovations in Engineering and Technology (IJJET)*, 14(3), 6-10.
- Killebrew, K., & Wolff, H. (2010, March). Environmental Impacts of Agricultural Technologies (No. 65). Bill & Melinda Gates Foundation. <https://econ.washington.edu/sites/econ/files/old-site-uploads/2014/06/2010-Environmental-Impacts-of-Ag-Technologies.pdf>
- LocalBuyx. (2021). Farm Mechanization: Meaning, Problems, Advantages and Disadvantages. Retrieved from LocalBuyx: <https://localbuyx.com/blog/farm-mechanization-meaning-problems-advantages-and-disadvantages/>
- Nordin, S. M., Noor, S. M., & Saad, M. S. bin M. (2014). Innovation Diffusion of New Technologies in the Malaysian Paddy Fertilizer Industry. *Procedia - Social and Behavioral Sciences*, 109, 768–778. <https://doi.org/10.1016/j.sbspro.2013.12.542>
- Pradhan, A., & Jayasuriya, H. P. W. (2016). Status and Potentials of Agricultural Mechanization in Sunsari District, Nepal. *Applied Engineering in Agriculture*, 32(6), 759–768. <https://doi.org/10.13031/aea.32.10763>
- Rahmat, S. R., Firdaus, R. B. R., Mohamad Shaharudin, S., Yee Ling, L., & Yildiz, F. (2019). Leading key players and support system in Malaysian paddy production chain. *Cogent Food & Agriculture*, 5(1), 1708682. <https://doi.org/10.1080/23311932.2019.1708682>
- R. Hagazy & M. Okasha. (2020). Current Perspective of Mechanization Level and its Supporting Policies in Asia. *Research gate*. https://www.researchgate.net/publication/343514085_Current_Perspective_of_Mechanization_Level_and_Its_Supporting_Policies_in_Asia
- S. Khan (2014). Qualitative Research Method-Phenomenology. *Journal of Asian Social Science*, 10(21), 298-310. DOI: 10.5539/ass.v10n21p298
- S. Munusamy, Y. Rajamoorthy & K. Rahim. (2017). Estimation of future paddy production and sustainable land allocation in Malaysia: A polynomial approach. *Pertanika Journal of Social Sciences and Humanities*, 25(4), 1616-1624.
- Udimal, T. B. (2017). Factors Influencing the Agricultural Technology Adoption: The Case of Improved Rice Varieties (Nerica) in the Northern Region, Ghana. *Journal of Economics and Sustainable Development*, 8, 137-148.