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The differences of farm financial performance in innovation adoption in beef cattle farming: A study in Peninsular Malaysia

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Abstract

Beef cattle farming has become a vital sub-sector in the agriculture industry in supplying protein for the populations. The self-sufficiency ratio (SSR) of beef is not encouraging, and the import value is kept increasing for many years. Meanwhile, innovation adoption in beef cattle farming is believed to improve beef production if used correctly. However, inefficient financial management has led to improper farming practices. This study aims to identify the farm financial difference in adopting such innovations. This study involves 233 beef cattle farmers from Johor, Selangor, Kedah and Kelantan using stratified and simple random sampling. It is found that integration and silage show more significant profit changes with more than 60%, while artificial insemination and vaccination show 33% and 42% profit changes, respectively. Hence, regular meetings conducted by the extension agents are essential to ensure that adopting innovation is successful besides good cooperation among all stakeholders, including the farmers, government agencies, farmers' associations and private sectors.

1. INTRODUCTION

Malaysia is a blessed country with a good climate and fertile soil for the agriculture industry. It has contributed to the Malaysian Gross Domestic Product (GDP) and has become the backbone of Malaysian economics since its independence in 1957. Abdullah and Abu Samah (2013) stated that the agriculture industry had been declared the third income generator for the nation in the Ninth Malaysian Plan after the manufacturing and services industry. Several things have been focused on during the Ninth Malaysian Plan, such as commercialising large-scale agriculture, ensuring high quality and value-added agricultural activities and fully utilising biotechnology. This effort had been supported by transforming the agricultural sector into a thriving business through improvements in production. Efforts have been undertaken to develop agricultural entrepreneurs and empower the existing small and medium entrepreneurs. Thus, it will also become a tool in combating poverty and unemployment among the Malaysian population (Abdullah & Abu Samah, 2014).

Beef cattle farming is categorised under the livestock sector and has been at the core of the Malaysian agriculture industry for years (Jamaludin et al., 2014). It supplies protein sources for the nations instead of poultry and fish. Generally, the ruminant sub-sector consists of cows, buffalo, goats, and sheep. However, these sub-sectors were less favourable due to many factors such as breeding problems, expensive ruminant feed and insufficient grazing area (Ariff et al., 2015; Hashim, 2015). The small size of local cattle and goats has raised a problem in the quality of the breed. This situation is due to the low meat production and the inefficiency level in the farm production operation (Hashim, 2015).

The expensive ruminant feed in Malaysia also has led to the declining growth of the ruminant sector. The cost of ruminant feed contributed more than 25% of the total production cost. The expensive animal feed was majority imported from other countries such as Thailand and European countries (Panadi et al., 2018). Besides that, the competition in using grazing areas with other industries such as manufacturing also led to insufficient grazing areas. Hence, some farmers preferred to use their land for more productive agricultural activities such as palm oil, fruits and vegetable cultivation for fast returns.

The researcher introduced several innovations to ease the farming practices, such as integration farming technique, artificial insemination (AI), silage as a feed and

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vaccination. Innovation also does not only rely on technology, such as the integration and feedlot farming techniques (Abdullah et al., 2021). Integration farming involves cattle in a palm oil plantation which can reduce the weeding cost and produce a higher fruit yield due to less competition between the grass and palm oil trees (Md. Said & Man, 2014). Besides, the waste produced at the farm can also be converted into compost, and this method could improve the social status of a cattle farmer by generating more income from the cattle's waste (Abdullah et al., 2021).

On the other hand, technology is understood as the collection of tools such as machinery, modifications and procedures used by humans to ease the farming process and produce more outstanding production (Mohamad Termezai et al., 2017). Assisted reproduction technology, including AI has been introduced to achieve high-quality cattle breed and produce healthy cattle (Basunathe et al., 2010). The AI procedure involves injecting bull semen into the cow uterus using the AI tools by the certified inseminator (Yimer et al., 2015). Unfortunately, not every farmer can afford to employ AI because of certain circumstances, such as poor extension services and low income (Rathod et al., 2017)

Silage use is an alternative feed source and has become crucial among cattle farmers nowadays, especially those in the east coast region of Peninsular Malaysia during the monsoon season. Making silage involves fresh Napier fermentation with an effective microorganism (EM) or molasses for 21 to 28 days before use. Usually, smallholder farmers process the silage manually, while the medium and large enterprise farmers employ a commercial machine to process it. At the same time, the Malaysian Agricultural Research and Development Institute (MARDI) has innovated OTOSIL, a silage processing machine. This machine proves it can reduce 22% of production cost and increase 12% of the quality of silage. Hence, this effort could help more farmers to produce silage for their cattle consumption to overcome the limited sources of forages and uncontrollable feed prices.

Adopting vaccination among ruminant farmers is also considered one of the innovations. Most farmers who afford to vaccinate their animals will do so as it is possible to avoid any unwanted diseases. Based on research by Basunathe et al. (2010) among dairy farmers in Nagpur district of India, 80% of respondents partially and fully adopted vaccination on their ruminants to prevent infectious diseases, ensuring better health and good feeding habits. A sound feeding system is also can be described as an innovation. In Malaysia, forages are a common crop for cattle feed instead of agricultural waste, such as palm kernel expeller, palm oil mill effluent and oil palm frond (Panadi et al., 2018).

Furthermore, adopting good farming practices in rearing beef cattle is fundamental to ensure greater returns and higher productivity. Instead of facing high farming costs, most farms with poor practices are expected as more problematic in earning higher profits. The animal unit returns are crucial in a business as the farm receipts mostly come from beef cattle sales. Even though there is an intervention of government agencies regarding this matter, unfortunately, the uptake and utilisation of innovation are still at a low pace (Abdullah & Sharun, 2018). Smallholder farmers also should have a rational farm size to provide the economical use of land, labour and up-to-date technologies.

It is understood that the innovation in beef cattle farming somehow aims to minimise the cost of production and maximise profit. Proper financial management will improve farm performance and be essential for rural economic development and self-investment in the future (Sazila et al., 2018). All the efforts previously helped farmers have a better livelihood and decreased beef import. However, there are still many challenges to be faced to achieve a higher input of production. This study is to find out the impact of using technology, where it focuses on the impact before and after using the specified technology.

2. METHODOLOGY

This study employed a multi-stage sampling technique involving 233 beef cattle farmers from four respective regions in Peninsular Malaysia. The population of beef cattle farmers is 41,305 in Peninsular Malaysia, and the sampling procedure involves a stratified sampling technique to divide these farmers into four regions, namely southern (Johor), central (Selangor), northern (Kedah) and east-coast (Kelantan). Next, farmers in the respective region are randomly selected using simple random sampling as it is the most appropriate technique for this study, where all respondents had an equal chance to be selected (Sekaran, 2006). The questionnaire was adapted based on established measures and theories, which consist of the socio-demographic profile, innovation adoption, farm management skills, access to information, and farm information, including the financial details such as the costs, price per unit and the units sold. The pilot study was also conducted among 32 beef cattle farmers in Kedah, and only 29 questionnaires were valid. Hence, the Cronbach alpha value measured is 0.897, considered high, and all items were reliable. The descriptive statistics were used to identify farm financial differences before and after adopting such innovations.

3. RESULTS AND DISCUSSION

The socio-demographics of the respondents are shown in Table 1 below. The mean age of the farmer is 48.4 years old, and the mean experience is 13.1 years. The majority of the farmers (61.4%) had secondary educational background where they had completed their *Sijil Pelajaran*

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Malaysia (SPM), while 18% had completed at least primary school. So that those farmers at least can read and do the basic mathematics to get involved in such innovations.

Table 1: Socio-economics profile of the respondents in Peninsular Malaysia

Characteristic	Frequency, n	Percentage, %	Mean
Age			48.4
Experience			13.1
Educational background			
Tertiary	37	15.9	
Secondary	143	61.4	
Primary	42	18.0	
None	11	4.7	

On the other hand, Table 2 demonstrates the profit changes for the integration rearing technique are the highest with 67%, followed by silage as cattle feed with 60.2% profit changes. Vaccination and AI are 42% and 33% profit changes, respectively. The findings clearly show that innovation in practices or technologies does contribute to the farm's production and profitability. For the farming cost, it is noticed that the integration rearing technique has 40.6% cost changes while silage has 40% cost changes, AI had lower total cost changes with 28.6%, and vaccination shows only 6.7% of total cost changes. After adopting such innovations, it is clearly demonstrated that farmers are successfully reducing their cost of farming activity and will improve their quality of life as they have sufficient feed supply for their cattle and an excellent farming technique (Ashley et al., 2018). Hence, the integration of farming technique and silage are two essential innovations for beef cattle farming. As it serves environmental sustainability, the integrated farming system and the innovation of silage have also benefited farmers economically as it is cost-efficient in beef cattle farming (Md. Said & Man, 2014; Raza et al., 2020; Reddy, 2016).

Table 2: The profitability before and after adopting the innovations in beef cattle farming

Variable(s)	Integration		Artificial insemination		Silage		Vaccination	
	Before	After	Before	After	Before	After	Before	After
Median of total cost (TC), RM	5,700	9,600	6,000	8,400	3,600	6,000	6,000	7,200
Δ of TC, RM (%)	3,900 (40.6%)		2,400 (28.6%)		2,400 (40%)		1,200 (16.7%)	
Median of total revenue (TR), RM	26,000	70,000	14,000	19,000	12,500	48,000	12,750	22,500
Δ of TR, RM (%)	44,000 (62.9%)		5,000 (26.3%)		35,500 (74%)		9,750 (43.3%)	
Median of profit, RM	19,200	58,200	6,000	8,950	9,000	22,600	6,500	11,200
Δ of profit, RM (%)	39,000 (67%)		2,950 (33%)		13,600 (60.2%)		4,700 (42%)	

4. CONCLUSION

The innovations in beef cattle farming are essential to increase productivity and fulfilling the population's demand. In order to adopt the innovation, the farmers should have the basic skills and knowledge to make it a success. Hence, the role of extension agents is vital to ensure all the innovations introduced are effectively increase farm performance and reduce the dependency on imported beef. Next, the farmers also need more collaborations with the private sector for a win-win situation in producing feed and beef. This situation will make a unified system in farming activity as it requires cooperation from all stakeholders, including the farmers, government, private sectors, and NGOs. The proper location selection and innovation could enhance farm productivity, reduce feed cost, and ensure environmental sustainability. However, this study had limitations as it does not cover Sabah and Sarawak in the West Malaysia region and will extend the research covering the whole region of Malaysia.

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