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Adoption of Technology in Malaysia's Livestock Industry

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INTRODUCTION

Increase in population, consumer welfare, globalization, industrialization, and technological and ICT development has transformed agriculture into a modern and innovative sector. Kennedy (2000) in his study explains that modernization of agriculture is an evolution of agricultural methods from people hunting and collecting food to a modern farming method such as farms or modern crops with genetically modified crops. In other words, it has been innovated and improved through technology. Other studies stated that modern agriculture refers to new or improved farming technologies such as high yield plant varieties, chemical fertilizers and irrigation techniques (Betz, 2009). The modernization of this sector is particularly important in reducing rural poverty (Betzz, 2009; IFAD, 2006). According to a report by the International Fund for Agriculture Development, changes in agricultural marketing systems and production technologies have provided opportunities for smallholders in developing countries in raising income for farmers and breeders (IFAD, 2006).

The Green Revolution in Asia illustrates that the use of modern technologies or enhanced technologies was to transform the agricultural sector into a field where poverty can be reduced and a part of which is conventional agriculture (Akudugu, Guo and Dadzie, 2012). Modern technology has a positive impact on the growth of agricultural productivity in developing countries (Nin *et al.*, 2003). The development of innovation and technology also can address the problems faced by the agricultural sector such as limited use of land for agricultural activities, low productivity, disease and pest infestation, and lack of labor (Rozhan, 2016). According to Akudugu *et al.* (2012), the country's ability to use agricultural production entirely depends on the innovation of farmers in this sector. However, the capacity of farmers to innovate in their production activities along the value chain of agriculture is relied on the availability of technology.

Even though technology has been identified as one of the important factors in the agricultural development, it seems that the livestock industry in Malaysia does not change much. Statistics show that the production of meat in Malaysia increased between 3-5% a year, lower than that of the increase in annual consumption. As a result, the industry is only able to supply between 28 and 30% of domestic demand. For example, the production of beef

was 49598 MT in 2017, whereas the total consumption was around 200,000 MT. The government imported around 150,402 MT of beef and beef based products from Australia, New Zealand and India as a way to fulfil the demand by domestic consumers. Livestock industry is very important to Malaysia's economy as it provides source of protein for people and generates income for breeders. In general, the livestock industry in Malaysia is not competitive compared to the neighbouring countries such as Thailand, Indonesia and Vietnam. Hence, the government sets new strategies that could transform this industry to become more dynamic and competitive in the future. This paper discusses the current scenario of livestock industry with regard to the application of technology by breeders and the government interventions as new strategy to improve this industry.

Impact of technology towards productivity

The use of modern agricultural technology, policy implementation, research and development (R&D) as well as innovation play an important role in increasing national productivity. Productivity is a stimulant for economic growth, especially in the uncertainty of the global environment (Malaysia Productivity Corporation, 2015). The low level of agricultural technologies adoption among farmers is a factor of low productivity in agriculture (Akudugu *et al.*, 2012). Hence, modern agriculture has become part of the key policies in the Malaysian Eleventh Development Plan (11MP). Among the technologies the use of smart agriculture technology as well as technology and information (ICT) are emphasized in farm management such as wireless sensor networks and smartphone applications. For the dissemination of information on pricing, demand and supply of agricultural products between agencies, expansion officers and farmers are done through media such as mobile phones and websites. ICT technology has brought a revolution of information where time and place was no longer a constraint but it has created a new marketplace paradigm that replaces the traditional system with new functions, structure and technology (Arshad and Shamsudin, 2007). The use of these technologies can increase the efficiency and reduce dependency on manpower. For the fruits and vegetables industry, the extensive use of modern technologies such as rain shelter structures, fertigation systems and farm automation through ICT and mechanization can increase the number of production cycles, ensure efficient use of inputs and improve the quality and quantity of crop yields (11MP). Indirectly, it increases the farmers' income.

A report by the Economic Planning Unit revealed that in general, during the period of 2010-2015 the agriculture sector very much relies on unskilled and semi-skilled workers (Economic Planning Unit, 2015). This is illustrated by the use of technology in this sector that is at a low level. According to Akudugu *et al.* (2012), low agricultural productivity also means low level of technology utilization. Table 1 shows the comparison of agricultural productivity between Malaysia and other high performance countries. In 2013, Malaysia's productivity was at 40th, facing a declined position as compared to 2012. Malaysia Productivity Corporation (MPC) also reported that the capital productivity in agriculture sector grew from -3.3% in 2013 to -2.6% in 2014. However, the growth was still negative which indicates that the agricultural sector uses less modern technology and machinery, especially among smallholders (MPC, 2015). Most sub-sectors are more labor-intensive than capital intensive.

Table 1. Comparison between agricultural productivity in Malaysian and selected countries, 2012-2013

	2012		2013	
	Rank	US $	Rank	US$
United State of America	4	84,104 (25.5%)	5	85,474 (25.4%)
Australia	6	78,866 (28.3%)	6	81,300 (26.7%)
Taiwan	26	28,447 (78.5%)	30	28,447 (76.3%)
Korea	30	25,781 (86.6%)	35	23,389 (92.8%)
Japan	32	24,906 (89.6%)	37	22,896 (94.8%)
Malaysia	**36**	**22,325**	**40**	**21,709**

Source: World Competitiveness Yearbook 2013 and 2014, Productivity Report 2014/2015

In the case of livestock industry, the production of fresh beef is inadequate to meet the people's demand. The major problem is that the beef sub-sector has remained uncommercialized due to low productivity and the private sector has been silent on the beef sub-sector development. Malaysia imported 75-80% of its beef requirement in order to meet the domestic demand. The same situation happened to the milk industry. The local production of milk is only able to supply less than 10% of the domestic demand. This is due to low productivity and resulted by the low adoption of technology. For example, the production of milk in Malaysia is about 10-15 litre per cow per day, as compared to 40-50 litre in the developed countries.

Taken into consideration of this situation, the modernization of the agricultural sector is one of the main thrusts in the 11th Malaysia Development Plan that cover the period of 2016-2020. The shift from the use of traditional production to the use of modern and innovative technologies was seen as able to generate higher income for farmers and entrepreneurs, strengthen national agricultural productivity and provide more employment opportunities and become a youth choice of job. It is hope that at the end of the 11th Malaysia Development Plan, the agricultural will be transformed toward a dynamic and competitive sector. This is especially true for the livestock industry as this industry is one of the least competitive in the agriculture sector.

Technology adoption in the livestock industry

In order to ensure agriculture products will produce sufficient food, farmers should be knowledgeable with new innovations and technology. It was known that technology was part of the important roles in empowering the nation's livestock industry and helping farmers in providing value added products and crops along the supply chain. For example, technology adoption in the non-ruminant sub-sector such as poultry, laying hens and pork are more advanced because they have already reached the commercial level. As a result, the Self Sufficiency Level (SSL) for poultry meat was at 103.33% while the pork was at 90.25% in 2017 (Department of Veterinary Services, 2018). According to a study done by Syauqi *et al.* (2016), majority of broiler farms in Malaysia are at a moderate index level of technology adoption in their farm practices (Fig. 1). As much as 36% of broiler breeders that used closed system have reached the best technological level. In other words, the closed house system in broiler farms have been using high technology in their farming practices. On the other hand, none of farmers who are using the open house system achieved the best technology adoption level. It was due to the fact that the use of the technology for this system is very minimal. There is a handful of high-tech broiler farms in which all aspects related to livestock are fully controlled by machines. The use of closed house systems is more preferred by growers in

Malaysia than open house systems as it is better and more efficient. However, it requires significant capital and cost.

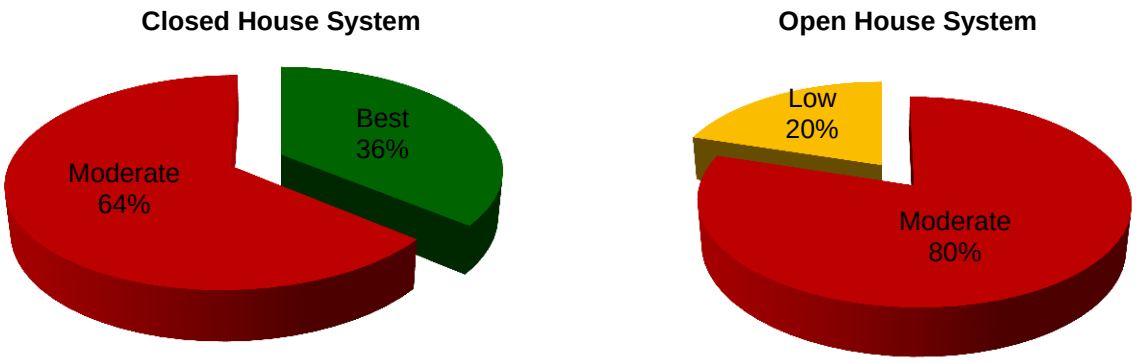

Fig.1. Level of technology adoption of closed and open house systems of broilers in Malaysia

In contrast, the adoption of technology among ruminant breeders in Malaysia is very low if compared to other Asian countries. As a result, the SSL for this sub-sector was very low and unable to meet the domestic demand. In 2017, the SSL for mutton was at 11.41% while beef was at 23.42% (Department of Veterinary Services, 2018). Based on a research conducted by Nor Amna and others in 2016, the level of technology adoption among small ruminants breeders like goats and sheep is mostly at a low level (72%) (Fig. 2). Only a small number of breeders (2%) are using a high and modern technology in their farming practices and most of them are large-scale operators. Small breeders are more focused on low-technology and conventional farming practices in order to reduce the production costs. Moreover, they are still practicing conventional methods, are not well exposed and lack of knowledge in better practices and technologies. This finding was consistent with Morris *et al.* (2007) where farmers do not apply new inputs or technologies in their activities due to the lack of information about the inputs. For them, improper use of inputs will result in lower yield compared to traditional inputs. Hence, access to reliable information is crucial to help increase farmers' knowledge thus boosting their rearing productivity.

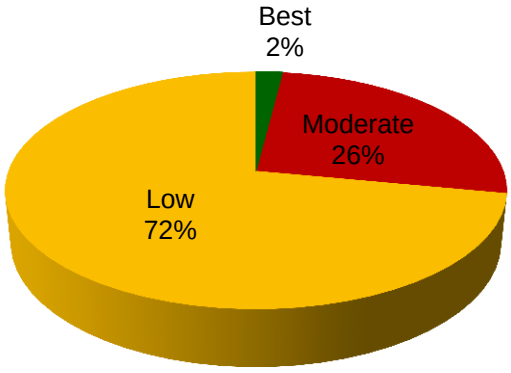

Fig. 2. Level of the technology adoption by goat and sheep breeders in Malaysia

The dairy industry is another sub-sector of livestock industry that is still lacking in technology adoption. The level of technology adoption by dairy breeders was at moderate

with percentage 88%, while the rest, 12% was at a high level (Fig. 3) (Nor Amna *et al.*, 2018). Technology played a major part in the dairy development but some of them are facing constraint in terms of availability of capital, knowledge and market risks. A total of 61% of dairy farms in Malaysia were using semi-intensive system, while the rest was in the intensive system. Generally, most of the large-scale dairy farms have adopted high levels of technology in order to increase the production as well as the quality of the milk produce.

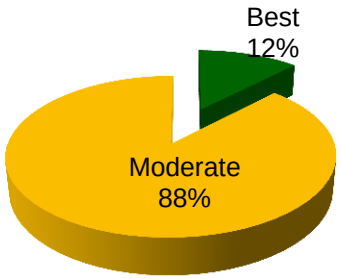

Fig. 3. Level of the technology adoption of dairy in Malaysia

Way Forwards

Nowadays, the agriculture sector faces various challenges to meet the growing demand of food to be internationally competitive and sustainable. Furthermore, it must meet the sustainability goals in the context of on-going agricultural policy reform, further trade liberalization and the implementation of multilateral environmental agreements (OECD, 2001). The liberalization process of trade widens supply and the degree of competition. The government of Malaysia emphasizes the balance of domestic and imported supplies. To promote industrial growth and meet consumer demand and industrial processing, imports of animal products such as meat and dairy was adjusted according to trade procedures approved by the World Trade Organization (WTO). Basically, efforts to liberalize the agricultural sector have been intensified since 1990s. The establishment of the WTO and the rapid liberalization of agricultural trade opened the agricultural industry to develop competitive advantages and new market opportunities (Loh, 2002).

From the First Malaysia Development Plan (1966 – 1970) until the Eleventh Malaysia Development Plan (2016-2020), various policies were introduced and millions of dollars were allocated by the government to improve the productivity and competitiveness of the livestock industry in Malaysia. The Malaysian government launched the Economic Transformation Program which focuses on twelve National Key Economic Areas (NKEAs) in 2010, and one of them is agriculture (NKEA 8). In this agriculture's NKEA, 16 Entry Point Projects (EPPs) have been identified to catalyze the establishment of market-driven, industrial scale and integrated-related business. Some of this EPP are focusing on the livestock sector, such as EPP5, EPP12, EPP13 and EPP16. The EPPs are expected to increase Malaysia Gross National Income (GNI) of RM2.8 billion (US$0.585 billion)by 2020. Details list of the EPPs is as in Table 2.

Table 2. The 16 Entry Point Projects (EPPs) in NKEA

EPP 1	High value herbal products
EPP 2	Production of swiftlet nests
EPP 3	Mini estate of seaweed
EPP 4	Fish rearing in cages
EPP 5	Cattle rearing in oil palm estates
EPP 6	Replication of integrated aquaculture model (iZAQs)
EPP 7	Premium market for fruit and vegetables
EPP 8	Strengthening the export capability of the processed food industry
EPP 9	Introducing fragrant rice variety for non-irrigated areas
EPP 10	Scaling up and strengthening paddy farming in MADA area
EPP 11	Scaling up and strengthening of paddy farming in other irrigated areas
EPP 12	Strengthening current anchor companies in cattle feedlots
EPP 13	Establishing dairy clusters in Malaysia
EPP 14	Establishing a leadership position in regional breeding services
EPP 15	Securing foreign direct investment in agriculture biotechnology
EPP 16	Investing in foreign cattle farming

Source: Kemubu Agricultural Development Authority, Ministry of Agriculture and Agro-Based Industry Malaysia

Lots of government intervention to improve the industry have been introduced such as facilitating the private sectors who wanted to involve in this industry. The government also play the mandatory roles such as in enforcing regulations and providing health services for animal welfare. As example, Malaysia's government has allocated RM5.3 billion (US$1.29 billion) in 2016's budget as a new initiative to modernize the agriculture sector. This proves the government's commitment to transform the food sector to be competitive and sustainable. During the 2018 budget presentation at the Parliament, the government has allocated RM400 million (US$97.5 million) for research and development (R & D) to be carried out by institutions of higher learning (IPT). Moreover, the overall context of agricultural policies and the level of support is a key factor in determining which technologies are adopted at the farm level and in which locations at the farm level. In Malaysia, the Department of Veterinary Services (DVS) is responsible in providing veterinary services that support the development and growth of the related animals, particularly in the food production (Mohd Nor *et al.*, 2003). The services by the DVS included animal health, veterinary public health, development of the animal industry, development of genetic resources, veterinary research, human resource development (HRD) and the enforcement of laws and regulations. Research and development (R&D) were strengthened through the Malaysian Agricultural Research and Development Institute (MARDI). The focus of research were on the development of new breeds, advanced reproductive technologies for genetic enhancement, intensive and semi-intensive environment friendly production systems and animal feeds formulation. R&D was expected to generate new technologies that can increase farm productivity, higher quality breed and efficient production system. Apart from government agencies under the Ministry of Agriculture and Agrobased Industry, the R&D was also undertaken by higher education institutions such as University Putra Malaysia (UPM), University of Malaya (UM) and University Kebangsaan Malaysia (UKM). In general, the trend towards better education, training of farmers and availability of financial resources are contributing towards adoption of sustainable farm technologies which are also support by the policies related to agriculture, environment, and research and development, so as to provide a combination of incentives and non-incentives to technology adoption.

CONCLUSION

As technologies are rapidly changing, technology adoption has been a crucial part as it was a major driving force to increase agricultural productivity. The adoption of technologies had a potential to contribute to industry development, production of agriculture and sustainable farming systems. Farmers should always look forward to new technologies to achieve better productivity; this will lead them to higher incomes, greater knowledge and having quality breeds or products. Moreover, encouragement and attraction of youth to be involved in this sector should be prioritized. Thus, consistent and coherent policies need to be in place. It is important to make policy decisions on robust and well-established scientific criteria so that the decision is justified and can be explained to all stakeholders.

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