Factors Impinging Farmers' Use of Agriculture Technology

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Abstract

Agriculture is now one of the most important sectors in the Malaysian economy. In order to further develop this sector, technology has become one of the main components. Typically, dealing with the agriculture sector can entail difficulties relating to a number of factors. Consequently, to overcome such problems, farmers are being encouraged to adopt technology that suits their farm. This paper aims to explain technology usage among farmers, and the benefits that can be gained from this technology. Moreover, the paper explains the factors affecting technology usage. Based on the findings, it can be concluded that farmers' perceptions and levels of education, as well as extension-workers' knowledge, the management of the extension program, and the physical conditions of the area, are all factors that affect technology adoption among farmers.

Keywords: technology, agriculture, adoption, benefits

1. Agriculture in Malaysia

The agricultural sector in Malaysia consists of the production, processing, and waste management of crops, livestock and fish. It has been one of the most important industries to generate income for the Malaysian economy, and has been proven as an effective medium to overcome poverty (Hayrol Azril et al., 2010). Doubtlessly, agriculture in many countries, including Malaysia, is still a pertinent sector due to the contribution it makes to increasing the economy of the nation and developing communities. During the economic crisis in 2007, Asian countries including Malaysia turned to agriculture as one of their main income generators. Because of its strength in terms of shaping the socio-economic development of the country, agriculture has been mentioned in every Malaysian Plan as having brought more money into the country and the local community. In the Ninth Malaysian Plan (RMK-9), for example, agriculture is declared as the third largest income generator for Malaysia.

In line with government efforts to further develop the agriculture industry, several high-impact agriculture projects such as TKPM (Permanent Food Production Parks), HIP-ZIA (High Impact Project-Aquaculture Industrial Zone), Agropolitan, and contract farming have been launched. Export for this industry has been recorded at almost more than 10 million US dollars in 2010. Based on the data gathered from the various countries, it has been proven that agriculture is the main factor in terms of strengthening economic development. However, Malaysia is currently facing new challenges with respect to producing new findings that will help to boost the Malaysian agriculture and food sector to a higher level. Therefore, a great deal of effort is needed to ensure that the agriculture sector can elevate the economic development of Malaysia.

2. Farmers in Malaysia

Aging is the main problem among farmers in Malaysia. Hayrol Azril et al. (2009) and Ezhar et al. (2007) have proven that the average age of farmers in Malaysia is in excess of 46 years. The industrialization in the country and youth migration to cities has created a serious shortage of agricultural workers in the country. However, most employers have solved this problem by importing foreign workers, though they still rely on traditional methods of agricultural production and processing, instead of using modern and efficient technology. Consequently, this situation reflects that Malaysia needs to attract and retain more young people within the agriculture community. On the other hand, farmers do not dismiss the usage of technology, especially ICT. According to Mishra and Williams (2006), use of computers with Internet access is directly related to the educational level of the operator, off-farm business income, the presence of a spouse and the regional location of the farm, and this research is also supported by Burke and Sewake (2008), who state that those with higher education levels are more likely to own and surf websites for their agro-business.

3. Benefits of Technologies to Farmers

One of the best ways to further develop agriculture as the third engine growth is by mastering ICT skills and knowledge. Among the efforts to develop the agriculture sector, attempts have been made to encourage technology adoption among farmers, particularly in terms of activities such as agro-based website surfing. Agro-based websites are very helpful and informative; for example, the website of the Ministry of Agriculture and Agro-Based Industry provides a lot of information needed by the agriculture community. According to Gakuru et al. (2009), the fact that ICT usage, including website surfing, is helping the agriculture sector cannot be disputed. Website surfing enables agro-based entrepreneurs to seek related information, products and services. Research conducted by Sadaf et al. (2006) stresses that encouragement to utilize ICT is important due to the fact that much of the agriculture community still relies on traditional means such as neighbors, family and other farmers, in order to get agriculture information. According to Barton (2003), websites provide farmers with the facilities to communicate with other farmers, extension officers and agencies across long distances. In addition, websites are the most popular online services for farmers, and are cheaper than telephone usage. Farmers are able to access information through ICT at any time, and this enables them to create networks with development agencies and other farmers, and eventually increase their chances to double their agriculture productivity (Obiechina, 2004). According to Pickerrnell et al. (2004), ICT has certainly had a big impact on agriculture. It provides opportunities for farmers to expand their market and reach new customers through the Internet. One example that shows the successful use of ICT in agriculture is "mobile telephony". This has been used to access information on market price, weather and many other aspects. These changes provide advantage to farmers and offer them opportunities in terms of improving their quality of life.

Besides ICT technology, agriculture engineering plays an important role in supporting the growth of agriculture and the agro-based industry. The national policy, which aims to reduce dependency on unskilled foreign labor, encourages the agriculture and agro-based industry to adopt capital and management-intensive agricultural engineering or mechanization technologies. A study conducted by Truong (2008) which focused on rice farmers' adoption of technology in the Mekong Delta was chosen as the backbone of this study discussion as Mekong Delta is a very well-known and successful paddy area development in the region and it is a hope that similar success can be adopted in other areas in the region. Truong (2008) shows that there are some technologies that benefit both farmers and the industry. Technologies such as Integrated Pest Management (IPM), "three reductions-three gains", row seeding, harvesting by machine and rice dryers have been proven to increase paddy yields. IPM strategy offers some advantages, such as input cost reduction (savings arising from reduced seed and pesticide use) and environmental protection. On the other hand, row seeding technology provides advantages relating to saving seeds, easing the crop handling process, and avoiding pest attacks; the technology is also easy to use. In addition, "three reductions-three gains" refers to reducing seed rate, fertilizer and pesticide use in rice production to increase yields, rice quality and economics. In addition, rice dryers are a technological adaptation that is being used amongst rice farmers to reduce grain loss from sun drying and the amount of hired labor required post-harvest.

4. Factors Affecting Technology Usage among Farmers

In a number of local studies by Salleh et al. (2009), Hayrol Azril et al. (2009), Abu Samah et al. (2009) have agreed with findings by Truong (2008) which accentuated on factors such as education, negative perceptions, lack of capital, small land areas, ineffective infrastructure facilities, and limited capacity of extension workers as the main drivers that led to low technology adoption. Additionally, factors such as the knowledge level of extension workers, methods of organization and management of extension programs, and local conditions are also highlighted as the drivers for technology adoption. Based on a study conducted by Truong (2008), there are many obstacles to running a successful technology strategy. The main reasons for non-adoption of technology are weak perceptions of technology and low education of farmers, low teaching capacities, limited knowledge among extension workers, disorganization, geographical conditions, and inadequate resources and funds. Furthermore, farmers should must have a certain level of education and be very familiar with rice farming in order to be motivated to learn new technology.

Furthermore, Truong's (2008) study suggests that technology adoption demands a great deal of land preparation, a high rate of seed germination, proper seed soaking and incubation, and maintenance of water after sowing. Technology usage must be in line with the financial capacities of farmers, and farmers with limited financial ability will have little chances to adopt the technology. In addition, not all farmers are able to adopt technology due to the small number of extension workers they have, and the fact that it comprises many measures that require a high level of knowledge from farmers. Furthermore, farmers are afraid of low price production and this technology adaptation also depends on the ecosystem (irrigation sources, fresh or saline water areas, inland fields

or vicinity to coastal area). In addition, mechanization in agriculture has been seen to be low because of limitations with respect to machine quality and quantity.

On the other hand, Truong (2008) suggests that some machines are too heavy, which creates mobility problems as it is difficult for farmers to transfer the machines from field to field. While traditional farmers are enjoying minimum costs with respect to conducting their farming routines, things are different for the technology adopters. In the case of paddy farmers, for example, the rice dryers, which help to reduce grain loss from sun drying and the need for hired labor post-harvest, involve a higher cost of drying per dryer, while no investment is needed for traditional farmers as they rely on the sun for the same process. Moreover, farmers need to consider transportation costs, as they must transfer their materials from their house to the dryer location. Technologies which contain complicated components also require more time and more labor, making them difficult for farmers to apply.

Factor	Ranking	Note		
	(*)			
Factor related to household conditions				
Education	1	Educated farmers prefer to experience the benefits of new technologies and were better able to acquire the technical knowledge and information.		
Farmers'	1	Farmers prefer to rely on traditional ways of farming as usage of technology may raise their concern with regard to losses of yield on things that they are less compatible with.		
perception				
Capital/poverty	1	Expensive technologies tools. More capital was also needed for certified seeds and new rice varieties.		
Age	2	Young farmers prefer to use technology rather than 'veteran' farmers		
Ethnicity	2	The minority of people is poor and has part-time jobs in off-farm activities; they have inadequate time to learn the innovations.		
Gender	3	Women are less exposed to technologies which resulted disagreements with their spouse on usage of technologies.		
Land size	4	Those with small farms place less interests on new technologies. Smaller farm lands require less advanced technologies compared to commercialized farms.		
Family labor	4	Inadequate family labor minimizes the usage of new technology resulted from less interest on agriculture among younger generation.		
Factors outside household conditions				
Training	1	Trainings should be provided to all farmers despite of their geographic locations.		
Extension personnel, methods and knowledge of extension staff	1	Inadequate numbers and other commitments of the extension staff will impinge the rate of technology adoption.		
		Extension staffs' capacity to convince farmers to use technology was low. Unsuitable selection in term of training sites, timings. There is a need to strengthen manpower and equipment for extension.		
Infrastructures and ecosystem	1	There is higher technology adoption in irrigated areas than in rain-fed areas. There is a need for the construction of infrastructural aspects such as roads and irrigation systems.		
Information	2	Information systems are available. Information provided must fit the abilities and interests of farmers so as to attract their attention.		
Site of training organization	2	Location of trainings should be near to the farmers' settlement.		

Table 1. Summary of factors affecting technology adoption by farmers (Truong, 2008)

Associations	2	Extension clubs, farmers' associations, women's associations and tight cooperation of "FATS" (farmers, administrators, traders, and scientists) should play their roles to embolden farmers in adopting technologies in their farming routine.
Market price	3	Good price on the market will motivate farmers to produce more whereby attempts to achieve such aim can be realized by using technologies.
Advertisement and marketing	1 3	Doubtlessly, advertisement via traditional mass media such as television and radio are highlighted as the most effective way to embolden farming community to use technologies in their farming routine as these two media tools are considered as the most reliable and trusted information sources.
Neighbors	4	Farmers usually imitate each other.
Clinics	5	The availability of clinics in the village or commune increased
		health awareness in farmers, which gear towards the usage of technologies.

(*) One indicates most important

5. Conclusion

In the author points of view, farmers should obtain certain levels of education that are associated with their farming activity, and have a willingness to learn new technologies. In addition, well-organized mass media and responsible bodies can play an important role via advertisement in order to embolden technology adoption among farmers. Furthermore, extension workers should update their knowledge on the new technology that will be introduced to farmers. They should also arrange suitable times for training, teach farmers by sequence, and practice technology adoption together.

Based on above discussion, effective program planning is needed to embolden farmers in adopting technology into their farming routine (Sork & Caffarella, 1990). Program planning can include a series of planned activities in a specific time, and bringing about changes in the community is one of the key objectives therein. Any programs that have been planned for the community must incorporate people who are highly skilled, knowledgeable and expert to guide the program. In this case, the extension officers must first be instilled with all the required technology skills and knowledge. Meeting all of these requirements will ensure the successfulness of the program planned for the farming community, so that it will be more effective and farmers will more easily understand the new technology.

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