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Intention Level of Farmers to Use Information Communication Technologies for Agricultural Risk Management in Malaysia

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Keywords

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Introduction

Climate changes influence farmers to manage their agricultural risk through various ways. Farmers first try to use previous knowledge or experience and even local wisdom to curtail the impacts of climate changes on the agricultural sector. However, since the advent of agricultural innovations, they try to graft new technologies like mobile phone to solve the issues. So, intention of farmers to use various digital technologies could be the result of improved agricultural production and reduced adverse impacts of climate changes. According to Hu, Li, Zhang, & Wang, in press, El Bilali and Allahyari (2018), Zhang, Wang, & Duan (2016) and Li, Li, Westlund, & Liu (2015), new technologies like ICTs have been helping farmers to improve agricultural production, significantly contribute towards sustainable food production and may become instrumental in rural household poverty alleviation. Beza et al. (2018) argued that there is a need to empirically comprehend the intention of farmers to use new technologies like mobile phone.

Kabbiri, Dora, Kumar, Elepu, & Gellynck (2018) highlighted that new technologies have grabbed the interest of users (farmers) easily. Moreover, ICTs not only assist users to learn and share valuable agricultural information, but also keep users updated about farm inputs (Kante, Oboko, & Chepken, 2019) and agricultural innovations in the agricultural sector. In this regard, Aldosari and colleagues (2017) stated that extension service providers need to make aware farmers through various advanced digital technologies for agricultural development. In this way farmers could become equipped with not only new technologies, but also sensitized about new issues emerging from climate changes. That is why, Adenle, Wedig, and Azadi (2019) argued that technological innovations play important role in the development of sustainable agriculture. ICTs also create social productive linkages with farmers and extension agents which assist in new technology adoption as opined by Shikuku (2019). In this way, farmers can easily communicate to resolve abrupt issues in the agricultural sector. Moreover, farmers may also obtain market information by the use of ICTs.

Agricultural risk is naturally bounded with climate changes. The current era of digital technologies also offers numerous benefits embedded in ICTs for the agricultural sector. Farmers are now abreast of weather forecasts, market information, pest and disease solutions, activities of formal and informal social networks, input price fluctuation, availability of agricultural labor, updates of tentative natural disasters, package of drought and resistant varieties, credit information from financial institutions and government policies are names a few. Importantly, mental inclination towards ICT usage is not only diminishing rural and urban digital divide, but also increasing use of digital technologies in the developing countries. Thus, these advantages tilt mental inclination of farmers towards the usage of ICTs in the agricultural sector.

Conversely, there are numerous barriers in the use or adoption of new technologies face by male and female users like ICTs in the agricultural sector. Numerous authors (Lwoga & Chigona, 2019; Rotz et al., 2019; Kante et al., 2019; Rahman, Barau, & Noman, 2019; Awan, Ahmed, and Hashim, 2019; Mwalupaso, Wang, Rahman, Alavo, & Tian, 2019; Aldosari et al., 2017) highlighted the barriers in the use of ICTs or latest technologies such as lack of ICT skills and trainings, low speed of internet, cost, a language issue, lack of linkages with agricultural extension service providers are names a few. Furthermore, according to Eitzinger et al. (2019), although there are many hurdles that exist in the use of ICTs, the use of mobile phone as a popular form of ICTs is increasing among the farming community. Thus, there could be many barriers which could inhibit farmers to use or adopt ICTs in the agricultural sector.

To this backdrop, the study was designed to examine the intention of farmers to use ICTs for the management of agricultural risk. Although previous researchers have tried to assess the intention of farmers in various other agricultural aspects, but usage of ICTs in the domain of agricultural risk management is hard to find. Therefore, the present research was designed to bridge the gap in the body of existing literature. The findings would be helpful for a variety of stakeholders to understand the intention of farmers to utilize ICTs in the context of risk management in the agricultural sector. It is important to mention here that agricultural risk mostly stem from adverse impacts of climate changes not only in Malaysia but also other parts of the globe. Thus, this kind of study is important from the empirical lens of Malaysia, and findings would be useful for other neighboring countries.

Theoretical Framework

The intention is perceived as a most important predictor of behavior of an individual (Gkargkavouzi, Halkos, and Matsiori, 2019) and used by some of the recent researchers in the agricultural sector, such as Faham & Asghari (2019), Tiraieyari, Ricard, & McLean (2019), Maleksaeidi & Keshavarz (2019), Rezaei, Safa, Damalas, & Ganjkhanloo (2019), Borges et al. (2019), Ruby, Abidin, Lihan, Jambari, & Radu (2019), Bagheri, Bondori, Allahyari, and Damalas (2019), and Yaghoubi, Yazdanpanah, & Komendantova (2019). Importantly, this predictor of human behavior used by Ajzen (Ajzen, 1991) in his both behavioral models, namely Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB). The intention is also visible in Technology Acceptance Model (TAM) and its extensions, plus in Unified Theory of Acceptance and Use of Technology (UTAUT). These models have been widely used by the researchers in different contexts. From the lens of agriculture, Adnan et al. (2017) stated that most of the researchers have utilized TRA and TPB to examine attitudes and behavioral intention of farmers. Thus, understanding future intention of farmers to use ICTs for agricultural risk management is important.

Purpose and Objective

The main purpose of this research was to determine the intention of Malaysian farmers to use digital technologies for management of agricultural risk from the future lens. The specific objective was to empirically analyze behavioral intention of the farmers to use ICTs for agricultural risk management.

Methods

The research was carried out in selected states of Malaysia through multi stage cluster sampling technique. In the multi stage cluster sampling technique, firstly, the clusters were chosen geographically. Secondly, three states were selected namely East zone (Pahang, Terengganu), South zone (Johor) and North zone (Kedah). In the next stage, the areas from each three states were selected randomly. Lastly, 360 respondents were chosen through simple random sampling technique. So, these chosen respondents were representing various areas of three states.

The pre designed questionnaire was used to collect research data from all 360 farmers. The research instrument was designed by following work of various researchers who have used TPB. The research instrument was designed in English language, however the medium of a questionnaire was changed into the local language (*Bahasa Melayu*) for proper understanding of the questions. After the pre testing of the research instrument through pilot study, some of the

questions were changed and few were deleted with the expert consultation and results of reliability analysis. The experts who were consulted were from the field of agricultural extension and rural development. In the questionnaire, 13 statements were asked about intention which were measured through five point Likert scale ranged from 1 (strongly disagree) to 5 (strongly agree). These statements were taken into consideration after a rigorous review of literature. Before fianl data collection, a pilot study was done on 50 farmers but could not be counted in the final administration of the statistical analysis. The reliability analysis was carried out with SPSS and Cronbach alpha was used as a yardstick. Hair, Anderson, Tatham, & Black (1998) stated that if the value of the statement is more than 0.60 then it may be considered as reliable and 0.70 or above is reflected as good and that statement may be appropriate for the research instrument. Thus, the alpha value was 0.818 and included in the created instrument. The data were collected from the field with the assistance of pre trained enumerators (local Malay). Finally, in order to obtain statistical results, SPSS (version 21) was administered to get the frequency, percentage, mean, standard deviation and levels of intention (low, moderate and high).

As far as level of intention is concerned, the Likert scale data were transformed into three levels namely low, moderate and high. So, the following class interval formula was used.

C. I = HSV-LSV/K

Class Interval width=Highest Scale Value-Lowest Scale Value/number of categories (K)

So, C. I = (5-1)/3 =1.33

C. I = 1.33

All in all, the range for level boundry was measured as low =1.00-2.33, moderate = 2.34-3.66 and high = 3.67-5.00.

Results

According to Ajzen (1991) the main element to check the ultimate behavior of an individual is intention. The intention of the farmers to use ICTs for agricultural risk management was also assessed. In this regard, the results are shown in Table 1. According to the findings, there were 48.9% of the farmers who strongly agreed that they intended to utilize ICTs in the future as these ICTs are comparatively useful to existing traditional technologies for agricultural risk management. However, 5.6% of the farmers were still uncertain in this context. The mean (4.42) also supports that the respondents had positive inclination towards ICTs to manage agricultural risk. The main reason could be the importance of ICTs in the current era as these are speedy, cheap and useful in obtaining and sharing useful information about natural disasters (floods, land sliding, cyclones, heat waves etc.), insect and disease attacks, drought, water shortage are names a few among the farming community.

Table 1
Intention of Farmers to Use ICTs for Agricultural Risk Management

	Strongly Disagree *F (%)*	Disagree *F (%)*	Uncertain *F (%)*	Agree *F (%)*	Strongly Agree *F (%)*	*M*	*SD*
I have intention to use ICTs in the future as these are relatively useful to existing traditional technologies regarding	1 (0.3)	1 (0.3)	20 (5.6)	162 (45.0)	176 (48.9)	4.42	0.64

agricultural risk management							
In my expectation, ICTs would be better than past methods for seasonal forecasts	3 (0.8)	4 (1.1)	46 (13.6)	111 (30.8)	196 (54.4)	4.37	0.81
I expect, ICTs can give quick awareness about solutions of agriculture risk	3 (0.8)	3 (0.8)	34 (9.4)	141 (39.2)	179 (49.7)	4.36	0.76
I intend to use ICT for agricultural risk management in coming time because it is cheaper than the available options	2 (0.6)	7 (1.9)	49 (13.6)	111 (30.8)	191 (53.1)	4.34	0.83
I have intention to continue using ICTs as these are helpful for better communication regarding agricultural risk management	2 (0.6)	6 (1.7)	34 (9.4)	163 (45.3)	155 (43.1)	4.29	0.75
I intend to use in the next 6 months because I trust in using ICTs	2 (0.6)	9 (2.5)	41 (11.4)	154 (42.8)	154 (42.8)	4.25	0.80
I anticipate ICTs are useful in understanding different aspects of agricultural risk management	3 (0.8)	4 (1.1)	51 (14.2)	146 (40.6)	156 (43.3)	4.24	0.80
I plan to carry my ICT anywhere to receive agriculture information	3 (0.8)	8 (2.2)	54 (15.0)	140 (38.9)	155 (43.1)	4.21	0.84
I want easy access to current ICTs even at my farm	6 (1.7)	9 (2.5)	51 (14.2)	136 (37.8)	158 (43.9)	4.20	0.89
It is difficult for me to use ICT for agricultural risk management	14 (3.9)	53 (14.7)	161 (44.7)	56 (15.6)	76 (21.1)	3.35	1.09
I am reluctant to prefer due to internet speed	11 (3.1)	70 (19.4)	136 (37.8)	67 (18.6)	76 (21.1)	3.35	1.11
It may be difficult to use ICTs due to small screen display	21 (5.8)	74 (20.6)	164 (45.6)	42 (11.7)	59 (16.4)	3.12	1.10
I might stop using ICTs due to battery issue	28 (7.8)	93 (25.8)	142 (39.4)	41 (11.4)	56 (15.6)	3.01	1.14
Total Average Mean						3.96	0.89

Note. Scale is 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Uncertain*, 4 = *Agree*, 5 = *Strongly Agree*

There were more than half of the research population (54.4%) who strongly agreed that ICTs would be better than past methods for seasonal forecasts. Though, 13.6% of the farmers were uncertain at this point. Agriculture is a profession which depends upon various seasons for different crops so farmers grow and harvest based on seasonal calendars. The irregularity or sudden change in weather affects directly agricultural products. Thus, latest digital interventions could assist farmers in advance weather forecasting and planning accordingly. Moreover, nearly half of the research population (49.7%) shown strongly agreement that ICTs could provide quick awareness about solutions of agricultural risk. Conversely, 9.4% of the farmers were uncertain at this point. Indeed, ICTs have become instrumental in creating awareness about various solutions of agricultural risks. Farmers in one area share experiences with other farmers even at different locations so that farmers may replicate the procedure to ultimately reduce the risks.

Similarly, there were more than half of the target population (53.1%) who demonstrated strongly agreement that ICTs are cheaper than the existing options so they intend to use ICTs for agricultural risk management in coming time. On the other side, negligible percentage (1.9%) of the farmers displayed disagreement. It could be due to the reason that farmers always search for an affordable solution for the agricultural problem, so ICTs would be an acceptable option in the current scenario. Thus, the responses of farmers about ICT usage from the future lens are an encouraging factor in the agricultural sector.

In addition, the farmers containing 45.3% were agreed that they had intention to continue using ICTs as these are helpful for better communication about management of agricultural risk (s). However, 9.4% of the respondents were still unclear and only 1.7% of the farmers exhibited disagreement in this regard. Actually, communication is an important element in the agricultural sector, and farmers have to communicate with a variety of stakeholders such as fellow farmers, agriculture extension advisors, input dealers, buyers and so on for various purposes. Thus, instead of physically approaching, they prefer to use ICTs like a mobile phone to quickly communicate which could serve the purpose and it does.

Trust is an important element in the adoption or use of any technology. In this perspective, 42.8% of the farmers revealed strongly agreed and agreed that they intend to use ICTs in the next 6 months on account of trust though 2.5% of the farmers disagreed. Therefore, the farmers had trust ICTs which influenced them to continue using in the approaching months. Trust level increases with the use and the passage of time exclusively when the user receives benefits.

ICTs offer to understand different aspects of agricultural risk management so there were 43.3% of the farmers who strongly agreed that they anticipated ICTs as useful in understanding different aspects of agricultural risk management yet 14.2% of the respondents remained uncertain. Additionally, 43.1% of the farmers revealed that they planned to carry their any kind of ICT anywhere to receive agriculture information. Nevertheless, 15% of the farmers were uncertain. It depicts that mobile phone, which is widely used form of ICTs, is easy to carry and helpful to receive required information even at the farm.

There were 43.9% of the farmers who strongly showed agreement that they want easy access to ICTs even at their farms, but 2.5% of the farmers demonstrated disagreement along with 14.2% of the farmers who were uncertain in this point. With the passage of time, urban rural digital divide is diminishing as public and private sectors are trying their level best to minimize the gaps through huge physical and financial investments. Farmers want ICTs in their easy access as they have to perform various activities like knowing weather forecasts, booking of agricultural inputs, paying loans online or farm related financial transactions, transporting their

produce to the markets, receiving and/or sharing of valuable information, consulting agricultural advisors, minimizing harvest losses, enhancing value chain and receiving updates about government policies and compensating schemes in the context of agricultural disasters are names a few. Drones and new agricultural machines are enticing farmers to not only improve their agricultural incomes but also to become resilient. All in all, it seems difficult to remain isolated from the digital world by the farming community in the current scenario.

Furthermore, farmers might not positively be inclined to use ICTs due to various grounds. Like, there were 15.6% of the farmers who agreed that it is difficult for them to use ICTs in the context of agricultural risk management however, 14.7% of the farmers negated (disagreed). Similarly, 18.6% of the farmers highlighted agreement that they are reluctant to prefer ICTs due to internet speed, though 19.4% of the farmers had shown disagreement on this point. Likewise, 11.7% of the farmers agreed that it could be difficult for them to use ICTs on account of small screen display yet 20.6% of the farmers remained disagreed. Plus, there were 11.4% of the respondents agreed that they might stop using ICTs due to battery issue still, 25.8% of the farmers demonstrated disagreement in this regard.

In conclusion, the farmers in the research area had positive intention to use ICTs for the management of their agricultural risk (s) as inferred from the field results as well as average mean (3.96). It is expected that more farmers would start using ICTs on account of numerous benefits embedded in ICTs for the management of agricultural risks.

Intention Level

Intention level of the farmers regarding ICTs usage in agricultural risk management is displayed in Table 2. The result in the table shows that an overwhelming majority of the farmers (80.3%) possessed a high level of intention to utilize ICTs though 18.9% of the farmers had moderate level and which is followed by the negligible percentage (0.8%) of farmers who adhered to low level of intention to use ICTs. The mean result (3.96) also reveals that farmers were agreed and anticipated to use ICTs for agricultural risk management in the context of Malaysia. In a nutshell, high level of intention was prevailing among the farmers in the research area to use ICTs for agricultural risk management. It may be due to many reasons like minimizing rural and urban divide by public and private sectors of Malaysia, investing wisely in the technology sector, sensitizing and familiarizing with the various ICTs, building and improving good physical and digital infrastructure and creating interest of the users particularly farming community.

Table 2
Intention Level of Respondents toward ICTs Use for Agricultural Risk Management (n=360)

Level	*F*	*%*	*M*	*SD*
High (3.67-5.00)	289	80.3	3.96	0.425
Moderate (2.34-3.66)	68	18.9		
Low (1.00-2.33)	03	0.8		
Total	360	100.0		

Conclusion, Implications and Recommendations

Intention of farmers to use various ICTs is important to determine the ultimate behavior of the farmers in any context. The current study aimed to unveil intention of the farmers to use ICTs for the management of agricultural risks. The findings showed that farmers had a positive

and high level of intention to use various ICTs to manage agricultural risk (s) from the context of Malaysia. Still, climate variations may negatively influence intention of the farmers not to use advanced digital technologies from the future lens. Thus, agricultural stakeholders are needed to remain in contact with the farming community and guide accordingly for reducing the adverse impacts of climate change which in the result may lead to low agricultural production. In this regard, agriculture and rural advisors may inform the farmers in advance about resilient techniques by the use of digital technologies. Plus, agricultural advisors could also prepare farmers to manage agricultural risks through various training programs. The study recommends that wide awareness programs should be initiated by public and private sectors to easily use digital technologies to tackle agricultural risks. The study also recommends agricultural advisory service providers to establish partnerships with various agricultural players and mobilize financial assistance for resource poor farmers with limited digital skills. Lastly, it is suggested that similar kind of study may be conducted in other countries to empirically examine the role of agricultural advisors to use ICTs for agricultural risk management.

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