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Factors Influencing Intention to Adopt Sustainable Agriculture Practices among Paddy Farmers in Kada, Malaysia

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ABSTRACT

A well-known fact is that indiscriminate use of chemical inputs in the production process can have negative effects on the environment, as well as increasing chronic and acute health problems for farmers who mishandle or not follow proper procedures in applying the chemicals. Sustainable agriculture is thus becoming an important concept in alerting the management about controversial agricultural practices. The objective of this study is to investigate the paddy farmer's intention to practices sustainable agriculture and to determine the significant factors that could be used as predictors in having intention to practice sustainable agriculture. Thus, in order to disseminate sustainable agriculture, it is absolutely necessary to comprehend the farmer's intention to apply sustainable farming practices based on Good Agricultural Practices (GAP). A total of 61 paddy farmer household heads were interviewed for this study during the main season of 2013. The coefficient of determination (R^2) of multiple regression analysis of 0.76 indicate that proportion of the total variation in paddy farmers intention to practice sustainable agriculture is explained by the following variables; farmers' attitude and perceived behavioral control towards sustainable agriculture, age, number of protection equipment's used, storage method of chemical input, awareness and knowledge of MyGAP/IPM are significant as influential determinants of farmers' intention to adopt sustainable agriculture at 5% level of significant.

Key words: Paddy, farming practice, sustainable agriculture, intention, MyGAP

INTRODUCTION

Traditionally, conventional agriculture was built around two related goals: the maximization of production and profit, which were developed without any consideration of their unintended, long term consequences on the ecological dynamics of agro-ecosystems and biodiversity (Gliessman *et al.*, 1998). Overuse of chemicals fertilizers, pesticides, herbicide and insecticide also raises input costs and lowers profit margins for farmers (Zhen and Zoebisch, 2006; Dawra, 2013). Similarly, improper application methods create chronic health problems among farmers. The chemical residues in food products can also have adverse effects on humans. The worst effect of using excessive chemicals is the evolution of aggressive pesticide resistant pest population (Dhawan, 2008). Sustainable agriculture is a well-known and important concept to alert farmers about the alternative farming systems and methods of farming (Rigby and Caceres, 2001).

As, Prasad and Power (1997) have mentioned, sustainable agriculture is now on the agenda of agricultural institutions around the world and can be one of the solutions to controversial farming issues as it can ensure both profitability, food quality and safety (Feher and Beke, 2013).

Studies has shown that farmers are very receptive in changing to sustainable agriculture (Casabona *et al.*, 2010) and stakeholders should join hands to ensure sustainable agriculture is being practices (IITA., 2008; Shi, 2010). Lichtfouse (2009) also has shown a correlation between farmers' quality of life and attitude towards sustainable agriculture. While, Wright (2009) has shown that intention to practice sustainable among farmers are important indicator to adopt sustainable agriculture. Similarly, Herath (2010), Hanna (2011) and Pimentel (2002) indicate that in order to motivate farmers to change to sustainable agriculture it is important to understand their intention. Theory of Planned Behavior (TPB) has become one of the most popular social psychological models for the prediction of a behavior (Ajzen, 2011). Many authors used TBP in their study to analyze social behavior in sustainable agriculture practices (Adebayo and Oladele, 2012; Herath and Wijekoon, 2013; Bond *et al.*, 2009; McCarthy *et al.*, 2007; Best, 2008).

There is a growing demand for quality products which provide opportunities for farmers to increase their income in Malaysia. In general, high value and quality agriculture is expected to contribute about 1% to the GDP during the 10th Malaysia plan (2010-2015) (EPU, 2010). Malaysian Good Agricultural Practices (MyGAP) was launched by the Ministry of Agriculture and Agro-based Industry on 28 August 2013 to cater for these. This not only ensures that Malaysian produce is benchmarked against other Good Agricultural Practices but allows Malaysia's agricultural produce to gain better recognition and be accepted both domestically and internationally. Since, rice is a staple food for Malaysians, the process of its production in terms of farming practices need to be changed in accordance with sustainable and environmentally friendly practices that have been stipulated by MOA.

In case of Malaysia, there is paddy check brochure published and distributed by MOA and MADA (Muda Agricultural Development Authority) as the detailed guidelines of the farming practices to manage paddy field following MyGAP to farmers. In order to monitor and observe the paddy's farming process such as irrigation water management; fertilizer, weed and pest control management and post-harvest handling, which are among the important farming processes, it is imperative to investigate the managing of these practices so as sustainable practices is being implemented. The 10 checklist items are as follows: 1. Soil acidity status: to make sure the soil is not acidic fields, 2. Plots condition: it must be flat and well maintained, 3. Weed control: weed can reduce paddy yields up to 90%, 4. Irrigation schedule: follow the schedule irrigation to save water, 5. Land preparation: tillage and soil levelling, 6. Seedling: from certified dealer, 7. Fertilizer application: adequate supply of nutrients and timely application of fertilizer is needed, 8. Water management: efficient water management and adequate time is essential to higher productivity, 9. Pest control: weed and pest can reduce paddy yield and 10. Harvesting: proper post-harvest handling can reduce losses.

Given the paddy check and given the above literature and past studies, it is therefore necessary to comprehend farmer's intention to apply sustainable farming practices as alternative farming systems in order to protect the environment and also the biodiversity. Thus, the objective of this study was to investigate Malaysian paddy farmer's intention to practice sustainable agriculture as proposed by MyGAP. The study will also investigate the determinants that could influence paddy farmers to have intention to practice sustainable agriculture.

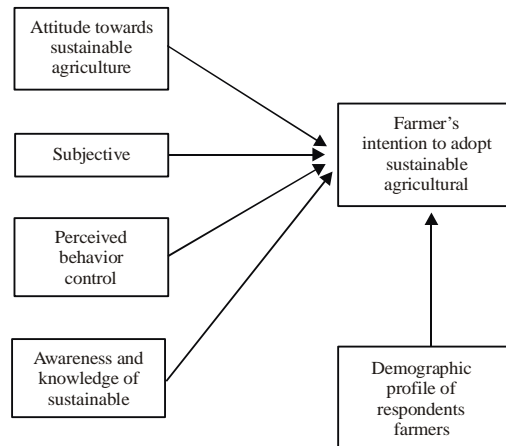


Fig. 1: Conceptual framework of paddy farmer's intention to adopt sustainable farming practices in KADA, Kelantan (Source: Modified from Ajzen (2011), Mccann *et al.* (1977) and Jacobson *et al.* (2003))

MATERIALS AND METHODS

Conceptual framework: Figure 1 shows the conceptual framework of the study based on the Theory of Planned Behavior (TBP) in order to examine the attitude, subjective norms, perceived behavioral control, awareness and knowledge related to sustainable agriculture practices and socio-demographic profile that could influence farmer's intention to adopt sustainable agricultural practices. According to Fielding *et al.* (2008) and Kaufmann *et al.* (2009), attitude, subjective norms and perceived behavioral control can influence farmer's intention to adopt new farming systems. However, various other researchers have found that awareness, knowledge and demographic profiles are also influential variables (Mccann *et al.*, 1997; Jacobson *et al.*, 2003). Thus awareness and knowledge as well as socio-demographic profiles such as farmer's age and education level are used in the study to determine the factors influencing farmer's intention to adopt sustainable farming practices.

Sample and questionnaire: This study was conducted through a field survey mainly by face to face interviews of paddy farmers in KADA granaries area, Kelantan. The survey area was covered under the supervision of the local farmers' agriculture organization (Pertubuhan Peladang Kawasan (PPK) with typical farming conditions of double cropping per year. Simple random sampling method was applied to collect data from the respondents under the same farming and irrigation systems in selected PPKs areas. The total number of the paddy farmers interviewed for this survey was 61 household heads. The survey was conducted in the main season of 2013.

Method of analysis: Multiple linear regression analysis was conducted to determine the influential factors on intention. We explore the relationship of farmers' intention to practice sustainable agriculture as a dependent variable and others as independent variables such as farmers' demographic profiles, awareness, knowledge and the three major factors in the theory of planned behavior; attitude towards the behavior indicating a favorable or unfavorable evaluation of the behavior, subjective norms indicating perceived social pressure to perform or not to perform the behavior and perceived behavioral control for perceived capacity to perform the behavior

(Ajzen, 2011). In order to predict the value of the dependent variable, each variable was formed by averaging the response (Pour, 2003). Likert scale data is analyzed as interval variables created through a composite score which is mean of Likert scale data. This will enable the use in regression analysis (Norman, 2010; Gattiker, 2013; Takehara *et al.*, 2008), which can be used as independent variables of regression analysis in the TBP studies (Kelly *et al.*, 2011). Likert scale data needs to be quantified for enabling to apply in parametric analysis (Kumazawa, 2013). In this study, elements from the TBP such as intention, subjective norms, perceived behavioral control, and attitude were given an average score based on Likert scale as McCarthy *et al.* (2007) conducted on a set of questions related to each element of farming practice (Shih and Fan, 2013; Tomasone *et al.*, 2014).

The regression model used can be specified as follows:

$$Y = a + b_1X_1 + \dots + b_jX_j + u$$

Where:

- Y = Intention mean on Likert scale to practice sustainable agriculture
- X₁ = Subjective norms mean on Likert scale
- X₂ = Attitude mean on Likert scale
- X₃ = Perceived behavioral control mean on Likert scale
- X₄ = Farmers' age in years old
- X₅ = Dummy for number of protection equipment such as mask, globe and apron etc used when applying chemical input on a farm?: Above 3 equipments = 1, below 3 equipments = 0
- X₆ = Dummy for storage of chemical input; Do you store chemical inputs in a safe place away from fire and children?: Yes = 1, No = 0
- X₇ = Dummy for education; above college = 1, until secondary school = 0
- X₈ = Dummy for awareness; Have you heard of MyGAP/IPM/: Yes = 1, No = 0 and
- X₉ = Dummy for knowledge related to MyGAP/IPM/: Have you attended any courses related to these?: Yes = 1, No = 0

RESULTS AND DISCUSSION

The data was analyzed using 2 different statistical techniques i.e. descriptive analysis and multiple linear regression. More detailed information on the model is used to determine the influential factors for the following variables as presented below;

- Subjective norms
- Attitude
- Perceived behavioral control
- Storage of chemical input
- Number of protective apparels and equipment
- Demographic profiles (age education) and
- Awareness and knowledge toward MyGAP/IPM

Table 1 shows the demographic profiles of interviewed farmers in KADA, Kelantan. The mean for the age of farmers was 51 years, including the only four female farmers. The majority of the farmers have completed elementary school as their educational background. Half of the farmers

Table 1: Demographic profiles of paddy farmers in KADA areas, Kelantan state

Parameters	No.
Gender	
Male	57
Female	4
Mean age (years)	51
Education	
No education/primary school	18
More than secondary school	43
No. of protective apparels and equipments (globe, apron, mask etc)	
Average number of equipment	3.5
Storage of chemical input	
Stored in a safe way	44
Stored in an unsafe way	7
Awareness: MyGAP/IPM	
Being aware of MyGAP/ IPM	50
Not being aware	11
Knowledge: MyGAP/IPM	
Had training experience	12
No training experience	48

Source: Survey (2013)

Table 2: Estimated coefficients of paddy farmer's intention to adopt sustainable agriculture

Parameters	B	SE	t	Sig.
Constant	1.637	0.584	2.804	0.007***
Subjective norms	0.068	0.049	1.385	0.172
Attitude	0.134	0.052	2.610	0.012**
Perceived behavioral control	0.577	0.083	6.979	0.000***
Age	-0.010	0.004	-2.616	0.012**
No. of protective equipment	0.089	0.036	2.498	0.016**
Storage of chemical inputs	0.253	0.104	2.420	0.019**
Education (dummy)	0.039	0.248	0.156	0.877
Knowledge: MyGAP/IPM (dummy)	0.251	0.090	2.771	0.008***
Awareness: MyGAP/IPM (dummy)	0.396	0.106	3.723	0.000***
Adjusted R square	0.769			

Dependent variable: Intention, *: 10% significant level, **: 5% significant level, ***: 1% significant level, SE: Standard error, Sig: Significance

were employed as part-time workers in the off-farm sector, while the other half were working as full time farmers. Even though average farm size was 7.1 ha, half of the farmers were working as part time farmer.

In order to analyze the significant factors that may have an influence on farmer's intention to adopt sustainable farming practice, multiple linear regression model was applied with "intention" as the dependent variable and with the following as explanatory variables, subjective norms, attitude, perceived behavioral control, age and level of education as demographic profiles, use of protective apparels, storage of chemical input, awareness and knowledge of MyGAP/IPM as shown in Table 2. The adjusted R² for the model equals to 0.769 indicating that 76.9% of the variation in intention can be explained by the model. Out of 9 explanatory variables, 7 of the following variables presented have a positive and significant effect on intention; attitude, perceived behavioral control, age, use of protective apparels and equipments, storage of chemical input, awareness and knowledge of MyGAP/IPM. McCarthy *et al.* (2007) indicated that farmer's attitude and level of perceived behavioral control determines strength of farmer's commitment to certain farming practices, also Bond *et al.* (2009) found that attitude was the most important factor influencing behavioral intention. The result in this study found that variables of attitude and perceived behavioral control are statistically significant at 5 and 1%, respectively indicating that farmers who have a positive attitude and perceived behavioral control have higher intention. Best (2008) found

that among farmers applying sustainable agriculture such as organic farming, newer farmers were more willing to be involved in sustainable agriculture and had more pro-environmental attitudes compared to the older farmers. Age of farmers had a significant relationship with farmers' intention, indicating that farmers who are younger have higher intention to adopt sustainable farming practice. Moreover, the number of protective equipments and storage methods for chemical inputs are statistically significant at 5% with positive signs. Farmers, who used a higher number of protective equipments while applying chemical input and store them properly had higher intention to adopt sustainable farming practices. As, Adebayo and Oladele (2012) found knowledge of farmers and extension workers contacts greatly influence motivation towards adopting organic farming, similarly knowledge of MyGAP/IPM turns out to be also significantly and positively related to farmers' intention at 1% significant levels showing that farmers with more awareness and knowledge have a higher level of intention to adopt sustainable farming practices.

CONCLUSION

It could be concluded that the paddy farmers in Malaysia have the intention to practice sustainable agriculture as stipulated by MyGAP. This intention is being enhanced by the positive attitudes and knowledge about sustainable agriculture although they are not as yet practices sustainable agriculture. The Paddy Check List booklet, which spell out the recommended paddy farming practices distributed by Ministry of Agriculture and Agro-based Industry to all paddy farmers is very useful media in alerting and to spur the adoption of sustainable agriculture practices. In the same token in order to translate the intention to behavior in practicing sustainable agriculture, serious efforts have to be undertaken by the relevant agencies to provide more information, training and extension to the paddy farmers. Demonstration plot of sustainable practices need to be established in order for the farmers to see and experience the real sustainable agricultural practices. It is now being used by most paddy farmers as a guideline for sustainable farming practices. This booklet might give some positive attitudes to the paddy farmers to have intention to be sustainable in their farming practices.

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