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Determinants of Paddy Farmer's Unsustainability Farm Practices

Zainalabidin Mohamed*, Rika Terano, Juwaidah Sharifuddin and Golnaz Rezai

Department of Agribusiness and Information Systems, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Selangor Darul Ehsan

Abstract

Sustainable agriculture is closely related to farming practices. In order to attain sustainable agriculture, there are many farming practices such as land preparation, used of fertilizers and weedicides among other indicators of farming practices. In particular, weed and pest control are focal points for certain crops such as cotton, rice, vegetables, and fruit with heavily applied chemical inputs which cause unsustainability in farming. Among food crops, paddy requires heavy doses of fertilizers, weedicides and pesticides to keep it healthy and productive. The objective of this study is to determine the factors that contribute to unsustainability of paddy farming practices at field level via Paddy Farmer Sustainability Index (PFSI) based on the current 33 paddy farming practices. Tobit regression analysis found that knowledge and awareness have played important role in determinant of unsustainability level in paddy farming.

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Keywords: Paddy, Sustainability, Farm

1. 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). Overused of chemicals also raises input costs and lowers profit margins for famers (Dawra, 2013). In addition the indiscriminate use of pesticides and other agricultural chemicals or their improper application methods create chronic health problems among farmers as well. Pesticide residues were found among fish samples in paddy farming areas such as Aldrin/dieldrin, chlordane,

* Corresponding author.
E-mail address: zainal.mohamed@gmail.com or zam@upm.edu.my

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HCH, and DDT which is dangerous to human health. This could be due to famer's lack of knowledge about pests and their control and hence overused of chemical input in order to protect their crops (Parveen, 2011).

Similarly 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 an important concept to alert farmers about the alternative farming systems and methods of farming. Sustainable agriculture can be considered alongside organic farming which is a rapidly growing sector in many countries (Rigby and Caceres, 2001). As Power (2003) and Prasad and Power (1997) have mentioned, sustainable agriculture is now on the agenda of agricultural institutions around the world as governments have become concerned with the issues of saving the environment, safe-guard the biodiversity and food safety. Sustainable agriculture can be one of the solutions to controversial farming issues as it can ensure both profitability, food quality and safety (Feher and Beke, 2013).

Standards in agriculture not only garner market access but also ensure that farming practices are carried out in an environmentally conscious and sustainable manner (Economic Transformation Programs 2013). In Malaysia, MyGAP (Malaysian Good Agricultural Practices) was launched by the Ministry of Agriculture and Agro-based Industry (MOA) on 28 August 2013. This not only to ensure that Malaysian producers produce are benchmarked against other Good Agricultural Practices but also to allows Malaysia's agricultural produce to gain better recognition and be accepted both domestically and internationally. In case of paddy, Rice Check that has been introduced by MOA has been recognized as the procedure to be followed by paddy farmers in reducing environmental pollution and assisting in developing an environmentally friendly and sustainable national agricultural industry. 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. Rice Check is a guideline of the practices of paddy farming in Malaysia which was formulated by MOA. Several practices has been stipulated under the Rice Check, these are as follows: Soil acidity status: to make sure the soil has no acidic fields; Plot condition: it must be flat and well maintained; Weed control: it can reduce paddy yields; Irrigation schedule: follow the scheduled irrigation timetable to save water; Land preparation: flatten the land; Seedling: certified seedling; Fertilizer application: high yields obtained through adequate supply of nutrients and timely required information; Water management: efficient water management and adequate time is essential to achieve higher productivity; Pest control: weed and pest can reduce paddy yield, and ; Harvesting: post-harvest losses. These are several practices that must be followed by the farmers in order to be certified as MyGap (Malaysian Good Agriculture Practices). In most study sustainability practices is difficult to follow and most paddy farmers are unsustainable in their practices (Bonny and Vijayaragavan, 2001; Taylor et al., 1993).

The objective of this study is to determine the factors that contribute to unsustainability of paddy farming practices at field level via Paddy Farmer Sustainability Index (PFSI) based on the current 33 paddy farming practices.

2. Methodology

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 PPK 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 2013/14. This study attempts to measure how paddy farmers practice sustainable agriculture by creating sustainability index for the whole practices as stipulated in the Rice Check. Score was given to each individual practices depending on how important the practices are. For those practices that do not follow the guideline as stipulated in the Rice Check will be given negative score or no score. While those framers following the stipulated guideline will be given positive score. Table 1 shows the scoring systems for creating paddy farmers sustainability index. After having calculated the raw score, the score will be converted to percentage score.

Table 1. Production practices included in the unadjusted Farmer Sustainability Index (FSI).

Farming practice	**Amount/frequency**	**Max score**	**Min score**
1. Land preparation (Rice check 1.2.5.)			
1.1 Soil acidity	Yes=1, No=0	1	0
1.2 Flat land	Yes=1, No=0	1	0
1.3 Soil to a depth of 10cm to 15cm	Yes=1, No=0	1	0
2.Seedling (Rice check 6)			
2.1 Amount of seeds 140kg/hectare	Below 130kg/ha=0	1	-1
	130-150kg/ha=1		
	above/ha = -1		
3.Fertilizer application (Rice check4.7.8.)			
3-1 timing 1st application (15-20 days after seedling)	Not following=0,Within 15-20 days=+1	1	0
2nd application (35-40 days after seedling)	Not following=0,Within 35-40 days=+1	1	0
3rd application (50-55days after seedling)	Not following=0, Within 50-5 days=+1	1	0
4th application (70-75days after seedling)	Not following/No application=0,	1	0
	Within 70-75 days=+1		
3-2. Amount of fertilizer 979kg/ha	(range 900 to 1000kg/ha)=+1, Less than 900kg/ha=0	1	-1
	Exceeding amount (above 101%)=-1,		
4.Water management			
4-1 Following irrigation schedule	Yes=1, No=0	1	0
4-2 Observing depth of water	Yes=1, No=0	1	0
5.Weed control (Rice check 3)			
5-1. Frequency	0 or 1 time=1, 2 times=0, above 3 times=-1	2	-1
5-2.Timing ・1st application (3-5 days after seedling)	Not following schedule=0, within 3-5 days=+1	1	0
・2nd application	Not following schedule=0	2	0
ex less than 15 days after seedling-very good	Less than 15 days=+2		
15-30 days after seedling-good	within 15-30 days=+1		
exceed 30 days after seedling-not effective	exceeding 30 days=0		
5-3. Amount of weedicide	Within limit=1,	1	-3
	Exceeding additional 50%=0		
	Exceeding additional 100%=-1,		
	Exceeding additional 200%=-2		
	Exceeding additional 300 above=-3		
5-4.Burning dried straw	Yes=1, No=0	1	0
5-5.Dry rotation 7-14 days after burn the dried straw	Yes=1, No=0	1	0
5-6.Glyphosate poison if unleavened paddy still grow	Yes=1, No=0	1	0
5-7.Second rotation in a wet way (stagnant water)	Yes=1, No=0	1	0

Farming practice	**Amount/frequency**	**Max score**	**Min score**
5-8.Pretilachlor at the rate of 1.76l/ha	Yes=1, No=0	1	0
5-9.Third rotation at distances 10 feet between the lanes.	Yes=1, No=0	1	0
5-10.scatter the quality seed earns from legal source	Yes=1, No=0	1	0
6.Pest control (Rice check 9)			
6-1. Frequency	0 or 1 time=1, 2 times=0, above 3 times=-1	1	-1
6-1. Pulling up weeds by hand	Yes=1, No=0	1	0
6-2. Record of your farming activities	Yes=1, No=1	1	0
6-3. Proper protective clothing for applying chemical inputs	Yes=1, No=1	1	0
6-4. Storing chemical input safely	Yes=1, No=1	1	0
6-5. How to throw the container of chemical input	chemical disposal=1, others=0	1	0
6-6. Varity of pesticide			
・2,4-D butyl ester	Used=+1, not used=0	1	0
6-7. Amount of pesticide	Within limit=1,	1	-3
(weather exceeding limit or not)	Exceeding additional 50%=0		
	Exceeding additional 51-100%=-1,		
	Exceeding additional 200%=-2		
	Exceeding additional 300% above=-3		
6-8. Organic pesticide	Organic pesticide used=1, no=0	1	0
Total score		33	-10

Source: Own calculation based on surveyed data and the formula is adopted from Taylor et al.(1993).

Thus after neutralizing the score, the maximum score is 100 indicating very sustainable practices; while on the other extreme 0 is very unsustainable. Paddy Farmers sustainability Index (PFSI) is applied to measure paddy farming practices and is addressed on value and range based on Taylor et al. (1993) and Zainal et al. (1994). The continuous sustainability percentage score (within a range of 0 to 100) were assigned to six discrete sustainability categories, with the following range of index values:

Possibly very sustainable : > 70.0;
- Possibly quite sustainable : 60.1 - 70.0;
- Possibly sustainable : 50.1 - 60.0;
- Intermediate : 40.1 - 50.0;
- Somewhat unsustainable : 40.0 - 20.0; and
- Unsustainable :<= 20.0.

Given the sustainability score, there is a gap between maximum score possible (100) and the minimum score (0) and the practices are assume constant within each farmers. Thus the different between the maximum possible score minus the sustainability score is equivalent to the unsustainability practices by the farmers. Thus the higher the sustainability index score the lower the UNSustainability index (PFUNSI) and vice versa. Thus those paddy farmers' falls under the somewhat unsustainable category thus the unsustainability become more unsustainable under the PFUNSI.

Formula for calculating: Paddy Farmers UNSustainability Index (PFUNSI):

1. Total Unadjusted farming practices score (TUFPS)= Σ Farming practices score
2. PFSI = TUFPS / Total possible farming practices score (TPFPS) * 100
3. Paddy farmers UNSustaiability Index (PFUNSI) = 100 – PFSI

As being discussed earlier, the objective of the study is to determine factors that cause unsustainability of from the socio-demographic background of the paddy farmers. Though some of the farmers were already categorized under unsustainable and sustainable with respect to farming practices, yet there are some socio-demographic factor that could to the unsustainability to the practices beside the farming practices as stipulated by the Rice Check.

The tobit regression analysis was used and specify as follows:

Y= a + bi Xi+...+ bjXj + u;

Where;

-Y is Farmer Unsustainable Index (range 0-100),

-X1 is age (dummy: above 55=1, below 55=0),

-X2 is awareness of Rice Check (MyGap) (dummy: being aware=0, not being aware=1),

-X3 is knowledge on sustainable agriculture (dummy: with knowledge=0, without knowledge=1),

-X4 is record for farming practice (dummy: taking record=1, not taking record=0),

-X5 is Full-time and part-time (Part-time=0, full-time=1).

3. Results and Dicusions

Table 2 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 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 hectare, half of the farmers were working as part time farmer.

Table 2. Demographic profiles of paddy farmers in KADA areas, Kelantan state.

	No.		No.
Gender		**Storage of chemical input**	
Male	57	Stored in a safe way	44
Female	4	Stored in an unsafe way	7
Mean age (years old)	51	**Awareness of Rice Check (MyGap)**	
Education		Being aware	50
No education/primary school	18	Not being aware	11
More than secondary school	43	**Knowledge of farming practice for Rice Check (MyGap)**	
Number of protective apparels and equipments (globe, apron, mask etc)		With knowledge	12
Average number of equipment	3.5	Without knowledge	48

In order to determine the significant factors that may have an influence on Paddy Farmers UNSustainability Index (PFUNSI), Tobit regression analysis was applied with “Paddy Farmers UNSustainability Index (PFUNSI)” as the dependent variable and with the following as explanatory variables such as age, awareness, knowledge, record for farming practice and full-time and part-time in Table 3. Out of five independent variables included in the Tobit regression analysis, two variables were statistically significant at 5% level with positive signs. Farmers who have not being aware of sustainable farming practiced paddy farming in highly unsustainable level compared with those farmers who have been aware of and farmers who did not have knowledge for sustainable agriculture tends to practice higher unsustainability level.

Table 3. Tobit regression analysis on unsustainability

Variable	Coefficient	Std.Error	z-statistic	Prob.	
Age (above 55=1, below 55=0)	0.018	0.025	0.71792661	0.47280254	
Awareness of Rice Check (MyGap) (being aware=0, not being aware=1)	0.034	0.016	2.05289319	0.04008294	***
Knowledge of farming practice for Rice Check (MyGap) (with knowledge=0,without knowledge=1)	0.076	0.03	2.51251383	0.01198744	***
Record for farming practice (taking record=1, not takeing record=0)	0.021	0.025	0.8362563	0.40301073	
Full-time and part-time (Part-time=0, full-time=1)	-0.02	0.025	-0.94599779	0.34414971	
Constant	0.464	0.037	12.65917	9.95E-37	
S.E. of regression	0.103	Akaike info criterion		-1.583865	
Sum squared resid	0.583	Schwarz criterion		-1.341634	
Log likelihood	55.31	Hannan-Quinn criter.		-1.488933	
Avg. log likelihood	0.907				

Dependent variable = Farmer Unsustainable Index (range 0-100).

4. Conclusion

Based on the Tobit regression analysis, 2 variables are found to be significant in explaining the unsustainability of paddy farming practices i.e. awareness about the existence of Rice Check and the knowledge about sustainable practices. Those paddy farmers who are not aware about Rice Check (MyGAP) and Sustainable practices are more unsustainable in their paddy farming practices. Those paddy farmers who do not have knowledge and training on MyGAP are more unsustainable in their paddy farming practices. Other variables are not significant in explaining the unsustainability practices by paddy farmers. Thus awareness campaign should be carried out by the relevant agencies about sustainable agriculture. The dissemination of knowledge via extension services should be intensified in order to enhance the adoption process of sustainable paddy farming practices.

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