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Perception and acceptance of farmers on precision farming technology in selected granary area

(Persepsi dan penerimaan petani terhadap teknologi pertanian tepat di kawasan sawah terpilih)

Hairazi Rahim*, Mohd Amirul Mukmin Abdul Wahab*, Mohd Zaffrie Mat Amin*, Azahar Harun* and Mohd Tarmizi Haimid*

Abstract

The adoption of advanced technology in agricultural production in developing countries such as Malaysia is vital, especially for the rice industry as a nation staple food source. Apart from ensuring the adequacy of the national food supply and sovereignty, consistent production of yields and returns can improve the living standards of existing rice entrepreneurs as well as attractive for new entrepreneurs especially young people to venture into. Appropriate agricultural applications that exploit the efficient use of technology and machinery are expected to be able to produce positive results in rice production in meeting various challenges such as weather uncertainty and continuity of the country's rice cultivation. Therefore, this study was conducted to assess the level of technological adoption in leveling and seed sowing, and technology for variable rate fertilization among rice entrepreneurs. The technologies are expected to contribute to the improvement in yield production for two major rice growing areas, MADA, KADA and PBLS to ensure food sovereignty of nations. The data have been attained through survey exercise in the selected granaries. A total of 400 respondents has been interviewed using a structured questionnaire in determining the perception and their acceptance towards precision farming technologies if available. The results show that farmers in MADA, KADA and PBLS are generally keen to adopt the precision farming technology developed by MARDI for leveling and seed sowing, and fertilisation activities. In addition, the cost comparison between the current practice and the new precision farming technology packages also been compared.

Introduction

Food production in South East Asian countries, particularly in Malaysia has become an issue and a major challenge in recent years. The extreme climate change phenomenon is a significant factor which is consistent with the substantial deterioration in paddy production. Changes in planting schedule and the use of plenty paddy varieties were among several endeavors to overcome this challenge, yet apparently less effective (DOA 2012; DOA 2015). Fluctuation in rice production is still happening with the increase of pest and disease attack due to climate uncertainty.

There is a significant correlation between extreme climate change and the increase of pest and disease attack as reported by some local researchers coincide with research findings by the extensive

*Economic and Social Science Research Centre, MARDI Headquarters, Persiaran MARDI-UPM, 43400 Serdang, Selangor
E-mail: hairazi@mardi.gov.my

researchers (Vermeulen et al. 2011; Firdaus, et al. 2013; Masud et al. 2014). However, farm management efficiency, including adherence to the planting manual is also the essential key to high yield production, thus will benefit the farmers in term of consistent revenue. Focus on technology advancement can be intensified in a way of efficient management with calculated risk, that is, remain in the status quo or the adoption of new technologies to increase the yield (Venkatesh and Davis 2000), but either way, it will take some work on its end.

Throughout the decades, lots of technologies have been generated regarding varieties, planting manual management and mechanisation to ensure the intensification of paddy yield production (Austin and Baharuddin 2012). The Malaysian Agricultural Research and Development Institute (MARDI) in particular, has developed a precision farming technology enclosed a number of rearing phase namely land levelling system and seeds sowing with conversion rate. Other two technologies, yield monitoring and early warning system are currently being developed and expected to complete and ready to employ by the end of 2019. These technologies are generated and employed under a mandate of the Ministry of Agriculture and Agro-Based Industry Malaysia (MOA Inc) by dint of allocated budget in the Eleventh Malaysian Plan (Rancangan Malaysia Ke-11, RMK11).

Technological adoption of land levelling and seed sowing with conversion rate systems could be a time - saving and input apart from increasing paddy yield. This is based on the precise land levelling ratio with setting index and seed sowing which contribute to the increasing in seed germination in a whole plot uniformly. Whereas, fertilising technology with conversion rate is likely to save the fertiliser use with the impact to reduce the frequency of pest and disease attacks causing by inappropriate fertiliser use.

Background

The first technological package comprises wet ploughing activity that is the last plough activity before direct seed sowing to be applied. Block mapping will be performed by a drone to acquire some information before channeling to the modified ploughing machine to make sure the land levelling is responding to the index setting which is +/- 5 cm. This will be conducted automatically only by one (1) labour, which is the driver of the machine. On the other hand, direct seed sowing will be using the existing land levelling information to determine the exact quantity of seed in accordance to appropriate land level. This is to ensure the uniform plant growth in the particular plot. Variable rate seed sowing is expected to save up to 25% of the current seed use (120 – 150 kg/ha).

The fertilising technology package with variable rate (VRT) refers to the first to fourth fertilising activities. Paddy plant growth information on greening aspect will be acquired by a drone before the fertilising activities are undertaken. In addition, soil analysis also was performed in order to get a recommendation for an appropriate amount of fertiliser used according to the paddy plant requisite. Fertiliser dispersed automatically using a spreader machine conducted by a driver in keeping with all the information mentioned earlier.

The application of these technologies by the farmers has to be measured empirically to avoid any adverse impact on the course of technology transfer. Profit excess discretion must be put under the main concern to benefit the technology consignee with regard to cost efficiency and food sovereignty. In keeping with that, this study is performed accompanied by the main objective to evaluate the acceptance of farmers from two main national granary areas, KADA, MADA and PBLS on precision farming technology developed by MARDI.

Methodology

This study is conducted by a face to face survey upon farmers in both KADA, MADA and PBLS granary areas using stratification easy sampling (Hair, Black et al. 2006). On March 5, 2017, a pilot survey has been carried out to ensure the respondents to comprehend the question structure as well as the process of collecting key input can be done systematically. The question structure is categorised into two major parts; first, to measure the level of acceptance in general, while the second part is to measure the level of acceptance for respondents towards precision farming technology in specific for two technology packages developed by MARDI. The respondents will be screened a video regarding of technology packages as a quick look as well as a short brief by researchers has been conducted before answering a structured survey.

The restructuring of the questionnaire was based on the parameters extracted from various sources of literature and adaptation from the study was conducted by Kebede et al. (1990) and Abu-Dalbouh (2013). However, this structure is improved and modified accordingly to the study area and the specified sample conditions (*Table 1*).

The number of respondents has been selected based on the availability of list name of farmers provided by Pertubuhan Peladang Kawasan (PPK) of each territory, districts and blocks. The minimum number of sample size was referred to the minimum sample size required as studied by Sudman, Sirken et al. (1988).

Findings

Some analyses were conducted to meet the objectives of the study. The findings were divided through each case study in three selected granary areas. Each case representing different granary areas and later explains the level of farmer acceptance of both appropriate agricultural technology packages; VRT seeding technology and seeding technologies as well as VRT fertilising technology packages.

MADA granary

The study revealed that most farmers in the MADA area were over the age of 51 and representing nearly 65% of the total respondents. The involvement of young people in rice cultivation activities is negligible that is only covering 11% of the total population of farmers. The majority of farmers (71%) finished their schooling at secondary school. Most of MADA farmers earn less than RM5,000 from paddy cultivation activities, but of that small percentage (4.7%) are divided into some higher income ranges when income from non-rice cultivation activities is included. A total of 56.4% of farmers yet bears household expenses in the range of between 3 – 5 people despite their age and infirmity.

In general, 62% of MADA farmers hold private ownership of rice cultivated land with an average area of 1.1 hectares, while 70% of them plant rice on rented or leased land with an average of 1.82 hectares. The majority (86.2%) of MADA farmers has paddy cultivation appliances worth less than RM10,000 according to their current status, which illustrates semi-mechanical practices and 40.2% of them were experienced more than 20 years in such activity (*Table 2*).

In referring to *Figure 1* below, at most 19.4% of farmers have knowledge in general about what is exactly the precision farming technology about. The percentage

Table 1. List of parameters that build questionnaire structure

Granary	Target of respondent	Response distribution	Respondent
MADA	100 farmers	Territory I, II, III and IV	94
KADA	150 farmers	District I, II, III, IV, V and VI	134
PBLS	150 farmers	Block I – VIII	130

Note: Analyses are carried out based on reliable respondents (90% from targeted 400 respondents)

Table 2. Socioeconomic profile for MADA farmers (n = 94)

Profile	Percentage (%)	
Age		
<20	0	
21 – 30	2.2	
31 – 40	8.8	
41 – 50	24.2	
>51	64.8	
Sex		
Male	98.9	
Female	1.1	
Household sizes		
<2	6.4	
3 to 5	56.4	
>6	37.2	
Education level		
Primary	15.1	
Secondary	71.0	
Diploma	12.9	
Degree	1.1	
	Rice cultivation	*Rice + others*
Income		
<RM 5000	43.6	38.3
RM5001 – RM10000	17.0	19.1
RM10001 – RM15000	18.1	14.9
RM15001 – RM20000	7.4	9.6
>RM20001	13.8	18.1

(*cont*.)

Table 2. (*cont*.)

Profile	Percentage (%)	
Status of cultivated Area		
Private Ownership (62%, Average Size = 1.1 ha)	<1 ha	63.8
	1 – 2 ha	19.1
	2 – 3 ha	10.6
	3 – 4 ha	3.2
	>4 ha	3.2
Rent/Lease (70%, Average Size = 1.82 ha)	<2 ha	69.1
	2 – 4 ha	24.5
	4 – 6 ha	1.1
	6 – 8 ha	3.2
	>8 ha	2.1
Tools and machinery values		
<RM10,000	86.2	
RM10,001 – RM30,000	6.4	
RM30,001 – RM60,000	2.1	
RM60,001 – RM90,000	1.1	
>RM90,001	4.3	
Experience (year)		
<5	7.6	
5 – 10	19.6	
11 – 15	15.2	
16 – 20	17.4	
>21	40.2	

Source: Primary data

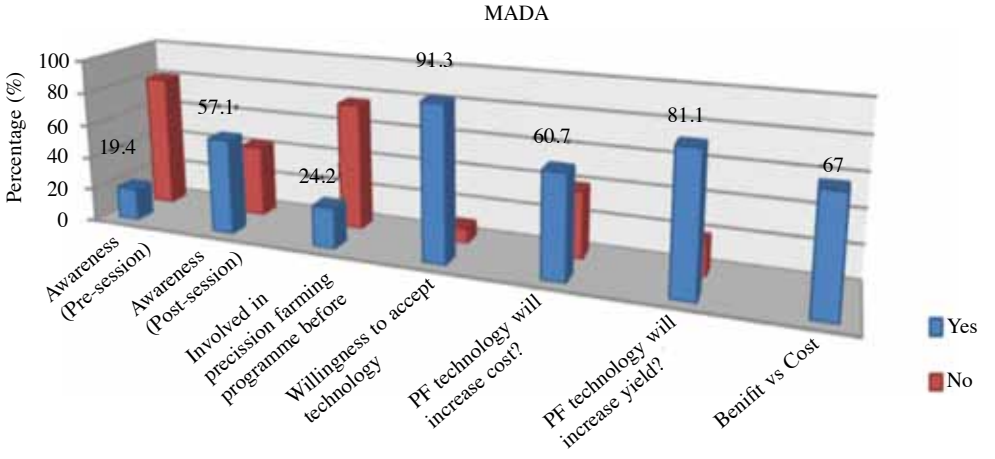

Figure 1. The acceptance of precision farming technology packages in general at MADA

increased to 57.1% subsequent to the video briefing session and a brief overview of the concept of agricultural technology was conducted. As a result, 24.2% report that they have taken part in the latest technology development activities based on the precision farming technology undertaken by various government and private agencies. If these conceptual technologies are available, most of them are willing to accept these technologies in the phase of their paddy cultivation activities. In spite of 60.7% of the respondents agreed the cost would be higher but simultaneously, 81.1% of them believe in positive returns across the technology application.

An in-depth study also found that farmers (82.6%) were ready to adopt the levelling technology package and variable rate seeding (VRT) developed by MARDI. The initial anticipation of the study with the assumption that this acceptance is based on several factors such as uneven planting area conditions, poorly levelling soil types, time-consuming for seeding processes and difficult seedling methods did not play a role in determining their acceptance of this precision farming technology. This means they are ready to accept this technology that facilitates phases in rice cultivation activities, even if they do not face difficulty in performing the levelling and seeding activities. This is probably due to most of their cultivated activities being managed and implemented using service providers to complete the phases. The study found that farmers in MADA were willing to pay RM225/ha to use the technology and seeding technology (VRT), taking into account the cost they spent earlier using semi-mechanical technology (*Table 3*).

Specific findings also discovered the acceptance by MADA farmers on the acceptance of the application of fertilising technology (VRT). The demanding of fertilising method, time-consuming fertilise and improper fertiliser quantity is factored in the primary assumption which considers 79.1% of the acceptance that pushing farmers to accept this technology has no effect. Nevertheless, they (86.4%) argue that the quality of the current fertiliser provided by the government is not attaining the quality required in rice cultivation. In every 3 to 4 times fertilising phases in each rice cultivation cycle, they are willing to pay up

Table 3. The acceptance of levelling and sowing (VRT) technological packages

Variable measured	Indicator	
	Yes	No
Acceptance	93.5	6.5
	Level	Uneven
Area condition	77.7	22.3
	Difficult	Easy
Type of soil	25.5	74.5
	Time-consuming	Time-saving
Current sowing procedure	22.8	77.2
	Difficult	Easy
Current sowing method	16.3	83.7
	Yes	No
Willingness to accept	82.6	17.4
	Average/ha	
Willingness to pay	RM225	

Source: Primary data

to RM100 based on the current costs they incur for the semi-mechanical technology (self-service or service providers) (*Table 4*).

KADA granary

41.4% of the total respondents are represented by farmers over the age of 51 in the KADA granary area. While most of KADA farmers are over 40 years old, the involvement of youth in rice cultivation activities, shows a fairly encouraging percentage which constitutes almost 35% of the total population of the farmers under 40 years old. In spite of the fact that the majority of farmers (69.8%) only completed secondary schooling. There was a better percentage of 16.3% (diploma) and 3% (degree) compared to the level of proficiency of farmer education in MADA.

A total of 43% of KADA farmers earns less than RM5,000 yet no percentage breakdowns for other income ranges are too low. The increase in non-paddy cultivation income shows a large percentage which is RM5,000 to RM10,000 while the largest percentage increase (6.7%) is in the range of RM10,000 to RM15,000. Studies suggest that greater involvement of the youth, labour and better utilisation of technology may spur the involvement of young farmers in the provision of services in rice cultivation activities as well as increase their income. In line with the farmer age profiles, the largest percentage of household members is more than six persons which are over 60%.

Only 37% of KADA farmers hold private ownership of land with an average area of 0.72 ha while 89% of them plant rice in rented or leased land with an average area of 4.45 ha. This fact has a significance that predominantly KADA farmers are cultivating paddy broadly without having private ownership of these lands. This is obviously a different kind of situation compared to the MADA granary area which has a relatively small size of the lease. A total of more than 50% of farmers in KADA have experience in paddy cultivation for less than 10 years. However, farming appliances worth over RM90,000 comprises the largest category owned by the farmers. A large value indicates the possibility of involvement of farmers in the provision of services or greater revenue potential if they perform the activities of their own therefore save on production costs (*Table 5*).

There are only 24.4% of farmers have knowledge in general about what is exactly

Table 4. Acceptance on fertilisation technology package (VRT)

Variable measured	Indicator	
	Yes	No
Acceptance	91.2	8.8
	Difficult	Easy
Current fertilisation method	22	78
	time-consuming	Time-saving
Current fertilisation period	21.1	78.9
	Appropriate	Inappropriate
Fertiliser amount suitability	78.9	21.1
	High	Low
Current fertiliser quality	13.6	86.4
	Yes	No
Willingness to accept	79.1	20.9
	Average per ha	
Willingness to pay	RM100	

Source: Primary data

Table 5. Socioeconomic Profile, KADA farmers (n = 134)

Profile	Percentage (%)	
Age		
<20	3.8	
21 – 30	9.8	
31 – 40	19.5	
41 – 50	25.6	
>51	41.4	
Sex		
Male	97.8	
Female	2.2	
Household size		
<2	5.5	
3 to 5	34.6	
>6	60.2	
Education Level		
Primary	10.9	
Secondary	69.8	
Diploma	16.3	
Degree	3.0	
	Rice Cultivation	*Rice + Others*
Income		
<RM5,000	43.0	31.1
RM5,001 – RM10,000	29.6	33.3
RM10,001 – RM15,000	11.1	17.8
RM15,001 – RM20,000	5.9	5.9
>RM20,001	10.4	10.4
Cultivated area status		
Private Ownership (37%, Average size = 0.72 ha)	<1 ha	76.3
	1 – 2 ha	14.8
	2 – 3 ha	4.4
	3 – 4 ha	2.2
	>4 ha	2.2
Rent (89%, a verage size = 4.45 ha)	<2 ha	36.3
	2 – 4 ha	25.2
	4 – 6 ha	14.8
	6 – 8 ha	14.1
	>8 ha	9.6
Tools & Machinery Values		
<RM10,000	19.3	
RM10,001 – RM30,000	19.3	
RM30,001 – RM60,000	23.7	
RM60,001 – RM90,000	9.6	
>RM90,001	28.1	
Experience (year)		
<5	27.3	
5 – 10	28.8	
11 – 15	12.9	
16 – 20	11.4	
>21	19.7	

Source: Primary data

the precision farming technology about as shown in *Figure 2*. The percentage increased to 73.8% subsequent to the video briefing session and a brief overview of the concept of agricultural technology was conducted. As a result, 14.1% report that they have been engaged in the latest technology development activities based on the precision farming technology undertaken by various government and private agencies. If these conceptual technologies are available, 92.4% of them are willing to apply these technologies in the activities. In spite of 92.4% of the respondents agreed the cost would be higher but simultaneously, 80% of them believe to gain some benefits apart from reducing operating costs across the technology application.

The study found that farmers (87.8%) are ready to adopt a levelling and sowing technology package (VRT) developed by MARDI. Preliminary anticipation of the study assumes that this acceptance is based on several factors such as uneven planting conditions, unpredictable land types and inconvenient seedling methods are apparently not a factor in determining their acceptance of this precision farming technology. The study found that farmers in KADA believe that the current sowing methods are time consuming (55.8%) thus agreed the sowing technology (VRT) may provide them a benefit in regard to time saving and willing to pay RM225/ha to use the technology by taking into account the

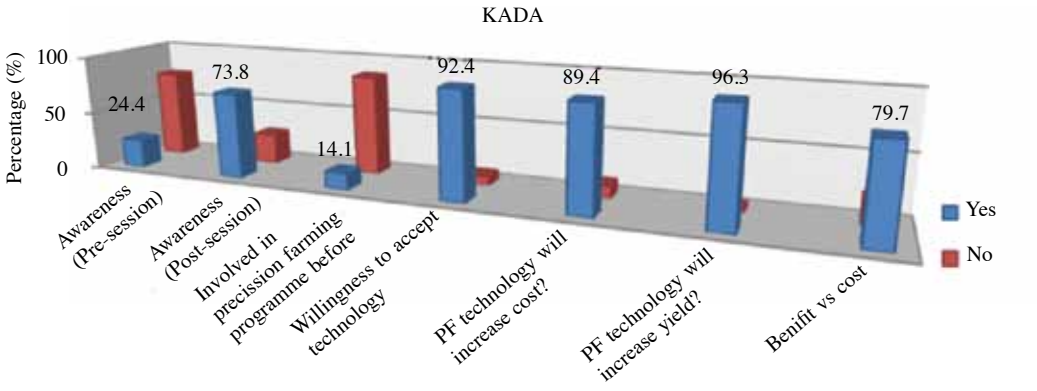

Figure 2. The acceptance of precision farming technology packages in general at KADA

cost they previously had with the use of semi-mechanical technology (*Table 6*).

The study shows that a large percentage (85.6%) believed that they would use the fertilise technology (VRT) if it had the chance. The acceptance is factored into current unfavorable fertilise methods (51.1%) and time-consuming fertilise (62.5%). 86.4% of farmers in KADA believed that the current quality of fertiliser is substandard for rice cultivation disregarded its quantity. It is likely that most farmers' purchase of additional fertiliser to ensure the yield return is as presume. In order to fertilize the soil (3 to 4 times in each cycle), the farmers are willing to pay up to RM122.50 based on the current costs they incur on semi-mechanical technology (self-service or service providers) (*Table 7*).

LS granary

Most farmers in the PBLS granary area were over the age of 40 representing almost 84% of the total respondents. The involvement of youth (<40 years) in rice cultivation activities is insignificant that is 16.9% of the total population of the farmers. 66.2% finished secondary school and most of the farmers earn less than RM5,000 (60%). It is only 7% of this range (income earner) earn RM5,000 to RM10,000 (0.7%) for the activity of non-paddy cultivation, ranging from RM10,000 to RM15,000 (5.4%) and the range exceeds RM20,000 (0.8%). A total of 49.2% of farmers yet bear household expenses in the range of between 3 – 5 people despite their age and infirmity.

Generally, 55% of PBLS farmers hold private land ownership with an average area of 0.89 ha while 67% of them cultivating on rented or leased land with an average area of 1.4 ha. 86.9% or a majority of farmers in PBLS own farming appliances worth less than RM10,000 according to the current status which illustrates the activities employ in semi-mechanical technology 46.2% of them have more than 20 years of experience in this activity (*Table 8*).

As can be seen in *Figure 3*, only 26.9% of farmers have knowledge in general about what is exactly the precision farming technology about. This percentage increased to 57.7% subsequent to the video briefing session and a brief overview of the concept of agricultural technology was conducted. As a result, 26.9% report that they have been involved with the latest technology development activities based on the precision farming technology undertaken by various government and private agencies. 81.5% expect an increase in costs upon technology application. In spite of 85.4% of the respondents agreed the cost would be higher but simultaneously, 56.9% of them believe to gain some monetary benefits apart from reducing operating costs across the technology application.

Table 6. Acceptance on levelling and sowing (VRT) technology package

Variable measured	Indicator	
	Yes	No
Acceptance	96.2	3.8
	Level	Uneven
Cultivated area condition	86.4	13.6
	Difficult	Easy
Type of soil	44.5	55.5
	Time-consuming	Time-saving
Current sowing procedure	55.8	44.2
	Difficult	Easy
Current sowing method	28.8	71.2
	Yes	No
Willingness to accept	87.8	12.2
	Average/ha	
Willingness to pay	RM265	

Source: Primary data

Table 7. Acceptance on fertilization technology package (VRT)

Variable measured	Indicator	
	Yes	No
Acceptance	90.1	9.9
	Difficult	Easy
Current fertilisation method	51.1	48.9
	Time-consuming	Time-saving
Current fertilisation period	62.5	37.5
	Appropriate	Inappropriate
Suitability of fertiliser amount	78.6	21.4
	High	Low
Current fertiliser quality	13.6	86.4
	Yes	No
Willingness to accept	85.6	14.4
	Average/ha	
Willingness to pay	RM122.50	

Source: Primary data

Table 8. Socioeconomic profile, PBLS farmers (n = 130)

Profile	Percentage (%)	
Age		
<20	0	
21 – 30	5.4	
31 – 40	11.5	
41 – 50	28.5	
>51	54.6	
Sex		
Male	96.9	
Female	3.1	
Household size		
<2	13.8	
3 to 5	49.2	
>6	36.9	
Education level		
Primary	23.8	
Secondary	66.2	
Diploma	9.2	
Degree	0.8	
	Rice Cultivation	*Rice + Others*
Income		
<RM5000	60.0	53.1
RM5001 – RM10000	28.5	29.2
RM10,001 –RM15,000	3.1	8.5
RM15,001 –RM20,000	3.8	3.8
>RM20,001	4.6	5.4
Cultivated area status		
Private Ownership (55%, Average size = 0.89 ha)	<1 ha	51.5
	1 – 2 ha	39.2
	2 – 3 ha	6.2
	3 – 4 ha	1.5
	>4 ha	1.5
Rent (67%, Average size = 1.4 ha)	<2 ha	78.5
	2 – 4 ha	16.2
	4 – 6 ha	3.8
	6 – 8 ha	0.8
	>8 ha	0.8
Tools and machinery values		
<RM10,000	86.9	
RM10,001 – RM30,000	6.9	
RM30,001 –RM60,000	2.3	
RM60,001 –RM90,000	1.5	
>RM90,001	2.3	
Experience (year)		
<5	10.0	
5 – 10	18.5	
11 – 15	10.0	
16 – 20	15.4	
>21	46.2	

Source: Primary data

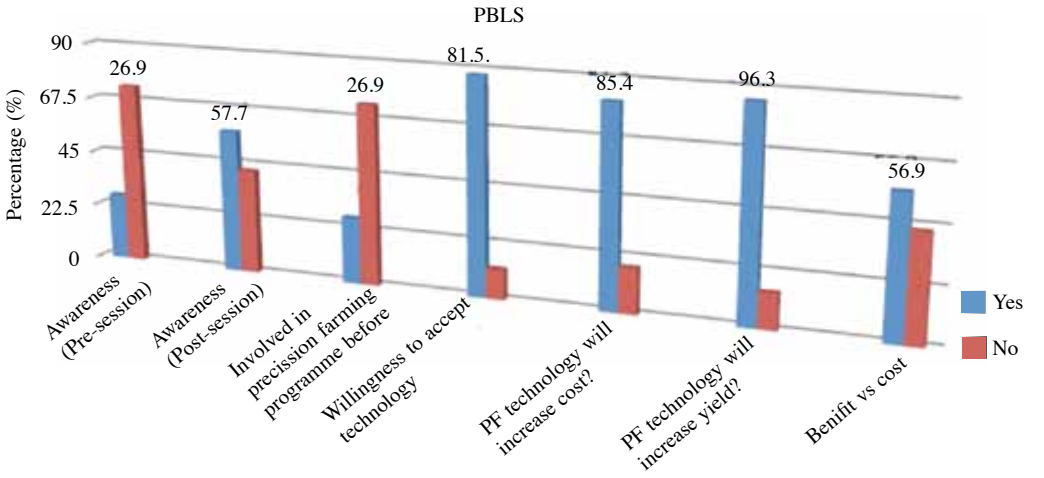

Figure 3. The acceptance of precision farming technology packages in general at PBLS

The findings show that 76.2% of the farmers are willing to adopt a levelling and variable rate seeding (VRT) technology. Several factors such as poorly flattened soil types, the time-consuming seeding process and the difficulty of sowing methods do not seem to be associated in determining their acceptance of this precision farming technology. Uneven planting areas might contribute to the factor. Despite convenience process in levelling and seeding, PBLS farmers are ready to adopt this technology, probably due to the service providers system that facilitates them to complete all the activities. The study found that farmers at PBLS are willing to pay RM198.60/ha to employ both technologies by taking into account the cost they spent previously using semi-mechanical technology (*Table 9*).

The acceptance of MADA farmers on the fertilise technology (VRT) was found to have a large percentage of 75.4% as shown in *Table 10*. No factors that may contribute to this acceptance as the farmers found that fertilising process is convenient, timely and sufficient in quantity. In order to give effect to this phase, they are willing to pay up to RM163.15 based on current costs incurred using semi-mechanical technology (self-made or use of service providers).

Recommendations

Paddy entrepreneurs in MADA, KADA and PBLS are generally willing to accept the precision farming technology in their cultivation practices. There is, however, concern over rising costs that are expected to occur across the technology application. In the early hypothesis, cost increment is necessary in any new technology application. The comparison of current standard costs used in the levelling and seeding phase and fertilisation are presented in *Table 11*.

This comparison is very useful in giving an overview to the service providers either from government agencies or private parties in developing cost-effective and competitive cost of production and services if the appropriate agricultural technology application developed by MARDI is to be utilised in selected granaries.

Table 9. The acceptance of levelling and sowing (VRT) technological packages

Variable measured	Indicator	
	Yes	No
Acceptance	96.2	3.8
	Level	Uneven
Cultivated area condition	40.0	60.0
	Difficult	Easy
Soil types	15.4	84.6
	Time-consuming	Time-saving
Current sowing procedure	26.9	73.1
	Difficult	Easy
Current sowing method	20.0	80.0
	Yes	No
Willingness to accept	76.2	23.8
	Average/ha	
Willingness to pay	RM198.60	

Source: Primary data

Table 10. Acceptance on fertilization technology package (VRT)

Variable measured	Indicator	
	Yes	No
Acceptance	88.5	11.5
	Difficult	Easy
Current fertilisation method	23.1	76.9
	Time-consuming	Time -saving
Current fertilisation period	34.6	65.4
	Appropriate	Inappropriate
Suitability of fertiliser quantity	78.5	21.5
	High	Low
Current fertiliser quality	76.9	23.1
	Yes	No
Willingness to accept	75.4	24.6
	Average/ha	
Willingness to pay	RM163.15	

Source: Primary data

Table 11. Willingness to pay average comparative in cultivation activity: DOA Standard VS MADA, KADA Dan PBLS

Activity	Standard (RM)	Precision farming (RM)		
		MADA	KADA	PBLS
Levelling and sowing (VRT)	130	225	265	198.60
Comparison (%)		73.10	103.80	52.80
Fertilisation (VRT)	160	100	122.50	163.15
Comparison (%)		– 37.50	– 23.40	1.97

Note: Leveling and sowing = wet ploughing and direct sowing, fertilisation = four times
Source: DOA (2015) and primary data

Conclusion

Paddy entrepreneurs in both main stalls of Malaysia, MADA and KADA are generally willing to accept the exact agricultural technology MARDI has developed. This includes two technology packages pertaining to land leveling and variable rate seeding, and variable rate fertilisation. The farmers are also cooperative to bear a slight increase in costs in the technology application in accordance with the cost calculation. Related specific agencies such as MADA, KADA and IADA PBLS; also generally for all authorities that play the role as service providers in rice cultivation activities should put more concerns in continuously enhance the technologies in rice cultivation. Private public partnership in research and development (R&D) needs to be enriched as the internalisation of new technologies is really needed in further improvement of the rice industry. Public research institution specifically MARDI has been mandated by the government to put a lot more attention in developing the precision farming technologies. This is because of the pressure in increasing the yield concurrently ensuring the self sufficiency of the staple food of the

nation. Moreover, advanced technologies in rice cultivation have been assumed among the relevant factor in encouraging the youth to embark into the industry. In addition, efficient technologies would contribute to the sustainable on the environment without abandoning the monetary-profit maximisation through fewer inputs and cheaper operational cost.

References

Abu-Dalbouh, H.M. (2013). A questionnaire approach based on the technology acceptance model for mobile tracking on patient progress applications. *Journal of Computer Science* 9(6): 763 – 770

Austin, O.C. and Baharuddin, A.H. (2012). Risk in Malaysian agriculture: The need for a strategic approach and a policy refocus. *Kajian Malaysia* 30(1): 21 – 50

DOA (2012). Data Terbuka DOA & MOA

DOA (2015). Pakej Teknologi Padi, Perpustakaan Negara Malaysia

Firdaus, R.R. (2013). The impact of climate change towards Malaysian paddy farmers. *Journal of Development and Agricultural Economics* 5(2): 57 – 66

Hair, J., et al. (2006). Multivariate Data Analysis: A Global Perspective. Upper Saddle River, New Jersey, Pearson Prentice Hall

Kebede, Y., Gunjal, K. and Coffin, G. (1990). Adoption of new technologies in Ethiopian agriculture: The case of Tegulet-Bulga district Shoa province. *Agricultural Economics* 4(1): 27 – 43

Masud, M.M., Rahman, M.S., Al-Amin, A.Q., Kari, F. and Filho, W.L. (2014). Impact of climate change: an empirical investigation of Malaysian rice production. *Mitigation and adaptation strategies for global change* 19(4): 431 – 444

Sudman, S., Sirken, M.G. and Cowan, C.D. (1988). Sampling rare and elusive populations. *Science 240*(4855): 991 – 997

Venkatesh, V. and F.D. Davis (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science* 46(2): 186 – 204

Vermeulen, S. J. (2011). Options for support to agriculture and food security under climate change. *Environmental Science and Policy* 15(1): 136 – 144.

Abstrak

Penerapan teknologi yang lebih maju dalam pengeluaran pertanian di negara membangun seperti Malaysia adalah penting terutamanya dalam industri padi yang merupakan sumber makanan ruji. Selain daripada menjamin kecukupan bekalan dan kedaulatan makanan negara, pengeluaran padi yang konsisten dan mendatangkan pulangan lumayan mampu meningkatkan taraf hidup pengusaha padi sedia ada di samping menarik minat pengusaha baru terutamanya golongan muda untuk menceburkan diri. Aplikasi pertanian tepat yang mengeksploitasi penggunaan teknologi dan mesin yang lebih kos efisien adalah dijangka mampu membuahkan hasil yang positif dalam pengeluaran padi dalam mendepani pelbagai cabaran seperti ketidaktentuan cuaca dan kesinambungan penanaman padi negara. Oleh yang demikian, kajian ini dilaksanakan bagi mengukur tahap penerimaan teknologi perataan tanah dan penaburan benih secara kadar boleh ubah, dan teknologi pembajaan secara kadar boleh ubah di kalangan pengusaha padi. Teknologi ini dijangka dapat menyumbang kepada peningkatan hasil bagi memastikan kedaulatan makanan negara di dua kawasan penanaman padi yang utama, MADA, KADA dan PBLS. Data diperoleh melalui kaedah survei kepada petani di jelapang terpilih. Seramai 400 responden telah ditemu bual menggunakan borang soal selidik berstruktur untuk menentukan persepsi dan penerimaan mereka terhadap teknologi pertanian tepat padi. Keputusan menunjukkan petani di MADA, KADA dan PBLS secara umumnya berminat menerima penggunaan teknologi pertanian tepat yang MARDI bangunkan dalam aktiviti perataan tanah dan penaburan benih, dan pambajaan secara kadar boleh ubah. Di samping itu, perbandingan kos pada masa kini yang dinikmati oleh petani dalam aktiviti perataan dan pembajaan turut dibandingkan dengan kesanggupan membayar jika bertukar menggunakan dua pakej teknologi berkenaan turut didapati.