Innovation characteristics and technology adoption on Probio_FM

by Admin Jurusan Agribisnis

Submission date: 15-Apr-2023 07:12PM (UTC+0700)
Submission ID: 2065223865
File name: ovation_characteristics_and_technology_adoption_on_Probio_FM.pdf (424.75K)
Word count: 3552
Character count: 19736

ISSN: 0852-3681
E-ISSN: 2443-0765

Jurnal Ilmu-Ilmu Peternakan 32(2): 159 – 166
Available online at http://jiip.ub.ac.id

Innovation characteristics and technology adoption on Probio_FM in the implementation of an integrated farming system in Bangka Tengah

Rufti Puji Astuti[1)], Novyandra Ilham Bahtera*[1)] and Fournita Agustina[1)]

[1)]Department of Agribusiness, Universitas Bangka Belitung
Bangka, 33172, Indonesia

Submitted: 27 January 2021, Accepted: 08 August 2022

ABSTRACT: The strategy to disseminate innovative technology is vital. It expects the technology to be effective and can be adopted. The assessment of the perception of farmers towards the characteristics of innovative technology is needed to identify the potential implementation of sustainability. The study aims to understand the characteristics of technology innovation of Probio_FM in the food processing of palm oil and to examine the impact of innovation characteristics on the adoption of innovation. The survey was employed as the research method. Structural equation modeling with smart partial least squares was used to analyze the data. The study discovered that the innovation characteristics and adoption of Probio_FM technology were relative advantages, compatibility, complexity, liability, and observability. The innovation characteristics had a significant impact on the adoption process. Technology innovation was accepted by society. The variable of relative advantage, trialability, and compatibility was the most important innovation characteristic of livestock farmers in the process of adoption of Probio_FM technology in food processing of palm oil.

Keywords: Animal Feed; Innovation Characteristics; Probio_FM Technology

*Corresponding Author: novyandra.ib@gmail.com

DOI: 10.21776/ub.jiip.2022.032.02.01

INTRODUCTION

The supply of the need of meat consumption in Kepulauan Bangka Belitung Province is about 85% which is supplied from the other provinces such as Lampung, Bali, and Nusa Tenggara Timur. It shows the agribusiness opportunity to raise cows. The development of cattle farming agribusiness through the implementation of an integrated farming system between plant dan cattle has been conducted by the local government through an integrated oil palm and cattle system or known as *system integrasi Sapi Kelapa sawit* (SISKA). The endeavor in supporting the SISKA program is through farmer assistance program to innovate and adopt the feed processing technology using palm oil midrib-leaf with the farmer group approach. The innovation of Probio_FM technology is one of the technology and innovation packages in higher education research that is disseminated to farmers in supporting the SISKA program. Since 2018, farmers have been using the technology to produce oil palm frond silage as cattle feed.

The Probio_FM technology is the innovation that is used in animal feed processing. It includes the role of probiotics that contain some species of lactic acid bacteria derived from microbial isolation in the digestive system of Kerinci duck (Manin, 2010). The use of Probio_FM is proven to tackle the issue of odor pollution in a cage, reduce the number of pathogenic bacteria in the poultry digestive system, increase animal health, improve the productivity of ducks and cows, to achieve the efficient cost of feed and time to feed, and to ease the feeding management (Adibrata et al., 2021; Astuti et al., 2019; Hendalia, 2018; Hendalia et al., 2012, 2017; Manin et al., 2014; Manin et al., 2014; Manin & Hendalia, 2012; Pranoto et al., 2020).

The application of technological innovation has a vital role in determining the success of the agribusiness sector both production quality and quantity. Its role will be useful when the adoption process occurs as the innovation is effective and measurable. The adoption of innovation can bring a change in agribusiness conditions both internally and externally (Ridwan, 2013). The adoption of the innovation process is influenced by some factors that determine the adoption level which are innovation, socio-economic condition, availability of information channels, and external factors (Hutapea et al., 2013; Prabayanti, 2010; Sulaiman & Darwis, 2018).

The Probio_FM technology is considered an innovation in supporting the Tunas Baru farmer and Saling Gumilang in supporting the SISKA program so it is vital to study how the farmer perception towards the innovation characteristics. Rogers (1995) argues that there are five innovation characteristics which are i) relative advantage; ii) compatibility; iii) complexity; iv) trialability, and v) observability.

The assessment of farmer perception is required to know the continuity of the adoption of innovation of the Probio_FM technology in supporting the SISKA program in Bangka Tengah so that the assessment of livestock perception towards the innovation characteristics of Probio_FM technology is the main objective of the study. Furthermore, the study also aims to analyze the impact of innovation characteristics on the adoption process. The results of the study are expected to be utilized as basic information for the university as the innovation actor to evaluate the usefulness and sustainability of feed innovation and technology-based Probio_FM.

MATERIALS AND METHODS

The study was located in Bangka Tengah. The location of the study was chosen as the Probio_FM was initially introduced in the given location. The saturation sampling was used to determine the respondents by taking all members of the population. There were 38 farmers in Tunas Baru and Saling Gumilang farmer groups as

DOI: 10.21776/ub.jiip.2022.032.02.01

the respondents in the study. Face-to-face interview with a questionnaire was applied to collect the data. Microsoft Excel 2010 was used to process the quantitative data while structural equation modeling (SEM) using smart partial least squares (PLS) was applied to analyze the data.

There were two stages of the data analysis process which were outer model analysis (measurement model) and inner model analysis (structural model). The evaluation of the measurement model was applied by understanding the loading factor score (λ). It was valid when the loading factor score was above 0.5.

The significant model in the evaluation of the structural model was based on an estimated score of the path parameter coefficient and t score above 1.96. The significant test was conducted by using bootstrapping as the resampling method. There were five observed latent variables and 20 manifested variables. (Table 1).

Table 1. The observed variables in the study

Exogen latent variables are characterized as innovative	
Indicator variable (manifested) Relative advantage (X1)	There was a positive relationship between relative advantage and speed of adoption. The indicator of relative advantage: 1. level of economic advantage (X1.1) 2. low start-up cost (X1.2) 3. low risk (X1.3) 4. lack of uncomfortableness (X1.4) 5. save energy and time (X1.5) 6. the experience on speed impact (X1.6)
Indicator variable (manifested) compatibility (X2)	There was a positive relationship between compatibility and speed of adoption The indicator of compatibility: 1. norms and belief systems of socio-cultural (X2.1) 2. known idea (X2.2) 3. need of innovation recipient (X2.3)
Indicator variable (manifested) Complexity (X3)	There was a positive relationship between complexity and speed of adoption The indicator of complexity: 1. continuity (X3.1) 2. complex (X3.2) 3. simple (X3.3)
Indicator variable (manifested) Trialability (X4)	There was a positive relationship between trialability and speed of adoption Indicator of trialability: 1. scale to try (X4.1) 2. risk to try (X4.2)
Indicator variable (manifested) Observability (X5)	There was a positive relationship between observability and speed of adoption 1. The ease in communicating the innovation (X5.1)
Endogen latent variabel	
Indicator variable (manifested) Endogen latent (Y)	The speed of adoption is the required time for a member of a social system to receive the innovation Indicator: 1. understanding stage (Y1.1) 2. learning stage (Y1.2) 3. considering stage (Y1.3) 4. using stage (Y1.4) 5. evaluating stage (Y1.5)

RESULT AND DISCUSSION

The characteristics of innovation in Probio_FM technology

The characteristics of innovation were measured by the nature of innovation which was a relative advantage, compatibility, complexity, trialability, and observability. Rogers and Shoemaker model was employed to describe the adopting decision-making process. The SEM-PLS was used to analyze the results on the contribution of each measured indicator variable. The details were as follows:

Table 2. Contribution of indicator variables on the characteristics of innovation and adoption of innovation

Latent Variable	Manifest Variable	Loading Factor	T-value	Cronbach's Alpha	AVE	Validity	Reliability
Characteristics of Innovation (X)							
Relative advantage (X1)	Economic advantage	0.648	5.996	0.801	0.562	Valid	Reliable
	Startup cost	0.757	6.221			Valid	
	Implementation risk	0.847	25.70			Valid	
	Comfort	0.861	8.160			Valid	
	Time and power – saving	0.751	5.309			Valid	
	Cognitive processing speed	0.591	3.912			Valid	
compatibility (X2)	The known idea	0.936	16.59	0.808	0.720	Valid	Reliable
	The socio-cultural value and belief	0.751	5.459			Valid	
	The need for an innovation receiver	0.847	12.43			Valid	
Complexity (X3)	Hard	0.647	7.744	0.734	0.732	Valid	Reliable
	Easy	0.864	5.884			Valid	
Trialability (X4)	Scale trials	0.875	5.665	0.794	0.825	Valid	Reliable
	Risk trials	0.940	5.944			Valid	
Observability (X5)	Easiness to disseminate innovation	0.654	2.030	1.000	1.000	Valid	Reliable
The Adoption of Innovation							
Adoption Process (Y)	Stage of knowing	0.917	38.82	0.923	0.762	Valid	Reliable
	Stage of learning	0.894	19.38			Valid	
	Stage of considering	0.794	8.533			Valid	
	Stage of using	0.863	13.86			Valid	
	Stage of evaluating	0.891	29.46			Valid	

The outer model analysis showed a loading factor of more than 0.5. It indicated all used indicators were able to measure the construct. Thus, all the valid indicator variables reflected both characteristics of innovation and adoption of innovation. The validity of the indicator variable was also shown by the t-value score which was more than 1.96 (Table 1).

The data analysis on the measurement model in Table 1 also explained that the used indicator variables were reliable. The Cronbach's Alpha score showed more than 0.7. The average variants extracted were

more than 0.5. It meant all the used indicator variables were reliable to measure the construct.

Relative Advantage

Innovation contributed to the relative advantage in various aspects such as social, economic, political, comfort, the use of time and energy, implementation risk, startup cost, and impact of implementing innovation (Fujiarta et al 2019). The innovation of Probio_FM as the technology was able to give a relative advantage, especially on the comfort aspect. The loading factor score was λ= 0.861 (Table 1).

The livestock farmers believed their failure could occur when the implementation of technology was low. Furthermore, the implementation technology had a positive impact on the time and energy effectively and efficiently used as well as reduced the odor pollution around the cage. Relative advantage in the economic aspect was experienced by the livestock farmers as the cost of feed production was reduced by 63%.

Complexity

The difficulty level of innovation determined the speed of innovation being adopted. The adopter was faster to adopt the innovation that was more understandable and user-friendly (Ahmad, 2016). The innovation of Probio_FM technology was considered as easy to understand and use. The loading factor score on the indicator of easiness level was λ= 0.864 (Table 2). Those were easy to learn and apply and inexpensive tools.

Compatibility

The compatibility was measured with three indicator variables: The compatible innovation on the need of the beneficent, the compatible innovation on the previous idea, and the compatible innovation on socio-cultural beliefs and practices. The Probio_FM technology was considered compatible with the cultu of livestock farmers. They applied the integrated farming system between cattle and oil palm plantations. Fujiarta *et al* (2019) argued that the innovation of the rice planting machine in Tabanan Regency was compatible as it matched with the socio-cultural of paddy farmers who planted the paddy in a conventional system.

The innovation of Probio_FM technology was considered compatible with the previously known idea. The implementation of Probio_FM technology was not that different from the previously known idea but the quality of the produced feed was more compatible with the need of the livestock farmer.

Trialability

The trialability meant the ability of innovation to be implemented on all scales and conditions. Ahmad (2016) stated that the innovation was able to test in any conditions without any requirement, it showed the innovation was triable. The trialability of innovation of Probio_FM technology is mainly reflected by the try risk indicator. The innovation of Probio_FM technology was able implemented. The livestock farmer was able to implement the innovation at any needed scale. They could set the variation of dose ingredients based on the cost, need, and amount of the owned livestock. The Probio_FM was also considered environmentally friendly. Thus, it led to the braveness of livestock farmers to implement the innovation.

Observability

The observability meant to what extent the implementation of innovation could be disseminated and spread by others. The observability was mainly reflected by the ease to disseminate as the indicator of innovation. The result was recognized by the livestock farmers as observable such as the comfort of the cage and the odorless air in the environment.

The Impact of characteristics of innovation on the adoption of innovation on the Probio_FM technol y

The decision on acceptance or rejection of innovation was part of the process of the adoption of innovation. The decision at a particular time was affected by various factors including characteristics of the innovation.

Table 3. The path parameter coefficient of the impact of characteristics of innovation on the adoption process based on the original sample value and t-value

Hypothesis	Original Sample	T-value	Note
Relative Advantage > Adoption of Innovation	0.894	6.303*	Significant
Compatibility > Adoption of Innovation	0.470	1.983*	Significant
Complexity > Adoption of Innovation	0.066	0.306	Insignificant
Trialability > Adoption of Innovation	0.587	2.030*	Significant
Observability > Adoption of Innovation	0.109	0.725	Insignificant

* t significance (0,05):1,96)

The structural model evaluation result showed that there was a significant impact of innovation characteristics on the adoption of innovation. T-value scores on the relative advantage, compatibility, and trialability were above 1.96 (table 3).

It meant that the impact of innovation characteristics on the adoption of the innovation process on the Probio_FM technology was explained by the relative advantage, compatibility, and trialability. The model of the impact of innovation characteristics on the adoption process showed an r-square of 0.753. It meant that the model in the study was considered robust. Moreover, the factors that measured the adoption of the innovation process could explain the various adoption of innovation scores of 75.3 percent. The rest was described by the other variables that were not used in the model.

The estimation score on the path parameter coefficient in table 3 illustrated that the contribution of the innovation characteristics, relative advantage, compatibility, and trialability positively contributed to the adoption of the innovation process. It meant the impact of innovation characteristics on the adoption of the innovation process was explained by the positive correlation among the relative advantage, compatibility, and trialability towards the stages of the adoption process. The positive score on the path parameter coefficient figured that the more relative advantage compatibility, and trialability were experienced from the innovation, the faster adoption of the innovation process.

The original score of the estimated analysis on path parameter coefficient showed the proportion of each characteristic on the innovation characteristics towards the adoption process. Based on the sample of the original score in table 3, described that the impact of the innovation characteristics on the adoption process was dominantly influenced by the relative advantage of the innovation (0.894). In addition, the compatibility and trialability scores were 0.470 and 0.587 respectively. It meant that the adoption of innovation on the Probio_FM technology in the feed process of palm midrib was conducted by livestock farmers due to the experience of the relative advantage.

The adoption of the innovation process was influenced by the innovation characteristics. Irvany (2011) argued that there was a relation between adoption and innovation characteristics in the adoption of innovation in organic paddy farming practices.

Ahmad (2016) stated that there was a significant impact of relative advantage, complexity, compatibility, and trialability towards the adoption of innovation in organic vegetable farming practices. The adoption process, both on the innovation of Probio_FM technology and the innovation of organic vegetables, was influenced by the trialability. The innovation with trialability was able to fasten the adoption process. However, the study showed differently that the adoption of innovation was mainly influenced by the relative advantage, not trialability.

DOI: 10.21776/ub.jiip.2022.032.02.01

CONCLUSIONS

The study concludes that the innovation characteristics of Probio_FM technology in feed processing of palm oil midrib were reflected by relative advantage, compatibility, complexity, trialability, and observability. The relative advantage, trialability, and compatibility were robust in reflecting the innovation characteristics. In addition, the innovation characteristics influenced significantly the adoption process. The relative advantage mainly affected the adoption process with 0.894. The compatibility and trialability affected the adoption process with 0.470 and 0.587 respectively. The livestock farmers who adopted the innovation were influenced by the experienced relative advantage.

ACKNOWLEDGMENTS

The authors would like to thank the Institute of Research and Community Service (Indonesian: Lembaga Penelitian dan Pengabdian kepada Masyarakat or LPPM) Universitas Bangka Belitung for pleasant administration to support us during the study.

REFERENCES

Adibrata, S., Bahtera, N. I., Astuti, R. P., & Arkan, F. (2021). The perception level on the impact of integrated livestock-fish production systems on environmental pollution. *IOP Conference Series: Earth and Environmental Science*, *926*(1), 012008. https://doi.org/10.1088/1755-1315/926/1/012008

Ahmad, Y. (2016). Pengaruh karakteristik inovasi pertanian terhadap keputusan adopsi usaha tani sayuran organik. *Journal of Agroscience*, *6*(2), 1–14.

Astuti, R. P., Manin, F., Adriani, A., Bahtera, N. I., & Adawiyah, C. R. (2019). The agricultural extension services to stock farmers through utilizing the Probio_Fm in improving the productivity of beef cattle in Central Bangka, Indonesia. *1st Workshop on Multimedia Education, Learning, Assessment and Its Implementation in Game and Gamification*, 3–8. /http://dx.doi.org/10.4108/eai.26-1-2019.2283322

Fujiarta, P. I., Sarjana, I. D. G. R., & Putra, I. G. S. A. (2019). *Faktor yang Berkaitan dengan Tahapan Adopsi Petani terhadap Teknologi Mesin Rice Transplanter (Kasus pada Enam Subak di Kabupaten Tabanan)*. *8*(1), 29.

Hendalia, E. (2018). Aplikasi teknologi probio_FM untuk mengoptimalkan produksi pakan lokal berbasis ikan rucah di kabupaten tanjung jabung barat. *Prosiding PKM-CSR*, *1*, 236–244.

Hendalia, E., Manin, F., & Asra, R. (2017). The Application of Probio _ FM Plus through drinking water in broiler at Politani Kupang. *Jurnal Ilmu-Ilmu Peternakan*, *20*(1), 33–38.

Hendalia, E., Manin, F., Yusrizal, & Nasution, G. M. (2012). The application of probiotic in increasing protein efficiency in reducing fecal ammonia on broiler chicken. *Agrinak*, *2*(1), 29–35.

Hutapea, Y., Suparwoto, & Efendy, J. (2013). Kecepatan adopsi varietas unggul dan kelayakan usahatani kedelai di Sumatera Selatan. *Agriekonomika*, *2*(2), 123–138.

Irvany, P. N. (2011). *Implementation of Organic Rice Farming Technology in Ciburuy Village, Cigombong Sub-district, Bogor Regency*. IPB University.

Manin, F. (2010). Potensi Lactobacillus acidophilus dan Lactobacillus fermentum d ari Saluran Pencernaan Ayam Buras Asal Lahan Gambut sebagai Sumber Probiotik. *Jurnal Ilmiah Ilmu-Ilmu Peternakan*, *XIII*(5), 221–228.

Manin, F., & Hendalia, E. (2012). The potency of Bacillus and Lactobacillus Bacteria as probiotic to reduce ammonia pollution in poultry house. *Jurnal Peternakan Indonesia*, *14*(2), 360–367.

Manin, F., Hendalia, E., Lukman, H., & Farhan. (2014). Pelestarian dan budi daya itik kerinci sebagai plasma

nutfah Provinsi Jambi berbasis Probio_FM di Kecamatan Air Hangat Kabupaten Kerinci Provinsi Jambi. *Jurnal Pengabdian Pada Masyarakat*, *33*(1), 30–50.

Manin, F., Hendalia, E., Yatno, & Rahayu, P. (2014). Impact of Probiotik Probio_FM to Health Status of Kerinci Duck. *JURNAL ILMU TERNAK*, *1*(2), 7–11.

Prabayanti, H. (2010). *Faktor-Faktor yang Mempengaruhi Adopsi Biopestisida oleh Petani di Kecamatan Mojogedang Kabupaten Karanganyar*. Universitas Sebelas Maret.

Pranoto, Y. S., Agustina, F., & Astuti, R. P. (2020). Pemanfaatan teknologi Probio_Fm dalam penerapan sistem integrasi sapi kelapa sawit di Bangka Tengah. *Agrokreatif: Jurnal Ilmiah Pengabdian Kepada Masyarakat*, *6*(3), 213–221. https://doi.org/10.29244/agrokreatif.6.3.213-221

Ridwan, H. (2013). Sifat inovasi dan peluang adopsi teknologi pengelolaan tanaman terpadu krisan dalam pengembangan agribisnis krisan di Kabupaten Sleman, DI Yogyakarta. *Jurnal Hortikultura*, *22*(1), 86. https://doi.org/10.21082/jhort.v22n1.2012.p85-93

Rogers, E. M. (1995). Diffusion of innovations. In *Macmillian Publishing Co*. https://doi.org/citeulike-article-id:126680

Sulaiman, A. A., & Darwis, V. (2018). Kinerja dan perspektif agribisnis lada dalam upaya meningkatkan kesejahteraan petani. *Perspektif*, *17*(1), 52–66.

Innovation characteristics and technology adoption on Probio_FM

ORIGINALITY REPORT

11%	10%	5%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	S Adibrata, N I Bahtera, R P Astuti, F Arkan. "The perception level on the impact of integrated livestock-fish production systems towards the environmental pollution", IOP Conference Series: Earth and Environmental Science, 2021 Publication	1%
2	ojs.uho.ac.id Internet Source	1%
3	jurnal.uns.ac.id Internet Source	1%
4	resmilitaris.net Internet Source	1%
5	iopscience.iop.org Internet Source	1%
6	eudl.eu Internet Source	1%
7	www.coursehero.com Internet Source	1%

8	ejournal.umm.ac.id Internet Source	1 %
9	docplayer.net Internet Source	<1 %
10	docobook.com Internet Source	<1 %
11	prosiding-pkmcsr.org Internet Source	<1 %
12	ejournal.unib.ac.id Internet Source	<1 %
13	jurnal.unsur.ac.id Internet Source	<1 %
14	journal.ipb.ac.id Internet Source	<1 %
15	journal.ubb.ac.id Internet Source	<1 %
16	repository.unja.ac.id Internet Source	<1 %
17	H. U. Padu, A. A. Nalle, O. H. Nono, M. F. Lalus, S. Sembiring. "Level of Motivation and Adoption of Innovation at Pig Farming in Southwest Sumba Regency", Jurnal Sain Peternakan Indonesia, 2022 Publication	<1 %
	uwspace.uwaterloo.ca	

18	Internet Source	<1%
19	www.atlantis-press.com Internet Source	<1%
20	Kevin Zhu, Shutao Dong, Sean Xin Xu, Kenneth L Kraemer. "Innovation diffusion in global contexts: determinants of post-adoption digital transformation of European companies", European Journal of Information Systems, 2017 Publication	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		