The Priority of Extension Planning to Sustain Organic Farming System: The Case of Paddy Planting in Indonesia

Ujang Maman, Agribusiness Post-Graduate Program, Faculty of Science and Technology, State Islamic University Syarif Hidayatullah Jakarta, Indonesia

Imam Subchi, Anthropological Program, Faculty of Social and Political Sciences, State Islamic University Syarif Hidayatullah Jakarta, Indonesia

Nandang Najmul Munir, Agribusiness Graduate Program, Faculty of Agriculture, Universitas Islam "45"

Zahrotun Nihayah, Psychological Program, Faculty of Psychology, State Islamic University Syarif Hidayatullah Jakarta, Indonesia

Yusuf Durachman, State Islamic University of Syarif Hidayatullah Jakarta, Indonesia, yusuf_durachman@uinjkt.ac.id

Abstract-The end of a project is frequently followed by cessation of innovative activities. Therefore, the question of how to sustain organic rice farming system (ORFS) is valuable. Based on "importance-performance-analysis" (IPA) model, this research aims to explore the main achievement of ORFS implementations that should have to be maintained. By 109 samples based on Slovin Formula with 7% error probability taken randomly in Tasikmalaya Regency, West Java, Indonesia, and data was collected during July-September 2019, the research finds three ORFS' attributes categorized into high expectation and high performance in farmer perspective, includes understanding of liquid and solid organic fertilizer making, manufacturing vegetable organic pesticide; and adopting organic fertilizer & vegetable pesticide in farming practice. Based on IPA approach, these items are the achievement that should be kept to maintain the ORFS practice.

Keyword-The IPA model analysis, OFRS attribute, maintaining ORFS practice.

Introduction

The unsuitable use of pesticide and its residue is a crucial issue for food safety and human health, and deeply needs to solve. Pyne (2015) identified, farmers commonly accustomed to use pesticide in their farming practice to discourage pest growth, to upgrade the crop yield and to inhibit the disease-carrying-insect. More than 80% of pesticide use – as found in Pyne's research (2015) – was widely sprayed in farming practice. However, unfortunately, less than 0.1% of pesticide use reached properly the target to attack the pest out; while the rest is left in soil, water, and air (Pyne, 2015). This fact and condition, according to Pyne (2015), has aroused the question of how the fate of pesticide that did not reach the target to strike plant-disturbing organism.

By the case of two states of Kaduna and Ondo, Nigeria, F.O., (2016) expressed, the Nigerian farmer was heavily depend upon pesticide for controlling weeds, insect, pest, and plant diseases. Quoting Asogwa and Dongo, F.O. (2016) estimated, the Nigerian farmers used about 125,000-130,000 metric tons of pesticides each year for crop farming. But, unpleasantly, there was a strong tendency the use of pesticide was without any consideration of quality, legal, licensed, and permitted products by the local agricultural authority. F.O. (2016) emphasized, the mostly uncontrolled use of pesticides certainly has brought out the critical question of its impact for human health and environmental disturbance.

Similarly, referring to data from Ministry of Agriculture of Republic of Indonesia, Sumiati and Julianto (2018) presented, 95.2% of farmers in Indonesia utilize pesticides to avoid the attack of plant-disturbing organism. But, unhappily, Eliza *et al*. (2013) previously described the usage of pesticide – by the case of chili farmer in Lampung, Indonesia – without any consideration of insect and pest level. They regularly squirt pesticide out regardless of the existence of pests and diseases. For several farmers, the pesticide is not poison, but it is a necessity-sure cure to increase crop production and to prevent harvest fail, as it is clearly seen in the behavior of onion farmer in Central Java (Puspitasari and Kilos, WY).

By this context, it is not amazing, he paddy farmer in sub district of Darmaga, Bogor Regency, West Java, Indonesia has had a relatively high loyalty to pesticide use, in which the customer satisfaction index reached 79.14% and the level of habitual buyer is 40% (Mustikarini*et al*., 2014). Previously, Apriliantina (2013) in the light of his research in Indramayu, West Java, affirmed that more than 85% of paddy-farmer-respondents commonly spray

DOI: 10.5373/JARDCS/V12I6/S20201211
**Corresponding Author: Ujang Maman*
Article History: Received: May 23, 2020, Accepted: July 26, 2020

pesticide regardless of the number of pest organism. The major respondents argue for their pesticide use, because it has fast and direct observed result and more practical to perform.

However, it should seriously be considered, the rest of pesticide is pollutant threatened the fresh water quality for human consumption. Concerning the public health, Pyne (2015) emphasized, pesticide use resulted in afflictions for both farmers and surrounding community. Pamungkas (2016) in his in-depth literature study has identified, pesticide has had poisoning effect on the work of human organs and organ systems. Intake of pesticide poisonings could occur consciously or unconsciously through skin, respiratory and orally; while the rest of pesticide has a strong resistant on the vegetable, fruits, and leaves. The research experience of Desika*et al*. (2012) in various markets in the twin cities of Hyderabad and R. R. District, India should seriously be considered, in which pesticide residues have a strong resistance, and easily found in various fruits and vegetables by the aid of lab instrument analysis.

Indeed, the Government of Indonesia (GoI) has deeply been aware of harmful of uncontrolled pesticide for food safety and human health. Therefore, since 1989 – sponsored by FAO – the GoI has launched IPM (Integrated Pest Management) Program to control wide spread of pesticides. To disseminate this program, Ministry of Agriculture (MoA) has adopted Farmer Field School (FFS) model – in which the FFS is one of the agricultural extension models. This model has encouraged farmer to observe regularly the growth of plant-disturbing organism as well as its predator; and also to promote the proper usage of pesticide on the basis of pest number and its natural enemy. In this context, the FFS model has developed the farmers to become expert of pest and let them to make a right decision about the necessary level of pesticide use (Maman*et al*., 2015 and 2018).

However, in the Indonesian context, the IPM program has not been completely successful. The knowledge as well as the practical gap between the expected and the actual performance is still high, in which it indicated the farmer still has strong dependence upon pesticide to protect their crop, as clearly found in the case of onion farmer in Central Java (Maman*et al*., 2015). In addition, the implementation of IPM program is strongly depends on the government budget. The consequence, when the project comes to an end, the innovation of pesticide control tends to cease. In post-IPM project, it is only a few farmers control routinely pests movement and their balance with natural enemy, and use pesticide when it is needed, and use licensed and permitted pesticide (Maman*et al*., 2015).

By this condition, the only hope is directed to organic farming system (OFS) which is also promoted by GoI. The OFS is basically not different with the IPM principles. The OFS practice, however, is certified and routinely supervised by a certification body; and in several cases it is supported by corporation to market the OFS yields (MoA, 2016). This innovation is valuable to yield healthy food, but it aroused critical question about its sustainability. Will this innovation come to an end as it is previously experienced by IPM? What is the high achievement to be kept to maintain this farming practice? This research is mainly aimed to answer this question. The research should certainly be conducted within the OFS farmers. The farmer in Tasikmalaya regency, West Java has relatively performed the organic rice farming system (ORFS). Therefore, the research was conducted in this eastern part of West Java and it was focused on the ORFS' farmer groups.

Framework Analysis and Reasoning

The organic farming system (OFS) -- referring to International Federation of Organic Agriculture Movement (IFOAM, 2007) -- is a production system seeks to sustain the health of soil, people, and ecosystem. This farming system relies on biodiversity, cycles, and ecological processes adapted to local conditions, rather than using inputs with adverse effects. Thus, the OFS combined tradition, innovation, and sciences to benefit environment and to promote fair relationships and a good quality of life for all involved in farming process.

The implementation of OFS should tightly be controlled in each stage of farming practice, in pre-cultivation as well as plant maintenance and harvest. The Simpatik United Farmer Group (2017) – based on his experience – identified the "control points" (CP) in OFRS. For the phase of farming preparation, the CP should be carried out in determining farming location, bordering between conventional and organic farming, and in germination process. In planting process, there are three important CPs, which included planting way, organic fertilizer making and vegetable pesticide manufacturing. Finally, in plant maintenance and harvest process, the ORFS took six important CPs, , in which it included watering, weed cleaning, plant surveillance, harvest timing, paddy grain condition, and product coding (Figure 1). This tight control is strongly expected to yield qualified & safety food, in which it is indicated by successful of pesticide control and free-pesticide residues in rice, fruit, and vegetables (FAO, 2017).

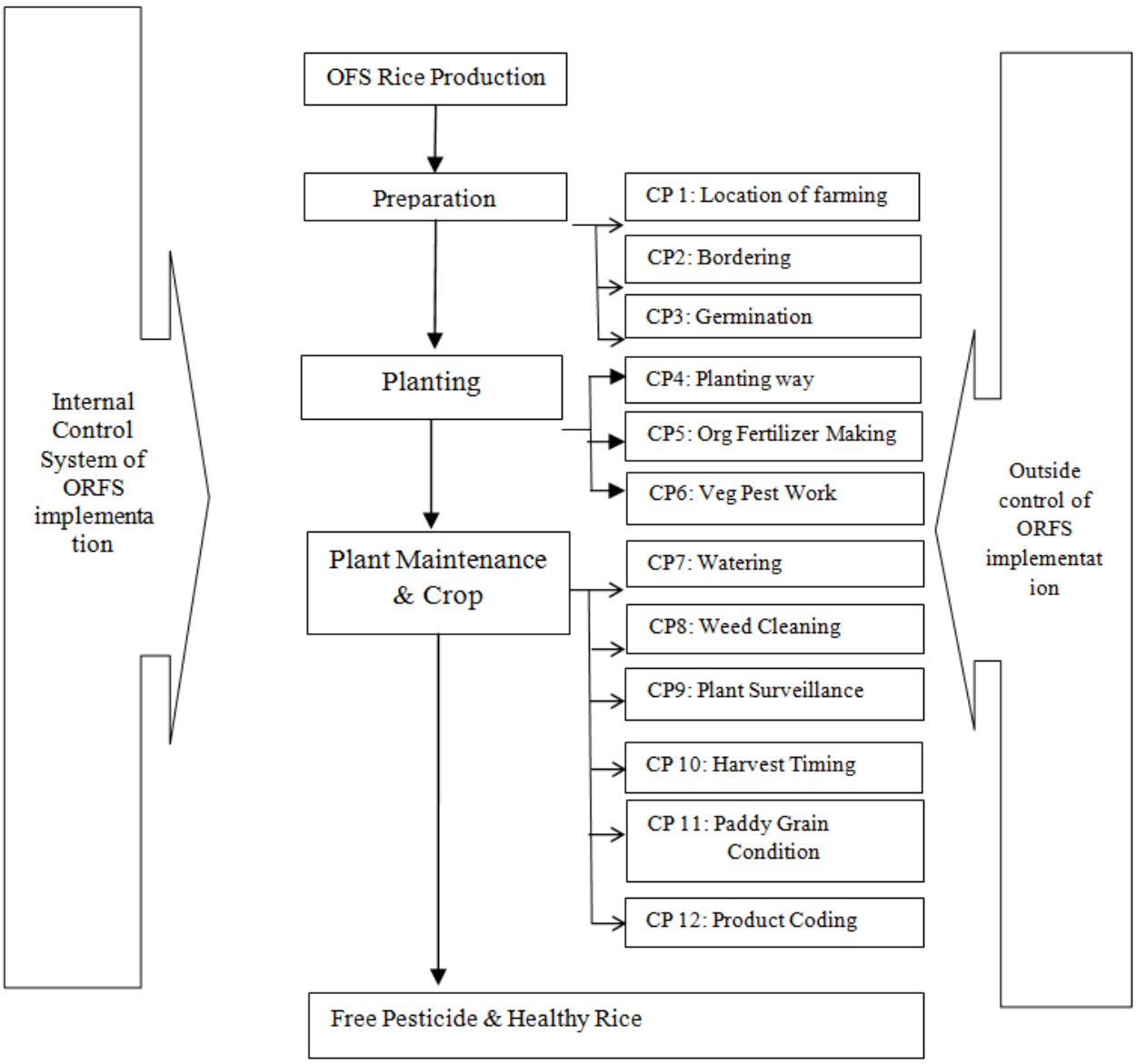

Figure 1. Framework Analysis to Prioritize Agricultural Extension Planning

By the above CP as the "stone stairs" that should be stepped, the ORFS attributes have be completely be adopted at all stages. However, to identify the achievement of proper use of pesticides and other chemical intake, this research focuses on planting phase based on question of what the ORFS attributes in planting stage that should be emphasized to sustain this farming innovation.

Research Methods

This research was started by a qualitative data investigation about the attributes of ORFS in planting stage based on literature review and farmer experience in a local context. The next, the research adopted a survey type in four districts of Tasikmlaya regency, West Java based on the existence of ORFS farmer in the four districts. The research variables are farmer perception about the importance of the ORFS attributes and their performance in planting phase.

The sampling technique adopted Slovin Formula with tolerated error is less than 7%. By 236 of ORFS farmers gather in *Simpatik* united farmer group, the sample size is 109, taken randomly and proportionally in nine villages of four districts. This research adopted Likert scale to measure the important level of ORFS attributes and also the farmer performance. Fortunately, the research instrument got high reliability according to alpha Cronbach's criteria with 0,942 scores from questionnaire test to 30 farmers, who had almost similar characteristic with the respondents. Data analysis based on research aim adopted Importance-Performance-Analysis (IPA) model by following stages.

DOI: 10.5373/JARDCS/V12I6/S20201211
*Corresponding Author: Ujang Maman
Article History: Received: May 23, 2020, Accepted: July 26, 2020

The first, measuring degree of expectation and performance of ORFS attribute in farmer view, and was categorized into high, moderate, and low based on following formula [1]:

$$Interval = \frac{\text{The higher Score } - \text{The lower Score}}{\text{Amount of Alternative Category}}$$

The second, determining total score and average of expectation and performance of each ORFS attribute based on sample size. *The third*, identifying compatibility and gap between expectation and performance by the formula of [2]:

$$Tki = \frac{\overline{Xi}}{\overline{Yi}} \times 100\%$$

In which:

Tki = Level of compatibility

$\overline{Xi}$ = Performance score

$\overline{Yi}$ = Expectation score

The forth is formulating the matric of expectation and performance and providing it in four quadrants by adopting the formula of [3]:

$$\overline{\overline{X}} = \frac{\sum_{i-1}^{N} \overline{xi}}{k}$$

$$\overline{\overline{Y}} = \frac{\sum_{i-1}^{N} \overline{yi}}{k}$$

Where:

$\overline{\overline{X}}$ = The average of the average of performance score

$\overline{\overline{Y}}$ = The average of the average of expectation score

K = The amount of the ORFS attributes

The fifth is providing each attribute of ORFS in Cartesians diagram describes the level of priority in quadrant matric based on formula of [4]:

$$\bar{X} = \frac{\sum Xi}{n} \bar{Y} = \frac{\sum Yi}{n}$$

Where:

$\bar{X}$ = Average of performance score

$\bar{Y}$ = Average of expectation/importance score

n = Amount of sample

Referring to Ormanović*et al*. (2017), the IPA model and mapping the ORFS attributes in cartesian diagram is specially designed to detect the attributes that should be the object of consentration. Originally, the cartesian diagram will provide four quadrans, in which the quadrant (I) describes the high expectation and low performance indicated the high priority to improve. The quadrant (II) provides high expectation and high performance represents the strong compulsion to maintain the achiebvement. The quadrant (III) shows the low importance and low performance; and finally the quadrant (IV) denotes the high performance but in low importance, concluding the unnecessary to consider.

Result and Discussion

The research qualitatively collected five attributes as the result of literature study and in-depth interview with the prominent members of farmer practitioner of ORFS. In the light of the fist CP (planting way), the research presented two items of ORFS attributes. For the second CP (organic fertilizer making), the research also collected two important items that should be implemented in ORFS adoption. While, for the third CP, the research merely found single important ORFS attributes (Table 1).

Table 1. Attributes of ORFS in Planting Process

Control Point (CP)	Code	Attributes of ORFS in Planting Process
Planting way	X1	Performing banal cultivating with 1-2 seed stem
	X2	Immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm
Organic Fertilizer Making	X3	Solid and liquid organic fertilizer making in accordance with ORFS barometer
	X4	Understand the techniques of solid and liquid organic fertilizer making process
Vegetable Pesticide Making	X5	Making and using the vegetable organic pesticide

ORFS Farmer Characteristics

The degree of importance and performance of the ORFS attributes is based on the farmer perception. Therefore, the social characteristics of farmer are valuable for reliability, validity and quality of their view for farming practice. The farmers are mature and experienced in ORFS performance, indicated by seniority, in which more than 97% of respondents has reached their 40s or older; more than 59% has experienced in farming practice more than ten years; more than 77% of them has adopted the ORFS for more than ten years. The education level is highly enough in local context to support their maturity; and also the land ownership status could strengthen decision to adopt the farming innovation by which more than 74% of respondents are land owner and 60% of the respondents are a senior high school graduation or more (Table 3).

High Expectation

Measuring the farmer expectation and performance in Likert scale is the *first* stage of IPA model. Based on this measurement, the *second* stage proved, the farmer expectation for each of ORFS attribute as well as for the total attributes is averagely high. It strongly indicated, each item of ORFS practice has a high degree of importance in mature and experienced farmer view. The only one attribute that is perceived less important is performing banal cultivating with 1-2 seed stem. The other attributes – which include immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm; solid and liquid organic fertilizer making in accordance with ORFS barometer; understand the techniques of solid and liquid organic fertilizer making process and making and using the vegetable organic pesticide – are strongly important (Table 3).

Table 2. Social Characteristic of Research Respondents

Social Characteristic	Category	Respondents Amount	Percentage
Age	Young (20 - 40 years)	3	2.75
	Old (40 years and more)	106	97.25
Level of Last Education	High (Junior high school and more)	66	60.55
	Low (ES and less)	43	39. 45
Land ownership	Owner	81	74.31

DOI: 10.5373/JARDCS/V12I6/S20201211
*Corresponding Author: Ujang Maman
Article History: Received: May 23, 2020, Accepted: July 26, 2020

	Tenant	28	25.69
Farming Experience	Young Farmer (<10 years)	44	40.36
	Old Farmer (>10 years)	65	59.64
ORFS Implementation since	2000-2005	18	16.51
	2006-2010	84	77.06
	≥ 2011	7	6.42

Sources: Primary data, processed (2019)

Unlike the expectation, the farmer performance in implementing the ORFS attributes is relatively moderate in the light of the above formula. The farmer has honestly expressed the implementation of three items of ORFS attributes – which include solid and liquid organic fertilizer making in accordance with ORFS barometer; understand the techniques of solid and liquid organic fertilizer making process; and making and using the vegetable organic pesticide – is relatively high. While, the implementation of other items -- immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm; and performing banal cultivating with 1-2 seed stem – is relatively moderate (Table 3).

The Compatibility and Gap

The analysis of compatibility and gap between the expectation and performance is the *third* important stage. The more little gap of attributes would probably be the high achievement and should be prioritized to maintain. In this context, the research proved two attributes which have high compatibility between farmer expectation and performance, in which it consist of: (a) understand the techniques of solid and liquid organic fertilizer making process; and (b) making and using the vegetable organic pesticide (Table 4). However, this hipothetical finding should deeply explored by implementing the *forth* stage of IPA model to formulate the metric of expectation and performance by considering the average of the average of performance score; the average of the average of expectation score; and amount of the ORFS attributes elaborated in formula [3].

Table 3. Expectation and Performance of ORFS Attributes in Planting Process

Control Point	Code	Attributes of ORFS in Planting Process	Average of Expectation	Average of Performance
Planting way	X1	Performing banal cultivating with 1-2 seed stem	2.96 (Moderate)	2.47 (moderate)
	X2	Immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm	3.49 (High)	3.12 (Moderate)
Organic Fertilizer Making	X3	Solid and liquid organic fertilizer making in accordance with ORFS barometer	3.70 (high)	3.24 (high)
	X4	Understand the techniques of solid and liquid organic fertilizer making process	3.73 (High)	3.38 (high)
Vegetable Pesticide Making	X5	Making and using the vegetable organic pesticide	3.70 (high)	3.53 (high)
		Average	3.52 (high)	3.15 (Moderate)

Table 4. Compatibility and Gap between Expectation and Performance of ORFS Attributes Implementation

Control Point	Code	Attributes of ORFS in Planting Process	Compatibility (%)	Gap (%)
Planting Way	X1	Performing banal cultivating with 1-2 seed stem	83.44	16.56
	X2	Immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm	89.32	10.68
Organic Fertilizer Making	X3	Solid and liquid organic fertilizer making in accordance with ORFS barometer	87.47	12.53
	X4	Understand the techniques of solid and liquid organic fertilizer making process	90.73	9.27
Vegetable Pesticide Making	X5	Making and using the vegetable organic pesticide	95.33	4.67

The Main Attributes to Maintain

The compatibility and gap between expectation and performance of attributes in this research has furtherly been explored by considering the average of performance score, average of expectation /importance score in the light of the sample amount; and it was formulated in [4]. By this process, the research finally comes to a mapping of ORFS attributes; and by which we are able to arrange planning to prioritize the extension program and to maintain the main achievement of ORFS implementation (Figure 2).

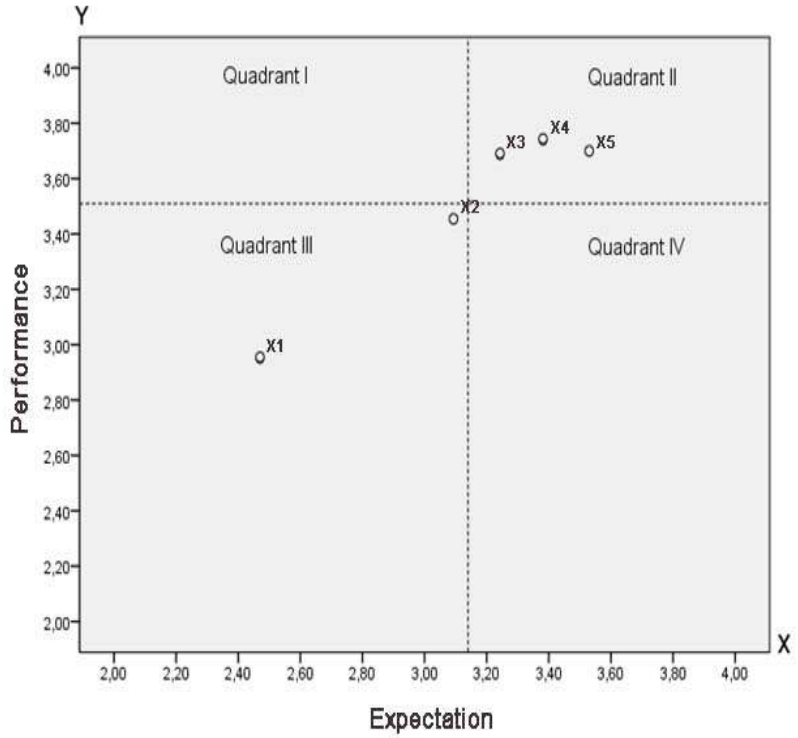

Figure 2. Cartesian Diagram to Identify the Prioritized Planning to Maintain ORFS Implementation Planting Process

The research in contrary – based on the process itself – has presented two attributes – of (1) performing banal cultivating with 1-2 seed stem; and (2) immerse the seedlings with horizontal roots, and the distance between clumps is 30x20 cm – that mapped into third quadrants, in which it could be categorized into low important and the low performance; and it clearly denotes the unnecessary to consider in extension planning to develop the ORFS practices.

DOI: 10.5373/JARDCS/V12I6/S20201211
Corresponding Author: Ujang Maman
Article History: Received: May 23, 2020, Accepted: July 26, 2020

Conclusion and Recommendation

The extension of organic rice farming system in Indonesia has proved three main achievements cognitively as well as practically. The farmers have a strong perspective on the importance of understanding the techniques and processes for making liquid and solid fertilizers; the importance of solid and liquid organic fertilizer making in accordance with ORFS barometer; and also the importance of making and using the vegetable organic pesticide. Fortunately, the farmer has also performed the mentioned three items in daily farming practice. However, unpleasantly, this research finding has merely based on farmer view, in which it leads us to deepen the items by exploring the experts' perspective.

However, despite its weaknesses, the research has shown the way to maintain the sustainability of innovation even if the project has ended and to strengthen good farming habits, by emphasizing to three main items of ORFS.

Acknowledgment

The Authors deeply appreciate to Rector and the Director of Center for Research and Publication UIN Syarif Hidayatullah Jakarta for funding of this research

Reference

[1] Apriliantina, RisaSondari (2013), Pengetahuan, Sikapdan Tindakan Petani Padidalam Penggunaan Pestisida di Kabupaten Indramayu Jawa Barat, [Knowledge, Attitudes and Actions of Rice Farmers in the Use of Pesticides in Indramayu Regency, West Java], Thesis of Graduate Program, Bogor Agricultural University.

[2] Dasika, Rohan. Siddharth Tangirala and Padmaja Naishadham, 2012, "Pesticide residue analysis of fruits and vegetables," *Journal of Environmental Chemistry and Ecotoxicology* Vol. 4(2):19-28.

[3] Eliza, Try. Tubagus Hasanuddin. Suriaty Situmorang (2013) Farmers' Behavior In Chemical Pesticides Use: Case of Chili Crop Farmers at Gisting Atas Village, Gisting District, Tanggamus Regency," *JIIA* 1(4): 334-342.

[4] FAO, 2017, Meeting proceedings: Regional consultation on food safety indicators for Asia and the Pacific, 6–8 December 2017, Singapore

[5] F.0., Issa (2016) Farmers Perception of the Quality and Accessibility of Agrochemicals in Kaduna and Ondo States of Nigeria: Implications for Policy, *Journal of Agricultural Extension*, 20(1): 81-95

[6] Gapoktan Simpatik, 2017,"Standar Operasional Prosedur (SOP) Sistem Budidaya Padi Organik," Unpublished document.

[7] International Federation of Organic Agricultural Movement (FOAM) (2007), The IFOAM basic standards for organic production and processing, IFOAM, Germany

[8] Maman, Ujang, IinInawati, MiekeSyefira (2018) Adoption of Farmer Field School to Develop Entrepreneurship: The Case Seed Growers and Small Business Trainees, The 2nd ICOSAT Proceeding Published by Atlantis Press

[9] Maman, Ujang, Eka Nurhandayanti, and Hendrik Hexa Yoga (2015), The Effectiveness of Farmer Field School in Dissemination of Innovation: The Case of Orchid Farmer in Tangerang Banten and Onion Farmer in Berebes Central Java," *Middle East Journal of Scientific Research*, 23(12):2927-2936.

[10] Ministry of Agriculture (2016) Petunjuk Teknis Pengembangan Desa Pertanian Organik Padi [Technical Guidelines for the Development of Paddy Organic Agriculture Villages], MoA, Jakarta

[11] Mustikarini, Fibria, Retnaningsi, and Megawati Simanjunta (2014) Kepuasandan Loyalitas Petani Padi Terhadap Pestisida [Rice Farmers' Satisfaction and Loyalty toward Pesticides], *Jur. Ilm. Kel. &Kons*. 7(2): 93-102.

[12] Ormanović1, Šemso, AlenĆirić, MunirTalović,, HarisAlić, EldinJelešković, Denis Čaušević1 (2017), Importance-Performance Analysis: Different Approaches, *Acta Kinesiologica* 11 (2): 58-66

[13] Pamungkas, OktofaSetia (2016) Bahaya Paparan Pestisidaterhadap Kesehatan Manusia [Dangers of Pesticide Exposure to Human Health], *Bioedukasi* 14(1): 27-31

[14] Puspitasari and Adhitya Marendra Kiloes, WY, Perilaku Petanidalam Menggunakan Pestisida di Sentra Produksi Bawang Merah Kabupaten Brebes [Farmer's Behavior in Using Pesticides in the Shallots Production Center in Brebes Regency], Proceedings of the National Location-Specific Agroinovation Seminar for Food Security in the Era of the ASEAN Economic Community.

[15] Pyne, Erin, 2015. Occurrence and Distribution of Pesticide Residues in Soil as a Result of Long-Term Application, Thesis in Utrecht University, Wageningen.

[16] Sumiati, Astri Sumiati, and Julianto, Reza Prakoso Dwi (2018), Analisa Residu Pestisida di Wilayah Malang dan Penanggulanganyauntuk Keamanan Pangan Buah Jeruk [Analysis of Pesticide Residues in the Malang Region and Management for Citrus Fruit Food Safety], *Buana Sains*, 18(2): 125-130.