Universal Journal of Agricultural Research 10(5): 449-463, 2022 http://www.hrpub.org
DOI: 10.13189/ujar.2022.100501

Initiating Model of Agricultural Development Based on Local Wisdom: The Case of Risk Mitigation of Organic Rice Farming in Indonesia

Ujang Maman[1,*], Abuddin Nata[2], Djawahir Hejazziey[2], Yusron Razak[2], Asep Usman Ismail[2], Armaeni Dwi Humaerah[1], Muksin[3], Irwa Rochimah Zarkasi[4], Bambang Eko Samiono[5]

[1]Agribusiness Post-Graduate Program, Faculty of Science and Technology, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia
[2]Post Graduate School, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia
[3]Politeknik Negeri Jember, East Java, Indonesia
[4]Faculty of Social and Political Science, University of Al-azhar Indonesia, Indonesia
[5]Faculty of Economy and Business, University of Al-azhar Indonesia, Indonesia

Received May 24, 2022; Revised August 22, 2022; Accepted September 19, 2022

Cite This Paper in the Following Citation Styles

(a): *[1] Ujang Maman, Abuddin Nata, Djawahir Hejazziey, Yusron Razak, Asep Usman Ismail, Armaeni Dwi Humaerah, Muksin, Irwa Rochimah Zarkasi, Bambang Eko Samiono , "Initiating Model of Agricultural Development Based on Local Wisdom: The Case of Risk Mitigation of Organic Rice Farming in Indonesia," Universal Journal of Agricultural Research, Vol. 10, No. 5, pp. 449 - 463, 2022. DOI: 10.13189/ujar.2022.100501.*

(b): *Ujang Maman, Abuddin Nata, Djawahir Hejazziey, Yusron Razak, Asep Usman Ismail, Armaeni Dwi Humaerah, Muksin, Irwa Rochimah Zarkasi, Bambang Eko Samiono (2022). Initiating Model of Agricultural Development Based on Local Wisdom: The Case of Risk Mitigation of Organic Rice Farming in Indonesia. Universal Journal of Agricultural Research, 10(5), 449 - 463. DOI: 10.13189/ujar.2022.100501.*

Abstract Agricultural development in Indonesia still depends on ideas and practices taken from outside or international agency. By the less successful integrated pest management in Indonesia encouraged by FAO, and the imperfection of organic rice farming (ORF) is still one stretch and has the same water flow with the conventional farming, it could be probably contaminated by chemical residue, and therefore, the agricultural development based on local wisdom can be a valuable alternative. Pleasantly, Indonesia is rich with farming local wisdom, and the research about this local practice is frequently conducted. But, unfortunately, this research is merely to describe it case by case in local context and does not yet become a systematic planning for agricultural development. Therefore, the aim of this research is not only to explore farmer local wisdom in mitigating risk of organic rice farming especially in pre-planting period, but to formulate the items of this mitigation into a planning which could gradually be implemented as the first & second priority, the items that have been completely implemented, and as the aspects of mitigation which are not important to develop. By in-depth interview with the prominent farmer, this research finds five items of local wisdom to mitigate the risk of organic rice farming, in which part of them are making a filter tub upstream into organic rice fields, topped with water hyacinth (*eceng gondok*); providing rice seeds by themselves; and the seed to be planted should come from organic seedbeds. Adopting the Importance Performance Analysis to the 109 samples in Tasikmalaya, West java -- which the sample size is determined by Slovin formula with below 7% of error probability and adopts stratified proportional random sampling -- this research which proves *eceng gondok* planting in the upstream is one of the local wisdom that is usually practiced to mitigate ORF, and it should be maintained. Another action that should be maintained is the awareness that the seeds should come from organic seedbeds. While, the agreement that farmer group association should provide rice seeds themselves is one of local wisdom that should be prioritized in agricultural extension. Based on this research, the model of agricultural development could be on the basis of local practices, and it could be implemented in

Indonesia as well as in other countries that have local wisdom.

Keywords Local Wisdom, Importance, Performance, Priority of Agricultural Extension

1. Introduction

The question of how to optimize the availability of healthy and safe food – in which it is free-chemical input residue – is strongly valuable. The food security, according to The Economist [5], is not merely indicated by food availability and affordability, but it strongly depends upon the healthy and safe food. For the Muslim society, the healthy food availability is not merely physical need, but it is part of their faith which could not be separated. The halal and *thayyib* – as food requirement and criteria for Muslim consumer – is a united concept. Allah told the people: "O mankind! Eat of that which is halal and *thayyib* on earth, and do not follow the footsteps of *Shaitan* (Satan). Verily, he is to you an open enemy" [34]. Quoting Abu Bakr Ibn al-Arabi, Nafis [19] explains, "*Thayyib*" (good) is opposite of the malignant, which means bad; and it also indicates the thing that is appropriate for the body of mankind.

The food contaminated by pesticide residue or chemical input in general of course disturbs the concept of *thayyib,* in which it is harmful for mankind body health. The literature study of Pamungkas [22] points out pesticide consists of poisoning effect on the work of human organs. The pesticide poisonings could occur through respiratory, skin, and orally; while the pesticide residue has strongly been resistant on leave, fruit and vegetable. Desika *et al*. [4] in his research in several market in the twin cities of R.R. District and Hyderabad, India proves the pesticide residues have a strong resistance, and by the aids of instrument lab analysis, it could easily be found in various vegetables and fruit. The research of Pyne [24] has added the crucial point of pesticide-residue harmful for human health, in which less than 0.1% of pesticide spraying reaches the target properly to attack the pest; while the major rest of pesticide contaminates air, water, soil, vegetable, and fruit.

The Indonesian Government (GoI) since 1989 – assisted by FAO and World Bank – has actually launched the IPM (Integrated Pest Management) program specially designed to control wide spread of unsuitable use of pesticide; and disseminated by the media of Farmer Field School [11]. But, unfortunately, this program is not completely successful. The end of the program, because of the cessation of aid from the world bank, also resulted in the end of the habit of observing pests and natural enemies. The principle that pesticides are only used when there are more pests than its predators, which is disseminated in field school, is gradually disappearing [11]. The awareness of pesticide's harmful has been slowly getting away. Sumiati and Julianto [26] – by quoting the data of the Ministry of Agriculture of the Republic of Indonesia – shows 95.2% of Indonesian farmers use chemical pesticides to protect the plant from the attack of plant-disturbing organism. Unpleasantly, the farmer – indicated by chili farmer in Lampung Province, Indonesia -- sprays pesticide regularly without any consideration of insect and pest level as well as regardless of the existence of pests and diseases [6]. The pesticide, for them, is not poison, but it is a medicine which is needed to increase the yield and to avoid crop failure [23]. The consequence, the farmers have high loyalty to the pesticide use. The research of Mustikarini *et al*. [17] in Darmaga Sub District, Bogor, West Java, Indonesia proved the customer satisfaction index of farmer to pesticide usage reached 79.14% and the level of habitual buyer of this chemical input is 40%.

The organic farming movement -- which coincides with IPM or after IPM -- is a valuable way to support the purposes of pesticides reducing or even disappearing. Referring to International Federation of Organic Agriculture Movement [9], the organic farming system (OFS) is defined as a production system which seeks to sustain the health of soil, people, and ecosystem. This modern practice is based on biodiversity, cycles, and ecological processes according to local conditions, rather than using chemical inputs. Thus, the OFS, as well as the organic rice farming (ORF), is a combination of tradition, innovation, and sciences to benefit environment and to promote fair relationships and a good quality of life for all sides involved in farming process. For the certain farmers in Indonesia, the practice of ORF has become their achievements, especially in planting and plant maintenance, in which they perceive the practice, is important and accordingly they have adopted and implemented this practice completely [15].

However, in the Indonesia context, the development of ORF gets high challenge as well as the high risk which probably nullify the organic status of food yielded. This is because the ORF practice is not yet adopted by all farmers. Many of them oppositely are still depend upon conventional farming, using chemical input. The two ways of this farming is frequently neighbor, has the same flow of water and the same area of paddy field. In addition, the paddy field which has the different way of farming is also often line up from upper to lowland. The water which flows from the conventional farming in upper area could probably bring the pesticide residue to the lower area of the rice field.

By the less successful of IPM to reduce the chemical input and the imperfect ORF practice, the alternative model of agricultural development is strongly needed as a part of serious effort to yield the healthy and safe staple food. The control of chemical input based on the farmer local wisdom could be a proper alternative for Indonesia and other developing countries that have the same experience or even for the developed countries. Fortunately, many researches

has explored farmer local wisdom in many areas of Indonesia, such as the research of Yusdiari *et al.* [29], Wa Kuasa *et al*. [28], Kusumawati *et al*. [30], Ignatiu *et al*. [32], and Kusumawati *et al*. [31].

However, the research about farmer local wisdom in Indonesia commonly tends merely to describe this local practice, casuistic, and in local context. The result of the research has not been becoming a model to arrange a planning of agricultural development. From this research, it is difficult to determine what the farmer local wisdom that should be disseminated, what of these practices that should be maintained because it has become a common practice and important, and what of these habits that should be a low priority because it is not highly important based on scientific finding. Thus, it is not surprising, the farmer local wisdom has not yet become the model of agricultural development; and oppositely the model of development in Indonesia still depends upon the "outside model" or the idea and practice which come from external agency.

Therefore, this research paper initiates to explore farmer local wisdom and at the same time to compile it into a model of agricultural development planning; but the exploration of local practice in this research paper is merely limited in mitigating the case of the risk of organic rice farming system. Although it is still limited, this research is expected to yield the model of agricultural development planning based on the local wisdom, and hoped the model could be replicated in different subject of research and in different location inside or outside Indonesia.

For the purpose to compile the model, this research is conducted in Tasikmalaya, Indonesia. This research location is suitable for this purpose because it is not merely has the organic farming community but this innovative farming area in Tasikmalaya is located around the conventional farmer and has the same flow of water. Therefore, the organic farming could strongly be contaminated by the residue of chemical input. Fortunately, based on preliminary observation, the farmers in local area have local wisdom to mitigate the risk. Thus, this research aims to explore this local practice, and followed by mapping this practice to formulate the model of agricultural development planning.

2. The Previous Research of Farmer Local Wisdom

The major aim of this research is to identify the proper actions in planning process to control the risk of organic rice farming system, to yield the real organic rice as safe and healthy food. However, this planning should not be simply formulated on the top-down way or based on the elite judgment or strongly based on the international agency. The action of mitigation is expected not to get an elite bias. Therefore, based on the assumption that the farmer in the local context has specific experience and achievement [15], this research tries to explore the farmer local wisdom in farming practice, especially in controlling the chemical input and pesticide residue. The local wisdom, according to Yusriadi *et al*. [29] – which refers to the various sources – is local knowledge derived from the value of local culture. The local wisdom, for more clearer, and referring to the same source, is the unique way regulated by the cultural norm in the form of ritual and tradition which is held tightly by communities. This wisdom is frequently inherited by a community from their ancestors which affects strongly the pattern of knowledge, attitude and behavior of the community. The indigenous community in South Bandung, West Java, Indonesia – for instance – forbid themselves to eat rice, and they have to be sufficient by eating cassava because of the ancestral traditions they inherited [14].

The farmer local wisdom could be found in many areas, especially in developing countries. The farmer in India has his own local way to grain storage and it strongly contributes to socio- economic empowerment due to the cheap and eco-friendly. The bee cultivation for the Pakistan farmer is part of their local wisdom to preserve the pollination process in accordance with the ecosystem chain. The indigenous adaptation strategy for African farmer has led them surviving in a drastic climate change [33]**.** In the Indonesian regions with their variety of cultures, norms, and habits are rich with the local wisdom in farming practice, and it is proved by several researches. For the Muna community in Southeast Sulawesi, Indonesia, for example, the local wisdom in farming practice is described in *Kaindea* structure. The *Kaindea* in local context means a forest to fulfill the need of societies which is located in a central point or in the middle, surrounded by the society's gardens. The people are forbidden to cut the timber in *Kaindea* forest, but they are allowed to take other forest products such as sugar palm, fruits, tubers, and bamboo shoots [28]. The researcher found, the *Kaindea* forest has an ecological function: to preserve water availability, to create the climate balance, and to keep the soil fertile [28]. The Muna community in this context has a strong agreement not to use synthetic or chemical fertilizer and pesticide because of their belief in ecological balance that it is able to prevent the coming of pest and other plant-disturbing organism [28].

The Muna's farming local wisdom, fortunately, could not be separated from religious faith and spiritual appreciation as it could be seen in *Kasalasa* tradition. The *Kasalasa* in simple way is a ceremony to express their thankfulness to God as has given them a successful in land preparation. The ceremony itself is conducted by the farmer who extends and opens new garden; it is performed after land clearing, before planting. The neighboring people gather in that ceremony even though only some of them who open new garden. Traditionally, and it has become part of their life, they pray to God led by their

imam (traditional religious leader), asking to God to prevent the coming of pest, plant disease, and various form of disaster which will lead the harvest fail. The farmer has the meal together after praying, and of course it will make close togetherness and partnership in performing the farming practice [28].

The farmer local wisdom which is based on the religious belief is also found in the village of Rossoan, sub-district of Enrekang, South Sulawesi, Indonesia [29]. This endogenous practice is completely performed in each stage of farming, include the *massimatana* ritual in pre-nursery, the *mabanne-banne* tradition in planting process, the practice of *majappi* in plant maintenance, and *menongan kumande* habit in harvesting process. The *massimatana* ritual is a kind of praying and asking for permission to God to start the nursery and request to God to get a blessing and successful in seeding performance, and is prevented from any forms of failure. This local wisdom is strengthened by the togetherness, in which the process of seedling is carried out by the owner and assisted by family members and other farmer around the rice fields [29].

The *mabanne-banne* tradition in planting stages is very interesting. The farmers in this region strongly avoid the planting in the time of entering the new moon, the end of the dead month, and also at the full moon. The information from their ancestor indicates, the pests and insects are breeding drastically in these periods, especially in new month. Therefore, there is a high probability to get a pest attack if they conduct the rice planting in these times. This is the kind of their effort traditionally to prevent the failure of rice farming, but the farmers in this region do not just rely on their effort. The praying and asking for God as fortune giver for them is a power, in which they perform the effort as well as the praying [29].

The *majappi* is also a tradition that could be developed to be a modern practice. The farmers in their local wisdom do not merely weed the grass that grows around the rice plant together, but they also have a habit to monitor the rice plant periodically during the period of rice plant maintenance to pay attention to the presence of pest, insect, and plant disease. The monitoring is conducted in the morning as well as in the evening. When the rice has come to two-months old, they have a tradition to bind the ginger to the rice plant as an effort to eradicate the pest and insect. The farmer in this region has also traditional practice to get rid of the bird which will disturb their rice plant by making a scarecrow from the used plastic; and when moved by wind blow, it will scarce the birds [29].

In the harvesting process, the farmer community in Enrekang region has a tradition of *menongan kumande,* which could be interpreted as the meal sharing between farmers as the form of gratitude to God, because God has given the sustenance. The people who have the rice fields or other crops yielded from the soil such as onion and corn are obliged to participate in this ceremony. The meal sharing is performed in the rice field area [29]. The harvest itself is conducted by helping each other. The rice field owners inform all the farmer community and the neighbors the day of the harvest, and call them to participate in harvest process. However, the rice field owners commonly prefer the community member who do not have rice field or considered does not have the head of family who is responsible for meeting the food needs [29].

Unlike the local farmer wisdom in Enrekang which is based on religious awareness, the traditional farming practice in Rejang Lebong regency, Bengkulu Province, Indonesia is majorly relied on the magic consciousness. The role of handler, as the consequence, is very important in every stage of farming practice. The land opening should be started by providing the offering (*sesajen*) to prevent the angry of magic soul who inhabit the place. The spell is recited in seed preparation and planting to get succeed of farming practice, avoided from pest attack, harvest fail, and other losses [30].

In addition to supernatural habit, the Lebong society is rich with the practical aspects to support the organic farming system, which they have gotten from their forefather. They can take advantage of straw, the rice bran, leather of *kolang kaling*, disturber plant (weeds) as material to manufacture the organic fertilizer. They can also control the *walang sangit* (stink bug) by spraying the sour bamboo water into all parts of plant. The camphor, for Labong society, could be benefited to control the pig by clamping it in bamboo and placing it on the edge of the fields. The sea sand for them can be used to eradicate the leafhopper, but unfortunately it should be prayed by handler and strewed on agricultural fields [30].

Other traditional materials that could be used to control the pest and other plant disturber organism – according to Lebong society – is *cengkol*, human urine that was born breech, and human hair to repel the rat; chewed betel water, five fruits of *sambu* flowers, and mangosteen leaves to eradicate the *walang sangit* (animal that has piercing smell) and aphid; and water of shrimp to control the leafhopper. However, all these traditional materials will not be effectively implemented unless it follows the supernatural and magical appreciation. To carry out the recipe about chewed betel water to chase away the stink bug, for instance, the farmers have to catch seven *walang sangit*, and these killed pests should be put in bamboo which has been filed with the water of the *sirih* (chewed betel water); and before it poured into the rice field, it should previously be prayed by handler. For the same purpose, the *sambu* fruits should also be prayed by handler and placed on the four corners of the rice field [30].

The magical belief that has been structured in farming practice is also found in the farmer of Samin, Klopoduwur Village, Banjerejo Sub-District, Blora District, Central Java, Indonesia. The Samin farmers are endogenous and traditional farmer – or *utun* farmer in Javanese terminology – who got their teaching related to farming practice from their forefather. They are prohibited to sell their farming

land to the outside people of Samin in order to maintain the cohesiveness, solidarity, togetherness among the endogenous farmers, and to maintain their customs [31]. For the Samin farmers, the agricultural land, spring as the source of water, and the soil fertility is actually a gift from the nature that should be nurtured. The farmers should have a high responsibility not to destroy the soil by chemical input. They are strongly prohibited to use the chemical input, and therefore, they utilize the manure to fertilize the land instead of chemical fertilizer. The *kadeso* for the Samin farmer is a kind of ceremony that is obliged to them, in which each farmer has to cook the *nasi tumpeng* (cone-shaped rice) and they have to pray together in source of water closest to their rice field led by their traditional farmer, requesting to the nature – not to God – to make their field fertile, no shortage of water, avoided from any loss, and get abundant yields [31].

The traditional farming practice which is relied on local wisdom is also found in Riang Dua Bour rice field community in East Nusa Tenggara (NTT) [32]. The keyword to understand their farming local wisdom is a balancing in ecological nature. They utilize animal waste and residual hay as natural fertilizer instead of using the chemical input. In the view of Bour's farmers, utilizing the chemical fertilizer will lead the farmer depending on the chemical input forever because of losing and damaging the soil fertility; and the consequence, the farmers will always feel need an-organic fertilizer to recover their soil fertility. They also consider chemical pesticide will destroy pest predator and living organism which are beneficial to protect the plants from pest attack [32].

Regarding the modern farming technology, in the view of Bour's farmers, is unproductive for the life of community. The farmer's solidarity, togetherness, and helping each other is more valuable for them; while the agricultural machinery will limit the human labor. Therefore, the Bour's farmer do not reject the modern technology but prefer to maintain the local wisdom's values rather than adopting and utilizing chemical input and farming machinery as an effort to increase the yields. The Bour's farmers also believe more in their own production instead of choosing other party's product. There is unwritten agreement to use their own seeds, which is yielded in the previous season. The manpower for tillage and weeding is also based on mutual assistance, and it is not paid but the landowner should merely provide the consumption [32].

The farmer local wisdom in all Indonesian archipelagos is of course more than the above-mentioned, but these are the examples of traditional ways of farming. Thus, the development of agriculture in Indonesia – or could probably in other countries – is not merely to extend the use of modern technology but it should be relied on the traditional practice or at least it should have a high compatibility with the local wisdom. Therefore, in this research paper, the exploration of farmer local wisdom is not merely to describe these local practices but to identify which of practices that should be developed and should be maintained especially in controlling the risk of organic rice farming. The result of this research is expected to be the model of agricultural development, and the consequence of this research will contribute significantly to the international development in the field of agricultural practices.

3. Framework Analysis and Reasoning

The need of safe food is essential for human life, and it should be planned to produce the healthy staple food. Because the use of chemical inputs has become a habit of farmers as a negative impact of the green revolution, the development of organic rice farming is a solution. But unfortunately, for the Indonesian condition – and specifically in the research location – the status of organic food is actually jeopardized by the conventional practice. The soil, water, and air have a high probability to be contaminated by chemical input residues, while organic practitioner has frequently the same flow of water from the higher location to the lower rice fields. The control of risk should not have to adopt the external practice but it is better to explore "the social capital" in which it is from, for, and by the local farmers, but it should systematically be planned to make a possible implementation, evaluation, and periodically be targeted.

Fortunately, referring to the previous research, this study assumes that the farmers especially in the research location have "the local wealth" in the form of local wisdom that could be extended to control the risk of organic rice farming practice. However, as part of planning process, this research paper does not aim merely to describe the traditional practice, but it aims to classify this endogenous way of farming into the first and second priority to develop, the achievement (the real practiced local wisdom) that is needed to maintain, and the local practice that does not need to develop or should not be considered. This identification in planning process is very important because the part of local farming practice that they have gotten from their forefather have been starting to fade, in which the farmer does not feel it important [28]; but in contrary this local practice in some areas is still practiced strongly such in Enrekang [29], Lebong [30], Blora [31], and East Nusa Tenggara [32].

This research, for this purpose, does not adopt the logic and flow model of house of risk (HOR) -- in which it is frequently implemented in identifying and prioritizing the actions of mitigation -- but follows the Importance Performance Analysis (IPA) model. By adopting the HOR model, Maman *et al*. [12] – for example – started the research by identifying the event of risk, the agent induces the coming of risk, and determining the agent that should be prioritized to mitigate by performing the HOR-1's model analysis. The next stage of research is exploring the

potential of proper action to mitigate the risk. The research finally concluded – by adopting the HOR-2's model analysis -- the 1st, 2nd, 3rd, 4th priority and so on regarding the action of mitigation. But unfortunately, this identification is based on "the top" decision, which could not properly avoid the elite bias and judgment.

The change of interviewee to be grassroots people -- such as the farmer as the informant -- the HOR model could not avoid the rigid planning. Maman *et al*. [13] who adopts the HOR to arrange the planning of mitigation of land conversion risk could not avoid the linear and rigid planning. The research presented merely the first priority, second, third, and so on although it is based on the local farmer perspective.

In fact, the planning should be diverse in line with variety of people who will execute the action. The people could probably think the subject planned is important and they have implemented it or even the action has become their habit as their achievement to hold. The arrangement of planning for this people should completely be different with the people who think the case is important but they could not perform it yet; and also different with the people who perceives that the item is not strongly important, and they also do not perform it yet.

In the light of this reason and based on the assumption that the farmer has the farming local wisdom but has variations in its implementation, this research adopts the IPA, instead of the HOR model. The IPA is originally developed by Martilla and James at the end of seventies, which is created specifically to measure customer satisfaction as well as to detect the necessary improvement of a services or product [21; 13]). Fortunately, on the basis of perception on the importance of certain attribute which face to face with its performance; the IPA model has been adopted in many fields. Since initial introduction of this model analysis, Ormanović *et al*. [21] has collected 1075 paper with the key words of importance and performance in various fields. Chen [13], for example, has developed IPA model to identify the tourist satisfaction in China and its implication for management strategy in developing the services of the corporate.

The basic principle of IPA operation is confronting between expectation and satisfaction or importance vs. performance. Murali and Pugazhendhi [18], as for illustration, have adopted the IPA model to present the customer satisfaction of after sale service (ASS) of home appliances. In this context, the researchers identified twenty attributes relating to the satisfaction of ASS. Based on the measurement result of ASS, these twenty attributes have been divided into four categories: (a) the high expectation vs the high satisfaction; (b) the high expectation vs the low satisfaction; (c) the low expectation vs the low performance; and (d) the low expectation vs high satisfaction. This category practically indicates the different implication for management strategy. The first indicates the successful of corporate as an achievement to sustain. The second recommends the necessary of improvement as a high priority planning. The third proves the low priority of improvement; and the fourth indicates the unnecessary attributes to consider.

In the light of above discussion, this research paper aims to identify the farming local wisdom practice to control the risk of organic rice farming system. By adopting the IPA model, this research in further step categorizes and arranges the planning on the basis of importance and performance. However, the risk definition and the risk of organic rice farming system should of course be previously presented. According to Baranoff *et al.* [2], the risk consists of the meaning of uncertainty which affects the unexpected result. According to Sotic and Rajic [25], the risk could be defined based on the probability, expected value, uncertainty, and the objective of the action. The unsuccessful target, according to Sotic and Rajic [25] is a risk indicated by the unpleasant result. Ajupov *et al*. [1] emphasizes, the risk is an action or condition that has a possible adverse effect, and could happen in all conditions. Omar and Din [20] -- for more clear -- presents the important keyword of the risk, in which it is the existence of "a negative impact". The level of unpleasant and disadvantage is of course relating to the decision making based on certain condition. The level of lose for certain people is highly significant but for other, the degree of lose is insignificant. The risk level, according to Sotic and Rajic [25], is frequently based on people's view, in which the yield is not the same with planned.

The organic rice farming system has certainly the single risk in production process, in which it is the probability of organic status loss, or the yielded product does not meet the organic criteria. Gambelli *et al*. [8] by overview of studies on risk inspection in EU organic certification found the farmer's non-compliance (NC) is the main factors for the risk. The European Organic Certifier Council [7] has also emphasized the keyword of NC in the certification process of organic farming. Gambelli *et al.* [8] elaborated the NC into the farmer's NC attitude, non-organic land, and processing activity. The contaminated soil and non-sterile processing from chemical input could seriously be a risk jeopardizes the organic status of product yielded. In the local context of Indonesia by the case of special region of Yogyakarta, referring to Sriyadi [27], the most of organic farmer is still not certified, and the farmer's awareness of organic farming is relatively low, in which it leads to incomplete implementation of organic principle. This is of course a serious risk.

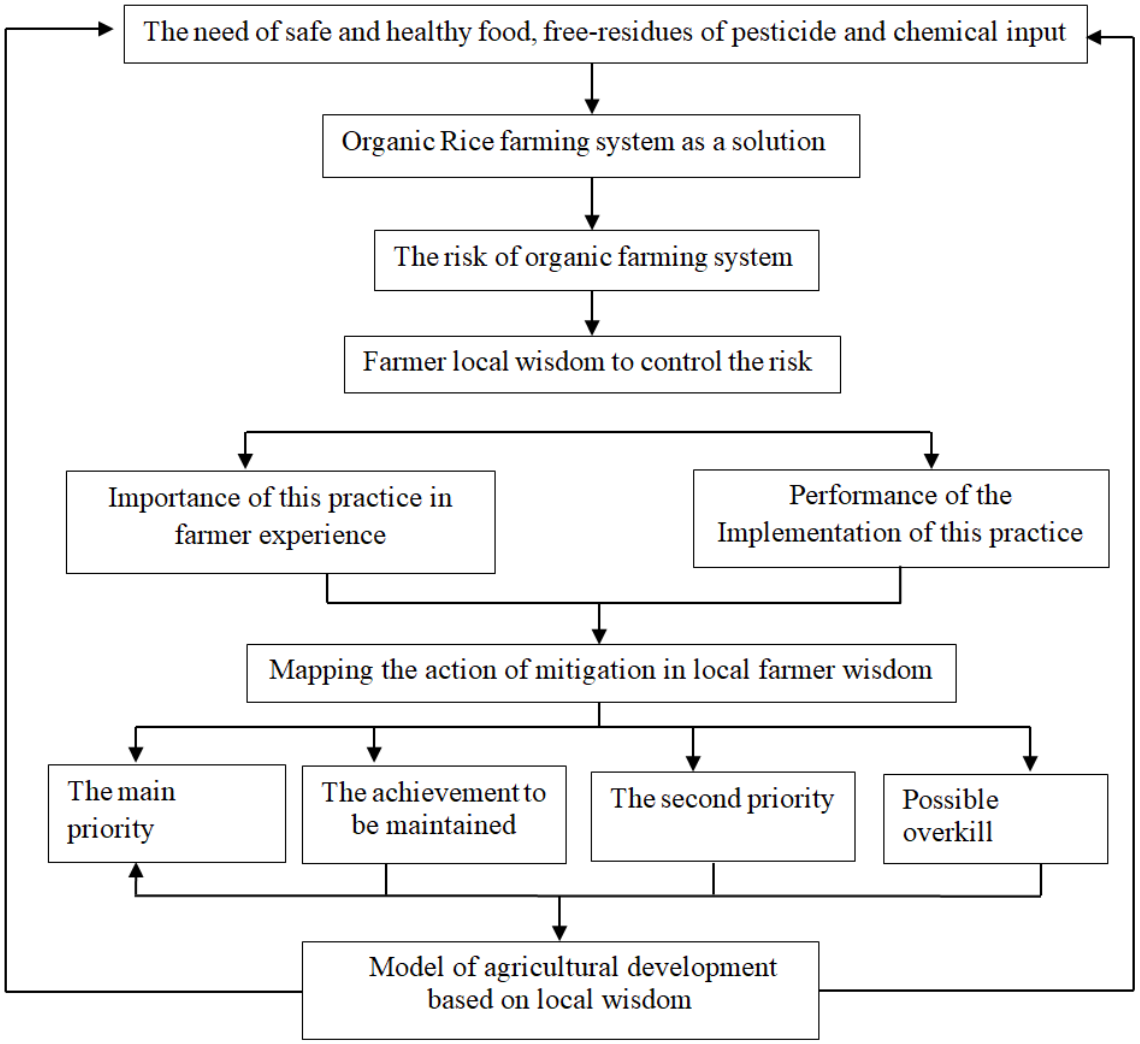


Figure 1. Framework analysis to control risk of ORF to yield the safe and healthy food

The above-mentioned risk of organic farming process could probably happen in each step of farming process in pre-planting activity, such as in land preparation, watering/irrigation, nursery process, and source of seeds. The risk control is of course should be explored deeply in each step of farming practice, but this research focuses mainly to explore the farming local wisdom in pre-planting stage of rice farming activities. By systematizing traditional farming which they inherited from their ancestor – as illustrated in Figure I – it will strongly support the effort to yield the healthy and safe food for human life sustainability on the basis of local farmer experience. In addition, the results of this study can be a model for the development of agricultural innovations based on local wisdom.

4. Material and Methods

Following the IPA model and logic, this research is majorly divided into two steps. The first -- and it is a very important stage -- is exploring the traditional practice – as part of local wisdom in farming – especially the way to control the threat to organic status which is majorly adopted and implemented by the Farmer Group Association of Simpatik (*Gapoktan Simpatik*) in Tasikmalaya, West Java, Indonesia. In this step the research could be categorized into a qualitative study. In this stage, this research adopts the in-depth interview and direct observation to explore the farmer local wisdom based on grounded exploration. The key informants are the prominent farmers of organic rice farming system gather in *Gapoktan Simpatik.*

Although the way of control of risk of organic rice farming is acquired from and part of their life, the research measures quantitatively the degree of importance and performance of each action in four levels of Likert scale in local farmer view. In this second stage and based on the research aim, this study is a kind of a survey sample. The population is organic rice practitioner gather in in Simpatik farmer group association in Tasikmalaya, West Java; and the sample size is 109 farmers based on Slovin formula

taken from 236 organic rice farmers with error probability is less than 7%; and the research respondents are determined by a proportional stratified random sampling in four villages of research location. The research variables are the importance and performance of each action of local wisdom to control the organic rice farming risk (ORFR).

Following the survey requirement which needs a valid and reliable instrument, prior to data collecting, this research performs a validity and reliability test of instruments. Fortunately, in line with the Cronbach alpha criteria, this research questionnaire gets 0.942 score of reliability from 30 respondents who have similar criteria with the sample of this research.

Data analysis based on the IPA logic and flow adopts the following stages. *The first*, categorizing the degree of importance and performance of each action of risk control into high, moderate, and low in the light of this formula [1]:

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

The second, counting the total score, the average, and the average of the average of importance and performance of each attribute. The total score is the result of sum of Likert scale measurements from the total respondents. The average is the total score of each attribute divided by the number of respondents; and the average of the average is the total of the average divided by the number of attributes mitigation.

The third, assigning suitability and gap between importance and performance level by adopting the following formula:

$$Tki = \frac{\overline{Xi}}{\overline{Yi}} \times 100\% \quad [2]$$

In which:
Tki = Level of suitability
$\overline{Xi}$ = Performance score
$\overline{Yi}$ = Importance score

The Forth, providing the matric of importance and performance level, and dividing it into four columns of 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:
$\overline{\overline{X}}$ = Average of the average of performance score
$\overline{\overline{Y}}$ = Average of the average of importance score
K = The number of actions to control the risk

The fifth, presenting each farmer local wisdom in controlling the risk in Cartesian diagram determining level of priority in quadrant matric based on below formula;

$$\bar{X} = \frac{\sum Xi}{n} \qquad \bar{Y} = \frac{\sum Yi}{n} \quad [4]$$

Where:
$\bar{X}$ = Average of performance score
$\bar{Y}$ = Average of importance score
n = Amount of respondent

This formula [4] identifies and divides all farmer local wisdom in controlling the risk wisdom into four quadrants in a Cartesian diagram. The first (A) presents high importance and low performance indicates high priority of the action of risk control in local farmer's view. The second (B) identifies high importance and performance indicates the local practice that is implemented strongly in daily farming practice. The third (C) represents low importance and low performance as a second priority of the actions; and the fourth (D) presents high performance but low importance, proving the unimportant action to plan.

5. Result and Discussion

5.1. The Local Wisdom in Risk Control of Organic Rice Farming

Based on in-depth interviews with organic farmer activists who are members of *Sympatic* Farmers Group Association (*Gapoktan Simpatik*) in Tasikmalaya, West Java, Indonesia, this research found five local practices to control the risk of organic rice farming, especially in pre-planting phase. The five practices in this research paper are coded X1 to X5 to facilitate identification and map the prioritized planning. The first practice (X1) is based on the togetherness and mutual understanding as a common habit of farmer, in which in the land preparation, they come to agreement not to use the agricultural production tool (*alsintan*) that is no longer suitable for use or contaminated by chemical input. The consequence is the land prepared to cultivate the rice will be completely sterile from chemical input residues, and of course it will meet the requirements of organic farming system.

The local wisdom in farming practice as found in the research location frequently does not consider the scientific point of view, but it is merely a habit. To control the flow of water from conventional farming to the organic field which has high possibility that the water is contaminated by chemical residues, the traditional practice recommends to create a filter tube in the upstream water and to plant the water hyacinth above the filter tube (X2). The water hyacinth – in farmer's view -- is believed to be able to clean water from residue of chemical input. But fortunately, this unscientific view point finally gets support from research finding. Lissy and Madhu [10] in their experiment prove water hyacinth could effectively remove heavy metal from aquatic ecosystem. The next research conducted by Moyo *et al*. [16] concluded, water hyacinth – by the case of Shagashe river in Zimbabwe and also by triplicate samples in this river – could highly reduce the polluted water. In more specific, this research presented, the water hyacinth could remediate 25% of electrical conductivity, 26% of total dissolved solids (TDS), 45% of sulphate, 33% of

phosphate, and 37% of total hardness [16].

The social participation is part of the local wisdom that should be held together. In this context, to control the risk of organic farming, there is an agreement; the farmer should participate in the training of seedling and making organic fertilizers (X3). The training of course has the positive impact in which the organic farming community will understand thoroughly the organic seeding process; will be able to provide and produce independently natural inputs in the form of fertilizers. In addition, the training is also useful for the farmers to be able to monitor the pre-planting process in accordance with organic farming standards.

The other local wisdom is also found in the selection of seed sources. The seeds used by farmers should be from organic nurseries (X4), carried out directly by the farmer independently as well as by other parties, but the farmers should know the process, which means that farmers know the origin of the seeds and the seeds should have an organic label. In addition to previous practice, the *Gapoktan* should provide seeds from independent nurseries as well as the seeds are purchased with an organic label (X5). This is necessary to make easier for farmers to get truly organic seeds. In more detail, the action of mitigation of organic rise farming risk in the pre-planting phase are presented in Table 1.

5.2. The Importance Level of Farmer Local Wisdom

As a practice initiated by a farmer community, the action of risk control of organic farming system is assumed to get a high expectation from the local farmer. Thus, the identification of importance level of this practice in farmer's view point is very important as part of bottom-up planning process. The importance level of this practice in farmer's view is very essential because the farmers themselves who will adopt and implement the action of the risk control. Based on the data presented in Table 1, the farmers' expectation to each mitigation attribute gets the average between 3.39 and 3.61 which could be categorized into high; and the average of the average gets 3.51 which could also be categorized into high category. This research result indicates the high level of farmer's expectations to implement this action of mitigation of organic rice farming risk. In other word, the farmers consider that the implementation of these actions of risk control is highly important. From five actions of risk control in pre-planting phase, the action with the code of X4, in which the seeds to be planted should be from the organic nursery, obtained the highest average value of expectation with a score is 3.61. It indicates strongly that this item (X4) is the most important in farmer perspective as an effort to obtain the real organic rice product.

However, the action with the code of X3 which encourages the farmer to highly participate in a training to make nursery and organic fertilizer gets merely the score of 3.39. It indicates the farmer has low expectation to this action. In the farmer perspective this action has a low importance to control the risk of organic farming. It is not amazing because making a nursery and organic fertilizer has become a habit as part of their daily practice. The participation of farmer in this activity will not get a significant result for them. The grade of important level of each attribute and the average of the average is completely presented in Table 1.

5.3. The Performance of Implementation of Farmer Local Wisdom

This performance is used to identify the extent to which the application of action to control the risk of rice organic farming is practically adopted in the daily farming practice. This performance is measured by a four-level of Likert scale with variations in the selection of keywords according to the context of the question, such as never, sometimes, often and always with a tiered score between 1 to 4. In the light of this measurement, the average score of performance of implementation of action of risk control in the pre-planting phase ranges from 2.55 to 3.52. There are four actions indicate high performance, and oppositely there is an action gets place of lower performance.

The performance of the implementation of risk control in this pre-planting phase – for more clearer – gets an average of average score of 3,196, which is in the medium category. While, based on the measurement results regarding the level of importance or expectation, the farmers consider the actions of risk control are important with average of average score is 3.51 (Table 1). Indeed, the gap between expectations and performance could not completely be avoided yet. The gap averagely obtains score of 0.314. Although it is relatively low, it should get pay attention seriously to yield the real organic rice. Therefore, the gap should be identified for each action of risk control for further planning of this action of mitigation.

The recommendation that *Gapoktan* must provide organic seeds (X5) turned out to be in its performance of implementation gets the lowest score compared to other action with an average score of performance is 2.55, below the average of the average of the performance, in which it is 3.196 (Table 1). This indicates the hope that *Gapoktan* will provide organic seeds is not yet implemented; or in contrary, the farmers do not utilize the organic rice seeds provided by *Gapoktan*. The other actions of risk control (X1, X2, X3, and X4) obtain relatively high score (Table 1). The action of X5, therefore, should get special attention in this research as the main planning in performing the organic rice farming, although it needs further mapping.

The recommendation regarding the necessity of the seeds that will be planted should come from organic nurseries gets the highest average score of performance (3.52). Based on this score, the farmers do not merely consider the high importance of this item, but they also have completely implemented this action. This attribute could also be considered as the most implementable item.

This action has become really a local wisdom as a common practice, in which the farmer has performed the organic nurseries independently to prevent chemical contamination of seeds; and this action is probably the farmer achievement in conducting the organic rice farming practice in pre-planting phase, which should be maintained.

5.4. The Compatibility between Expectations and Performance

The presentation of percentage of compatibility – as well as the gap – is essential following the next stage of Importance Performance (IPA) analysis model. This presentation actually describes the asymmetry between expectation and performance, and the planning of agricultural extension in the IPA model is actually based on this compatibility and gap. The action of risk control which gets the lower gap hypothetically is the achievement of the program that should be maintained; while the higher gap of action could probably the main action that needs to plan to remediate the organic rice farming system. The mapping of the actions to perform the proper planning is actually based on this compatibility and gap.

The level of conformity of expectations and performance of pre-planting-risk control on average gets a high percentage, which is 91.45%. This means that in general there is a match between expectations and performance of its implementation. The highest suitability level of action is "participating in a training to make a nursery and organic fertilizer" (X3), in which its percentage of compatibility reaches 98.38%. The next high suitability is "the seed to be planted comes from organic seedbeds" (X4) which gets percentage of 97.78. The action regarding the suggestion to make a filter tub upstream to organic rice field, topped with water hyacinth (*eceng gondok*) (X2) get merely 96.00% of suitability. The attribute of provision to make an agreement with all organic farmer not to use agricultural production tool that is not suitable for use or contaminated by chemical input (X1) is merely gets the rank of fourth (93.08%). This relatively high gap indicates that the togetherness within the farmer community has started becoming to fade. The cooperation and making agreement within the farmer community is most likely is a very serious problem in farming practice, although the togetherness is part of local wisdom inherited from their forefather.

The action of risk control that should get a high attention, in this context, is the item that the farmer group association (*Gapoktan*) should provide organic seed independently (X5). The farmers consider this provision as the strongly high important item, indicated by the high expectation of farmer, in which the average score gets 3.59 from the 108 respondents of this research. But, unfortunately, the performance of its implementation is strongly low, which the score is merely 2.55. The compatibility level between the farmer expectation and the performance is also low, in which it is merely 71.3%. The asymmetry is very high, reaches almost 29% (Table 1). If it is compared to the average of compatibility which gets 91.452% -- and the average gap is 8.55% -- this action should also get a serious attention; and it could be said that the control of risk of organic rice farming should focus on this item; while the other action should be held as an achievement. However, the proper risk control planning in the farmer view point needs seriously a further analysis to map all these five recommendations of action.

5.5. Mapping of Risk Control

Mapping the risk control is aimed to determine priority programs properly in the development of organic rice farming systems that are being carried out by organic farming practitioners. This mapping will show clearly the urgency level of each action to plan – high and low priority – and the action that should not be planned as well as the action that has been implemented as the farmer's achievement in farming activity.

This mapping is carried out using a quadrant approach, in which this section discusses the expected value (Y) and performance value (X). The results of Importance Performance Analysis (IPA) will properly form a matrix consisting of four quadrants, which each matrix describes the priority scale. The Cartesian diagram matrix consisting of four quadrants is formed by two perpendiculars intersecting lines at the points (Y) and (X). The average value of the average level of performance appraisal can be symbolized by (X), while the average value of the average level of expectation/interest is symbolized by (Y). These two points intersect into four quadrants. The first quadrant (I) is located on the upper left, the second quadrant (II) is located on the upper right, the third quadrant (III) is located on the lower left, and the fourth quadrant (IV) is located on the lower right. These quadrants will describe which of action of local wisdom that should be a first and second priority in a planning, which action that does not need to plan, and which action that is considered as an achievement that should be maintained.

Table 1. The Farmer Local Wisdom to Control Risk of Organic Rice Farming System in Pre-cultivation Stage

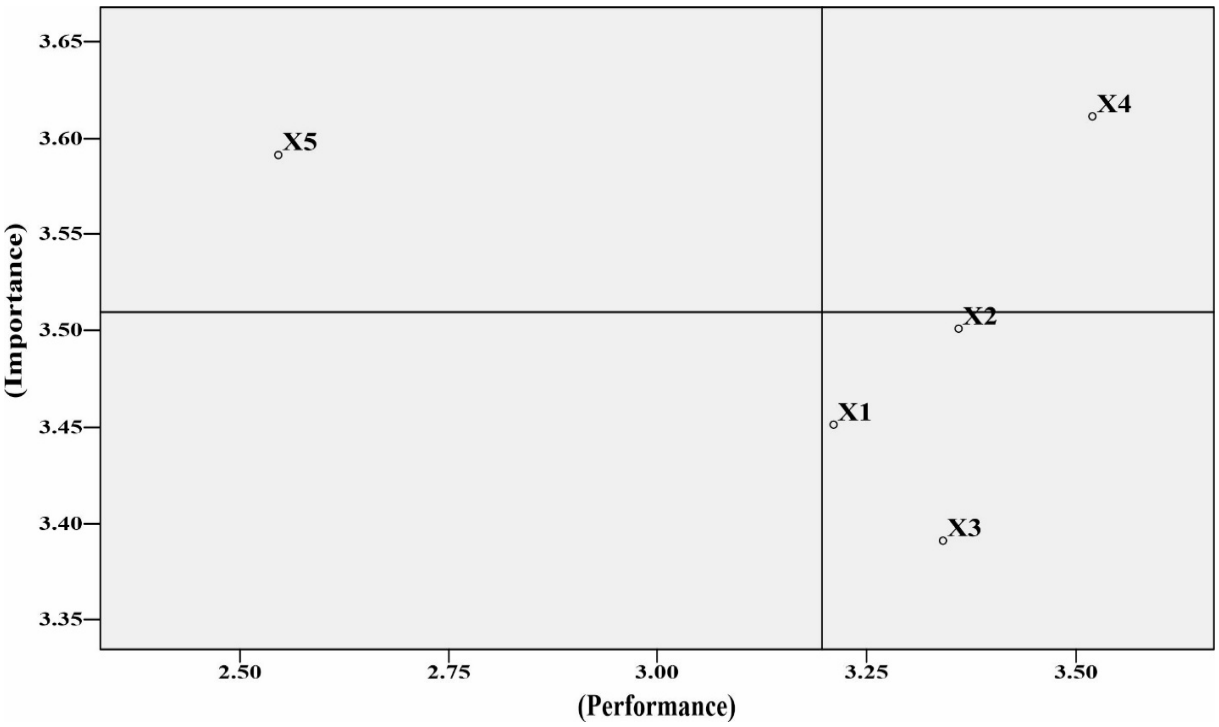
Cultivation Stage	Code	The action to control the risk of organic rice farming	Expectation			Performance			Compatibility Level (%)
			Total Score	Average	Category	Total Score	Average	Category	
Land Preparation	X1	Make an agreement with all organic farmers not to use agricultural production tool (*alsintan*) that is no longer suitable for use or contaminated by chemical input	376	3.45	High	350	3.21	High	93.00
Watering	X2	Make a filter tub upstream into organic rice fields, topped with water hyacinth (*eceng gondok*)	381	3,50	High	366	3.36	High	96.00
Nursery	X3	Participating in a training to make a nursery and organic fertilizers	370	3,39	High	364	3.34	High	98.38
Source of seeds	X4	The seeds to be planted come from organic seedbeds	393	3.61	High	384	3.52	High	97.78
	X5	Farmer group associations provide organic seeds	391	3.59	High	278	2.55	Moderate	71.09
		Average of the average		3.51	High		3.196	Moderate	91.25

Note: (1) The Total score is the sum of measurement result in Likert scale;

(2) The average is the total score of each attribute divided by the total of respondents

(3) The average of the average is the sum of each average of attribute divided by the number of attributes

(4) The compatibility is the conformity between the expectation and implementation



Note:

X1: Making an agreement with all organic farmers not to use agricultural production tool that is no longer suitable for use or contaminated by chemical input;

X2: Making a filter tub upstream into organic rice fields, topped with water hyacinth;

X3: Participating in a training to make a nursery and organic fertilizers;

X4: The seeds to be planted come from organic seedbeds;

X5: Farmer group associations provide organic seeds

Figure 2. Cartesian Diagram of Risk Control Planning for Organic Rice Farming System in Pre-planting Phase

The coordinates obtained from the intersection points on (Y) and (X), -- which is the result of the average value of the average level of farmer performance appraisal with the symbol (X) -- is 3.20. Meanwhile, the average level of interest/expectations of farmers symbolized by (Y) is 3.51. The Cartesian diagram matrix obtained based on this intersection is presented in Figure 2, which describes a map of indicators/action of control of the organic rice farming system in the pre-planting phase based on the difference between expectations and performance, which is divided into four quadrants, namely quadrants I, II, III, and IV.

In the light of this way of mapping, as hypothetically predicted, the X5 attribute should be priority of the planning. This attribute gets high expectation from the farmer, but its implementation is low. Adopting the IPA's sentence "be concentrate here" to make any planning to remediate this action of mitigation. Referring to Table 1, the average of importance level of this attribute is 3.59, while the rate of its implementation is merely 2.55. In line with this average score, the compatibility level is also low (merely 71.03%), and the gap is high (28.97%). This action takes space in the quadrant I, which concludes that the *Gapoktan* should provide the organic seed for the whole organic rice farmer practitioners. The all sides should seriously support the farmer group association to perform this serious task. In other sentence, this local wisdom of farming practice needs reinforcement from the farmer communities.

If the X5 could be considered as the lack of organic rice farming practice, the X4 and X2 – based on this mapping itself – should be perceived as the farmer's achievement in performing their local wisdom relating to the organic rice farming practice. In the IPA's sentence, the seeds to be planted comes from organic seedbeds (X4), has to be "kept up as the good work". This achievement has actually been predicted by the high score of importance degree within the farmer of organic farming practitioners as well as the high score of its implementation (Table 1). The IPA's rule suggests, the high score of importance level as well as the level of its implementation indicates the action is as an achievement that needs to maintain. The agricultural extension planning in this context is how to maintain this achievement; and the planning should be made based on this aim. Thus, it could be concluded that this item of local wisdom is part of the farmer's way in pre-cultivation stage to mitigate the risk of organic rice farming.

The action of X2 – although a little less – could also be placed at this achievement position. The score of

importance level and performance is relatively comparable (Table 1), which indicates that making a filter tube upstream into organic rice field, top with water hyacinth is not merely a farmer's local wisdom, and supported by scientific finding, but it is also a daily habit in their organic rice farming practice to yield the real organic product.

Regarding the X1 and X3 action – as a result of this mapping – it needs further exploration. These attributes actually take the third quadrant, in which the IPA's rule insists "the possibly overkill" of these items, indicates the unnecessity of these actions to consider in arranging the development planning of organic rice farming system. This conclusion is not amazing because the average score of the X1 and X2 – from the 108 respondents – is lower than the average of the average score of its importance level; while, the average score of its performance is higher than the average of the average score of its performance level (Table 1). However, if we perform a further observation, the average score of the importance of these two items (X1 and X2) could actually be categorized into high, in which the average takes the position above three (3). The performance level also obtains a high score category (above three). Based on this depth consideration, these actions of mitigation could actually be regarded as farmer's achievement. These two actions could be considered as traditional way in farming practice that is still be hold tightly by the farmer community at least in the research location.

In addition, the provision to make an agreement with all organic farmer not to use agricultural production tool (*alsintan*) that is no longer suitable for use or contaminated by chemical input (X1) -- based on the in-depth interview with the farmer – has become a part of their custom in performing the organic farming system. The suggestion to participate in a training to make a nursery and organic fertilizer (X3) is not strongly important for the farmer, because making organic nursery and fertilizer for the farmer has been part of their habit.

In the light of this argument, this mapping based on IPA model approach, has actually proved the two categories of planning about the control of the risk of organic rice farming system, which includes an action as the main program to remediate, and four items as farmer achievement needs to maintain. Fortunately, the mapping does not find the low priority as it is usually placed in the third column of Cartesian diagram; and this research actually proves the absence of action that should not be important to plan although we found three attributes in the fourth column.

Apart from the results of this mapping, the model IPA could be a model of planning in agricultural development based on local wisdom. Likewise, the exploration of local wisdom is not just a description but can become an agricultural development plan.

6. Conclusions and Recommendation

In the light of this mapping based on IPA model, in pre-planting stage, the research finds four kinds of local wisdom which are properly maintained and hold strongly by the farmer community in the research location; and this local wisdom could be considered as farmer achievement in controlling the risk of organic rice farming system. The four traditional practices include: (a) Making an agreement with all organic farmers not to use agricultural production tool that is no longer suitable for use or contaminated by chemical input; (b) Making a filter tube upstream into organic rice field, topped with water hyacinth; (c) Participating in a training to make a nursery and organic fertilizer; and (d) The seeds to be planted come from organic seedbed. Oppositely, this research finds a local wisdom that is very important in farmer view, but it needs remediation and reinforcement as the main planning in controlling the risk of organic rice farming system. This local wisdom that needs remediation is the agreement that the farmer group association should provide organic seeds for all of the group members of organic rice farming system.

In accordance with this research finding, the planning of risk mitigation should explore the local wisdom as the social capital in the planning of extension and development. The planning should avoid the top-down process and strong dependence on the external agency; and in contrary the planning should be relied on the assumption that the farmer – or the grass root communities – has good ideas, way of life, proper practices that could be developed in the modern life. Thus, the modern life should be relied on the basic traditional practices. This model of farming extension based on local wisdom should be socialized to the farmer audience in the world, especially in the developing countries who are rich of local wisdom, and it should become the model of agricultural development. However, to develop this model completely, it needs further research with more sample size to get higher scope of generalization and to get the more accurate data of farmer local wisdom.

Acknowledgments

This research strongly appreciates to the Rector of Universitas Islam Negri (UIN) Syarif Hidayatullah Jakarta and the Director of Center for Research and Publication of the UIN Jakarta for funding this study; and the researcher teams also appreciate many sides for their support to finish and publish this research paper.

REFERENCES

[1] A.A. Ajupov, M.A. Beloborodova, M.G. Sorokina, M.G., and A.A. Sherstobitova, Risk-Management in Economic and Financial System. International Business Management, Vol. 10 (22), pp. 5227-5231, 2016, https://medwelljournals.com/abstract/?doi=ibm.2016.5227.5231

[2] E. Baranoff, P.L. Brockett and Y. Kahane, Enterprise and Individual Risk Management (Unnamed Publisher), W.Y.

[3] J.K. Chen. A New Approach for Diagonal Line Model of Importance-Performance Analysis: A Case Study of Tourist Satisfaction in Chin, *Sage Open*, Vo.11(1), pp. 1-11., 2021, DOI: 10.1177/2158244021989276

[4] R. Dasika, S. Tangirala and P. Naishadham, 2012, "Pesticide residue analysis of fruits and vegetables," Journal of Environmental Chemistry and Ecotoxicology Vol. 4(2), pp. 19-28, 2021, DOI: 10.5897/JECE11.072

[5] The Economist (2019), Global Food Security Index 2019: Strengthening Food Systems and The Environment Through Innovation and Investment, The Economist Intelligent Unit, London, UK, 2019.

[6] T. Eliza, T. Hasanuddin. S. Situmorang. Farmers' Behavior in Chemical Pesticides Use: Case of Chili Crop Farmers at Gisting Atas Village, Gisting District, Tanggamus Regency," JIIA 1(4), pp. 334-342, 2013,

[7] European Organic Certifier Council, Risk-assessment in organic certification: A snapshot of the current implementation and further perspectives, EOCC Task Force Risk Assessment Final report, EOCC, Belgium, 2016. https://eocc.nu/wp-content/uploads/2016/02/TF-RA_Final-report1.pdf

[8] D. Gambelli, Solfanelli, Francesco., and R. Zanoli. Risk assessment in EU organic certification system: a systematic literature review, Proceedings of the 4th ISOFAR Scientific Conference. 'Building Organic Bridges', at the Organic World Congress 2014, 13-15 Oct., Istanbul, Turkey, 2014, https://orgprints.org/id/eprint/23827/

[9] International Federation of Organic Agricultural Movement (FOAM), The IFOAM basic standards for organic production and processing, IFOAM, Germany, a corrected version 2007, https://agritech.tnau.ac.in/org_farm/pdf/IFOAM_basic_standards.pdf

[10] A.M. Lissy P N., A. Mary and B. Dr. G Madhu. Removal of Heavy Metals from Waste Water Using Water Hyacinth, ACEEE Int. J. on Transportation and Urban Development, Vol. 01(01), pp. 48-52., 2011, DOI: 1.IJTUD.01.01.39.

[11] U. Maman, E. Nurhandayanti, and H.H. Yoga. 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), pp. 2927-2936, 2015, https://www.idosi.org/mejsr/mejsr23(12)15/17.pdf

[12] U. Maman, A. Mahbubi, and F. Jie. Halal Risk Mitigation in The Australian-Indonesian Read Meat Supply Chain, Journal of Islamic Marketing, Vol 9(1), pp. 60-79, 2018, https://doi.org/10.1108/JIMA-12-2015-0095

[13] U. Maman, N. Adiarni, and Fahriany. Mitigation of Land Conversion Risk in Post-Harvest Phase to Optimize Staple Food Availability, Journal of Engineering and Applied Science Vol.13(8), pp. 2003-2012, 2018, https://medwelljournals.com/abstract/?doi=jeasci.2018.2003.2012

[14] U. Maman, Murodi, Nindyantoro, E. Mujahidin, D. Zaenuddin, Muhyani, Muksin. Formulating Extension Model to Encourage Staple Food Diversification: A Solution to Food Crisis Potential, Universal Journal of Agricultural Research Vol. 9(4), pp. 138–148, 2021, DOI: 10.13189/ujar.2021.090405

[15] U. Maman, Y. Razak, Murodi, A. Saefuddin, F. Hendra, Zirmansyah, Nindyantoro, L.I. Ichdayati, Junaidi. Formulating Agricultural Extension Planning Based on Farmer Achievement: The Case of Organic Rice Farming Risk Mitigation in Indonesia, Universal Journal of Agricultural Research Vol. 10(1), pp. 64-76, 2022, DOI: 10.13189/ujar.2022.100106

[16] P. Moyo, L. Chapungu and B. Mudzengi, Effectiveness of water Hyacinth (Eichhornia crassipes) in remediating polluted water: The case of Shagashe river in Masvingo, Zimbabwe, Advances in Applied Science Research, 4(4), pp. 55-62, 2013, www.pelagiaresearchlibrary.com

[17] F. Mustikarini, Retnaningsih, and M. Simanjuntak, Kepuasandan Loyalitas Petani Padi Terhadap Pestisida [Rice Farmers' Satisfaction and Loyalty toward Pesticides], Jur. Ilm. Kel. &Kons. 7(2), pp. 93-102, 2014, DOI: https://doi.org/10.24156/jikk.2014.7.2.93

[18] S. Murali, and S. Pugazhendhi. An Importance and Performance analysis of ASS attributes for home appliances manufacturing firms, Vels Journal of Mechanical Engineering, Vol-2 (2), pp. 7-13, 2015, https://www.semanticscholar.org/paper/An-Importance-and-Performance-analysis-of-ASS-for-Murali-Pugazhendhi/8fee35f606f2aa5a469fc87f993e9c6eff811a9d

[19] M.C. Nafis. The Concept of Halal and Thayyib and Its Implementation in Indonesia, Journal of Halal Product and Research, Vol. 2(1), pp. 1-5, 2019, https://doi.org/10.20473/jhpr.vol.2-issue.1.1-5

[20] R.Omar and J. Din., Risk Assessment Tool for Software Project in Malaysian Public Sector. Journal of Engineering and Applied Sciences, Vol. 12(3), pp. 527-533, 2017, https://www.medwelljournals.com/abstract/?doi=jeasci.2017.527.533

[21] S. Ormanović, A. Ćirić, M. Talović, H. Alić, E. Jelešković, D. Čaušević. Importance-Performance Analysis: Different Approaches, Acta Kinesiologica, Vol. 11 (2), pp. 58-66, 2017, http://actakinesiologica.com/wp-content/uploads/2018/01/Ormanovi%C4%87-2017.-Supp2-9.pdf

[22] Pamungkas, Bahaya Paparan Pestisida terhadap Kesehatan Manusia [Dangers of Pesticide Exposure to Human Health], Bioedukasi 14(1), pp. 27-31, 2016, https://jurnal.unej.ac.id /index.php/BIOED/article/view/4532

[23] Puspitasari and A.M. Kiloes, 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, 2017, http://repository.pertanian.go.id/handle/123456789/7303

[24] E. Pyne. Occurrence and Distribution of Pesticide Residues in Soil as a Result of Long-Term Application, Thesis in Utrecht University, Wageningen, 2015, https://studentthes es.uu.nl/bitstream/handle/20.500.12932/20943/ErinPyneFi nalThesis.pdf?sequence=2

[25] A. Sotic, and R. Radenko. The Review of the Definition of Risk. Online Journal of Applied Knowledge Management, Vol. 3(3), pp. 17-26, 2015, http://www.iiakm.org/ojakm/ar ticles/2015/volume3_3/OJAKM_Volume3_3pp17-26.pdf

[26] Sumiati, and R.P.D. Julianto, 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), pp. 125-130, 2018, DOI: https://doi.org/10.33366/bs.v18i2.1185

[27] Sriyadi. The Risks of Organic Rice Farming: A Case Study in The Kebonagung Village Imogiri District and Wijirejo Village Pandak District Bantul Regency, Special Region of Yogyakarta, 4th International Conference on Food and Agriculture Resources (FANRes 2018) Published by Atlantis Press, 2018, https://doi.org/10.2991/fanres-18.201 8.15

[28] W. Kuasa, U. Rianse, W. Widayati, D. Sidu,W. G. Abdullah, Z. L. Zulfikar, L.O. Syukur, I. S. Rianse, Local Wisdom of Farmers in Meeting of Local Food, International Journal of Sustainable Tropical Agricultural Sciences (IJSTAS), Vol. 2(1), pp 53 – 60, 2015, http://ojs.uho.ac.id/index.php/ijstas/article/view/635

[29] Yusriadi, Irmayani, I. Rosada, M. Ilsan, Wahyuni, Muhdiar, Local Wisdom on Farming Activities and Its Benefits to Agriculture in Enrekeng District, Indonesia, Malaysian Journal of Social Sciences and Humanities (MJSSH) Vol. 3(5), pp. 48-54, 2018, https://msocialsciences.com/index.p hp/mjssh/article/view/157

[30] N. Kesumawati, Jafrizal and Yawahar. Excavating the Local Wisdom of Farmer Community in Order to Support Organic Farming Technology Based on Local Resources in Rejang Lebong District of Bengkulu, International Seminar on Promoting Local Resources for Food and Health, 12-13 October,2015, Bengkulu, Indonesia, http://repository.unib. ac.id/11479/1/090%20Neti%20Kesuma.pdf

[31] D.A. Kurniasari, E.D. Cahyono, Y. Yuliati, Local Wisdom of Traditional Samin Farmers in Klopoduwur Village, Banjerejo Sub-District, Blora District, HABITAT, Vol. 29 (1), pp. 33-37, 2018, DOI: 10.21776/ub.habitat.2018.029.1 .4

[32] Sinu Ignatiu, Airthur Moresi M., Siubelen Yacobus C.W., The Innovation of Agricultural Technology Based on Local Wisdom in Riang Dua Bour Rice Field Community, RJOAS, 7(103), pp. 154-150, 2020, DOI: 10.18551/rjoas.2020-07.19

[33] K. Prayoga, A.M. Riezky, A.R.Syuhada, D.S. Prayoga. Socio cultural and agricultural local wisdom by cetho indigenous community to preserve the nature. AGROMIX, 11(1), pp. 21-31, 2020;https://doi.org/10.35891/agx.v11i1. 184

[34] The Al-Baqarah Verse 168. Al-Qur'an dalam Tiga Bahasa Arab-Indonesia-Inggris [Al-Qur'an in Three Languages of Arabic-Indonesian-English].