

# Perception and Strategy of Developing Organic Rice Farming Systems in Malang, Indonesia

Amin Setyo Leksono\*, Irfan Mustafa\*, Zulfaidah Penata Gama\*, Aminudin Afandhi\*\*, and Anisa Zairina\*\*\*

\*Departments of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya, Indonesia65145

\*\*\*Faculty of Agriculture, Universitas Brawijaya, Indonesia 65145

\*\*\*\*Forestry Study Program, Faculty of Forestry, Malang Institute of Agriculture, Indonesia 65143

\*\*\*\*\*

## Abstract:

This study aims to analyze the level of understanding of farmers towards the resources supporting organic farming systems and developing strategies for developing organic farming systems based on local capacity. This study adopted a sequential mixed method approach in which quantitative data collected from questionnaires while quantitative data was obtained from deep interviews. A total of 58 respondents responded to the questionnaire consisting of questions of internal and external environmental factors, while 7 informants were selected as information for deep interviews. This research concluded that the level of farmers' understanding of organic farming systems was considered high except for their understanding of the natural enemy. Although they often practice their knowledge, in general, they still continue the conventional cultivation system. Based on Strengths, Weaknesses, Opportunities, and Threats analysis of this study indicates the choice of diversification strategy. Therefore, the recommended strategy choices include increasing collaboration, certification programs, increasing the availability of resource packages (organic fertilizers and pesticides), and farmer-friendly technology so that farmers' preferences increase; support from the local government and field counsellors to bridge the product marketing.

**Keywords** —organic rice farming, diversity, management, strategy

\*\*\*\*\*

## I. INTRODUCTION

Organic farming is an important agricultural and food production system, which is environmentally friendly and able to support several positive impacts on ecosystems and rural communities [1,2]. This is because this system plays an important role in alternative food chains, and produces healthier food products [3]. Much evidences show that the

adoption of organic agriculture increases productivity globally, and that it will be possible to feed the world's population that grows with food produced in this system [4].

Organic farming refers to farming systems that increase soil fertility through maximizing the efficient use of local resources [4]. This system is characterized by the use of organic fertilizers and pesticides; avoid using organisms that are modified

by germs; and efforts to increase biodiversity to maintain ecosystem balance [5]. This farming system relies on a number of agricultural practices based on ecological cycles, and aims to minimize the environmental impact of the food industry, maintain long-term sustainability of land and reduce the use of non-renewable resources to a minimum [4].

A total of 69.8 million hectares worldwide were organically managed and involved 2.9 million organic producers at the end of 2017. Those were represented a growth of 20 percent or 11.7 million hectares over 2016, the largest growth ever recorded (FAO, 2019). In Indonesia, organic agriculture has established since 1984 along with the declaration of food self-sufficiency. In 2010, the Department of Agriculture declared the slogan "Go Organic 2010" to foster the implementation of organic agriculture in Indonesia. Indonesian Agricultural Statistics stated that the total area of Organic Agriculture in Indonesia in 2009 was 231687 Ha. This size is considered relatively small because it shows a low land share percentage. Until 2013, only 0.1% of agricultural land had implemented an organic farming system [6].

Many factors may responsible for the slow development of organic farming systems in Indonesia. One of those is the organic farming system implementation at the level of farming actors. Therefore, the focus of this research is on the perception and development strategies to develop an organic farming system in rural communities.

There have been quite a lot of studies on organic farming systems related to management and the social economy, for example about farming perception farmers' perception on organic farming systems in selected local government [7]; socioeconomic impact of smallholder systems [1]; organic farming as a development strategy [3]; development of organic rice farm business [6]. However, the detail exploration on farmer obstacles and strategies for developing organic farming systems in accordance with the farmers' capacities had never been done. The purpose of this study is to

analyze the level of understanding of farmers towards the resources supporting organic farming systems and develop strategies for developing organic farming systems based on local capacity.

## **II. MATERIAL AND METHOD**

This research was conducted in Pagelaran District, Malang Regency, East Java, Indonesia. The distance of the research location in the capital of Malang Regency is around 12 km. The approach used in this research was sequential mixed method. First, data collection techniques were done through the distribution of questionnaires, then filling in a list of questions. Later, interviews and direct observation of the farming system were conducted to explain the first result.

Respondents were determined by purposive sampling with the criteria of farmers who have run agriculture both organic and non-organic for 10 years. Sampling was done by taking the people chosen by the researchers according to the specific characteristics possessed by the sample [6]. A total of 60 respondents was selected to fill out a questionnaire consisting of questions of internal and external environmental factors. And of those, 58 of data was considered reliable and valid.

The next step was done with a series of in-depth interviews conducted to identify farmers' knowledge and attitudes about the organic farming system. Interviews were conducted with seven key informants, consisting of five men and two women. Selected informants were those who have knowledge, experience, in the rice farming system and understand the cultural knowledge of the local [8]. The key people selected are presented in Table 1.

TABLE 1  
PROFILE OF KEY INFORMANTS

Informant	Informant code	Experience (years)	Age (year old) and gender
Field extension officer	I1	25	52 M
Head of village government	I2	34	60 F
Head of farmer group	I3	45	72 M
Young farmer	I4	12	43 M
Farmer	I5	26	56 M
Farmer	I6	29	45 M
Female farmer	I7	35	53 F

The questions given during in-depth interviews are linked to the results of questionnaires that have been filled out by respondents. Focus group discussions were adopted to clarify strategies based on stakeholder participation. The duration of the discussion is 90 minutes.

List of questions were as follows

1 What is the level of understanding of organic rice farming system cultivation techniques by farmers? From who do the farmers get information?

2 What is the presence of organic fertilizers and pesticides on the market?

3 How is farmers' knowledge about local materials that can be used to make organic fertilizer and pesticides?

4 What is the skill level of farmers making organic fertilizers and pesticides?

5 How do the farmers understand the benefits of species diversity in farming the land?

6 What types of refugia plants do you know? Have you ever planted it?

7 What is the knowledge of farmers about predatory Arthropods, which are natural enemies of pests? Have you ever identified their occurrence in the farm?

8 To what extent is the application of organic farming systems in this district? What are the obstacles that are often encountered the farmers?

Data were analysed descriptively. The formulation of the strategy was analysed by SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. The stages of SWOT analysis were as follows: data collection, data analysis and decision

making. At the data completion stage, data can be divided into: external data (opportunities and threats) and internal data (strengths and weaknesses). The model used in this stage consists of internal factors and external factor analysis. Each question item is weighted and scored, with the total weight of each factor being 1.0. Furthermore, the rating is determined based on the level of importance with a scale from 5 (very important) to 0 (very not important). The weight of multiply by ranking produces a score value.

### III. RESULT AND DISCUSSION

#### A. Characteristics of Respondents

The socioeconomic characteristics of respondents include age, education, farming experience, and the number of household members, are shown in Table 2 below. Based on the data, most respondents were male (93.6%), 46–75 years old (83.9%); and had an elementary school education level (71.8%). Most of them have long experience in farming (92.3%) and have 0.62 ha (in average).

TABLE 2  
SOCIOECONOMIC CHARACTERISTICS OF RESPONDENTS OF RICE FARMING IN MALANG

Characteristics	N (%)	
Age (year)	27–45	14.1
	46–75	83.9
Gender	Male	93.6
	Female	6.4
Education	Elementary School	71.8
	Junior High School	23.1
	Senior High School	3.8
	Bachelor	1.3
Experience of cultivation	< 15 years	7.7
	≥ 15 years	92.3
Rice field width	Minimum (ha)	0.5
	Maximum (ha)	1.5
	Average (ha)	0.62
Livestock animal	Cow dan goat	

#### B. Farmer knowledge on organic farming

From the whole item of questions about the organic farming system, the level of respondents'

understanding organic farming and its practices (question 1 to 6) was considered very high (more than 50%) and high (more than 20%). Different things were found at the level of understanding of the types the arthropod natural enemy and practices of organic farming systems (question 7,8). The average level of understanding (high and very high) of the latter questions fell belows 40% (Figure 1).

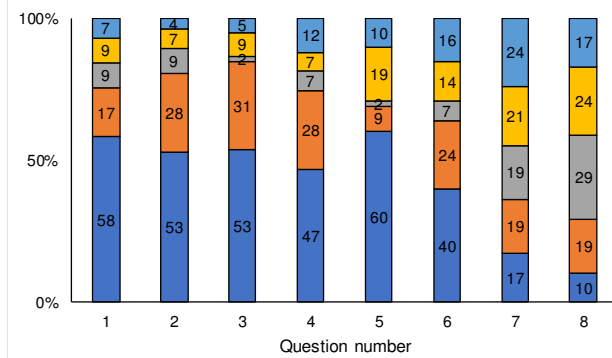


Figure 1. Degree of understanding of local farmers on organic farming systems

The results of the farmer level of understanding were strengthened by the interview data. Their knowledge of the organic farming system was obtained from field counsellor and other informants (I1, I2 and I5), traditional direct practice in the field (I1 and I4) and from the internet (I6). Knowledge of the existence of organic fertilizers and pesticides on the market was delivered by I1.

"There are some organic pesticides on the market, but the price varies and is more expensive than the synthetic one."

Farmers' knowledge of surrounding materials for making organic fertilizers and pesticides was also high. One informant stated.

"Organic fertilizers are made of animal manure and litter, while the raw materials used to make biopesticides were galangal, kaempferia galangal, curcuma, bael fruit, and bitter yam tubers, ginger, turmeric, curcuma, etc."

Farmers used to practice in making it (I2). This is supported by other respondents who state that.

"We use neem, bead-tree, marigold and yam can be used as biopesticide ingredients. The material is available in the field so it's easy to get." (I5)

Regarding the understanding of wild plant species on the edge of the land, one informant stated

"I once planted marigold to expel sucking pests. As the flower attracted natural enemy, the existence of the flower may suppress the pests. Natural enemies are usually like yellow flowers with pollen." (I6)

This is supported by another informant who stated

"We used to plant marigold, floss flower and the sunflower." (I4)

Regarding the understanding of natural enemies, some informants said that they knew spiders, ladybird beetles, dragonflies and wasps as potential predators.

A contrast to According to the informant, the problem of the slow implementation of organic farming systems is caused by several problems.

"The obstacle in implementing organic farming systems is due to water quantity and quality problems. The water used for paddy fields here comes from the end of the sub-district channel, meaning in terms of limited quantity, while in terms of quality it is less supportive because of the possibility of experiencing pollution. In addition, the farmer groups also do not have a regular schedule of crop patterns. There was occasionally delayed between one and another the rice fields. Besides that, farmers are still waiting for the business act or to provide the initiative to start implementing this system." (I2).

Other information conveyed different information.

"The main obstacle in implementing this system is difficult because most farmers feel that the implementation of this farming is complicated (impractical), while the benefits the farmer may obtain equal to the capital spent, especially labour capital." (I3)

Other informants conveyed obstacles related to public awareness.

“The majority of the farmers are tenants or sharecroppers hence they are unable to make their own decisions.” (I2).

**C. Strategy to develop organic farming system**

The results of the SWOT analysis showed that the farmers have internal strengths. Those were included: understanding of the organic farming cultivation, organic fertilizer, benefits of wild plants and support from the local government. Meanwhile, their internal weaknesses were included: unstable irrigation system, the majority of farmers are tenants, uneasy technology and unorganized of cropping schedule. The IFAS matrix analysis shows that the total score for internal strength was 1.85, while that of internal weakness was 1.5. Therefore, the total internal score was 0.35 (Table 3).

TABLE 3  
INTERNAL STRATEGIC FACTORS ANALYSIS SUMMARY MATRIX

No	Internal factor	Weight	Score	W x S
1	Understanding of the organic cultivation system	0.15	3	0.45
2	Knowledge about ingredients for making organic fertilizer	0.1	5	0.5
3	Knowledge of the benefits of the wild plant diversity	0.15	4	0.6
4	Support from the local government	0.15	2	0.3
	Total (W x S)	0.55	14	1.85
	Weaknesses			
1	Unstable irrigation system	0.1	3	0.3
2	The majority of farmers are tenants	0.1	3	0.3
3	Complicated technology	0.2	4	0.8
4	Unorganized of cropping schedule	0.05	2	0.1
	Total (W x S)	0.45	12	1.5
	Strength – Weaknesses score			0.35

The external opportunities include: The availability of organic fertilizers and pesticides on the market and community demand for organic products. External threats include: low of central government support through the ministry of agriculture; costly certification fees; difficult of marketing system; and lack of partnership. The IFAS matrix analysis showed that the total score for external opportunity was 1.2, while that of external threat was 1.7. Therefore, the total internal score was -0.55 (Table 4).

TABLE 4.  
EXTERNAL STRATEGIC FACTORS ANALYSIS SUMMARY MATRIX

No	external opportunity	Weight	Score	W x S
1	The availability of organic fertilizers and pesticides on the market	0.15	3	0.45
2	Community demand for organic products	0.15	3	0.45
3	Increasing community awareness about healthy product	0.15	2	0.3
	Total of external opportunity	0.45	6	1.2
	external threat			
1	Unstandardized of organic rice price	0.15	3	0.45
2	Costly certification fees	0.1	2	0.2
3	Difficult of marketing system	0.15	3	0.45
4	Lack of partnership	0.15	4	0.6
		0.55	14	1.70
	Opportunity – Threat score			-0.55

Based on the results of IFAS and EFAS matrix analysis, the plotting in the vent diagram the value fell on quadrant II. That meant the appropriate strategy that with this situation was the diversification strategy (Figure 2). Because our best strategy was diversification, therefore ST-strategy options were discussed first, followed by SO, WO and at least WT options are analyzed (Table 5).

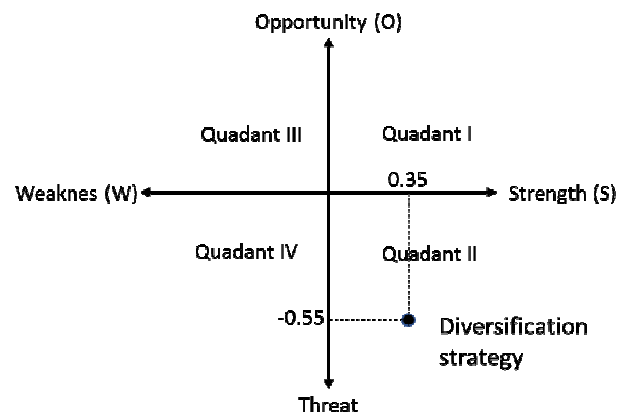


Figure 2. Position of appropriate strategy to develop an organic farming system

**ST-strategies**

There are two strategies can be chosen by farmer groups, namely utilizing support from the local government and extension workers to establish partnerships. The second strategy that can be taken is support from the local government for certification fees. Generally, the cost of certification is quite expensive for farmers. Therefore, there needs to be support from the government. This support does not always have to be in the form of cash, but rather what is needed is how much effort must be made to maintain the quality of the management of the system. Generally, after certification, farmers become less concerned so as to facilitate failure during surveillance.

**SO-strategies**

The form of SO strategy can be an option to enforce an understanding of the organic farming system using available organic fertilizers and pesticides on the market. These organic inputs may easy the practice. One obstacle that is often felt by farmers to apply organic farming systems is because farmers feel this system is complicated. One example is in making organic fertilizers and pesticides. The survey results showed that types of organic fertilizers and pesticides are available in the market. However, the prices of organic fertilizers and pesticides available are generally expensive. Because of this situation is the choice of strategies to provide incentives for organic farming actors is very relevant.

**WO-strategies**

Form of SO strategy that can be an option: convincing landowners about the opportunities of community need and use available from organic fertilizers and pesticides on the market for easy cultivation implementation. The rice farming system in Indonesia is generally carried out by smallholder farmers. Even if they have their own land, the size of the land is too narrow to be able to implement organic farming solely. It requires wider land to enable application of organic farming effectively. This is due to organic farming systems

must be free of synthetic pesticide and fertilizer. In the case of small land sizes, the influence of neighbouring conventional systems can reduce the quality of product yields. Another important thing was water irrigation. On the small size of land, the effect of pollution may reduce the quality of irrigation water.

**WT-strategies**

The choice of the last form of strategy is the WT strategy. The strategy that can be chosen is to reduce the number of tenant farmers and avoid costly certification and fees to fill the local market when stock availability decreases. The first strategy can be done by involving as many landowners or owner farmers as possible. Furthermore, with cooperation between landowners, the size of organic agricultural land will be more adequate. Thus, the production of organic products also increases. When the number of products increases, the effort to register for certification is worthy. The second strategy is to fill the local market when stock availability decreases. This can be done by arranging the product to be released to the market at the right time, i.e. When the demand is high and the supply is not able to meet all the needs.

**Table 5. SWOT strategy matrix for developing the organic farming system**

Factors	Internal strength	Internal weaknesses
External opportunity	Increasing the availability of resource packages (organic fertilizer and pesticides) and farmer-friendly technology so that farmers' preferences increase (S1 - O1). Support from the local government and extension workers to bridge the product marketing (S4 - O2)	Convincing landowners about community need opportunities (W2 - O2) Use available of organic fertilizers and pesticides on the market to easy cultivation implementation (W3 - O1)
External threat	Support from the local government and extension workers to seek of partnership (S4 T4) Support from the local government for certification fees (S4 T2)	Focusing on the production process (W2 - T2) Fulfil local market when stock decreasing (W4 - T3)

The results of this study indicate the choice of the best strategy for developing organic farming systems is diversification; Therefore, the recommended strategy choices include: increasing collaboration, certification programs, increasing the availability of input source packages (organic fertilizers and pesticides) and farmer-friendly technology; and support from local governments to bridge the product marketing system.

Overall, community understanding of organic farming systems was considered good. This included the cultivation technique, the use of organic fertilizers and pesticides, types of local raw materials that can be used to make organic fertilizers and pesticides, types of refugia plants and efforts to conserve natural enemies. Some farmers had experiences on practicing organic farming cultivation, making organic fertilizers and pesticides and using refugia plants. The application of this knowledge is very important to remember organic farming is characterized by efforts to preserve species diversity. In general, species abundance and diversity increase on organic land [9,10]. Natural enemy groups also increase with organic farming systems. The performance and effectiveness of natural enemies can be enhanced by manipulating habitats [8,11].

Farmer knowledge is generally obtained from field counsellor, another member group, internet and other source. A study conducted in Nigeria, showed that there was a significant relationship between sources of information about organic agriculture and farmers' perceptions about organic agriculture. Sources of information that are complete and delivered by credible parties increasingly increase opportunities for farmers 'knowledge about organic farming and farmers' perceptions about organic farming. This implies that those who have more access to information about organic farming tend to have a good perception of organic farming. Therefore, local and global development strategies are needed that explicitly cover present and future generations, so that understanding of ecosystems and the

preservation of biodiversity and plant and animal species can be maintained.

Organic farming requires care and diligence handling rather than non-organic. Farmers should spend more time to weed out. This situation leads the farmer to avoid the organic farming practice. Economic aspects can be sustainable if agricultural production is able to meet the needs and provide sufficient income for farmers. However, often the economic motivation is the driving force in the direction of development of organic agriculture. Awareness of the dangers caused by the use of synthetic chemicals in agriculture makes organic farming attract good attention at the level of producers and consumers. Another problem is difficult to get the organic rice in the market. This might be another factor that hampered the development of organic rice.

Most agricultural systems in Indonesia have a small-scale land. In dealing with structural changes in agriculture, rice farming is increasingly difficult to remain viable in the economy.

Previous research shows the need to increase cooperation with other farmer groups that have implemented organic farming systems as well as with other required stakeholders [5]. With good cooperation, the economic capacity of farmer groups is also stronger so as to encourage the achievement of agricultural production targets [9].

The certification program is one of the obstacles in developing organic farming systems, due to difficult processes and expensive costs. This is one of the factors causing the level of certification of organic agriculture in Indonesia to average below 50% [6]. Efforts to improve certification need to be supported, considering that many studies report that organic farming systems have good economic prospects [2]. In addition, the system is believed to be able to develop a paradigm based on the revitalization of small agriculture that emphasizes diversity, synergy, recycling and integration, and social processes that value community participation and empowerment [13]. Meanwhile, a study in the United States shows that certified organic farm households do not have a higher income guarantee

compared to those who use conventional systems. This is because they also bear higher production costs, including labour, insurance and marketing costs. Unfortunately, the lack of economic incentives can drive delays in the conversion of organic agriculture [14]. Therefore, we need a holistic policy to develop a sustainable organic farming system. The policy must aim to develop rules to guide decisions to meet current needs and challenges regarding the production and supply of safe and nutritious food, without compromising the ability of future generations to meet their own needs. In general, the design of each agricultural policy is improved by considering three tiers as follows: (I) assessment of organic farming practices; (II) management by policy-makers (e.g., institutions/governance, social systems and legislation); and (III) strategies and practices related to food production (e.g., technology selection and implementation) [15].

#### IV. CONCLUSIONS

Based on Strengths, Weaknesses, Opportunities, and Threats analysis of this study indicates the choice of diversification strategy. Therefore, the recommended strategy choices include increasing collaboration, certification programs, increasing the availability of resource packages (organic fertilizers and pesticides), and farmer-friendly technology so that farmers' preferences increase; support from the local government and field counsellors to bridge the product marketing.

#### ACKNOWLEDGMENT

We would like to thank Rector dan Director of Research and Community Service of Universitas Brawijaya. This research was supported by Universitas Brawijaya though Excellent Research Grant. We also thank to our field assistants who help the data collection.

#### REFERENCES

- [1] I. Darnhofer, "Organic Farming and Rural Development: Some Evidence from Austria," *Sociologia Ruralis*, vol. 45, np. 4, pp. 308 – 323, 2005.
- [2] S.A. Kennvidy, "Organic Rice Farming Systems in Cambodia: Socio-economic Impact of Smallholder Systems in Takeo Province," *International Journal of Environmental and Rural Development* vol. 2, no. 1, pp. 115 -119, 2011.
- [3] M. Vaarst, (2010). "Organic Farming as A Development Strategy: Who are Interested and Who are not?" *Journal of Sustainable Development*, vol. 3, no. 1, pp. 38-50, 2010.
- [4] T. Gomiero, D. Pimentel and M. G. Paoletti, "Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture," *Critical Reviews in Plant Sciences*, vol. 30, pp. 95-124, 2011. DOI: 10.1080/07352689.2011.554355
- [5] A.S.Leksono, J. Batoro, A. Afandhi, and A. Zairina, "Strategy to develop the organic farming system based on farmer perception and knowledge in Pagelaran Malang East Java Indonesia," *International Journal of Scientific and Research Publications*, vol. 8, no. 10, pp. 2250-3153, 2018.
- [6] T. Dalmiyatun, W.D. Prastiwi, and H. Setiawan, "Strategy development of organic farming rice farm business at Susukan District of Semarang," *Agricultural Socio-Economics Journal*, Vol. 18, No. 2, pp. 61-69, 2018.
- [7] O.B. Oyesola, and I.E. Obabire, "Farmers' Perception of Organic Farming in Selected Local Government Areas of Ekiti State, Nigeria," *Journal of Organic Systems*, vol. 6, no. 1, pp. 20-26, 2011.
- [8] Z. Abidin, A.S.Leksono, B. Yanuwadi, and M. Purnomo, "Refugia effect on arthropods in an organic paddy field in Malang District, East Java, Indonesia," *Biodiversitas*, nol. 21, no. 4, pp. 1415-1421, 2020.
- [9] A.S. Leksono, I. Mustafa, A. Afandhi, and Z. Anisa, "Habitat modification with refugia blocks for improving arthropods richness and diversity in paddy field," *International Journal of Civil Engineering and Technology*, vol. 10, no. 8, pp. 256-263, 2019.
- [10] A.S. Leksono The effect of organic farming systems on species diversity. *AIP Conf Proc* 1908: 030001. 2017.
- [11] M. P. D. Garratt, D. J. Wright, and S. R. Leather, "The effects of farming system and fertilisers on pests and natural enemies: A synthesis of current research," *Agriculture, Ecosystem and Environment*, vol. 141, pp. 261–270, 2011.
- [12] T Karyani, F Arifin, H Hapsari, E Supriyadi. "Organic Rice Farming For Sustainable Development in The Nurani Sejahtera Farmers Group", IOP Conference Series: Earth and Environmental Science, 2019.
- [13] M. A. Altieri, F. R. Funes-Monzote and P. Petersen. Agroecologically efficient agricultural systems for smallholder farmers: contributions to food sovereignty. *Agronomy for Sustainable Development*. 2012. 32(1), pp 1–13.
- [14] H. Uematsu, and A. K. Mishra, "Organic farmers or conventional farmers: Where's the money?" *Ecological Economics*, Vol.78, pp. 55-62, 2012.
- [15] M.G. Rivera-Ferre, "Framing of agri-food research affects the analysis of food security: The critical role of social sciences," *International Journal of Sociology, Agriculture and Food*, vol.19, pp. 162–175, 2012.