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Organic Agricultural Discourse in the Highlands and Lowlands. Case Study: Subang Regency, West Java Province

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Abstract

The disparity in the amount of production and price of rice produced by organic farming in the highlands and lowlands of Subang Regency doesn't make farmers stop producing it. This study aims to analyze organic rice farming in the highlands and lowlands, as well as analyze the factors that cause disparities in organic rice production in the highlands and lowlands. This research is a case study in Sagalaherang and Pringkasap District, Subang, West Java. Farming analysis and comparative case study analysis are the analytical methods used in this study. The results showed that: 1) organic rice production in the highlands is 3.2tons/ha, with an income of IDR17,600,000 and production costs IDR17,706,500, the farming business suffers a loss per season of IDR106,500, Ratio per Cost (R/C) is 0.99 and not making a profit. Rice production in the lowlands is 4 tons/ha, with an income of IDR22,000,000 and production costs IDR14,426,667, the farmer's profit per season is IDR7,573,333, the R/C is 1.52 and the profit rate is 0.48%; 2) several factors causing disparities in production yields in both areas covering geographical location, agro-climate, cultivation techniques, farmer knowledge, use of agricultural tools and machinery, marketing, and institutions. Although the income of farmers in the highlands is quite small, farmers keep choosing

organic farming since they know that organic farming is healthy. The central government, regional governments, and farmers must work together to create new market opportunities so that rice produced from organic farming can be optimally absorbed by the market at competitive prices.

Keywords: Organic Agriculture, Highlands, Lowlands, Farming, Rice

Introduction

Rice is one of the four strategic commodities and priority commodities cultivated in Indonesia [1], which is the most widely planted crop and is a staple food for more than half of the global population [2]-[5]. The community's need for food availability increases along with increasing population growth. therefore, increased food production is needed to maintain food security and keep pace with the demands of population growth, increased incomes, and nutritional needs [6]-[8] especially in the territory of Indonesia because the majority of Indonesian people depend on consumption of rice as the main staple food.

Rice is the result of the processing of milled rice. In order to improve nutrition and get healthier rice, rice can be grown organically. Rice which is grown organically is one of the staple foods that is quite sought after and in great demand today because it contains less chemicals and is safer for health, so it is now widely produced [9]-[10]. Organic rice production, is farming activity by carrying out the process of rice production (pre-harvest) to processing (post-harvest) which is environmentally friendly and managed naturally without chemical fertilizers or pesticides [11].

Organic rice cultivation is a sustainable rice cultivation technique that is oriented towards the utilization of natural (local) materials by eliminating chemical inputs and reducing environmental impacts [12]-[13]. The principle of organic farming is to avoid environmental damage and quality degradation. The characteristics feature of organic farming systems are their increased biodiversity at the soil, crop, field, whole rotation or polyculture, and landscape levels [10]. Several reasons emerged from choosing organic rice production including, first, to preserve the environment or back to nature because organic rice applies a system of eliminating external inputs (does not use chemical fertilizers, chemical pesticides, chemical herbicides, etc.) which encourages the creation of sustainable agriculture and promises solutions to reduce the burdens/negative impacts on the environment [14]-[15]. Second, health reasons are back to healthy because organic farming plays a role in eliminating harmful chemicals and toxins, thereby increasing the health and nutritional value of the product [16]. Lastly, market reasons (market-oriented), more consumers want safe and high-quality rice [17].

Subang Regency is one of the organic rice-producing areas. The areas in Subang Regency which are centers of organic rice are in the Sukamandi Village area, Sagalaherang District with the condition the area in the form of highlands and an area planted with organic rice covering an area of 5 hectares, as well as Pringkasap Village, Pabuaran District with geographical conditions in the form of lowlands and an organic rice planting area of 15 hectares. The spread of organic rice cultivation covers the highlands and lowlands, both privately owned and leased land. Differences in regional altitude (geographical conditions) affect production results [18]. In addition to the differences in the height of the area of production and sales of organic rice, it is influenced by several other factors. Land conditions, irrigation, treatment, processing, and various production facilities can also be factors that affect rice production. To get accurate results and valid calculations of farmers' income, a farming analysis is needed to see whether it is profitable or not and must be discontinued. The purpose of this research is to analyze rice farming on organic farming in the highlands and lowlands and to analyze the causal factors.

Method

The research is a case study of the Peteuy Gedhe Farmer Group in Sukamandi Village, Sagalaherang District, and the Bumi Mandiri Farmer Group in Pringkasap Village, Pabaruan District. The research location was chosen because the two farmer groups are organic rice-producing centers in Subang Regency which represent the highlands and lowlands. The types of data used in this research are primary and secondary data. The primary data used in this study were obtained through in-depth interviews and focus group discussions with the agriculture service, NGOs, PPL, UPTD, heads and members of farmer groups, and seed breeders. Meanwhile, secondary data was obtained through literature studies from the Subang District Agriculture Service, the Central Bureau of Statistics, and the Ministry of Agriculture. The analysis used in this research is the farming analysis and comparative case study. Farming analysis was used to determine production costs, profits, revenue per cost, and profit rate, while a comparative case study was used to find out the factors causing the differences in the characteristics of organic farming in the two study locations.

Farming Business Analysis

Farming analysis in the form of cost data analysis revenue and profits using descriptive analysis. Farm income theory has been put forward by [19]-[21]. Organic rice farming income is obtained from the difference between total revenue and total costs. The total income of organic rice farming can be calculated by the following formula:

$TR_1 = Y_1 \cdot Py_1$

$TR_2 = Y_2 \cdot Py_2$

with:

TR_1 = Receipt of organic rice from Sukamandi Village, Sagalaherang District (Rp)
TR_2 = Receipt of organic rice in Pringkasap Village, Pabaruan District (Rp)
Y_1= Organic rice production in Sukamandi Village, Sagalaherang District (Kg)
Y_2= Organic rice production in Pringkasap Village, Pabaruan District (Kg)
Py_1= Price of organic rice in Sukamandi Village, Sagalaherang District (Rp)
Py_2= Price of organic rice in Pringkasap Village, Pabaruan District (Rp)

The total cost (TC) for organic rice farming can be calculated using the following formula:

$TC_1 = TFC_1 + TVC_1$

$TC_2 = TFC_2 + TVC_2$

with:

TC_1 = Total cost of organic rice in Sukamandi Village, Sagalaherang District (Rp)
TC_2 = Total cost of organic rice in Pringkasap Village, Pabaruan District (Rp)
TFC_1 = Total fixed cost of organic rice in Sukamandi Village, Sagalaherang District (Rp)
TFC_2 = Total fixed cost of organic rice in Pringkasap Village, Pabaruan District (Rp)
TVC_1 = Total variable cost of organic rice in Sukamandi Village, Sagalaherang District (Rp)
TVC_2= Total variable cost of organic rice in Pringkasap Village, Pabaruan District (Rp)

Organic rice farming income can be calculated using the following formula:

$\pi_1 = TR_1 - TC_1$

$\pi_2 = TR_2 - TC_2$

with:

π_1 = Income of organic rice farming in Sukamandi Village, Sagalaherang District (Rp)

π_2 = Income of organic rice farming in Pringkasap Village, Pabaruan District (Rp)

R/C analysis

The feasibility of farming in this study can be determined using R/C analysis for both organic and inorganic rice. The formula used is:

$$R/C_1 = \frac{TR_1}{TC_1}$$

$$R/C_2 = \frac{TR_2}{TC_2}$$

With:

R⁄C₁ = Revenue-cost ratio for organic rice in Sukamandi Village, Sagalaherang District (Rp)

R⁄C₂= Revenue-cost ratio for organic rice in Pringkasap Village, Pabaruan District (Rp)

The criteria for calculating income are:

1) If *R/C > 1*, it means that farming is feasible to run;

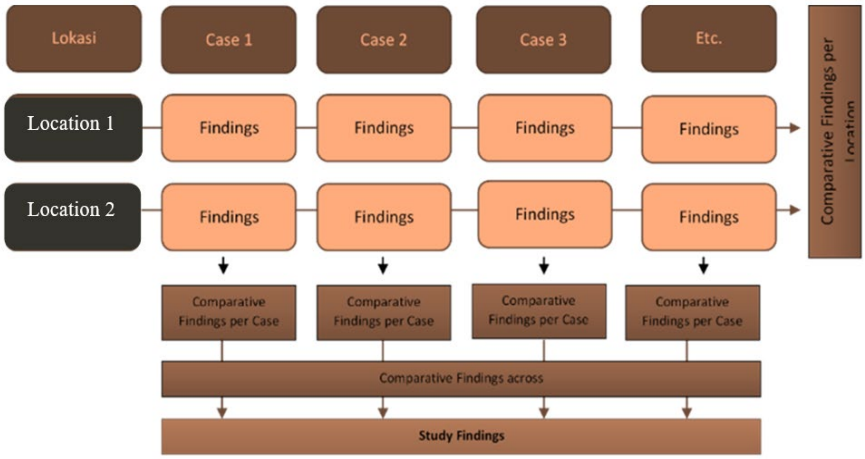
2) If *R/C = 1*, it means that the farm is in BEP condition;

3) If *R/C < 1*, it means that farming is not feasible to run

Comparative Case Study

Comparative case studies adopt what Maxwell calls a process orientation. The process approach is seeing the world in terms of people, situations, events, and processes that influence one another. This explanation is based on an analysis of how several situations and events influence each other and how x plays a role in causing y, which is the process that connects x and y [22]. The comparative case study analysis was used to compare several disparity factors in organic rice production in Sukamandi Village, Sagalaherang District, with the topography of the highlands and Pringkasap Village, Pabaruan District, with the topography of the lowlands. Illustration of the process of comparative analysis based on case studies as shown in Figure 1.

Figure 1 Comparative case study approach



Source: Table based on the discussion of the comparative case study approach [23]

Result and Discussion

Farming analysis on organic rice in the Highlands and Lowlands of Subang Regency

Organic rice farmers in Subang Regency are located in two different geographical conditions, namely in the highlands and lowlands. The upland farmers are centered in the Sukamandi Village area, Sagalaherang District, located in the Peteuy Gedhe Farmer Group, while the lowland farmers are in the Pringkasap Village area, Pabuaran District, located in the Bumi Mandiri Farmer Group. Growing organic rice is a new cultivation technology for farmers in the highlands, therefore farmers feel motivated to try it, apart from that, by growing organic rice, farmers can consume the rice they produce which is healthy and safe from chemical residues.

While lowland farmers choose to grow organic rice because they continue the cropping system from generation to generation and take advantage of market opportunities for organic rice.

These two different geographical conditions of farmers, also affect the cultivation, processing, and production of organic rice. The following table shows the results of the analysis of farming in the two regions:

Table I Farming Business Analysis in Sukamandi Village and Pringkasap Village

Peteuy Gedhe Farmer Group, Sukamandi Village, Sagalaherang District		**Farmer Group of the Independent Earth Association of Pringkasap Village, Pabuaran District**	
Production Description	**Cost**	**Production Description**	**Cost**
A. PRODUCTION INCOME (3.2 ton/ha)	17,600,000	**A. PRODUCTION INCOME (4 ton/ha)**	22,000,000
B. PRODUCTION COSTS		**B. PRODUCTION COSTS**	
1. Seed	260,000	1. Seed	200,000
2. Fertilizer		2. Organic Fertilizer	1,000,000
Make own POC	980,000	3. Ameliorant	180,000
Buy POC	2,000,000	4. Rhizobacteria	180,000
Manure	700,000	5. Phytohormones	180,000
3. Botanical Pesticides	700,000	6. Bionutrition	180,000
4. Labor		7. Vegetable Pesticides/POC	1,000,000
Soil Processing	2,100,000	8. Labor	
Wholesale Land Exercise	2,100,000	Land/Tractor Processing	1,200,000
Planting	300,000	Seeding	120,000
Planting	1,350,000	Spraying Seedlings	120,000
Weeding	1,500,000	Planting	1,200,000
Fertilization (Manure)	700,000	Organic Fertilization	600,000
Spraying	600,000	Planting Spraying	1,800,000
POC Fertilization	1,600,000	Rim Care	700,000
Harvest (Bawon 10:1)	2,132,000	Irrigation	300,000
Transport Power	500,000	Weeding	1,800,000
5. Land and Building Tax	87,500	Harvest (Bawon 6:1)	3,666,667
6. Shrinkage		**C. PROFIT (A-B)**	7,573,333
Hoe	1,000	**D. R/C (A/B)**	1.52
Sickle	2,000	**E. PROFIT RATE (% PROFIT TO COST) C/B*100%**	0.48%
Sprayer	16,000		
7. Fuel	78,000		
C. PROFIT (A-B)	-106,500		
D. R/C (A/B)	0.99		
E. PROFIT RATE (% PROFIT TO COST) C/B*100%	-0.006%		

Source: Analysis Results, 2023

Organic rice farming in Sukamandi Village belonging to the Peteuy Gedhe Farmer Group can generate income of IDR 17,600,000 by spending as much as IDR 17,706,500 in production costs, so from this production, it can be seen that farmers do not experience profits and have expenses that are much higher than the sales proceeds amounted to – IDR 106,500. The R/C ratio of the farm is at 0.99 which means that the farm has no profit. The profit rate obtained is -0.006% (no profit). Farming in

Pringkasap Village can generate an income of IDR 22,000,000 with a production cost of IDR 14,426,667, so it has a profit of IDR 7,573,333.

The resulting R/C ratio value shows at 1.52, so that the resulting farming can be categorized as profitable. The profit rate reached 0.48%. Sales profits from organic rice farming in Pringkasap Village are higher when the paddy grain has been processed into organic riceThe price obtained from the sale of organic rice is much higher than that of unhulled rice, which is 17,000 per kilogram. The results of the two farming analyzes show that organic farming in the lowlands of Pringkasap Village, Pabuaran District, is more profitable compared to organic farming in the highlands of Sukamandi Village, Sagalaherang District. [24] also explained that areas that are more suitable for rice production are lowland areas (below 350 meters above sea level). Lowland farmers in Pringkasap Village also have a consistent market for selling their organic rice products at high prices.

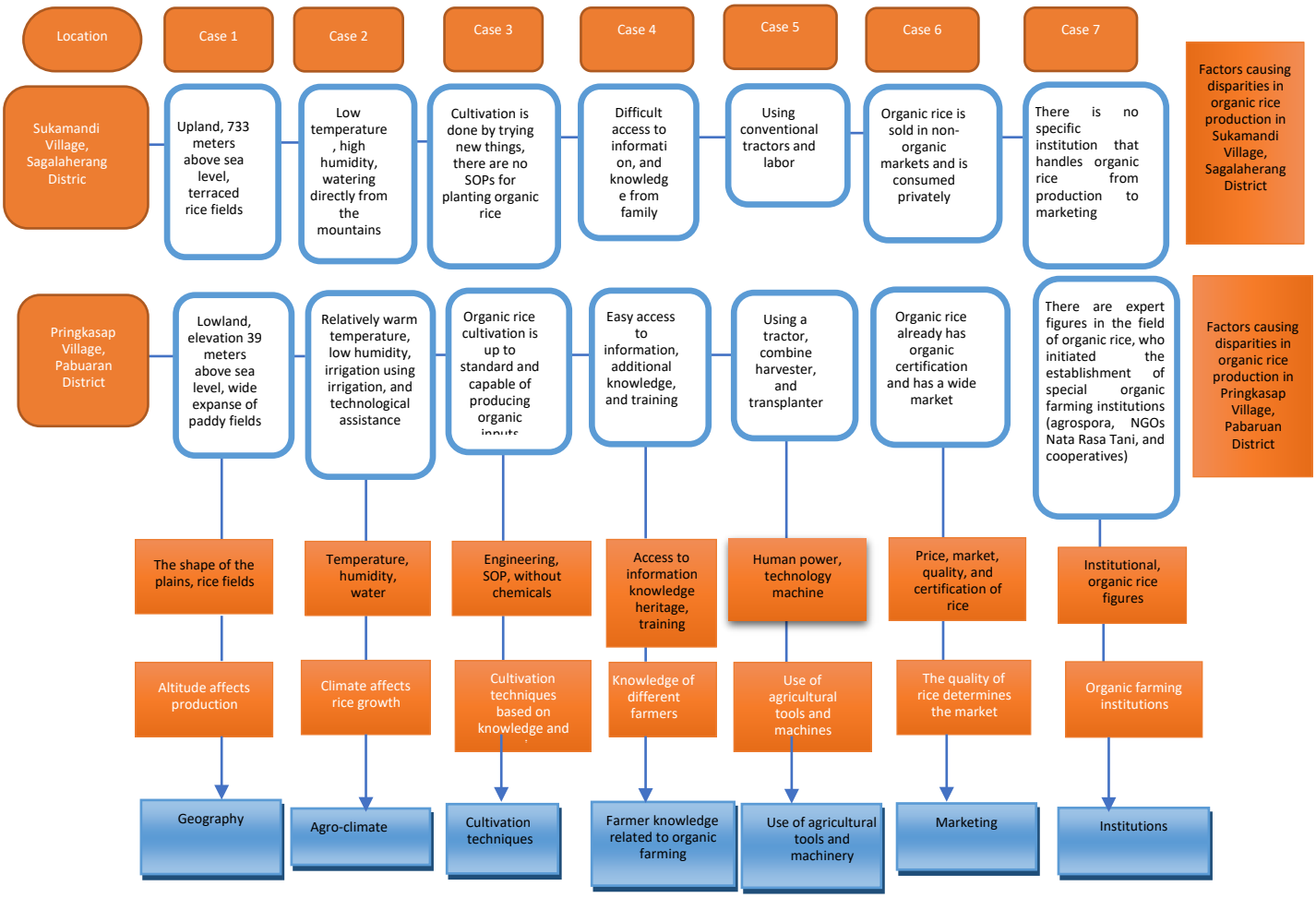
Factors causing disparities in organic rice production in Sukamandi Village, Sagalaherang District, and Pringkasap Village, Pabaruan District

Organic rice production in Sukamandi Village, Sagalaherang District, is smaller than in Pringkasap Village, Pabaruan District. This certainly resulted in a difference in income between organic rice farming in the two villages. The causative factors of the disparity in organic rice production in Sukamandi Village, Sagalaherang District and Pringkasap Village, Pabaruan District include geography, agro-climate, cultivation techniques, farmer knowledge related to organic farming, use of agricultural tools and machinery, marketing, and institutions (Figure 2).

First: Geographical Location Factors. Sukamandi Village, Sagalaherang District, is a highland with an altitude of 733 meters above sea level with terraced rice fields. The purpose of using terracing is to maintain stability and maximize sloping land in the highlands so that plants can grow well and reduce erosion. Terraces have various ecological, aesthetic, and cultural functions as a soil and water conservation method [25]. In contrast to Sukamandi Village, Pringkasap Village, Pabaruan District, is included in the lowlands with an altitude of 39 meters above sea level with large expanse of paddy fields. The lowlands have good soil and good conditions so that various kinds of plants can thrive.

References [26] shows classify the altitude for agriculture into four classes, namely <100 m, 100-200 m, 200-800 m, and >800 m. The number of productive tillers and grain filling in the highlands is lower than in the lowlands [27]. Differences in altitude, varieties and planting methods give different responses to plant height and greenness of rice. The higher the altitude, the lower the pressure and temperature, causing rice plants grown in the highlands to have a shorter stature and a lower level of green leaves. Rice plants living in the lowlands are more resistant to disease and pests, and also produce higher yields [28].

Figure 2 Comparative case study



Source: Analysis Results, 2023

Second: Agro-climate Factors. Sukamandi Village, Sagalaherang District, is a highland which has low temperature, high humidity, and has direct irrigation from the mountains. Pringkasap Village, Pabaruan District is located in the lowlands with relatively warm temperatures, low humidity, and an irrigation system that may have been polluted, however Pringkasap Village farmers use technological assistance and other supporting facilities such as biofilters and plant barriers to irrigate organic rice fields so that they are free of chemicals. The ideal standard of humidity needed for rice plants is 1.778 mm during growth. Weather plays a dominant role in influencing the growth and yield of rice [29]. The weather component is a combination of solar radiation, temperature, precipitation, relative humidity, and wind speed. Differences in altitude affect the temperature. Low-temperature stress affects the physiological processes of rice plants and harms metabolic processes and grain

production. In Brazil, rice plants suffer damage due to low temperatures. This is the case in Rio Grande do Sul, the southernmost state, where indica rice production accounts for more than 60% of the total national production of Brazil [30]. Rice plants like other tropical or subtropical crops are susceptible to cold temperatures, with continuous stress culminating in crop damage. Environmental stress also has an impacts on rice quality and productivity [31]-[32].

Third: The Cultivation Technique Factor. Organic rice farming is a sustainable rice cultivation system without chemical inputs and has the potential to reduce environmental impacts [12] despite having less fertile soil [33]. Organic rice is not just ordinary rice but is processed and cultivated through an organic approach. Organic farming seeks to maintain, care for, and improve the quality of soil fertility through organic fertilization, crop rotation, and land conservation [34]. Organic farming is able to reduce pollution, produce quality agricultural products that meet nutritional quality standards and are safe for the environment, avoid the use of external energy that comes from chemical fertilizers, pesticides, and fuel oil, and can obtain satisfaction from the results of organic farming [35].

Organic rice cultivation techniques in Pringkasap Village, Pabaruan District, are following standard operating procedures for organic rice planting and are controlled by farmers and field extension workers so that they are not mixed with non-organic materials. The technology developed by the Pringkasap Village farmer group for the development of organic farming is Ameliorant, Rhizobacteria, Phytohormones, Bionutrition, MOL, POC, vegetable pesticides, and biological agents. All of these technologies are created, developed, and applied independently by farmer groups. The organic rice cultivated in Sukamandi Village, Sagalaherang District, is carried out because farmers want to try new things, by prioritizing aspects of conventional farming without chemicals, but there is no standard operating procedure for organic rice planting. Sukamandi Village farmers only rely on organic farming activities which means using organic fertilizers and organic pesticides. The Sukamandi Village farmer group also develops POC independently but has not been able to meet the needs of farmers so they continue to provide POC from outside plus manure and biological pesticides.

Fourth: Farmer Knowledge Factor. Farmers as a whole accept organic farming technology. However, attitudes towards aspects of implementing organic farming are not as strong towards the impact on the environment and soil health, as well as the economic benefits of organic farming, so it requires institutional support in creating awareness of advances in organic farming technology [36]. The farmers in Pringkasap Village have more knowledge than the farmers in Sukamandi Village. This is because lowland farmers find it easier and faster to obtain information on organic rice farming than those in the highlands. Access to information is easier

and faster in the lowlands through figures and institutions engaged in organic farming. Upland farmers only take advantage of knowledge from the family and do not add to their knowledge from new information that has been developed by agricultural researchers. Selection and cultivation techniques play an important role in the success of agricultural production businesses. Knowledge of the relationship between risk and profit is an important part of business management [37].

Fifth: Factors of Use of Agricultural Equipment and Machinery. The process of planting rice generally uses conventional labor. Planting rice seeds requires a lot of labor and a long time so the costs incurred are higher. The high cost of cultivating labor as a result of the scarcity of labor in rural areas, makes farmers rely more on mechanical farming tools such as harvesting machines (combine harvesters) and planting (rice transplanters) [38]. The condition of the rice field plots in the lowlands is in the form of a wider expanse than the condition of the rice fields in the highlands which are sloping and made of terracing.

Pringkasap Village farmers can use agricultural tools and machines such as tractors, combine harvesters, and transplanters in organic rice cultivation, while Sukamandi Village farmers only use tractors and employ labor in planting and harvesting activities. The combine harvester is a type of harvesting machine where the activities of cutting, holding, threshing, and cleaning are carried out simultaneously. The combine harvester machine is operated by two operators, one operator is in charge of controlling the combine harvester machine, and the other operator is in charge of holding the sacks when putting the grain into the sacks. Rice combined harvester (CH) assistance is one of the Indonesian government's policy instruments to encourage increased production and income of rice farmers. Although the main benefit is to save costs and speed up harvesting, combined harvesters can also reduce harvests [39].

Sixth: Marketing Factors of Organic Rice Production. The marketing of organic rice in Pringkasap Village is good because the farmers already have a market for selling organic rice at a much higher price than ordinary rice. The organic rice of Pringkasap Village farmers received organic certification from LSO in 2016 and already has a consistent market inside and outside Subang Regency. Meanwhile, in the highlands of Sukamandi Village, farmers do not yet have a good market. Organic rice produced by farmers is sold at the same price as ordinary rice. Sukamandi Village Farmers only fulfill market demand and choose to consume it privately. Participation in organic farmer groups must be increased to increase the collective marketing of organic rice products. In addition, the government must provide alternative employment, marketing training, and low-interest loans to organic rice farmers to support the collective production and marketing of organic rice [40].

Seventh: Institutional Factors. Institutions are the foundation for the formation of social capital that can facilitate cooperation in organic rice

farming activities [41]. Institutional support in the development of organic farming systems has an important role in every farming activity through the social capital of farmers which includes cooperation networks, mutual trust in cooperation, and cooperative norms in organic farming systems that will affect the success of farming. Farmers in the highlands of Sukamandi Village have not been accommodated by institutions that specifically handle organic rice farming from production to marketing. Organic rice farmers from Sukamandi Village joined other farmers in the Peteuy Gedhe Farmer Group.

Organic rice farmers in the lowlands of Pringkasap Village have joined the Farmer Group of the Bumi Mandiri Association. In addition to having a special farmer group for organic rice farming, in Pringkasap Village there is an expert figure in the field of organic rice who initiated the establishment of a special organic farming institution, namely Agrospora, non-governmental organizations (NGOs) Nata Rasa Tani, and cooperatives. Agrospora is a forum for empowering farmers engaged in the development of an Integrated Organic Farming System, which produces organic rice, organic livestock, and organic horticultural crops. NGOs play a role in assisting farmers to develop organic farming through training and briefing activities for organic farmers regarding the SOP of organic rice cultivation. Cooperatives play an important role in marketing organic rice products in Pringkasap Village.

Conclusion

This study aims to analyze rice farming in the highlands and lowlands and determine the causal factors. The results showed that organic rice farming in the lowlands was more profitable than in the highlands. The R/C ratio value for organic rice farming in the highlands is greater than organic rice farming in the lowlands, namely 1.52> 0.99. Organic rice farming in the lowlands focuses on buying and selling to consumers, the price of organic rice that has been milled into rice can reach around IDR 17,000.00/kilogram. Organic rice in the highlands is focused on private consumption by farmers because they have not found an appropriate market price and do not generate profits when traded. Several factors causing the disparity of farming in the lowland and upland areas are determined by geographical location, agro-climate, cultivation techniques, farmer's knowledge related to organic farming, use of agricultural tools and machinery, marketing, and institutions. To increase the economic value of the organic rice farming, the government together with the private sector must create opportunities and wider market access so that farmers' rice products can be absorbed by the market at competitive prices.

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