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Development Strategies of Extension Service Performance using Importance Performance Analysis and Customer Satisfaction IndexMethods in Bondowoso, East Java, Indonesia

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Abstract

This study assessed the performance of extension services in efforts to maintain the food security of paddy-rice farmers households in Bondowoso, Indonesia. The farmers satisfaction with extension services is very closely related to the management of extension services that can be identified through feedback from farmers as users of extension services. This study was aimed to analyze the performance of extension services and promote the development strategies. The survey method was used to determine the level of innovation needs and availability of innovations through extension services as well as the level of farmer satisfaction with the performance of extension services. Data obtained from structured interviews with 200 respondents and the observation process. Data analysis used the Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI) methods. The results of the analysis showed that the innovation needs of rice farmers in maintaining production and productivity, farming sustainability, self-development, and farm security are sufficiently available and quite following farmer needs. The availability of innovations that must be the priority of extension workers in the development of rice farming is on marketing the harvest, sources of financing, the quality of products desired by consumers, and opportunities for farmers to develop themselves by trying out innovations with other farmers. This result is strengthened by the results of CSI analysis which shows that rice farmers are quite satisfied with the availability of innovations in extension services. The strategy that needs to be developed in improving the quality of extension services is to increase the competency of extension workers in accessing technology and management of farmer groups.

Keywords:*CSI, feed security, IPA, performance of extension service,rice farmer.*

1. Introduction

The existence of a nation will be fragile if the government is unable to provide food by involving and moving the people [25]. Data compiled by [13] shows that the population of Indonesia is 39,68 million people or 31,86% of the total population working in the agricultural sector, while the Gross Domestic Product (GDP) of the Second Quarter 2017 of the agricultural sector contributed around 13,92 %. Whereas the population is projected to continue to increase from 238,5 million in 2010 to 305,6 million in 2035 [5]. This means that the contribution of the agricultural sector in Indonesia in the food supply is still relatively low and tends to decrease, while the population is growing and increasing. Food is a basic need of the Indonesian people, thus the problem of food supply needs to be seriously addressed by Indonesia.

One crucial food challenge is that food availability is linked to production. The first crucial point is the availability of food resources, which are related to agriculture and other supporting sectors. Food production in the agricultural sector depends on the performance of farmers. Therefore we need policies that stimulate the enthusiasm of farming, subsidies, and protection of agriculture. Second, the affordability or ability of people to access food. Affordability is described as easy, cheap, and quality. Easy has the meaning of the community being able to get means that procurement starting from the distribution network, transportation, warehouses, and others must be well-systemized so that the construction of infrastructure especially roads becomes an integral part of strengthening food security. Cheap means that the lower level society can reach and quality, that food has good quality. Third, dependence on one particular type of material, especially when supply has decreased [19].

Problems that often occur in the implementation of the extension are related to the level of technical and managerial competency of the extension workers, the job satisfaction of the extension workers that affect the performance and understanding the potential of resources, culture, and needs of the farming community [3, 20, 15]. On the other hand, the participation and involvement of extension workers are needed in supporting the success of agricultural development. Extension workers and farmers are partners in agricultural development, so there needs to be a positive perception of the role of extension workers and the active participation of farmers as beneficiaries of education [17]. Farmers 'problems with extension can be seen from the variety of farmers' perceptions about extension information, which is sometimes one-way, farmers are not involved in the program planning process, farmers do not know the background of the program [10], and the level of participation tends to be high if farmers feel the benefits directly, especially related to the presence or absence of economic and physical benefits [24], even though it is known that the impact of the extension program is sometimes slow compared to the agribusiness period.

A concept that extension should be oriented to the needs of farmers based on the philosophy of extension that is “helping the community to help themselves” [14], therefore agricultural extension oriented to farmers should be in line with the principles of agricultural extension that includes (1) interests and needs, (2) lower community organizations, (3) cultural diversity, (4) cultural change, (5) cooperation and participation, (6) democracy and the application of knowledge, (7) learning while working, (8) the use of appropriate methods, (9) leadership, (10) trained specialists, (11) the whole family, and (12) satisfaction [14]. However, there are things that cannot be denied, namely the many results of research and technology development in Indonesia that have not been utilized by farmers because they are substantially irrelevant to the reality of farmers' needs (too expensive), do not provide significant benefits compared to the practices that have been used by farmers, and/or technically less reliable than similar technologies on the market [12].

This condition requires researchers and extension workers to first understand precisely and comprehensively the reality of farmers' needs and adoption capacity, farmer's economic analysis, and to compare technology reliability objectively so that it is potential. Facts found in the field also show that the level of farmers' adoption of technology still tends to be low, thus agricultural productivity achieved is not in accordance with the existing potential. This condition is thought to be due to the diversity of farmers' perceptions about innovation [4, 28] and there has not been intensive and open communication and interaction between the actors of research and technology development [11, 1], although the technology users of the agricultural sector are farmers. The main key to increase opportunities for extension services in the form of technology dissemination that can improve the welfare of farmers and provide benefits to farmers is to make a proper, comprehensive and in-depth understanding of the reality of farmer needs, an understanding of farmer's adoption capacity both technically and financially, an understanding of socio-farmers' culture especially in disadvantaged areas.

This study is focused on 1) analyzing the level of need and availability of rice farmers' innovations in maintaining household food security and assessing the availability of information

through the performance of extension services, 2) discovering the level of farmer satisfaction, and 3) developing appropriate strategies for developing extension services systems towards food resilience household in Bondowoso.

2. Methodology

The study site was in Bondowoso Regency, East Java, which is located at coordinates between 113”48’10”-113”48’26” East Longitude and 7”50’10”-7”56’41” South Latitude, Indonesia. The location of selected villages based on the potential of rice plants was carried out in four villages, namely Tanah Wulan, Sucolor, Sumbersuko, and Kelurahan Curahdami. The study was conducted from July to September 2019, with 200 respondents.

This study uses a quantitative approach with a survey method that focuses on explanatory research, namely research to describe quantitatively a tendency, behavior, or opinion by examining population samples or explaining data findings through a list of written questions or structured interviews [22, 16, 7]. The data collection strategy used refers to Fink in [7], namely by questionnaire, interview, structured note review, and structured observation.

Analysis to produce an assessment of the performance of extension based on the attributes that have been determined and analysis of service satisfaction for the extension service used the Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI) methods. The first stage of the IPA is to determine the level of concordance between the level of needs and the level of achievement of extension performance through comparison of achievement scores with needs scores, the second stage calculates the average score of each attribute, then the average of all attributes will be the limit in the Cartesian diagram. The final stage is the description of each attribute in the Cartesian diagram [2].Customer (farmer) satisfaction with extension services is calculated using the CSI method [18], with step 1) calculating Weighting Factor (WF), i.e. changing the average value of the need level to a percent, so that a total of 100% is obtained, 2) calculating the Weighting Score (WS), i.e. the multiplication value between the average value of the educational attainment performance level with Weighted Factor, 3) calculating the Weighted Total (WT), i.e. adding up the Weighting Score of all attributes, and 4) calculating the Satisfaction Index, i.e. Weighted Total divided by the maximum scale used then multiplied by 100%.

The measurement scale used is the Likert scale 1 to 4 (Table 1), the results of data processing are presented in a Cartesian diagram consisting of four quadrants.

Table 1 Scoring assessment of the level of need and achievement of extension services

Score	Level of Needs (Y)	Level of Extension Workers Achievement (X)
1	Not needed	Incompetent
2	Lack of need	Lack of competence
3	Needed	Competent
4	Very Needed	Very competent

Relation between level of needs and achievement perceived by the rice farmers is illustrated at Cartesian diagram on Figure 1.

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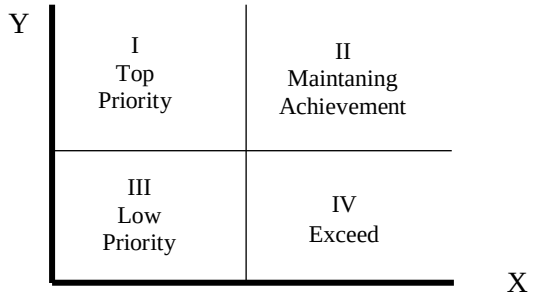

Figure 1. Cartesian diagram of IPA method

The entirety of the farmer level of satisfaction can be seen at the criteria satisfaction level in Table 2.

Table 2 Score and Criteria of CSI

Score CSI	Criteria of CSI
0,76 – 1,00	Satisfied
0,51 – 0,75	Satisfied enough
0,26 – 0,50	Lack of satisfaction
0,00 – 0,25	Unsatisfied

Source: [18] modification

3. Result and Disscussion

3.1 CharacteristicsofPaddy-RiceFarmers

Most residents in Bondowoso generally work in the agricultural sector. Based on [6] land use for agriculture is very high, meaning that around 90,08 percent of the land area in Bondowoso has agricultural potential which consists of 35,55 percent in the forestry sector; 27,66 percent of the moor; and 20,74 rice fields. Potential food crops are rice, corn, and cassava. Rice potential in Bondowoso reaches productivity of 6,15 tons per hectare from an area of 87.410 hectares with a production of 537.450 tons.

Institutional at the farm level consists of farmer groups, farmer groups combined, and Farmer Economic Institutions (FEI). Bondowoso has 2.731 farmer groups, 218 combined farmer groups, and 11 FEI (farmer cooperatives, joint venture groups, and agribusiness microfinance institutions) (Simluhtan, 2019). Farmer groups are an inseparable organization in achieving successful agricultural development. The condition of farmer groups in Bondowoso in recent years has not experienced development and tends to remain constant. Data from Simluhtan (2019) shows that Bondowoso has 1.495 of food crop farming groups. Bondowoso does not have a seed breeding farmer group but has an FWUC (Farmer Water User Community).

Rice farmers as individuals have characteristics that can be seen from the behavior in running a farm. The majority of rice farmers in Bondowoso are at the age of 43 years, which belonged to the productive age category. The average length of formal education is seven years, which means that it has the equivalent of an elementary school. The most attended non-formal education is extension activities with average participation in extension two to three times in the last six months. The average land area is 0,27 hectares and has an average farming experience of 18 years. The average number of family dependents is three people per household with an average income of Rp. 1.424.000 per month.

The level of cosmopolitan is the openness of farmers to information through the relationship of farmers with various sources of information needed [26], the condition of rice farmers in

Bondowoso is in a low category. This means that rice farmers do not have an orientation out of the social system and have a low level of interaction with outside the social system. The survey results show that the use of the internet network is only enjoyed by 13,5 rice farmers. The rest, apart from not having a smart communication device (smartphone), farmers depend on information from their peers or from extension workers.

3.2 Suitability Level Analysis between Level of Needs and Innovation Availability of Rice Agribusiness

Human basic needs vary in variety such as physical and spiritual needs, material and non-material, the needs of healthy living, and so forth. Basic needs or basic human needs are very important needs for human survival, both those consumed by individuals (food, housing, clothing) and certain social services (drinking water, sanitation, transportation, health, and education) [21]. One of the causes of not fulfilling human needs is poverty, and this is a major problem in developing countries. These problems include lack of goods or services needed to achieve a decent standard of living, inability to get adequate goods and services, lack of income to meet basic living needs [23].

In the conceptual framework of farmers' life, needs in agricultural activities require to be identified to achieve farming goals. There are two things that become the focus of farmers at the same time, namely meeting the needs of households and meet the needs of farms that are developed. The need for rice farming is the main source to meet household needs, therefore it is necessary to identify the needs of rice farming that are classified into the objectives of achieving productivity, business security and sustainability, and identity. The grouping of needs in research refers to Maslow's Hierarchy of Needs which is packaged by [8] to 1) physiological needs will be met if there are production and productivity, 2) security, i.e minimizing the production risk, 3) social needs, the way of life of fellow farmers, 4) identity goals (packaging of self-esteem needs and self-actualization), through developing personal abilities, achieving social status, self-pride, and channeling aspirations. The level of suitability between the level of innovation needs and the availability of innovation in rice farming in Bondowoso is presented in Table 3.

Based on Table 3, the average value range from 51-75 or 65,73 percent, therefore it can be concluded that as whole attributes provided sufficiently proper indicator, which means the availability of innovation level is sufficient to meet the innovation needs of rice farmers. The illustration of rice farmer's needs is information to support achieving production and productivity particularly rice superior variety, selling price, price of agriculture production equipment, and rice cultivation technique suitable for the land condition needed by farmers in Bondowoso.

Information about superior varieties needed by farmers is a variety that is suitable for the conditions of the land, is resistant to pests and diseases, and the most important is the quality of production is in demand by consumers. Based on Table 3 explains that the need for information about superior varieties of rice ranks first as rice seeds are an important component in rice farming. If the seeds obtained are low quality then it can have an impact on crop failure. The availability of superior rice seeds in Bondowoso is provided by the agriculture service and distributed through extension workers. For this reason, the need for seeds is in accordance with the needs of farmers, although it has not yet touched all rice farmers in Bondowoso.

The selling price of rice has basically been set by the government both in the form of Dry Grain (GKG) or in the form of rice through the highest retail price (HET). Information on the selling price of rice is needed by farmers as a basis for making decisions in selling products. Based on the results of the survey explained that the average farmer stated that the availability of rice selling price information was obtained from extension workers and from the average selling price information on the market. Information on the selling price of rice is not the same between one broker and another.

This condition is proven as shown in Table 3 which shows that the selling price information and the availability of information are less suitable to the needs of the community.

Table 3. Level of Needs and Innoation Availability of Rice Agribusiness at Bondowoso in 2019

Indicator	No	Atribute	Average score of Innovation Needs (Y)	Weighting Importance Score	Rank	Average score of Innovation Availability (X)	Weighting Satisfaction Score	Rank	SuitabilityRank	Rank
Physological Needs (Production and Productivity)	1	Rice superior variety	3,61	7,98	1	2,67	0,21	1	74,06	6
	2	Rice selling price	3,37	7,46	5	1,95	0,15	5	57,86	12
	3	Production equipments price	3,06	6,77	12	1,65	0,11	7	53,92	13
	4	Rice cultivation technique	3,51	7,77	2	2,39	0,19	2	68,09	10
Security Needs (production risk)	5	Climate change adaptation	3,34	7,38	7	2,51	0,18	3	75,11	5
	6	Product marketing	3,14	6,94	11	2,28	0,16	4	72,73	7
	7	Planning needs and capital	3,31	7,31	8	1,95	0,14	6	59,00	11
	8	Harvest management	3,35	7,40	6	2,54	0,19	2	75,78	4
Agribusiness Sustainability Needs	9	Irigation	3,47	7,67	3	2,01	0,15	5	57,86	12
	10	Capital resource	3,16	6,98	9	2,61	0,18	3	82,73	3
	11	Consumer desired product quality	3,16	6,98	9	2,64	0,18	3	83,68	1
Self-identity Improvement Needs	12	Trying innovation with other farmer	3,14	6,95	10	2,62	0,18	3	83,28	2
	13	Discussion to solve agribusiness problem	3,39	7,50	4	2,42	0,18	3	71,39	8
	14	Reward for achievement	2,23	4,93	13	1,57	0,08	8	70,40	9
Total average			**45,20**			**31,79**			65,73	
Weighting Average Total							**2,29**			
Customer Satisfaction Index *)							**57,24**	**Satisfied Enough**		

Description: *) score 0-25: unsatisfied; 26-50: lack of satisfaction ; 51-75: satisfied enough; 76-100: satisfied

The price of agricultural production facilities will greatly affect the capital needs of farming, for that Bondowoso farmers need more information on the agricultural production facility prices used for plan farming, especially capital preparation and estimating the availability of agricultural production facilities on the market. In rice farming, the most crucial supporting factor for success in achieving production and productivity is proper rice cultivation techniques. This technique is needed by farmers to increase production. Basically, rice cultivation techniques have been known by farmers through hereditary experience, but in practice, it is necessary to use appropriate technology to improve the cultivation techniques carried out by farmers. The information most needed by farmers in cultivation techniques is planting, irrigation, fertilizing, pest management, and post-harvest handling.

Security requirements, namely information need to minimize production risks needed by rice farmers in Bondowoso. Production risks in this study refer to risks or losses as a result of ecological, economic, and social processes that are outlined in the information needs about climate change adaptation, marketing of agricultural products, planning of capital requirements, and handling of agricultural products. Farmers in Bondowoso prioritize information needs about climate

change adaptation, planning needs, and capital, as well as handling crop yields rather than marketing information on agricultural products [9].

Information needs about climate change adaptation are needed to anticipate crop failure due to ecological factors such as mass pest attacks and soil degradation. Planning needs and capital is needed to anticipate the availability or limitations of the agricultural production facility and the sources of capital that can be obtained. The level of rice farmers' needs for planning needs and capital is relatively higher because the average farmer has not mastered farming planning techniques and has not been able to make farm analysis. Basically, the planning carried out by rice farmers in Bondowoso is based on estimates that are not documented. Moreover, the problem of farming capital, until this research was conducted and based on information obtained from farmers, the capital used is the result of the sale of part of the rice harvest and debt to family or colleagues.

The level of social needs of farmers in living side by side in their social systems still needs each other help. The socio-cultural characteristics in Bondowoso are so strong that the conditions of a harmonious way of life, maintaining local resources, are still held firmly by the community. In the context of agricultural social life, establishing good relations with other farmers in an effort to maintain the sustainability of farming, this research focuses on the social relations of farmers in obtaining information on the irrigation, capital providers, and product quality alleviated by consumers. Based on the survey results, the need for irrigation is the highest social need in Bondowoso. Irrigation problems that occur well in Bondowoso are uneven water distribution.

Bondowoso has high rainfall so that the availability of water is abundant. However, Bondowoso has a topographic area consisting of hills and valleys, causing irrigation water flow is also uneven. Bondowoso has four HIPPA groups, but besides the limited number of HIPPA's existence and function, it is still not optimal, given the large area of rice fields. Based on the description it can be said that farmers need cooperation both inside and outside the social system to maintain the sustainability of farming.

The level of farmers' need for capital provider information is relatively good. Even though Bondowoso has a farmer economic institution, it has not yet run optimally in providing farm capital. Existing KEPs are the Farmer Cooperatives, KUB, and Agribusiness Microfinance Institutions (LKM-A). Farmers must-have information on other capital providers for the sustainability of their farming. In the indicator of product quality that is alleviated by consumers is at the lowest level in meeting consumer needs. The production that is obtained is at least in accordance with the needs because consumer tastes will continue to change. Farmers in Bondowoso need information about the quality of products which consumers desire, including farmers themselves as consumers. However, the average harvest is consumed by themselves considering the relatively small yields harvested this year due to pests and diseases.

The last level of need is self-identity, which includes increased personal ability, social status, maintaining a positive culture, social norms, and spiritual satisfaction. In this study indicators that reflect the identity of self-contained in the need to try innovation with other farmers, the need to discuss in solving farming problems, and the need for recognition of the success achieved. The survey results indicate that the level of farmers' needs in Bondowoso regarding self-identity which is the highest need is to try innovation and discuss in solving farming problems. While the need for recognition of the success of farming that is achieved is less needed by farmers in Bondowoso.

Based on CSI analysis, it shows that rice farmers are quite satisfied with the availability of innovations from extension workers who are considered to be in accordance with the innovation needs of farmers. This shows that the availability of information and innovation by the Extension Center is sufficient to meet the needs of rice farmers in running their farming.

3.3 Suitability Level Analysis on the Needs of Innovation and Extension Service Outcomes

Implementation of extension for rice farmers in Bondowoso Regency is carried out by the Extension Center (BP). The existence of this extension agency is part of the instruments of

accelerating agricultural development in the broadest sense, namely as a process of learning, facilitation, escort, mentoring, and transfer of information and technology. Based on Law No.23/2014 the implementation of extension is changing, especially in extension institutional. This can be seen from the use of the term extension at the sub-district level in Bondowoso. The district level extension agency in Bondowoso is under the auspices of the Department of Agriculture Affairs.

Bondowoso has seven Extension Centers (EC) which cover 23 sub-districts, therefore each EC has 3-4 sub-districts. Following its role, BP is an extension agency that provides service facilities to farmers' needs, one of which is the availability of information or innovation.

Extension has a strategic role in increasing the capacity and independence of the community as an effort to preserve natural resources. The role of extension workers in this case is very important as a driving force and motivator in the dynamics of the agribusiness system chain. Benchmarks of success can be seen from the process of dynamics reciprocally in the extension process. Bondowoso has seven BPs with 224 extension workers in 209 villages and 10 urban villages. Distribution of extension workers based on the status of appointment and the number of fostered groups of farmers per village or urban village can be seen in Table 4.

Table 4 Distribution of Extension Workers based on Appointment Status at Bondowoso in 2019

Description	Bondowoso
Total Extension Center (number)	7
Total Subdistrict	23
Total Village	209
Total Urban Village	10
Status penyuluh:	
a. Civil person (person)	118
b. THL-TB Capital (person)	42
c. THL-TB Regional (person)	64
Total group-farmers	2.731
Average supervised group-farmers per village	12

Source: Simluhtan (2019); Bondowoso Department of Agriculture Affairs(2019)

Based on the data in Table 4 it can be seen that the number of extension workers in Bondowoso Regency is based on the mandate law policy No.19/2013, namely one village of one extension worker. This condition shows that the Bondowoso Regency government has been pro-active in fulfilling the extension quota by opening the formation of the Regional Agricultural Relief Workforce (THL-TBD) extension workers since 2016. However, due to the technical staff at the Agriculture Service Office of Bondowoso Regency, it has been reduced due to retiring and assignment in to increase employee productivity, causing many extension workers to be seconded in service. This has an impact on the area of agricultural extension work in some agricultural extension workers and the problem of workload due to increased work area. For this reason, an analysis of the level of compatibility between the needs of extension services is needed and the achievements of extension services, the results of which are presented in Table 5.

Suitability level is a comparison between the level of needs score with the achievement of extension services so that it can be used to determine the priority scale [27]. Based on Table 5, obtained an average suitability value in the range 51-75 that is 75,11 percent so that it can be concluded that the attributes that describe the indicators are quite appropriate, meaning that the extension services by BP are good enough to meet the needs for extension services.

Table 5. Suitability Level of Extension Services with Achievement of Extension Services at Bondowoso in 2019

Indicator	No	Atribute	Average score of Innovation Needs (Y)	Weighting Importance Score	Rank	Average score of Innovation Availability (X)	Weighting Satisfaction Score	Rank	Suitability Rank	Rank
Extension Material Suitability	1	Update material and suitable for needs	3,30	11,23	3	2,58	0,29	2	78,29	4
Extension Method Accuration	2	Applied Extension Method	3,26	11,09	5	2,24	0,25	5	68,80	8
Competency of Extension Workers	3	Planning and Evaluation of Agribusiness	3,29	11,19	4	2,70	0,30	1	81,91	3
	4	Access to Technology	3,50	11,91	2	2,45	0,29	2	70,00	7
	5	Build Network	3,26	11,09	5	2,68	0,30	1	82,21	2
	6	Group Management	3,58	12,18	1	2,36	0,29	2	65,78	9
	7	Active in searching business opportunity	3,26	11,07	6	2,48	0,27	3	76,19	5
Extension Intensity	8	Extension organizing	3,06	10,39	7	2,54	0,26	4	83,14	1
	9	Extension visit	2,89	9,83	8	2,05	0,20	6	70,85	6
Total Average			29,39			22,08			75,11	
Weighting Average Total							**2,46**			
Customer Satisfaction Index *)							**61,42**	**Satisfied Enough**		

Description: *) score 0-25: unsatisfied; 26-50: lack of satisfaction ; 51-75: satisfied enough; 76-100: satisfied

Extension services that are most needed by farmers are services to group management, access to technology, and the latest material on innovation and follow farmers' needs. This implies the meaning that the existence of farmer groups has not been able to help increase rice farming that is run both individually and in groups because of the lack of assistance by extension workers. There are not many farmer groups that function properly, especially in innovation trials. Some cases of the existence of farmer groups only as a basis in facilitating capital lending.

Based on Table 5 also shows that the level of appropriateness between the needs of extension services and the achievements of extension services shows the results of the farmers 'satisfaction index of extension services in Bondowoso are in the moderately satisfied category, meaning that farmers feel quite satisfied with extension services because they are sufficient to serve farmers' needs for innovation. However, the level of conformity that most needs to be considered is the intensity of extension especially in the implementation of extension. This implies that farmers' needs for innovation still rely on information from extension workers, although the number of extension workers has met the criteria of one village for one extension worker, but extension that occurs is still not optimal, thus it is necessary to increase extension activities. Second is extension workers competence in building networks. The need of rice farmers in the sustainability of farming requires the expansion of agribusiness networks, by increasing the competency of extension workers in building networks, it is hoped that farmers will be more open to innovation and efforts to develop rice farming so that they are more innovative, creative and adaptive. Third is the competency of farm planning and evaluation. Until now, rice farmers have not yet done written documentation about the farming that is done, for that through extension, it is expected that farmers can plan and evaluate farming so that they understand the capital requirements and the results obtained.

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3.4 Strategies for Meeting the Needs of Innovation and Extension Services for Rice Farming in Bondowoso

a. Meeting the needs or availability of innovation

The average perception of each attribute is the basis for determining whether each innovation availability attribute is good or not, by comparing the mean of all attributes of the level of innovation needs (x) and compared with the average of all attributes of the level of innovation availability (y). The average value of perception and expectation is used to analyze the data in the Cartesian diagram presented in Figure 2.

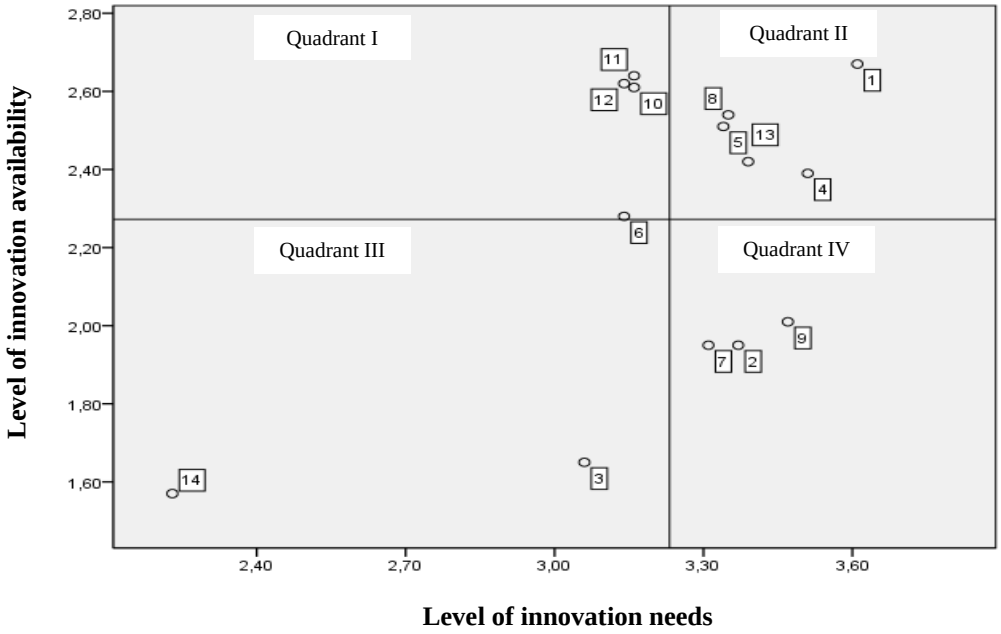

Figure 2. Cartesian diagram results determining the strategy to increase the availability of innovation

Quadrant I is a quadrant that has a very low level of satisfaction, thus it becomes a top priority for improvement. There are four attributes in quadrant I, namely marketing the product (6), sources of financing (10), the quality of products which consumer desire (11), and trying to innovate with other farmers (12).

Quadrant II is a quadrant expected by rice farmers and is in accordance with what is felt by farmers. This attribute is a priority to be maintained which consists of handling crop yields (8), adaptation to climate change (5), superior varieties of rice (1), discussion in solving farming problems (13), and rice cultivation techniques (4).

Quadrant III is low priority awareness because it contains attributes that are less important by rice farmers and in fact, the availability of innovation is not really needed by farmers. The order of attributes according to the priority level to be improved is the appreciation of the success achieved by rice farmers (3) and the price of agricultural production facilities (14).

Quadrant IV has a low level of need but has a high level of availability of innovation. The order of attributes that need to be made to reduce the availability of innovation because it is considered excessive is the planning of needs and capital (7), information on the selling price of rice (2), and irrigation (9).

Based on Figure 2 also confirms that extension agencies must prioritize the provision of information and innovations, especially regarding marketing the results in an effort to minimize farming risks, sources of funding related to farm capital as an effort, therefore

farms that are run can be sustainable, maintain and meet the desired quality of rice or rice consumers so that the products produced to fit the needs of consumers, and the extension agency is a learning center for farmers in trying innovations or facilitating farmers in testing innovations with other farmers in an effort to develop the confidence of farmers in developing their potential.

Innovations about new improved varieties, availability of production facilities and adaptation to climate change, handling of agricultural products and the habit of discussion in solving problems in farming need to be maintained in providing services to farmers in the form of providing innovation or assistance (Padillah et al., 2018).

For innovations that are less needed by farmers, it can be used as an alternative in motivating farmers in developing farming, and innovations that are considered excessive can be reduced by staying oriented to the situation and conditions of rice farmers.

b. Development of quality extension services

Based on the type of extension services that are relevant to efforts to build household food security that is focused on the service of relevant and updated materials, the accuracy of the extension methods, the competency of extension workers, and the intensity of extension, are broken down into nine attributes.

The average perceptions of each attribute are the basis for determining each attribute of the extension service performance is good or not, by comparing the average of all attributes of the level of need for extension (X) and compared with the average of all attributes of the performance achievement of extension services (Y). The average value of these perceptions and expectations is used to analyze the data in the Cartesian diagram presented in Figure 3.

Quadrant I is a quadrant that has a very low level of satisfaction so that it becomes a top priority for improvement. There are two attributes in quadrant I, namely technology access (4) and farmer group management (6).

Quadrant II is a quadrant expected by rice farmers and is in accordance with what is felt by farmers. This attribute is a priority to be maintained which consists of farm planning and evaluation (3) and the latest (updated) extension material and as needed (1)

Quadrant III is a low priority quadrant because it contains attributes that are less important by rice farmers and in reality, the extension services provided are not really needed by farmers. The order of attributes is according to the priority level to be improved, namely the existence of farmer visits (9) and extension methods applied (2).

Quadrant IV has a low level of service needs for extension services but has a high level of service extension outcomes. The sequence of attributes that need to be made to reduce the availability of innovation because it is considered excessive is the implementation of extension (8), building networks (5), and actively seeking business opportunities (7).

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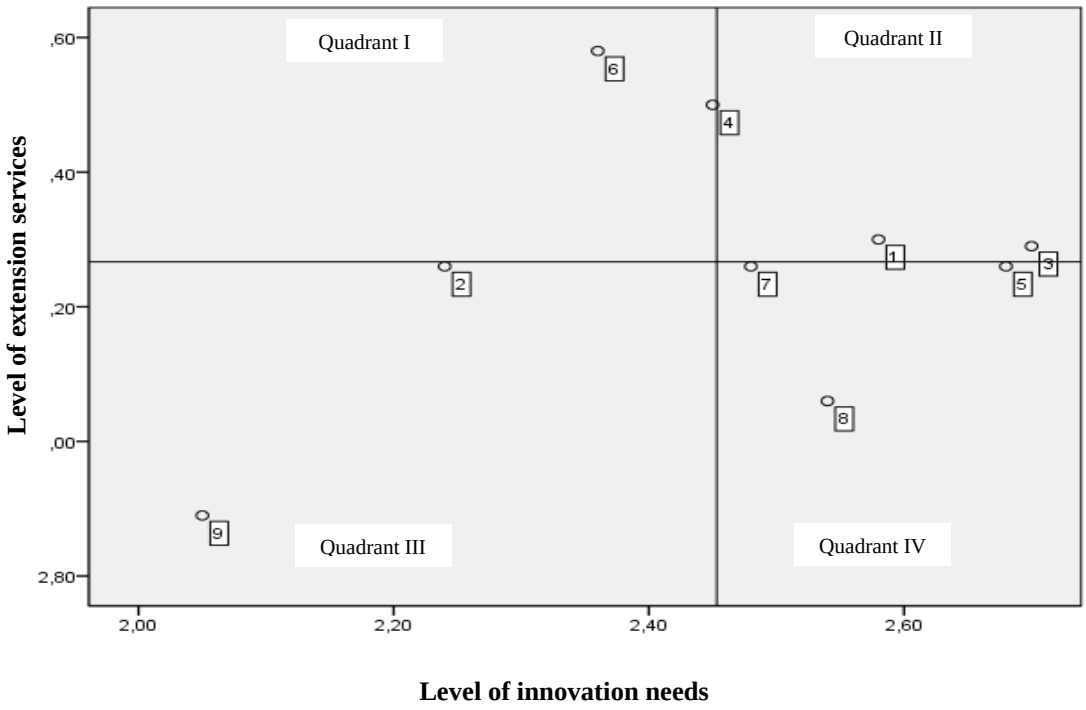

Figure 3 Results of a Cartesian diagram of strategies to improve extension services

Efforts that can be made to improve extension services are to improve the competency of extension workers, especially in technology access and management of farmer group management (Figure 3). Access to technology in question is the ways of extension workers in finding relevant innovations following the needs of farmers and land conditions and problems of farmers.

Second is the competency of extension workers in the management of farmer groups. The number of supervised farmer groups, as in Table 4 which explains that the average number of supervised per village is 12 farmer groups, this causes assistance and extension services can not be optimal.

In extension services that need to be maintained is the delivery of material that is appropriate to the needs and the latest as well as the ability of extension workers in planning and evaluating farming. That is, the service from the technical side of cultivation and management is good enough, therefore it needs to be maintained, but it must keep updating the material adapted to the latest innovations (Mardikanto 2009).

Overall, it can be said that the extension services are good enough in providing information that is suitable to the needs of rice farmers. However, improvement efforts need to be made to improve the quality of services to farmers.

4. Suggestion

The level of need and availability of innovation can be seen from the level of suitability shown that based on the elaboration attributes of several indicators, the highest level of suitability is in the indicators of farmer sustainability needs describing in the source of financing or farm capital and the product quality that consumers desire. The self-improvement indicators are elaborated through the behavior of trying to innovate with other farmers.

The level of need for extension services and achievement of extension services by BP, it can be explained that the level of conformity occurs in indicators of extension intensity,

namely the implementation of extension that has not been maximized, the competency of the extension workers to build networks and farm planning and evaluation.

The strategy to meet the needs is to increase the fulfillment of information sources on marketing results, sources of financing, the quality of products desired by consumers, and the existence of activities in trying to innovate with other farmers. While the strategy to improve extension services is to increase the competency of extension workers in accessing relevant technology and competence in developing farmer group management.

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