



Exchange of Information on Organic Rice Production Process at Farmer Group Association Sidomulyo Sleman Regency

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Abstract. This research aims to (1) determine the mechanism of information exchange in organic rice production and (2) identify the structure of the communication network and the role of actors in exchanging information on organic rice production. The actors involved in the research are organic rice farmers, Farmer Group Association Sidomulyo administrators, and agricultural extension. The basic method used is descriptive quantitative with network analysis (whole network). This study used Ucinet to find indegree, outdegree, distance, density, reciprocity, centralization, closeness centrality, and betweenness centrality. The results showed that (1) the exchange of information regarding the organic rice production process was carried out face-to-face. The most popular actor is the head of Farmer Group Sri Rejeki and one of its members. The most active actors are the Chairman of Farmer Group Association Sidomulyo and the agricultural extension in Farmer Group Association Sidomulyo; (2) the network formed has a low density with low to moderate reciprocity. The key actors in the network are the Chairman of Farmer Group Association Sidomulyo and the agricultural extension in Farmer Group Association Sidomulyo.

Keywords: Communication Network, Organic Rice, Information Exchange, Actors.

1 Introduction

Currently, the trend of a healthy lifestyle has begun to be carried out by many Indonesian people, one of which is by consuming organic agricultural products. Organic farming is based on 4 principles, namely: 1) Health Principles, 2) Ecological Principles, 3) Justice Principles, and 4). Protection Principles (Karyani, Arifin, Hapsari, & Supriyadi, 2019). According to statistical data and trends in organic farming in 2011, the market of organic agricultural products has very good prospects. The demand for organic agricultural products is increasing every year [2].

One of the organic products that is widely consumed by the public is organic rice. Organic rice is the second most organic product consumed by the community after

vegetables (David & Ardiansyah, 2017). The many applications of organic farming are supported by promising benefits. The income of farmers who cultivate organic rice is better than farmers who cultivate conventional rice (David & Ardiansyah, 2020). Mathematically, organic agricultural production inputs are lower than conventional agricultural inputs (with the same amount of output). The difference is caused by the absence of the use of pesticides and synthetic fertilizers in organic rice cultivation. This means that organic farming requires relatively less capital than conventional farming (Charina, Andriani, Kusumo, Sadeli, & Deliana, 2018).

The organic product market is not exclusive to the upper class, the middle class can also buy it. Organic rice consumers in DI Yogyakarta come from various groups of society, but the majority come from consumers with fixed incomes, high enough education, with small family sizes. Organic rice consumers are characterized by their concern for family, perception of purity level, and concern for environmental health (Widodo, Rina Kamardiani, & Rahayu, 2016).

One of the farmer groups in Sleman Regency, namely the Sri Rejeki Farmer Group, has implemented an organic rice cultivation system since 2015. Sri Rejeki Farmer Group is one of the farmer groups included in the Sidomulyo Farmer Group Association (Farmer Group Association). Farmer Group Association Sidomulyo oversees the Community Food Distribution Institute with the aim of guiding and facilitating farmers in organic rice production. Starting from the pre-production process, production, post-production, to organic product certification.

It is known that in the certification process not all applications are accepted. There are many conditions that must be met in order for a product to get official certification. A farmer must really understand the process of organic rice cultivation. The complexity of the certification process has a good purpose, which is to maintain the quality of organic agricultural products. These requirements have special standards that have been regulated by the government, namely SNI 6729 2016 concerning Organic Farming Systems.

Most farmers find it complicated and have to spend expensive in the process of cultivation and certification of organic farming (Soltani, Azadi, Mahmoudi, & Witlox, 2014). However, until 2020, there are 6.51 hectares of farmer-owned land in Farmer Group Association Sidomulyo that has been certified by the *Indonesian Organic Farming Certification* (INOFICE). Although the land area is only a small part of the total land area submitted for organic rice certification, farmers in Farmer Group Association Sidomulyo can run the program with the help of relevant stakeholders. This pattern of communication between farmers and stakeholders will form a communication network.

Communication networks have an important role in the diffusion of agricultural innovation [8]. One example of innovation is organic farming. Based on the above background, communication and exchange of information between farmers are an important part of the production process and certification of organic rice. Therefore, this study was conducted to determine the exchange of information in the organic rice production process in Farmer Group Association Sidomulyo Kapanewon Godean, Sleman Regency.

2 Research Methods

This study used a descriptive approach and communication network analysis. In this study, non-experimental quantitative research was carried out using communication network analysis whole network study design .

Communication network is a relationship device formed due to interactions between individuals with individuals, individuals with groups, or groups with groups (Eriyanto, 2014). Communication structure is closely related to the existence of central actors who play a role in disseminating information (Rahmawati, Muljono, & Sarwoprasodjo, 2016).

Meanwhile, *whole* network is one of the communication network designs that involves all actors in a group (Eriyanto, 2014). In this study, the communication network formed was analyzed to determine the role of each actor involved in the process of organic rice cultivation. The analysis can be used to describe the process of exchanging information on the organic rice production process.

Practically the analytical tool used in this study is Ucinet Software. Ucinet is the most widely used network analysis software for research. Ucinet is able to analyze and describe a communication network. Both small and large networks can be analyzed through Ucinet.

3 Results Of Research And Discussion

3.1 Information Exchange Mechanism in Organic Rice Production Process in Farmer Group Association Sidomulyo, Kapanewon Godean, Sleman Regency

The mechanism for exchanging information on organic rice production is divided into five topics based on the qualification of quality assurance certification and labeling of organic rice in accordance with SNI (Indonesian National Standard) (BSN, 2016). The distribution includes exchange of information on conversion and maintenance of organic management, exchange of information on contamination prevention, exchange of information on selection of plants and varieties, exchange of information on management of pests (Plant Disease Organisms), and exchange of information on organic rice certification. The mechanism of information exchange of organic rice production that occurs in Farmer Group Association Sidomulyo, Kapanewon Godean, Sleman Regency is as follows:

Table 1. Results of Information Exchange Mechanism Analysis

Parameter	<i>Indegree</i>	<i>Outdegree</i>
1. Information Exchange Mechanism on Conversion and Maintenance of Organic Rice Management		
Maximum	6	28
Minimal	0	0
Average	2,452	2,452

Parameter	Indegree	Outdegree
<i>Distance</i>		1,725
2. Information Exchange Mechanism on Prevention of Organic Rice Contamination		
Maximum	8	26
Minimal	0	0
Average	3,889	3,889
<i>Distance</i>		2,379
3. Information Exchange Mechanism on Selection of Organic Rice Crops and Varieties		
Maximum	7	27
Minimal	0	0
Average	2,750	2,750
<i>Distance</i>		1,799
4. Information Exchange Mechanism on Management of Organic Rice Pest (Plant Disease Organisms)		
Maximum	7	29
Minimal	0	0
Average	3,556	3,556
<i>Distance</i>		2,368
5. Information Exchange Mechanism on Organic Rice Certification		
Maximum	4	34
Minimal	0	0
Average	2,185	2,185
<i>Distance</i>		1,585

Source: Primary Data Analysis, 2021

Based on Table 1, it can be seen that the maximum indegree value ranges from 4-8, while the maximum outdegree value ranges from 26-34. The maximum outdegree value is higher than the maximum indegree value. That is, the most information submitted by an actor is higher than the most information received by an actor. Meanwhile, the minimum indegree and minimum outdegree values in all information exchange processes are the same, which is 0. Indegree and outdegree at least 0 indicate that there are actors who do not receive information at all and there are also actors who do not provide information at all. The average indegree and outdegree show the same value, which is in the range of 2.185 - 3.889. The value shows the average information submitted and the information received by the actor is 2 - 4 pieces of information. Meanwhile, distance shows a value of 1.725 - 2.379. The value means that to relate with other actors, the steps or distance required by an actor are on average 2 steps. The mechanism of information exchange can also be seen from the distribution of indegree and outdegree as follows:

Table 2. Indegree Distribution

<i>Indegree</i>	<i>Actor</i>	<i>Number of Actors</i>
1. Information Exchange Mechanism on Conversion and Maintenance of Organic Rice Management		
6	A10	1
5	A5, A8, A12	3
4	A1, A2, A3, A4, A7, A9, A11	7
3	A6, A13, A14, B14	4
2	B1, B3, B7, B11	4
1	B2, B4, B5, B6, B10, B12, B13	7
0	B8, B9, B15, B16, C1	5
2. Information Exchange Mechanism on Prevention of Organic Rice Contamination		
8	A10	1
7	A2, A5, A9	3
6	A1, A3, A4, A6, A7, A8, A11, A13	8
5	A12, A13	2
3	B14	1
2	B1, B3, B5, B13	4
1	B4, B6, B7, B9, B12, B16, C1	7
0	B2, B8, B10, B11, B15	5
3. Information Exchange Mechanism on Selection of Organic Rice Crops and Varieties		
7	A2	1
5	A10, A3	2
4	A4, A5, A7, A8, A13	5
3	A1, A6, A9, A11, A12, A14, B14	7
2	B1, B3, B5, B6, B7, B9, B13	7
1	B2, B4, B10, B12, C1	5
0	B8, B11, B15, B16	4
4. Information Exchange Mechanism on Management of Organic Rice Pest (Plant Disease Organisms)		
7	A2	1
6	A1, A4, A5, A6, A7, A9, A10	7
5	A3, A8, A11, A13, A14	5
4	A12	1
3	B14	1
2	B1, B3, B5, B9, B13	5
1	B2, B4, B6, B7, B16	5
0	B8, B10, B11, B12, B15, C1	6
5. Information Exchange Mechanism on Organic Rice Certification		
4	A1, A2, A4, A5, A10	5
3	A3, A12, B6, B13, B14	5
2	A7, A8, A9, A11, B1, B3, B9	7
1	A6, A13, A14, B4, B5, B6, B10, B15, B16, C1	10
0	B2, B8, B11, B12	4

Source: Primary Data Analysis, 2021

Based on Table 2, it can be seen that the indegree value is between the values 0-8. The highest indegree value in the information exchange mechanism regarding the conversion and maintenance of organic rice management and the information exchange mechanism regarding the prevention of organic rice contamination belongs to the A10 actor. This shows that the A10 actor has the highest popularity regarding the conversion and maintenance of organic rice management as well as the mechanism of information exchange regarding the prevention of organic rice contamination. The popularity value of the A10 actor is high because the A10 actor is the Chairman of the Sri Rejeki Farmer Group, a farmer group in Farmer Group Association Sidomulyo that cultivates organic rice. Because of his role as the head of the farmer group, A10 actors often get information from other actors outside the network.

Meanwhile, the highest indegree value for the mechanism of information exchange regarding the selection of organic rice plants and varieties as well as the mechanism of information exchange regarding the management of organic rice pests (Plant Disease Organisms) belongs to the A2 actor. This shows that the A2 actor is an actor who has high popularity. The popularity value of A2 actors is high because the actor is a member of a farmer group who actively seeks information and often asks other actors.

In the mechanism of exchanging information regarding organic rice certification, the highest indegree value is owned by 5 actors, namely actors A1, A2, A4, A5, A10. Meanwhile, there are 4 actors who have an indegree worth 0, namely actors B2, B8, B11, B12. Unlike the previous mechanism, if you look closely, the range of indegree between actors is not too far, namely degree 0 to degree 4. The distribution of actors among the degree scores is also almost even, although the most is the distribution of actors in degree 1. This shows that the amount of information received by actors on the network does not differ much.

Table 3. Outdegree Distribution Conversion and Maintenance of Organic Rice Management

<i>Outdegree</i>	<i>Actor</i>	<i>Number of Actors</i>
1. Information Exchange Mechanism on Conversion and Maintenance of Organic Rice Management		
28	C1	1
27	B13	1
4	A1	1
3	A8	1
2	A4, A6, B1	3
1	A2, A5, A10, A12, B2, B5, B7, B8	8
0	A3, A7, A9, A11, A13, A14, B3, B4, B6, B9, B10, B11, B12, B14, B15, B16	16
2. Information Exchange Mechanism on Prevention of Organic Rice Contamination		
26	B13	1
25	C1	1
14	A10, B1	2
7	A12	1

<i>Outdegree</i>	<i>Actor</i>	<i>Number of Actors</i>
4	A1, B5	2
3	A8	1
2	A4, B7, B8	3
1	A2, A3	2
0	A3, A6, A7, A9, A11, A13, A14, B2, B3, B4, B6, B9, B10, B11, B12, B14, B15, B16	18
3. Information Exchange Mechanism on Selection of Organic Rice Crops and Varieties		
27	C1	1
25	B13	1
4	A1, A10	2
2	A2, A4, A8, A11, A12, B1	6
1	A3, A5, B5, B7, B8	5
0	A6, A7, A9, A13, A14, B2, B3, B4, B6, B9, B10, B11, B12, B14, B15, B16	16
4. Information Exchange Mechanism on Management of Organic Rice Pest (Plant Disease Organisms)		
29	C1	1
25	B13	1
14	B1	1
5	A8, A12	2
4	A1	1
3	A11, B5	2
2	A4, A5	2
1	A2, A10, B7, B8	4
0	A3, A6, A7, A9, A13, A14, B2, B3, B4, B6, B9, B10, B11, B12, B14, B15, B16	17
5. Information Exchange Mechanism on Organic Rice Certification		
34	B13	1
13	C1	1
4	A1	1
2	A11, B5	2
1	A2, A4, A5, B1	4
0	A3, A6, A7, A8, A9, A10, A12, A13, A14, B2, B3, B4, B6, B7, B8, B9, B10, B11, B12, B14, B15, B16	22

Source: Primary Data Analysis, 2021

Based on Table 3, it can be seen that the outdegree value is between the values of 0-34. The highest outdegree score in information exchange numbers 1-4 was dominated by B13 C1 actors with a degree difference of only 1. This shows that C1 and B13 actors have the highest information activity among other actors in the network. The reason C1 and B13 actors have the highest outdegree is because C1 actors are Field Agricultural Extension who accompany the Sidomulyo Association while the B13 actor is the Chairman of Farmer Group Association Sidomulyo as well as the initiator

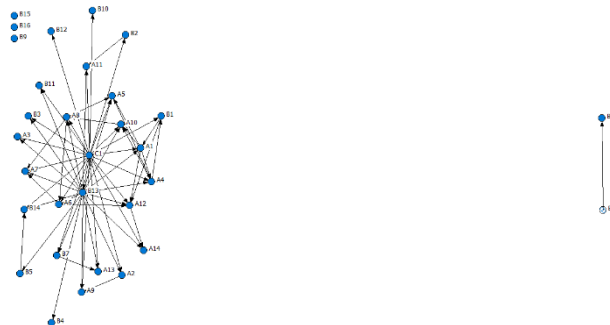
of organic farming in the Sidomulyo Poktan. These two roles greatly affect the dissemination of information in Farmer Group Association Sidomulyo because the two actors act as information centers.

Meanwhile, in the mechanism of exchanging information regarding organic rice certification, it is known that the actor who has the highest outdegree is the B13 actor. This value is the highest outdegree value among other mechanisms. B13 actors have the most outdegree because B13 actors are the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. In addition, B13 actors are also actors who play a lot of roles in registration, file management, importing assessors, and all matters related to organic rice certification.

Meanwhile, there are many actors who have a degree of 0, which means that the actor has never provided information to any actor in the network.

3.2 Communication Network Structure And Role Of Actors In Organic Rice Production Process In Farmer Group Association Sidomulyo Sleman Regency

Communication Network Structure of Conversion and Maintenance of Organic Rice Management in Farmer Group Association Sidomulyo Sleman Regency.



Source: Primary Data Analysis, 2021

Fig. 1. Sociogram Communication Network Conversion and Maintenance of Organic Rice Management

Table 4. Results of System Level Analysis of Communication Network Conversion and Maintenance of Organic Rice Management

Structure and Character	Value
Density	0.082
Reciprocity	0

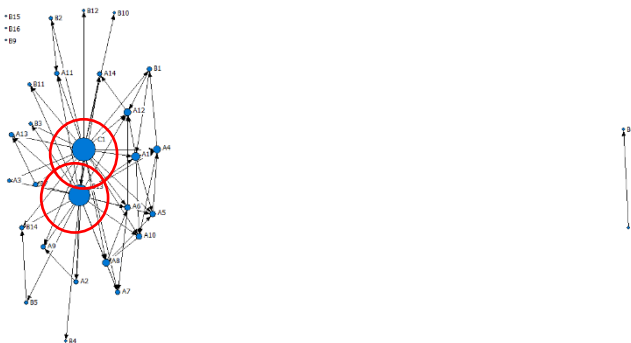
Source: Primary Data Analysis, 2021

Based on Figure 1, it can be seen that there are some actors who do not have any links to other actors, namely actors B9, B15, and B16. These three actors are called

insulates. The reason why the three actors became isolated actors is because all three of them are association administrators who are tasked with taking care of administrative matters. The B9 actor is the person in charge of the Alsintan I Service Business Unit, so it has more to do with agricultural tools and machinery than with the conversion and maintenance of organic management of organic rice. The B15 actor is the Secretary of the Management and Distribution Business Unit responsible for the administration and finances of Farmer Group Association. B16 actors are in charge of the Manpower Sector of the Management and Distribution Business Unit which is responsible for the activities of business units in Farmer Group Association. These three are not directly related to the conversion and maintenance of organic rice management, so none of the information comes in or out. In addition to the three isolate actors, there are also two actors who are far outside the center of the network. The actor only has one link, namely actors B6 and B8.

The five actors have the same letter code, namely code B. Code B represents the identity of the actor as the administrator of the group. There is no information coming in or out of these actors (except one, namely from B8 to B6 only) because not all association administrators directly cultivate organic rice. Some of them even make farmers as a side job. Conversion and maintenance of organic management is carried out once, namely at the time of transition between conventional rice cultivation and organic rice cultivation, so that information exchange is no longer carried out. Therefore, many actors are found isolated and there is no reciprocity (there is no reciprocal relationship between actors).

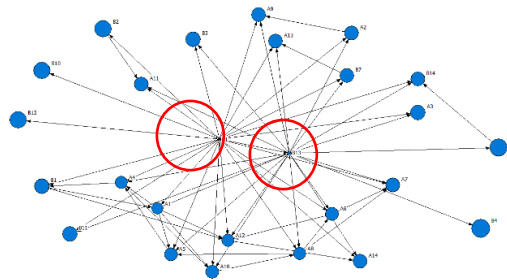
Density describes the intensity of relationships between network members in interacting. A network that has a high density is a network whose members interact with each other. Based on Table 4, the density formed is 0.082 or 8.2%. The density of 8.2% is low because it is far from the maximum value of 100%. The type of tissue formed also includes large size, so it is less cohesive or less tightly. This is because only certain actors provide information to other actors in the network. Low density indicates weak connectivity between farmers related to certain sources of information (Hertanto, Sugiyanto, & Safitri, 2016).



Source: Primary Data Analysis, 2021

Fig. 2. Sociogram Centralization of Communication Networks Conversion and Maintenance of Organic Management of Organic Rice

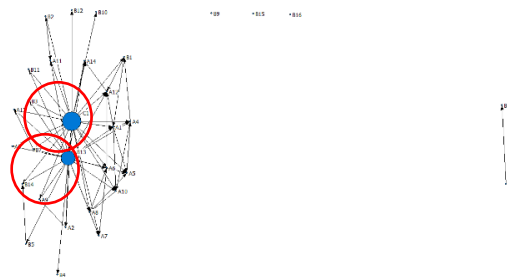
Based on Figure 2, it can be seen that the largest node is indicated by nodes belonging to actors C1 and B13. Actor C1 is a Field Agricultural Extension Officer who accompanies Farmer Group Association Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. Both actors are at the center of the network and have the largest node than other actors' nodes. This indicates that these actors are key actors in the communication network of conversion and maintenance of organic rice management. In addition to density and reciprocity, network characteristics can also be known at the actor analysis level. Here is a sociogram of actor analysis that includes closeness centrality and betweenness centrality.



Source: Primary Data Analysis, 2021

Fig. 3. Sociogram *Closeness Centrality Conversion and Maintenance of Organic Rice Management*

After elimination of isolate actors, a more representative Closeness Centrality sociogram was obtained. Based on Figure 3, it can be seen that the smallest node belongs to actor C1 followed by the second smallest node belongs to actor B13. Small nodes indicate a better level of closeness centrality. That is, C1 and B13 actors have a high degree of closeness and are also the most trustworthy by other actors in the communication network regarding the conversion and maintenance of organic management of organic rice. In addition to closeness centrality, communication networks can also be described in the sociogram betweenness centrality as follows:



Source: Primary Data Analysis, 2021

Fig. 4. Sociogram *Betweenness Centrality Conversion and Maintenance of Organic Rice Management*

Based on Figure 4, it can be seen that actor C1 has the largest node, followed by node belonging to actor B13. It is known that C1 actors are Agriculture Extension Worker, which has a role as a bridge of information between actors in the group. Therefore, the C1 actor has the largest node. Meanwhile, B13 actors have the second largest node because B13 actors also have a role as a bridge of information between actors. This is in accordance with the role of the B13 actor as Chairman of Farmer Group Association as well as the initiator of organic farming in Sidomulyo.

Communication Network Structure for Prevention of Organic Rice Contamination in Farmer Group Association Sidomulyo Sleman Regency.



Source: Primary Data Analysis, 2021

Fig. 5. Sociogram Communication Network for Prevention of Organic Rice Contamination

Table 5. Results of System Level Analysis of Communication Network for Prevention of Organic Rice Contamination

Structure and Character	Value
Density	0.113
Reciprocity	0.129

Source: Primary Data Analysis, 2021

Based on Figure 5, it can be seen that there are some actors who do not have any links to other actors, namely actors B2, B10, B11, and B15. These four actors are called isolates. The reason why the four actors became isolated actors is because the four are association administrators who are not directly related to efforts to prevent organic rice contamination, so there is no information entering or exiting. In addition to the four isolate actors, there are also three actors who are outside the center of the network. The actors each have only one link, namely actors B8 to B6 and B8 to B9.

The seven actors did not exchange information related to preventing organic rice contamination with other actors in the network center. The seven actors have the same letter code, namely code B. Code B represents the identity of the actor as the administrator of the association. There is no information coming in or out of these actors (except from B8 to B6 and B8 to B9) because not all association administrators directly cultivate organic rice. Some of them even make farmers as a side job.

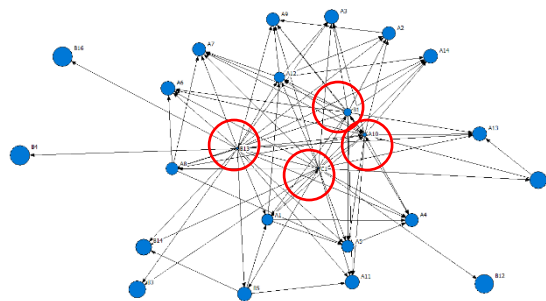
Density describes the intensity between network members in interacting. A network that has a high density is a network whose members interact with each other. Based on Table 5, the density formed is 0.113 or 11.3%. The density of 11.3% is low because it is far from the maximum value of 100%. The type of tissue formed also includes large size, so it is less cohesive or less tightly. This is because only certain actors provide information to other actors in the network.



Source: Primary Data Analysis, 2021

Fig. 6. Sociogram of Centralized Communication for Prevention of Organic Rice Contamination

Based on Figure 6, it can be seen that the largest node is indicated by *nodes* belonging to actors C1 and B13. Actor C1 is a Field Agricultural Extension Officer who accompanies Farmer Group Association Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. Both actors are at the center of the network and have *the largest* node than other actors' *nodes*. This indicates that these actors are key actors in the communication network of conversion and maintenance of organic rice management. In addition to *density* and *reciprocity*, network characteristics can also be known at the actor analysis level. Here is a sociogram of actor analysis that includes *closeness centrality* and *betweenness centrality*.



Source: Primary Data Analysis, 2021

Fig. 7. Sociogram *Closeness Centrality* Prevention of Organic Rice Contamination

After elimination of isolate actors, a more representative Closeness Centrality sociogram was obtained. Based on Figure 7, it can be seen that the new sociogram of closeness centrality of organic rice contamination prevention (b) shows changes in node size. In the new sociogram, it is known that the smallest node belongs to the C1 actor followed by the next small node which is B13, A10, B1, and A12. Meanwhile, the other nodes look almost the same size.

Based on the sociogram, it is successively known that actors C1, B13, A10, B1, and A12 have a high level of closeness to other actors in the communication network regarding the prevention of organic rice contamination. The five actors who have a high level of closeness centrality are known to be active actors in the group. Actor C1 is Agriculture Extension Worker Sidomulyo, actor B13 is the Chairman of Farmer Group Association Sidomulyo, Actor A10 is the Chairman of the Sri Rejeki Farmer Group, Actor B1 is the Chairman of the Sidomulyo Farmer Group, and actor A12 is the Chairman of the Sri Rejeki Farmer Group in the previous period. Based on this information, it is known that there are several important actors who have high close relationships as well as are most easily trusted by other actors in terms of disseminating information regarding the prevention of organic rice contamination. This is because the discussion on contamination prevention which includes banning the use of non-organic fertilizers, prohibiting the use of non-organic pesticides, and water contamination is widely discussed and highly considered by the management of the Sidomulyo Association and organic rice farmers. In addition to closeness centrality, communication networks can also be described in the sociogram betweenness centrality as follows:



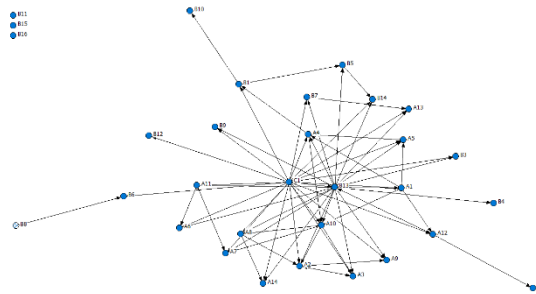
Source: Primary Data Analysis, 2021

Fig. 8. Sociogram *Betweenness Centrality* Prevention of Organic Rice Contamination

Based on Figure 8, it can be seen that actor B13 has the largest node, followed by nodes belonging to actors C1, A10, B1, and A12. It is known that actor B13 is the Chairman of Farmer Group Association as well as the initial initiator of organic rice cultivation in Farmer Group Association Sidomulyo. B13 actors have a role as a bridge of information between actors in the group. Therefore, B13 actors have the largest nodes. Meanwhile, actors C1, A10, B1, and A12 also have nodes that look quite large. This is due to their important position in the Sidomulyo Association, so

that the actor also bridges information about preventing organic rice contamination for other actors.

Communication Network Structure for Selection of Organic Rice Plants and Varieties in Farmer Group Association Sidomulyo Sleman Regency.



Source: Primary Data Analysis, 2021

Fig. 9. Sociogram Communication Network for Selection of Organic Rice Plants and Varieties

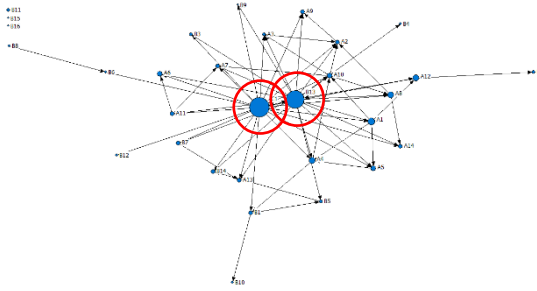
Table 6. Results of System Level Analysis Communication Network Selection of Organic Rice Plants and Varieties

Structure and Character	Value
Density	0.083
Reciprocity	0.088

Source: Primary Data Analysis, 2021

Based on Figure 9, it is known that there are some actors who do not have any links to other actors, namely actors B11, B15, and B16. These three actors are called *insulates*. The reason why the three actors became *isolate actors* is because all three of them are association administrators who are not directly related to efforts to select organic rice plants and varieties, so there is no information that enters or exits.

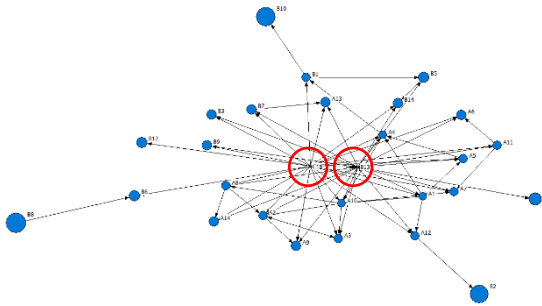
Density describes the intensity between network members in interacting. A network that has a high density is a network whose members interact with each other. Based on Table 6, the density formed is 0.083 or 8.3%. The density of 8.3% is low because it is far from the maximum value of 100%. The type of tissue formed also includes large size, so it is less cohesive or less tightly. This is because only certain actors provide information to other actors in the network.



Source: Primary Data Analysis, 2021

Fig. 10. Sociogram Centralization of Communication Network for Selection of Organic Rice Crops and Varieties

Based on Figure 10, it can be seen that the largest node is indicated by *nodes* belonging to actors C1 and B13. Actor C1 is a Field Agricultural Extension Officer who accompanies Farmer Group Association Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. Both actors are at the center of the network and have *the largest* node than other actors' *nodes*. This indicates that these actors are key actors in the communication network for selecting organic rice plants and varieties. In addition to *density* and *reciprocity*, network characteristics can also be known at the actor analysis level. Here is a sociogram of actor analysis that includes closeness centrality *and* betweenness centrality.

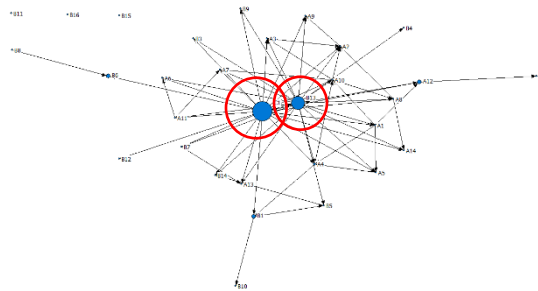


Source: Primary Data Analysis, 2021

Fig. 11. Sociogram *Closeness Centrality* Selection of Organic Rice Plants and Varieties (b)

After elimination of isolate actors, a more representative Closeness Centrality sociogram was obtained. Based on Figure 11, it can be seen that the sociogram of closeness centrality of the selection of new organic rice plants and varieties (b) shows changes in node size. In the new sociogram, it is known that the smallest node belongs to the C1 actor followed by the next small node, B13. Meanwhile, the other nodes look almost the same size.

Based on the sociogram, it is known that C1 actors and B13 actors have a high level of closeness to other actors in the communication network regarding the selection of organic rice plants and varieties. Both actors who have a high level of closeness centrality are known to be active actors in the group. Actor C1 is Agriculture Extension Worker in Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo. Based on this information, it is known that these two are the actors who are the easiest to contact and the most trusted by other actors in the network. In addition to closeness centrality, communication networks can also be described in the sociogram betweenness centrality as follows:

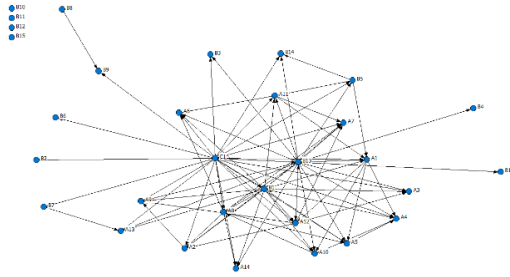


Source: Primary Data Analysis, 2021

Fig. 12. Sociogram *Betweenness Centrality* Selection of Organic Rice Plants and Varieties

Based on Figure 12, it can be seen that actor C1 has the largest node, followed by *node* belonging to actor B13. Actor C1 is a Field Agricultural Extension Officer while actor B13 is the Chairman of Farmer Group Association as well as the initial initiator of organic rice cultivation in Farmer Group Association Sidomulyo. Information regarding the selection of organic rice plants and varieties is important to convey to farmers because it affects the production of organic rice that will be produced by Farmer Group Association Sidomulyo. Therefore, the role of actors as a bridge of information between actors is important. Actors who bridge information must be actors who are easily met by other actors and honest in providing information (no manipulation of information). These characteristics are found in B13 and C1 actors. Based on this, it can be said that both have a role as a bridge of information about the selection of organic rice plants and varieties for other actors in the network.

Communication Network Structure For Management Of Organic Rice OPT (Plant Disease Organisms) In Farmer Group Association Sidomulyo Sleman Regency.



Source: Primary Data Analysis, 2021

Fig. 13. Sociogram of Communication Network for Management of Organic Rice Pest (Plant Disease Organisms)

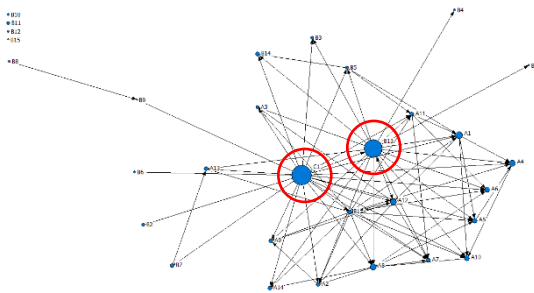
Table 7. Results of System Level Analysis of Communication Network for Organic Rice Pest Management

Structure and Character	Value
Density	0.103
Reciprocity	0.103

Source: Primary Data Analysis, 2021

Based on Figure 13, it is known that there are some actors who do not have any links to other actors, namely actors B10, B11, B12, and B15. These four actors are called isolates. The reason why the four actors became *isolated* actors is because the four are association administrators who are not directly related to the management of pests (Plant Disease Organisms), so that no information enters or exits.

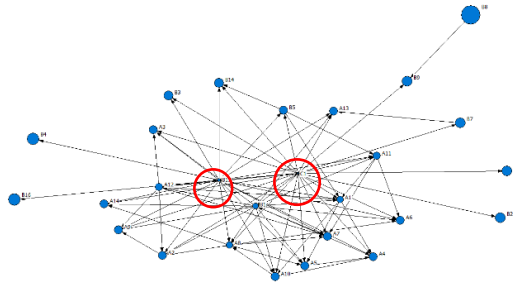
Density describes the intensity between network members in interacting. A network that has a high density is a network whose members interact with each other. Based on Table 7., the density formed is 0.103 or 10.3%. The density of 10.3% is low because it is far from the maximum value of 100%. The type of tissue formed also includes large size, so it is less cohesive or less tightly. This is because only certain actors provide information to other actors in the network.



Source: Primary Data Analysis, 2021

Fig. 14. Sociogram Centralization of Communication Network Management of Organic Rice Pest (Plant Disease Organisms)

Based on Figure 14, it can be seen that the largest node is indicated by *nodes* belonging to actors C1 and B13. Actor C1 is a Field Agricultural Extension Officer who accompanies Farmer Group Association Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. Both actors are at the center of the network and have *the largest* node than other actors' *nodes*. This indicates that these actors are key actors in the communication network for organic rice pest (Plant Disease Organisms) management. In addition to *density* and *reciprocity*, network characteristics can also be known at the actor analysis level. Here is a sociogram of actor analysis that includes closeness centrality *and* betweenness centrality.

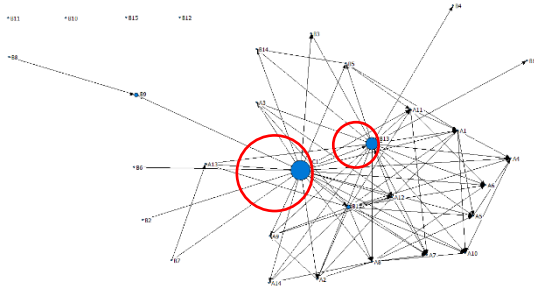


Source: Primary Data Analysis, 2021

Fig. 15. Sociogram *Closeness Centrality* Management of Organic Rice Pest (Plant Disease Organisms)

After elimination of isolate actors, a more representative *Closeness Centrality* sociogram was obtained. Based on Figure 15, it can be seen that the sociogram of *closeness centrality* of the management of new organic rice pests shows changes in *node* size. In the new sociogram, it is known that *the* smallest node belongs to the C1 actor followed by the next small node, B13. Meanwhile, the other *nodes* look almost the same size.

Based on the sociogram, it is known that C1 and B13 actors have a high level of closeness to other actors in the communication network regarding the management of organic rice pests. The three actors who have a high level of closeness centrality are known to be active actors in the group. Actor C1 is Agriculture Extension Worker in Sidomulyo while actor B13 is the Chairman of Farmer Group Association Sidomulyo. Based on this information, it is known that these two are the actors who are the easiest to contact and also the most trustworthy by other actors. In addition to closeness centrality, communication networks can also be described in the sociogram betweenness centrality as follows:

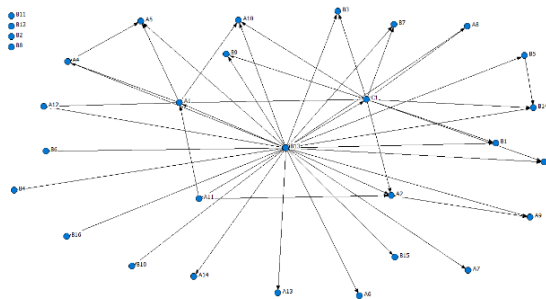


Source: Primary Data Analysis, 2021

Fig. 16. Sociogram *Betweenness Centrality* Management of Organic Rice Pest (Plant Disease Organisms)

Based on Figure 16, it can be seen that actor C1 has the largest node, followed by nodes belonging to actors B13 and B1. It is known that actor C1 is a Field Agricultural Extension Officer while actor B13 is the Chairman of Farmer Group Association as well as the initial initiator of organic rice cultivation in Farmer Group Association Sidomulyo, and actor B1 is the Chairman of Farmer Group Association Sidomulyo. All three occupy an important position in the Sidomulyo Farmer Group Association, so they have a role as a bridge of information on the management of large organic rice pests.

Communication Network Structure of Organic Rice Certification in Farmer Group Association Sidomulyo Sleman Regency.



Source: Primary Data Analysis, 2021

Fig. 17. Sociogram Communication Network Organic Rice Certification

Table 8. Results of System Level Analysis of Communication Network Organic Rice Certification

Structure and Character	Value
Density	0,063
Reciprocity	0,163

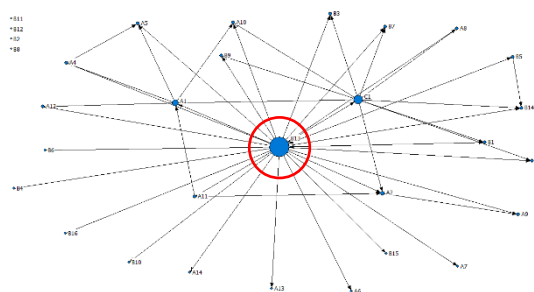
Source: Primary Data Analysis, 2021

Based on Figure 17, it is known that there are some actors who do not have any links to other actors, namely actors B2, B8, B11, and B12. These four actors are called isolates. The reason why the four actors became *isolated* actors is because the four are association administrators who are not directly related to organic rice certification, so there is no information entering or exiting.

Density describes the intensity between network members in interacting. A network that has a high density is a network whose members interact with each other. Based on Table 8, the density formed is 0.063 or 6.3%. The density of 6.3% is the lowest network density compared to the density of other networks, so it is a low density because it is far from the maximum value of 100%. The type of tissue formed includes large size.

This network regarding organic rice certification is less cohesive or less close. This is because only certain actors provide and receive information about organic rice certification. Information about certification is rarely received by organic rice farmers in general because they are not directly involved in the certification process, especially during visits Organic Certification Bodies. Only a few farmers know this information, for example organic rice farmers who act as administrators of the Sri Rejeki Farmer Group. Likewise, the management of the Sidomulyo Association. Not all information regarding certification is known to the management of the Sidomulyo Association because there is already a specific division of duties among the management of the Sidomulyo Association. Information about certification is more widely known by actors who are directly related to certification, such as the Chairman of Farmer Group Association Sidomulyo and ICS (*Internal Control System*) organic rice.

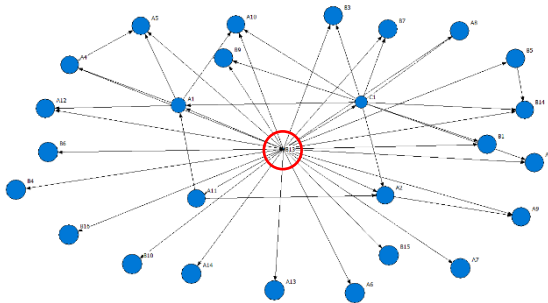
If connected with the concept of *semi-corporate farming*, Farmer Group Association Sidomulyo is a representation of the concept. It is known that there are two fundamental roles, namely manager and worker. The managers in question are actors who handle operational and administrative matters. The responsibility of the manager in the group is greater than that of the worker in charge of cultivating organic rice and following what is asked by the manager. In the organic rice certification communication network, the actor who acts as a manager is actor B13 as the chairman of Farmer Group Association Sidomulyo.



Source: Primary Data Analysis, 2021

Fig. 18. Sociogram Centralization of Communication Network Organic Rice Certification

Based on Figure 18, it can be seen that *the* largest node is indicated by the *node* belonging to actor B13. The B13 actor is the Chairman of Farmer Group Association Sidomulyo as well as the initiator of organic farming in Farmer Group Association Sidomulyo. The actor is at the center of the network and has *the largest node* than the *nodes* belonging to other actors. The actor is a key actor in the organic rice certification network because the B13 actor is one of the initiators of organic farming in Sidomulyo. B13 actors also deal a lot with Organic Certification Bodies, so all information comes from and is centralized in B13 actors. In addition to *density* and *reciprocity*, network characteristics can also be known at the actor analysis level. Here is a sociogram of actor analysis that includes *closeness centrality* and *betweenness centrality*.

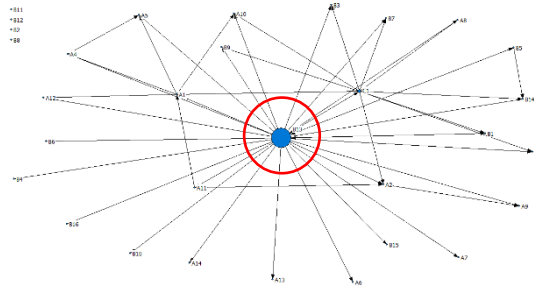


Source: Primary Data Analysis, 2021

Fig. 19. Sociogram *Closeness Centrality* Organic Rice Certification

After elimination of isolate actors, a more representative *Closeness Centrality* sociogram was obtained. Based on Figure 19, it can be seen that the sociogram of *closeness centrality* shows changes in *node size*. In the new sociogram, it is known that the *smallest node* belongs to the actor B1. Meanwhile, the other *nodes* look almost the same size.

Based on the sociogram, it is known that B1 actors have a high level of closeness to other actors in the communication network regarding organic rice certification. Actor B1 is the Chairman of Farmer Group Association who has a high level of *closeness centrality* because the actor is the actor who deals with organic rice certification the most and the most trusted actor compared to other actors. Therefore, if there are actors who want to know information about organic rice certification, they can directly contact B13 actors. In addition to *closeness centrality*, *communication networks* can also be described in the sociogram *betweenness centrality* as follows.



Source: Primary Data Analysis, 2021

Fig. 20. Sociogram *Betweenness Centrality* Organic Rice Certification

Based on Figure 20, it can be seen that actor B13 has the largest node. It is known that actor B1 is the Chairman of Farmer Group Association as well as the initial initiator of organic rice cultivation in Farmer Group Association Sidomulyo. B13 actors occupy an important position in managing organic rice certification, so that B13 actors have a role as a bridge of information between actors in the Sidomulyo Association.

In communication network analysis, the centrality of actors depicted by node size is an important component [13]. Network characteristics in the form of the largest value or largest *node* of *centralization*, *closeness centrality*, and *betweenness centrality* can be used to find key actors. *Centralization* indicates the centralization of the network on an actor. *Closeness centrality* shows the closeness of an actor with other actors in the network. *Betweenness centrality* shows the position of actors as intermediaries between actors in the network. So, based on the analysis of the structure of the communication network that has been carried out, it can be known the key actors in each network. Then, each of these networks will be made into one large network. The large network is a combination of organic management conversion and maintenance communication network (Network 1), contamination prevention communication network (Network 2), plant and variety selection communication network (Network 3), pest management communication network (Plant Disease Organisms) (Network 4), and organic rice certification communication network (Network 5). The key actors in such networks can be summarized in the following table:

Table 9. Key Actors on Each Network

Characteristic	Network 1	Network 2	Network 3	Network 4	Network 5
<i>Centralization</i>	C1, B13	C1, B13	C1, B13	C1, B13	B13
<i>Closeness centrality</i>	C1, B13	C1, B13, A10, B1, A12	C1, B13	C1, B13	B13
<i>Betweenness centrality</i>	C1, B13	B13, C1, A10, B1	C1, B13	C1, B13	B13

Source: Primary Data Analysis, 2021

Based on Table 9, it can be seen that from Network 1 to Network 4, the actors who play a big role are C1 and B13 actors. Meanwhile, on Network 5 the actor who plays a big role is the B13 actor. These results show that if there is an innovation or important information, then the dissemination of information regarding conversion communication and maintenance of organic management (Network 1), contamination prevention (Network 2), selection of plants and varieties (Network 3), and management of pests (Plant Disease Organisms) (Network 4), can be assisted by C1 and B13 actors. Meanwhile, if there is innovation or important information regarding organic rice certification, then the dissemination of information can be assisted by B13 actors. Networks that tend to be centered on B13 and C1 actors facilitate the dissemination of information because there will be key actors who are highly trusted by other actors, so they do not need to confirm information to other actors (Fikri, Rahmanto, & Suparno, 2020).

The hierarchical position of actor B13 as Chairman of Farmer Group Association and actor C1 as Agriculture Extension Worker is also the reason why these two actors act as network centers. The higher the hierarchy of an actor, the higher the likelihood of the actor providing information to other actors (JK, 2017).

In agriculture, information exchange between farmers is an important factor in the application of agricultural innovation. This statement is in accordance with research (Hendrawati, Yurisntae, & Radian, 2014). Similarly, in the process of organic rice production, information exchange is important because if there is no exchange of information, then the innovation of organic rice cultivation and the certification process will not run smoothly.

4 Conclusion

The exchange of information in the organic rice production process in Farmer Group Association Sidomulyo Sleman Regency is mostly carried out directly through group meetings. The mechanism of exchanging information can be known by looking at the value of *indegree*, *outdegree*, and *distance*.

- a) In the communication network of conversion and maintenance of organic rice management, *the maximum indegree* is owned by the Chairman of the Sri Rejeki Farmer Group, while the maximum *outdegree* is owned by Agricultural Extension Worker.
- b) In the communication network for preventing organic rice contamination, *the maximum indegree* is owned by the Chairman of the Sri Rejeki Farmer Group, while the maximum *outdegree* is owned by the Chairman Farmer Group Association Sidomulyo.
- c) In the communication network for selecting organic rice plants and varieties, *the maximum indegree* is owned by A2, namely organic rice farmers who are actively seeking information, while the maximum *outdegree* is owned by Agriculture Extension Worker actors.
- d) In the communication network for the management of organic rice pest (Plant Disease Organisms), *the maximum indegree* is owned by A2, namely organic rice

farmers who actively seek information, while the maximum *outdegree* is owned by Agriculture Extension Worker.

- e) In the organic rice certification communication *network*, the number of *indegree* actors in the network is not much different, while the maximum *outdegree* is owned by the Chairman of Farmer Group Association Sidomulyo.

In network 1 to network 4, the actors who play a big role are Agriculture Extension Worker and Farmer Group Association Chairman Sidomulyo. While in Network 5 the actor who plays a big role is the Chairman of Farmer Group Association Sidomulyo. If there is an innovation or important information, then the dissemination of information can be assisted by Agriculture Extension Worker and the Chairman of Farmer Group Association Sidomulyo. In addition to innovation or important information regarding organic rice certification, the dissemination of information can be assisted by the actor of the Chairman of Farmer Group Association Sidomulyo.

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