



Extension Communication Network in Innovation Adoption Rice in Tanah Datar Regency, West Sumatra Province

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ABSTRACT

The development of salibu rice is a flagship program in Tanah Datar Regency. Extension workers, as the spearhead, play an important role in the dissemination of salibu rice technology innovations. The lack of the spread of Salibu rice technology innovations in Tanah Datar Regency is allegedly due to the uneven knowledge and skills of extension workers about salibu rice technology innovations. For this reason, this study focuses on extension communication networks in Tanah Datar Regency. The research was carried out using the survey method, the determination of respondents was carried out by a census of 37 extension workers in Tanah Datar Regency, and data analysis was conducted using the Ucinet VI program. The study results show that the sociogram of the communication network regarding the adoption of salibu rice cultivation innovations in Tanah Datar Regency is a *radial personal network* that is open to the environment, but has low cohesiveness. Actors who play a role in local and global and betweenness centrality in the cultivation network in Tanah Datar Regency are played by extension coordinators. This indicates that the development of salibu rice technology innovations is open to farmers and communities outside Tanah Datar Regency, in addition to the fact that the extension coordinator is highly responsible for disseminating the salibu rice technology innovation.

Keywords:

INTRODUCTION

Extension workers play an important role in disseminating salibu rice technology innovations in Tanah Datar Regency. The development of salibu rice technology innovations invented by BPTP West Sumatra makes salibu rice one of the alternatives in developing paddy rice in West Sumatra Province. The main task of extension workers is to accelerate the dissemination of agricultural innovations, besides that it also functions for the socio-economic development of farmers, accessibility to agricultural information, accessibility to capital, infrastructure, markets and adoption of agricultural innovations as well as increasing the competitiveness of farmers in the development of agribusiness systems (Suradisastra, 2008; Anantanyu et al., 2009). Socio-technically, extension workers play a role in empowering farmers, farmer organizations, farmer groups, or farmer cooperatives; and creating networks (communication networks, cooperation networks, and business networks) between farmer groups, farmer groups, and or farmer cooperatives with supporting institutions and agricultural information resources (Setiawan, 2012). The social structure in a system or organization can explain the effectiveness of extension workers' performance, which will be better if done together. In addition to the social structure, the communication structure is also considered one of the determining factors for the performance of extension workers, in this case, the institution of extension workers (Roger & Kincaid, 1981).

In the context of communication patterns, organizational management is closely related to the organization's climate and the work culture of its members. This conception places the thoughts, feelings, interests, and choices of human actions that support the organization as its central focus so that it is possible for each organizational activity to be part of the totality of its life (Borgatti & Foster, 2003). For this reason, it is necessary to build a communication network within extension institutions to accelerate the dissemination of agricultural innovations (Pakpahan, 2004). It has been proven in developed countries that farmer organizations have made progress in agriculture. Through Rangkuti's research (2009), it was proven that adopting agricultural technology innovations is more effective with the existence of communication networks, because through communication networks between individuals and groups, there is a knowledge sharing process between extension workers.

Salibu rice cultivation is a local wisdom developed in West Sumatra, which is carried out to increase farmers' income due to low production costs. Salibu rice cultivation activities are a system that requires coordination, synchronization, and support from all relevant stakeholders or the community, from planning to implementation and supervision (Azahari, 2005). Based on the description above, this study analyzes extension communication networks in the salibu rice development program. Robins (2003) stated that communication networks are vertical and horizontal dimensions in organizational communication that are combined in various patterns. According to Rogers and Kincaid (1981), there are five levels of unit analysis in communication networks, which include: (1) individuals, (2) personal communication networks, (3) dyadic relationships, (4) clicks, and (5) systems (networks). The analysis of communication networks that continue to develop, according to Jensen (2003), is also known as the Total Network System, which consists of communication patterns among all individuals in the system, as in an organization. This network is made up of thousands of individuals in a large organization. Like Rogers and Kincaid (1981), Jensen (2003) also stated that a communication network at the click level is a system element that interacts with other elements. Typically, clicks consist of 5-25 members (some can be larger). Therefore, clicks are one of the main components of an organization's communication network. Furthermore, Jensen (2003) also explains that personal networks are defined as people who are interconnected by patterned communication that flows to each individual. In this regard, each individual has a personal network of people with whom he or she interacts consistently and communicates on specific topics. Thus, each individual has a communication environment, and this private network can partially explain the individual's behavior.

Scott (2010) also added several indicators that can be used in analyzing communication networks. One of the indicators of the network can be seen from several degrees of measurement, namely centrality. Centrality is divided into three, namely, local centrality, global centrality, and betweenness centrality. Local centrality is the degree to which an individual relates to another individual in a system. Local centrality indicates the number of relationships that an individual can make with other individuals in a certain system. According to Freeman in Scott (2000), local centrality can be relative. This will be especially important if the group size is not the same. Local centrality pays attention to the relative superiority of the individual in his or her closest relationship.

Freeman in Scott (2000) proposed a measurement of global centrality based on the term "closeness" of individuals. Freeman's measurement of global centrality is expressed in terms of "distance" among diverse individuals. Global centrality pays attention to the advantages of individuals with the entire network. The global centrality value indicates the number of bonds one needs to contact all the individuals in the network. The smaller the value of global centrality indicates the easier it is for one to contact all the individuals in the network.

Freeman in Scott (2000) added that betweenness is centrality that measures the extent to which a particular individual is located among other individuals in a network. Freeman further said that the concept of betweenness centrality refers to the level of frequency of an individual who is among individuals who are in contact in one line of communication.

Based on the explanation and description mentioned above, the research problem that is being answered in this study is: What is the communication structure in salibu rice cultivation? What is the role of actors in communication networks, as well as what factors are related to communication networks?

METHODS

The research was carried out in Tanah Datar Regency. Data collection was conducted from July to August 2020. The research analysis unit is the Salibu Rice Extension Officer. The determination of the respondent sample used the purposive sampling technique, which was taken deliberately. The respondents used as samples were Salibu Rice extension workers in Tanah Datar Regency

To map the communication network, respondents were taken using the "sampling intact system" technique by census (Rogers & Kincaid, 1981). With an "intact system", all individuals who become rice extension workers are within a social system. The sociometric analysis and communication networks used in this study were to see:

1. Communication structure, an analysis to see the relationship patterns and roles of salibu rice extension workers in the communication network.
2. Communication network, to describe the interaction between salibu rice extension workers related to efforts to obtain and provide information about salibu rice cultivation. From the data obtained, it will be possible to see the degree of local *centrality*, the degree of *global centrality*, and the centrality of togetherness (*betweenness centrality*).
 - a. Local centrality is a degree that indicates how well a particular individual is connected in his or her immediate environment. This degree indicates the maximum number of relationships that a particular individual is able to make with other individuals in his or her immediate environment, using UCINET VI, the degree of local centrality is obtained through a "*normalized degree of centrality*" or "*centrality degree*". Local centrality values are obtained through *network>centrality>degree*. The data obtained is ratio scale data.
 - b. Global centrality is a degree that indicates how far a particular individual must travel to contact all individuals in the system. This degree shows the ability of individuals to be able to contact all individuals in the system, using UCINET VI software, the value of global centrality is obtained through "*centrality closeness*" which is obtained through *network>centrality>closeness*. The data obtained is ratio scale data.
 - c. Betweenness centrality is the frequency with which an individual makes a connection with one click among other clicks. This degree indicates the ability of an individual to be a liaison between one actor and another in a network. Using UCINET VI the value of betweenness is obtained through *network>centrality and power>betweenness*. The data obtained is ratio scale data.

RESULTS AND DISCUSSION

Analysis of communication networks at the individual level in the study to see the local centrality, global centrality, and betweenness of salibu rice extension workers in Tanah Datar Regency. According to Scott (2000), the degree of centrality measurement consists of the varying degrees of individuals in a sociogram that can show how well a particular individual is connected to their environment. Centrality measurement can also be used to measure a person's excellence in the system. The average, maximum, minimum index of local centrality, global centrality and betweenness of respondents based on the topic of communication networks regarding salibu rice cultivation can be clearly seen in Table 1.

Table 1. Average, maximum, minimum index of local centrality, global centrality and betweenness based on the topic of communication network regarding salibu rice cultivation

Value	Communication Network Index of Padi Salibu Cultivation		
	Local centrality	Global centrality	Betweenness
Rata-rata	2.0	145,522.0	214.2
Maksimum	10.0	146,306	12,016
Minimum	0.0	121,476	0.0

Local Centrality

Local centrality is the degree to which an individual relates to other individuals in the system. Local centrality indicates the number of relationships an individual can make with other individuals in the system. According to Freeman (1979) quoted by Scott (2000), local centrality can be relative. This will be especially important if the group size is not the same. *Local centrality* pays attention to the relative superiority of the individual who is the *star* in his or her closest neighborhood relationships. The value of local centrality indicates the number of relationships that individuals are able to make within their immediate environment. The individuals with the greatest local centrality value are discussed in the "*star*" concept and the individual with the smallest local centrality value is discussed in the "*isolate*" concept.

Based on Table 1, it can be seen that the average value of local centrality of salibu rice extension workers in salibu rice cultivation shows a figure of 2.0. This means that the average Salibu rice extension worker is able to contact two good people about Salibu rice cultivation. The maximum value of local centrality for cultivation is 10 and the minimum is 0. This means that the salibu rice extension workers are able to contact 10 people in a system. The highest local centrality value for cultivation is held by node 37. The actor is 51 years old, has a bachelor's education, has participated in salibu rice cultivation training 5 times, has experience in salibu rice cultivation for 13 years. The actor is an extension coordinator, he is an exemplary extension worker and has won many awards at the national level. The actor is a Salibu rice activist. With his achievements and experience that he often hones, the actor is the center of attention and the center of information about salibu rice cultivation.

There is 1 individual who has the lowest local centrality value or isolate in the cultivation network shown by node 16 is an extension worker who is on average 47 years old, graduated with a bachelor's degree, has participated in salibu rice cultivation training on average twice, has experience in salibu rice cultivation for 5 years.

Global Centrality

The measurement of global centrality is referred to in the term "*distance*" among diverse individuals. *Global centrality* or global centrality pays attention to the advantages of actors with the entire network. The global centrality value indicates the number of bonds one needs to contact all the individuals in the network. Global centrality can provide an overview of individual access capabilities within the system. Global centrality is needed as a consideration to choose the right people as the key disseminator of information (Scott 2000).

Based on the results in Table 1, the maximum value of global centrality of 146306 cultivation was obtained. The minimum value of global centrality of cultivation 121,476. The average value of global centrality for cultivation is 145,552.04. The individuals who have the greatest global centrality value for cultivation are indicated by node 32. This means that regarding cultivation, there is one individual who is the most difficult to contact all individuals who are members of the group communication network system.

The lowest global centrality is played by the same individual as the highest local centrality. This indicates that the individuals with the lowest global centrality values show the least *distance* that a person has to travel or travel to contact all other individuals in the group system. Individuals who have a low global centrality value are individuals who have the ability to reach all individuals in the communication network system. The individual plays the role of the key disseminating information. Individuals who play the role of disseminators of cultivation information are played by node 35.

Betweenness

Betweenness is a measurement of centrality that measures the extent to which a particular individual is located among other individuals in a network. According to Freeman (1978), the concept of betweenness refers to the level of frequency of an individual who is among individuals who are in contact in a line of communication. If a person is in a communication line that connects between individuals or clicks, then that individual has a central position. Individuals with high intermediary values have the potential to control communication who can play the potential as a broker or *gatekeeper* in a network. Other individuals will become dependent on him if the one who connects him with another person has to pass through that individual.

From Table 1 it can be observed that the maximum value of betweenness among salibu rice extension workers in cultivation is 12016 and the minimum is 0. The individual with the maximum betweenness value for cultivation is 35 nodes. The 35 individuals are extension coordinators and rice activists

The position of these two individuals who have a high betweenness value is very strong because they are able to connect between individuals in the cultivation network system. This situation causes them to be contacted by many other individuals so that their position becomes a liaison between individuals in the communication network of salibu rice farmers.

Factors influencing communication networks in the Adoption of Salibu Rice Innovation

A significant factor influencing the communication network of salibu rice cultivation extension workers in Tanah Datar Regency is the availability of information about salibu rice and the support of supporting institutions.

The reliving of information about cultivation is very real and positive with local centrality. The Pearson correlation index between the relevance of information about aquaculture to local centrality is -0.257^{**} and -0.389^{**} . This means that the more relevant information about salibu rice cultivation received by extension workers, the lower the communication relationship made by salibu rice cultivators in their immediate environment. This means that extension workers who obtain relevant information about cultivation are extension workers who have weak skills in building communication with other extension workers in the group. This is because the extension worker is satisfied with the information he receives, so there is no need to have a relationship with other extension workers.

The relationship between the availability of information and the communication network of salibu rice cultivation in Tanah Datar Regency can be seen in Table 2.

Table 2. The relationship between information availability and the communication network of salibu rice cultivation in Tanah Datar Regency

		Salibu Rice Cultivation Communication Network		
		Local Centrality	Global Centrality	Betweenness centrality
Availability of Information				
1	Relevance of Information	-0.257**	0.119	-0.095
2	Completeness of Information	-0.123	0.114	-0.093
3	Sharpness of Information	0.055	0.317**	0.069
4	Timeliness	0.008	0.183*	-0.173*
5	Representational Information	-0.172*	0.134	-0.174*
Supporting from Institutional Support				
1	Agriculture Office	-0.063	0.106	-0.063
2	NGO	-0.117	-0.322**	0.029
3	Cooperative institutions	-0.234**	-0.515**	-0.092

The sharpness of information about salibu rice cultivation is very real and positively related to global centrality. The Pearson correlation index between the sharpness of information and global centrality regarding cultivation is 0.317**, this means that the deeper the information received by the extension worker about cultivation, the shorter the "distance" that the salibu rice extension worker must travel to contact all extension workers in his group. This means that the sharper/deeper the information that the extension workers have, the higher the ability of the salibu rice extension workers to contact all other extension workers. This happens because extension workers who have sharp/in-depth information have independence in accessing the information sources needed. They are able to access the information they need both with their immediate environment and with the wider environment or outside the system. This situation allows for rice extension workers to have a short distance to contact other rice extension workers, the shorter the distance to contact someone, the easier communication can take place with other individuals in their environment.

The timeliness of information about cultivation is tangible and positively related to global centrality. The correlation index between the timeliness of cultivation and global centrality was 0.183*. This index value shows that the more timely the information received by extension workers about salibu rice cultivation, the shorter the "distance" that extension workers must travel to contact all extension workers in their environment. This happens because rice extension workers who have timely information have the ability to access information when needed. They are able to access the information they need both with their immediate environment and in a wider environment or outside the system. This situation makes it possible for rice extension workers to have a close distance from other extension workers.

The timeliness and representativeness of information regarding cultivation are related to the real and negative relationship with the centrality of betweenness. The Pearson correlation index between the timeliness and representation of information regarding cultivation with betweenness centrality is -0.173* and -0.174*. This index value means that the more timely the information received and the more represented the information received, the lower the togetherness. In other words, the more timely the information on salibu rice cultivation and the representation of all cultivation information, the lower the ability of extension workers to make relationships and become liaisons with various parties. This happens because extension workers are able to find the information they need and the information already represents the information they need, so they don't need to contact others to fulfill the information they need.

The results of the Pearson correlation test showed that there was a real and positive relationship between extension worker support and local centrality regarding cultivation. The Pearson correlation index between extension workers' support and local centrality regarding cultivation is 0.183*, which means that the higher the support of the Agriculture Office, the higher the communication relationship made by rice extension workers in their immediate environment. This means that the high support of the Agriculture Office can increase the ability of salibu rice extension workers to build a lot of communication with other extension workers.

CONCLUSION

The sociogram of the communication network regarding salibu rice cultivation in Tanah Datar Regency is a *radial personal network* that is open to the environment, but low cohesiveness. Actors who play a role in local centrality, global centrality, and betweenness in the cultivation network in Tanah Datar Regency are played by extension coordinators. Factors related to communication networks are the availability of information and supporting institutional support. The availability of information that affects information relevance, information sharpness, timeliness and information representation. Meanwhile, the support needed is NGOs and cooperatives.

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REFERENCES

- Anantanyu S. 2009. Faktor-faktor yang mempengaruhi efektivitas kelembagaan petani. *J Penyuluhan* 5(1): 81-91.
- Jensen MT. 2003. *Organizational Communication; A Review*. Norwegia (NO). Agderforskining.
- Rogers EM, Kincaid DL. 1981. *Communication Networks: Toward a New Paradigm for Research*. New York (US): The Free Press.
- Setiawan I. 2012. *Dinamika Pemberdayaan Petani: Sebuah Refleksi dan Generalisasi Kasus di Jawa Barat*. Bandung (ID). Widya Padjadjaran.
- Suradisastra K. 2008. Strategi pemberdayaan kelembagaan petani. *Forum Penelitian Agro Ekonomi*.
- Pakpahan A. 2004. *Mengapa Kita Tertinggal? Karena Kita Lalai akan Dinamika dan Kekuatan Rakyat*. Majalah Analisis Kebijakan Pertanian (Agricultural Policy Analysis). Bogor (ID): Pusat Penelitian dan Pengembangan Sosial Ekonomi Pertanian.
- Rangkuti PA. 2009. Analisis peran jaringan komunikasi petani dalam adopsi inovasi traktor tangan di Kabupaten Cianjur Jawa Barat. *J Agro Ekonomi* 27(1):45-60.
- Robins SP. 2003. *Organizational Behavior*. New York (US): Prentice Hall
- Scott. 2000. *Social Network Analysis: a hand book*. Second Edition. California: SAGE Publication Inc
- Scott. 2010. *Social Network Analysis: a hand book*. California (US): SAGE Publication Inc.