The Relationship of Fish Farmer Characteristics and Communication Network in Aquaculture Business at The Village of Indonesia

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Abstract. Communication network is an indicator of interaction between one person to another person or a society to another society. To see the form of interaction happened, a research had done about the correlation between fish farmers’ characteristics and communication network in aquaculture business at Koto Masjid village Kampar Regency, Riau Province, Indonesia. This research was done using survey method. The respondents were chosen from the members of partnership program by PT Telkom as many as 90 respondents. The result of the study showed that there is a significant correlation between fish farmers’ characteristics and communication network in aquaculture business. The relationship in this research states that in the interaction among fish farmers in running aquaculture business is affected by fish farmers’ individual characteristics, these matters make them comfortable to communicate to fulfill their needs in running aquaculture business.

1. Introduction

The characteristic of human resources and natural resources are evenly important, to use and run them we need knowledge about potency and circumstances along with them. Personal characteristics as internal factors will affect one’s ability to do their work. In this matter, include farmers, fishermen, and fish farmer in run the business.

In development activities, communication plays an important role to reach a success. The role of development communication had been talked by experts, in general they agreed that communication has an important role in development or society’s empowerment. [1] stated that development is the useful changes toward a social and economic system and decided as a will of a nation.

Community based development needs some efforts to built a good communication among society so that there will be interaction, communication which contains all kinds of development information, and also from the other side. [2] stated that to make a social relationship in communication web, every actor brings his own characteristics, so that entering and outing configuration of an actor in communication web will affect the interaction structure form. [3] stated that individual characteristics will determine or affect his communication attitude which can be seen from his mind set, attitude pattern, and act pattern toward his surrounding. Individual characteristics is a personal aspect including age, education level, and psychological characteristics.

Communication network plays a role in shaping individual’s knowledge perspective, because there is an interaction happened among person in one community. [4] said that network as a group of individual person organize it self together which has a basic rule willingly to exchange information, material, team work, and empowerment. Engel [5]
stated that networking as a process of result of social relation developed by some people to get certain purpose or target, the characteristics and the function are determined by the mission. Networking describes community’s idea, the base for a person to share ideas, interact each other, based on the same interest, believe in each other, so that the success of social networking is determined by social synergy.

Therefore, the group of fish farmers as a social network, plays an important role to support the members’ efforts. Patin fish farmers in Koto Masjid village absolutely done a lot of interaction. The interaction form communication network which give benefit and effect in fish farmers’ lives.

Some researches stated that fish farmer’s individual characteristics which has a significant correlation with communication network in corn cultivation bussiness are the farming experience, perception toward technology and cosmopolitan [6]. In addition, [7] said that individual characteristics has a significant effect on farmer’s communication network in the process of innovation technology adoption level for hand tractor. This showed that the higher education, the higher experience, the higher cosmopolitan of a farmer will make him tends to take a part in communication network. [8] also said that individual characteristics has a significant correlation with communication network in implementing cassava production technology. In the research individual characteristics limited by age, education level, farming experience, group gathering experience, and cosmopolitan level.

Based on the earlier explanation, a problem was defined that is how is the correlation between communication network and fish farmer’s charactereristics in aquaculture bussiness at Koto Masjid village Kampar regency. From the problem it is needed to know the correlation between communication network and fish farmer’s charateristics in their aquaculture bussiness.

2. Methodology

This research was conducted on December 2013 until May 2014, at the center of Patin (P. hypopthalmus) aquaculture area in ponds. The exact location was at Koto masjid village District XIII Koto Kampar, Riau province. This area was chosen because this area was appointed as a model area for the center of aquaculture bussiness in Riau province. In this place a program called empowerment activities supported by goverment and PT Telkom is done and it is granted as Corporate Social Responsibility (CSR) area and nominated for CSR Award in 2011.

In order to help to find social reality toward this research, a technique of purposive sampling which mean the respondents in this research are chosen in purpose, is used to know communication network among fish farmers. To mapping the communication network determined the respondents the group of fish farmers who are also the member of partner PT Telkom at Koto Masjid village XIII Koto Kampar as example unit. This example was taken using technique “sampling intact system” [2]. By using this “intact system” all individual person in society represented by each group of fish farmer as a social system is a respondent.

The population of this research is all members of Patin (P. hypothalamus) fish farmers in ponds who followed partnership program with PT Telkom in the period of 2009 and 2010 who got a grant as many as 90 fish farmers. The prime data collected is: fish farmer’s characteristic data, and communication network among fish farmers within production and marketing activities in aquaculture bussiness.

Data analysis method to answer each reseach purpose can be seen in the following table:
Table 1. Method and analysis tool for communication network

| The aim of research                                         | Method                        | Tools      |
|-----------------------------------------------------------|-------------------------------|------------|
| Analyse the individual fish farmer’s characteristics     | Descriptive analysis          | Excel 2007 |
| Analyze communication network about production and marketing aquaculture bussiness among fish farmers | Analysis of the individual role in communication that are: centralization, togetherness and connection | UCINET 6.612 |
| Analyze the correlation between fish farmers’ characteristics and communication network in aquaculture bussiness | Rank Spearman Correlation    | SPSS 17    |

3. Result and Discussion

3.1. The characteristics of Fish Farmers

3.1.1 Age of fish farmers

Based on the result of the research, the average age of fish farmers in Koto Mesjid is 42 years old. The range of the majority of the respondents of the research is between 27 to 58 years old, the youngest is 27 years old and only one person in the age of 66 years old. From this data, we can conclude that 99% of fish farmers are in productive age.

The research by [9] in Nigeria showed the same thing that the average age of fish farmers are in the age of forties (44 years old) and in Thailand the average age is 45 years old [9]. Age plays a major role in increasing someone’s ability in doing a business, in all aspects that are: cognitive, affective and physical skill. In cognitive aspect the age of 15 – 45 years old is the optimal age to absorb knowledge from outside [10]. Young people also have greater power than older person physically. In aquaculture business, a strong and powerful physic is needed to run the business especially in production aspect, started from preparing the pond, grooming and harvesting. The aquaculture business in Koto Mesjid village are mainly run by young people because it is profitable and need only short time to work in the pond.

3.1.2 Fish farmers’ Formal education

The level of fish farmers’ formal education in both Regencies catagorized in low level (56,1%), within 7 years. The same thing happened in Thailand [5]. Along with government program to obligate citizens to study 9 years, some of the fish farmers could not finish this program. Even 11,9 % fish farmers did not graduate from Elementary school (six years). Nevertheless, some fish farmers finish their undergraduate degree (2,9%). These fish farmers usually have another occupation as teacher or bussinessman.

Research findings from [9] in Nigeria showed that the level of formal education of fish farmers has implication to the production development through new technology adoption. To know the condition of internal characteristics from the fish farmers in Koto Mesjid village can be seen From the following table.
### Tabel 2. The characteristics of Fish farmers

| Personal characteristic | Categories          | Scoring categories | Amount | Percentage (%) |
|------------------------|---------------------|--------------------|--------|----------------|
| Age                    | Not productive      | > 65 years         | 1      | 1              |
|                        | Productive          | 17 – 65 years      | 89     | 99             |
| Means =42,96            | Not yet productive  | < 17 years         | 0      | 0              |
| Total                  |                     |                    | 90     | 100            |
| Formal education       | Low                 | 1 – 12 years       | 43     | 48             |
| Means = 12,5 th        | Middle              | 13 – 15 years      | 32     | 36             |
|                        | High                | >16 years          | 15     | 17             |
| Total                  |                     |                    | 90     | 100            |
| Income                 | Low                 | < 2.million        | 9      | 10             |
| Means = Rp.4.453750,-  | Middle              | 2 – 3.5 million    | 29     | 32             |
|                        | High                | >3.5 million       | 52     | 58             |
| Total                  |                     |                    | 90     | 100            |
| Family members         | Small               | < 4                | 56     | 62             |
| Means=4,41 jiwa        | Medium              | 4-6                | 13     | 14             |
|                        | Big                 | > 6                | 21     | 23             |
| Total                  |                     |                    | 90     | 100            |
| Experience             | Low                 | < 3 years          | 1      | 1              |
| Means= 10 years        | Moderat             | 3 s.d 6 years      | 11     | 12             |
|                        | High                | > 6 years          | 78     | 87             |
| Total                  |                     |                    | 90     | 100            |
| Pond size              | Small               | < 300 m            | 1      | 1              |
| Means = 1174 m         | Medium              | 300 - 600 m        | 49     | 54             |
|                        | Wide                | > 600 m            | 40     | 44             |
| Total                  |                     |                    | 90     | 100            |
| Working time           | Long time           | > 4 hours daily    | 5      | 6              |
| Means= 2,11 hours      | Enough              | 2 s.d 4 hours      | 85     | 94             |
|                        | A moment            | daily              | -      | -              |
|                        |                     | < 2 hours daily    | -      | -              |
| Total                  |                     |                    | 90     | 100            |

Source: Prime Data, 2014

#### 3.1.3 Job Experience

The fish farmers in average already run aquaculture bussiness within 10 years. Table 2 explains that most of the fish farmers (87%) have run the bussiness for long time, 12% have moderate experience and only one farmer just started the aquaculture bussiness. This data explain that fish farmers who become the building partners in Koto Mesjid with PT Telkom have enough experience to develop and to run aquaculture business in ponds. [11] said that someone’s experience influent his tendency to need and his readiness to receive new knowledge.

#### 3.1.4 Family members

In general, fish farmers (62%) have a small family members (less than four person). In average, a household in Koto Mesjid village has four family members. This was also happened in Nigeria that a household has 5 person in it [9].

#### 3.1.5 Income

In average, family income from a fish farmer monthly is around Rp. 4.453.750,- (4,5 millions). Based on the income catagory, most of the fish farmers (58%) are in high level. The high income is caused by the fish farmers have a lot of production factors such as pond
size and supporting financial by CSR PT Telkom. Fish farmers with a low income as many as 10% is caused by they don’t have enough production factors such as limited pond size. Correlated by Poverty measurement from [12] someone is categorized as absolute poor if his daily income less than US$ 1 and poor if his daily income less than US$2. Hence, fish farmers in Koto Mesjid live in prosperity life.

3.1.6 Pond Size
Pond size is categorized as a number of assets. In average pond size of fish farmers in Koto Mesjid is medium. If compared with Cianjur and Bogor’s pond size it is smaller [13]. But, it is still profitable.

Pond size is varied between 200 m, 400 m, 600 m, 800 m 100 m and 1500 m each pond size. If fish farmer has more than one ponds, they will be able to support to grow more seed. Pond that best handled will gain best product, and vice versa. Fish farmers who have wide pond size, generally higher social status in their community, and tend have ability to influence other people.

3.1.7 Working Time
Working time the majority of fish farmers as in middle category as around 94% within 2 until 4 hours daily. So the fish farmers in koto mesjid categories work in long enough time for aquaculture activities.

The research about income and working time of onion farmers done by [14]. This research explained that farmer spent more time in another activities beside farming. This happened because their income from the other more than farming. [15] said that working time of farmer is less than formal and informal sector, but the income is higher than both sectors.

3.2 Communication network analysis in Individual level
Communication network about production among fish farmers happened to get information about the production of aquaculture. The number of actors (node) involved as many as 101 actors consist of 90 actors are from fish farmer member of partnership program and 11 actors are not member of partnership program that are the field advisors, advisor from fishery ministry, seed and food supplier from outer area.

The analysis of communication network in individual level was intended to see the local centralisation size, global centralisation, togetherness and relationship among fish farmers. According to [16] the degree of centralisation measurement consist of the degree of many kinds of individual in sociogram which can show how good the relationship between a specific person with his surrounding.

Centrality measurement has a purpose to identify the position or location and actor characteristic (node) in a communication network [17]. From the centrality measurement, the degree of various individual in sociogram will show how good the connection between an individual with his surrounding.
### Table 3. Average value, analysis of minimum and maximum communication network based on the topic about production and marketing of aquaculture business

| Indicator          | Network communication | Topic | All topic |
|--------------------|-----------------------|-------|-----------|
|                    |                      | Production | Marketing | All topic |
| Local Centrality   |                      | 8,3     | 8,2       | 9,6       |
|                    | maximum              | 100     | 77        | 100       |
|                    | Minimum              | 0       | 1         | 1         |
| Sentralitas Global |                      | 5358    | 5220      | 5288      |
|                    | maximum              | 10100   | 9506      | 10100     |
|                    | Minimum              | 155     | 117       | 100       |
| Betweeness         |                      | 89      | 62,6      | 66,3      |
|                    | maximum              | 1106    | 778       | 823       |
|                    | Minimum              | 0       | 0         | 0         |
|                    | node minimum value   | 45      | 46        | 46        |
| Connectedness      |                      | 5,8     | 5,4       | 6,6       |
|                    | Maximum              | 9,8     | 8,9       | 11,2      |
|                    | Minimum              | 2,8     | 2,9       | 3,5       |

Source: Prime Data, 2014

#### 3.2.1 Local Centrality

Individual who has the biggest local centrality value is called *star* and individual who has zero local centrality value is called *isolate* (undetected). The result of network data analysis on Table 3 can be seen that the value of fish farmer local centrality average in every topic is 9,6. Means that the fish farmers in average are capable of contacting 9 persons to talk about production and marketing in aquaculture business. The maximum local centrality from all issue/topic of communication network showed is 100 and the minimum is 1. Means that the fish farmers can call at the most 100 persons and at least 1 person in a system that is individual node 95.

#### 3.2.2 Global Centrality

The global centralisation measurement is expressed in a term of “distance” between various individual. Global centrality notice an actor’s superiority to the whole network. The smaller global centrality an individual has, the bigger he has capability to contact all people in the system [16]. In the context of information diffusion, individual with a low global centrality value will get information faster than individual with high global centrality value in a network [18]. Thus, global centrality can be used as a consideration to choose the right person as the key for information spreader.

The value of global centrality as shown in Table 3 is maximum 10100, and the minimum 100 and the average 5288 for all topics of communication network about production and marketing aquaculture business. Individual who has low global centrality that is node 95, Mr. SH.

#### 3.2.3 Betweenness

Betweenness is a centrality measurement to measure to what extend an individual stay among other individual in a network. According to [19], the concept of togetherness refers to the level of frequency an individual among individuals in a communication way. Individual who has a high betweenness value has a communication control potential to play a role as broker or gatekeeper in a network. Other individual will be depend on him.
From Table 3, the maximum betweenness value among fish farmer is 0. Means that individual who has maximum betweenness value will have a control to communicate in his network. Individuals who have maximum betweenness value are node 95, Mr SH, node 5, Mr NS, node 94, Mr MS and node 9, Mr AF. From the analysis it is known that 46 node has 0 betweenness value, means that 51% of the members of fish farmers are depend on specific individual to contact others.

3.2.4 Connectedness
Connectedness is a degree of a member of a system connects with another member. Connectedness value is measured by comparing all bonds formed. Connectedness can be a beneficial measurement to explain about individual’s dependable and susceptibility [20].

Data analysis in table 3 explained that maximum betweenness value is 11.2 and minimum is 3.5 for all topics. Means that individual who has maximum betweenness value has a dominant communication in his system. The maximum betweenness value shown by node 95. For all analysis in communication network the role of node 95 is the most dominant individual, this is the result of node 95 has a structural function as the head of partnership program, he is a businessman for supplying fish seed and fish processing and also has many relationship with outside information source. While individual who has a very limited connection in his system is node 24 because he has low education, poor experience, and own small ponds area.

3.3. The correlation of fish farmers’s characteristics and communication network
This research is to analyze the correlation between the fish farmers’s characteristics and communication network in aquaculture business by using Spearman correlation. The use of Spearman correlation is because both of the data variable individual characteristics and communication network are ratio scale which are process into ordinal data.

3.3.1. The correlation of fish farmers’s characteristics and local centrality
Local centrality is a degree to show how good is the connection of certain individual in his closer surrounding and his neighborhood. This degree shows the amount of maximal connections of a certain individual be able to make in his closer surrounding. According to [19] which was quoted by [16] local centrality depended on the relative individual superiority who became a star in a neighborhood relationship.

This research saw in what extend the correlation between personal characteristics of a patin fish farmer and local centrality. The result of correlation by using Spearman to both of variables is shown by Table 4.

Table 4. The result of Spearman correlation the variable of Fish Farmer Characteristics with centralitas local

| Personal Characteristics | Local Centrality |
|--------------------------|------------------|
| Age                      | 0.061            |
| Formal education         | -0.252*          |
| Income                   | 0.276**          |
| Family Member            | 0.206*           |
| Business experience      | 0.153            |
| Pond Size                | 0.125            |
| Working Time             | -0.027           |

* Correlation sig P<0.05 and ** Correlation sig <0.01
Source: Prime Data, 2014

Based on Table 4, the result of Spearman correlation showed that there is a negative significant relationship between formal education and correlation coefficient value = -0.252*. It means that the lower formal education of a fish farmer the lower communication network made by the fish farmers in his closer neighbor.
There is a positive significant relationship between the income and family members with local centrality and correlation coefficient value \( r = 0.276^{**} \) and \( t = 0.206^* \). It means that the higher income and more family members, the higher individual ability to be a star or a attention center in his closer neighborhood.

The higher income and the more members of family cause the household needs is higher. This also force an individual to interact actively in his neighborhood in order to open an oppurtunity to get more income to fulfill his daily need for the family.

### 3.3.2 The correlation of fish farmers’ characteristics and global Centrality

Global centrality is a degree to show how many ways a specific individual has to follow to be able to contact all other individuals in his system. This degree shows the ability of an individual to be able to contact all all other individuals in his system. The degree of global centrality can give a hint to know who are the key of information spreader in a system. And then, the relationship between fish farmers’ characteristics and global centrality can be seen in Table 5

| Personal Characteristic | Global Centrality |
|-------------------------|-------------------|
| Age                     | -0.044            |
| Formal education        | -0.076            |
| Income                  | -0.277**          |
| Family Member           | -0.039            |
| Business experience     | 0.096             |
| Pond Size               | -0.226*           |
| Working Time            | -0.202            |

* Correlation sig \( P<0.05 \) and ** Correlation sig \( <0.01 \)

Source: Prime Data, 2014

Table 5 shows that there is a real negative correlation between fish farmers’ income and global centrality with the value of correlation coeisien \( r = -0.277^{**} \). This result shows that the higher an individual fish farmers’ income level, the shorter distance that he has to follow to contact all other individual in his system. The lower global centrality value, the shorter distance that he has to follow to contact all other individuals in his neighborhood. Vice versa, the higher global centrality value, the longer distance that he has to follow to contact all other individuals in his neighborhood [16].

The higher fish farmer’s income, the shorter distance that he has to follow to contact all other individuals in his system. This means that the higher fish farmer’s income, the higher his ability to contact all other fish farmers. This happened because fish farmers with more income has independency to access information source needed.

Pond size has a significant real negative correlation with global centrality value, correlation coeffisien \( r \) value= -0.206*. Means that the wider fish ponds had by a fish farmers, the shorter distance that he has to follow to contact all other individuals in his system. This is because the wider ponds a fish farmer has, make him be able to try a new production technology, so that push the individual to be independence and access many kinds of information.There is no significant relationship among age, formal education, family number, experience and working hour with global centrality. This means that wether short nor long the distance a fish farmer to search, give and exchange information has no real relationship with age, education, family number, bussiness experience, and working hour.

### 3.3.3. The correlation of fish farmers’ characteristics and betweenness

Betweenness is a certain position an individual has among other individuals in a network. The position shows his ability to set a relationship with click or other group in a
network. If someone is in a communication path which links other individuals or click, that individual has a central position.

Individual with a high togetherness has a potential of communication control to play a role as a broker or gatekeeper in a network. Other individual will be depended on him if his communication path to link him to other people must be through the individual.

Tabel 6. The result of Spearman correlation test on variable personal characteristics and betweeness

| Personal Characteristic | Betweeness |
|-------------------------|------------|
| Age                     | 0.098      |
| Formal education        | 0.066      |
| Income                  | 0.215*     |
| Family Member           | 0.128      |
| Business experience     | -0.023     |
| Pond Size               | 0.275**    |
| Working Time            | 0.235*     |

* Correlation sig P<0.05 and ** Correlation sig <0.01

Source: Prime Data, 2014

Based on the The result of Spearman correlation test in table 6, it can seen that there is a significant real positive correlation between fish farmers’ income and togetherness value, the coefficient value \( r = 0.215^* \). This means that the higher fish farmers’ income the higher togetherness value. In other word, the higher fish farmers’ income the higher his ability to build a communication network to contact and be contacted other fish farmers to find and share information.

The pond size also has a significant relationship with togetherness with correlation coefficient value \( r = 0.275^{**} \). This explain that the wider pond had by a fish farmer, the higher his togetherness value in his neighborhood. Pond size will make a fish farmer be able to use a new production technology, a lot of fish seed, the high production cost, and a bigger harvest. This will make the fish farmer more independence, be able to master information, active in his group, and maybe rule and control his neighborhood.

Fish farmers’ working hour has also a significant correlation with togetherness with correlation coefisien \( r = 0.235^{*} \). This means that the higher working hour a fish farmer has the higher his togetherness. A fish farmer with a high working hour usually become the most sucessful fish farmer because he really focus on the job. This individual has a real fish farmer characteristics and become a role model for other individuals. This made them an information controller among members in his surrounding.

3.3.4 The correlation of fish farmers’ characteristics and Connectedness

Connectedness is a degree where the member of a system connected with other members of a system. The value of connectedness is measured by comparing all bondaries happening and the possibility of relationship which may be happen. If there are some different paths connected two individuals, they had a high connectivity. Means that there are more than one way to reach from one individual to another individual. Connectivity can be a useful measurement to understand the meaning of individual’s independency and fragility, [20].
Table 7. Result of spearman correlation variable between characteristics and Connectedness

| Personal Characteristic | Connectedness |
|-------------------------|---------------|
| Age                     | 0.06          |
| Formal education        | -0.078        |
| Income                  | 0.311**       |
| Family Member           | 0.186         |
| Business experience     | 0.117         |
| Pond Size               | 0.328**       |
| Working Time            | 0.187         |

* Correlation sig P<0.05 and ** Correlation sig <0.01

Source: Prime Data, 2014

Based on Table 7 it is explained that there is a significant real positive relationship between income and connectedness with correlation coefficient value $r = 0.311**$. This means that the higher fish farmer’s income, the higher his connectedness with other individuals. The higher income make fish farmers be able to master many source of information, economy, a bigger opportunity to do aquaculture business, ability to interact and go to many kinds of information source and other activities. These are the cause of a fish farmer has higher income and become a dominant individual in his surrounding.

Pond size also has a real relationship with connectedness with correlation coefficient $r = 0.311*$, this finding explains that the wider ponds had by a fish farmer, the higher the connectedness level in his surrounding. Pond size will make a fish farmer to use the newest production technology, bigger seed amount, high production cost, and more harvest result. This will make the fish farmer more active, independence, and be able to be the most dominant person in his surrounding.

4. Conclusion

Based on the explanation above, the research has some conclusion as follow:

Fish farmer characteristics in Koto Mesjid village are mainly in the productive age, education background in moderate level, family members in moderate, income in high, have wide pond size, have long term experience and have moderate working time. These conditions describe that fish farmer’s characteristics in Koto Mesjid village mainly have a good character to run the business in fish aquaculture.

The local centrality, global centrality, betweenness and connectedness can show an individual role in his network in his surrounding. Individual who has a role as a central in his surrounding, commonly has more abilities than others, has a job as controller in his group, well educated, has many assets, and has more experience will become a dominant individual in his system.

There is a significant relationship among some personal characteristics of fish farmers that are: education, income, family number, pond size, and working hour with communication network in aquaculture business in Koto Masjid village.

The relationship in this research states that in the interaction among fish farmers in running aquaculture business is affected by fish farmers’ individual characteristics, these matters make them comfortable to communicate to fulfill their needs in running aquaculture business.

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