Communication network of buffalo farmers in *lar* Gili Rakit of Sumbawa Island West Nusa Tenggara, Indonesia

P J Islamiah, F T Haryadi and B Guntoro
Departement of Livestock Sosio-Economics, Faculty of Animal Science, Universitas Gadjah Mada, Jl. Fauna No.3 Bulaksmur, Yogyakarta 55281 – Indonesia

Corresponding author: trisakti-h@ugm.ac.id

Abstract. Transporting buffaloes to natural pasture (*lar*) Gili Rakit by letting the buffaloes to swim in a bay locally called as “kebo nange”, is traditional management practiced by Sumbawa farmers. The information needs make individuals communicate with each other and form a communication network. This study determined the structure, cohesiveness, and centrality of actors of the Sumbawa farmers in the network of communication. 200 respondents from nine villages in Empang and Tarano Sub-districts were interviewed by using the snowball sampling method. UCINET 6 was used to analyze their communication network and discussed descriptively. The results of the study show that the communication network of Sumbawa buffalo farmers in Gili Rakit the two villages are radial personal networks and seven villages are interlock personal network. The central network dominant and centered on the main actors namely actors 72, 190, 68, 132, and 104 in the network with the highest local centrality 191 ties, global centrality 96135 ties and the centrality of actors 18.382.875 ties.

1. Introduction
Buffalo is one of potential livestock to produce meat and satisfy the demand of red meat in Indonesia. Sumbawa Island is an area for buffalo and cattle farming in Indonesia. Sumbawa buffaloes are often utilized as a means of supporting rural farming, such as plowing the fields, transporting goods and traditional events. Regional Government of Sumbawa through Regent’s Decree Number 832 of 2000 and Number 1520 of 2001 stipulates several areas which are used as pastures (*lar*). *Lar* Gili Rakit is one of the 1500 ha grazing land of the total area of 2133.12 ha. Gili Rakit is a small island in the north of Sumbawa Island which in Saleh Bay. Administratively in 2004 included in the area of the Tarano Sub-district which was the division of the Empang District. The latitude of Gili Rakit is -8.654323 and the longitude 117.982040. Tarano sub-district is located at -8.7477 latitude and the longitude 118.223. The latitude of Empang sub-district is -8.7985 and the longitude 118.0075. The distance of Gili Rakit with the capital city of the Sumbawa Regency is 90 km.

*Lar* Gili Rakit is one of the pasture lands for cattle, buffaloes, and horses during the rainy season or planting season for farmers in two sub-districts, Empang and Tarano. The culture of raising a Sumbawa buffalo livestock is traditional rearing. “kebo nange” is the process of moving the buffaloes to the pasture by swim across the Saleh Bay. Buffalo farmers usually move cattle from November to January. This is the awareness of farmers not to damage agricultural crops. Buffalo farmers then in groups check their buffalo twice a week to monitor their health, and the availability of drinking water on Gili Rakit when that happens. Buffalo farmers will return livestock to postharvest agricultural land.
This culture was certainly forming a repeated interaction which is indirectly also form of communication network. The process of information exchange that occurs between farmers illustrates the existence of networks that arise as a result of the need for information through face to face directly or through media to achieve certain needs.

The interaction can be used as a source of information dissemination, therefore can help farmers increase their livestock production, marketing, and others. Identify two components of social learning diffusion of information and aggregation of information [1]. The communication network which is a social network that is often done in the promotion of the flow of knowledge, meetings and vice versa communication networks will not be formed without any meeting, this refers to face to face in the diffusion of knowledge. Furthermore religion and ethnicity are important parts of social networks in society [2]. Given how networks can be, it is not surprising that there are many different ways of viewing position, centrality, or power in a network [3]. Network structure can even determine the information a person receives through social ties [4]. This network structure its important role in the dissemination of emerging technologies [5]. Analysis of communication networks will explain the forming process of communication in a phenomenon, which provides information about the structure, cohesiveness, and centrality of actors in the network.

2. Material and methods
This research was conducted for four months in nine villages in Empang and Tarano Sub-districts. There were 200 buffalo farmers involved in this study. This study used the sociometric method with snowball sampling techniques and structured interviews using a questionnaire. The sociometric method is a network analysis approach by giving sociometric questions to respondents. The method recognizes the communication network formed between Sumbawa buffalo farmers. Snowball sampling used a multi-stage approach where respondents are sociometric determining who is the respondent. The first stage carried out on the snowball sampling method was to identify individuals who were considered as focal actors. Then the actor was asked to name a few of the other actors who are related to him at a later stage. The data obtained were analyzed using the communication network analysis software, UCINET 6. The software is used to describe the relationship between buffalo farmers. Explain network structure and identify actors [6].

3. Results and discussion
Through network analysis software, matrix data that had been input would describe a sociogram showing the relationship between one actor and other actors in the network. It was explained how actors interact with each other in the network. The following is a sociogram of buffalo farmers by nine villages in Figure 1.

![Sociogram of Sumbawa buffalo farmers in nine villages](Figure 1. The sociogram of Sumbawa buffalo farmers in nine villages used the Lar Gili Rakit)
Figure 1 shows that there were no actors as isolates in the network. It certainly was the desired result in a network. However, to find out in detail the shape of a network it was necessary to know the cohesion of the network structure. Density, diameter and distance analysis of network communication will determine the structure of a network. The density analysis shows the intensity between network members in communicating. The diameter and distance analysis indicated the distance needed between actors in communication.

Table 1. Cohesion measure buffalo farmers in nine villages

| Indicator of Cohesion | Cohesion of villages |
|-----------------------|----------------------|
| Density               | Empang Atas 0.292   |
|                       | Empang Bawa 0.256   |
|                       | Boal 0.432         |
|                       | Karongkeng 0.403    |
|                       | Labuhan Bontong 0.381|
|                       | Ongko 0.058        |
|                       | Bantulante 0.174    |
|                       | Jotang 0.300        |
|                       | Lamenta 0.168       |
| Diameter              | 6 4 3 5 6 11 3 4 8 |
| Distance              | 1.903 1.651 1.597 2.358 2.075 4.394 1.626 1.679 1.992  |
| Connectedness         | 0.536 0.532 0.923 0.745 0.650 0.528 0.698 0.767 0.551 |
| Closure               | 0.553 0.538 0.571 0.559 0.527 0.445 0.639 0.516 0.298 |
| Compactness           | 0.359 0.383 0.698 0.583 0.579 0.280 0.540 0.524 0.297 |

Table 1 shows that density between actors was low in large network groups. The low-density value in the network shows the lack of interaction due to the many paths that must be passed in order to be able to connect with other actors in the network [7]. Cohesiveness occurs when members of the network interact with each other. This interaction causes information from one actor to be owned by another actor in the network. The cohesiveness of a network among others can be seen from the value of connectedness, closure, and compactness between members in the network in the process of finding or receiving information. The larger the group size of a network, the lower the intensity of communication [8]. From the results of the data analysis, it can be identified that the communication networks in the two villages are radial personal networks and seven villages are interlock personal network. It has a low degree of integration but has the nature of openness to their environment while individuals involved in interlocking communication networks consist of homopolar individuals, but are less open to their environment [9].

Table 2. Centrality of the actor in the network of buffalo farmers

| Node | Degree | nDegree | Closeness | nCloseness | Betweeness |
|------|--------|---------|-----------|------------|------------|
| 72   | 191    | 0.960   | 96135     | 0.961      | 18.382.875 |
| 190  | 125    | 0.628   | 67918     | 0.679      | 7.237.565  |
| 68   | 18     | 0.090   | 51958     | 0.520      | 5.320.701  |
| 132  | 17     | 0.085   | 51289     | 0.517      | 4.806.189  |
| 104  | 15     | 0.075   | 51026     | 0.513      | 3.769.346  |

Centrality analysis in Table 2 shows that there were five actors who had the highest centrality, namely actors 72, 190, 68, 132 and 104. The centrality of actor determined the position in the network. Centrality referred to how centralized a network was for several actors. The centrality explains the relationships on a network spread to most actors or focus on just a few actors. The centrality of an actor is determined by the degree of relationship that describes the actor's popularity[10]. The number of proximity relations that describe the relationship of the actor's proximity to other actors in the network determine the value of local centrality. The number of intermediary relations illustrate the actor's important role in connecting actors and bridging the exchange of information flows that determine the value of global centrality [11]. Actor 72 is the focal actor and he is formal leader. The actor had a high level of livestock ownership. Livestock ownership is one indicator of the wealth
status of farmers and potential sources of agricultural income. A portion of livestock-related income can be used to facilitate farmers’ access to information [12].

4. Conclusion
This study concluded that small size networks were more cohesive compared to large size networks. Relationship structure between actors is also different. Actors with high centrality are the most important actors in the network. The actor controls and influences the process of information dissemination in the network. This study provides an overview for the government in the process of adoption innovation and information dissemination in the countryside.

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