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Original Article

Social network analysis on mangrove ecosystem management of Welu Basin, Thailand

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Abstract

The use of social network for support mangrove ecosystem management in terms of proposed policy was studied. The results show that most samples, live in Baan Si Lamtian and Baan Paaknam Welu. Majorities of samples are women in the age range of 51-60 years old and they are fishery and have own business, respectively. The social network characteristics are the center person of the network who is the mainstay of Baan Nagoong and close-by the person on a network cultivating farmers group of Baan Si Lamtian. Two main proposed policies are hastening to the control of encroach on forests, fishing gears uses and illegal germinate aquatic animals. In addition, information including coincide planning with fishermen who set the fish traps and specify Tambon Bangchan to be the special area for aquatics management were proposed by setting the measurement with community for farm control and cultivate plot which caused shallow in the basin.

Keywords: social network analysis, Welu basin, mangrove ecosystem management

1. Introduction

The collaborative learning of learning community cause the systematic thinking and able to create the concept of which relate to situated learning theory by get into real situations and make members experienced together with create knowledge and summary by themselves to be their own summary and situations (Lave and Wenger, 1991) by learning from real situations through the social network of community which make the related knowledge that get along with context and condition which social network between community can describe by social network analysis (SNA), the popular quantitative analysis tools together with computer programs such as Net Miner and popular tools in community studies in terms of knowledge management by project the interaction pattern of community members through communication and conversation which is the same pattern as flow of data and knowledge (Cross *et al.*, 2006). The pattern from the social network analysis is totally different from community network structure which is formal. It shows the power and roles transmit and describe who the leaders and followers are etc. This is the vertical interaction. The pattern from social network analysis is informal. Actually, it is invisible but real structure which can grow the community (Cross *et al.*, 2002)

Welu basin is the important wetland in the international level consists of abundant mangrove forest that is the important economical aquatic animals nursery ground. There are plenty of plants, rare and about to extinct animals preceding, the population amount has risen up so the need of resources use is high including demand for getting benefit from aquatic animal resources which is the common of property. Everyone tries many ways to get the most advantages for themselves. Encroach on forest for use in prawn

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cultivation, expand the oyster, sea mussel and ark shell cultivate plot etc. These activities dramatically expand in a very short period without any carefulness and planning. For example, in the case of shell cultivation, at present the natural environment is not longer suited with the cultivation that make the shell have slower growth so there should have shell cultivation management in Welu river by spread the cultivation in a dense area to the others that able to effort the cultivation for decreasing the environment decadence and sustain the shell cultivation (Meksumpun *et al.*, 2002) While the banana shrimp and sea crab have overrate of maximum economic yield, which need to down 60 % and 10% of current exertion in order to get the highest return (Aujimangkul *et al.*, 2003). These are the impact occurred to the basin ecosystem, especially most of the population has a low rate of participation. Over 90% have never been a part of decision making, doing, getting benefit and evaluating in the coastal resource management (Techarat, 2003). To participate in the Welu basin's mangrove ecosystem is the rush needs, especially the performance of community network in an area because social relationships are a major aspect of the Welu basin mangrove ecosystem management community social network monitoring and supporting. While community social network facilitate social interactions, it is a principle domain wherein working relationships form between members. They create these relationships and the larger networks that have significant effects on member's behavior and the characteristics of community social network such as discussion network size of strong and weak ties, bridge, network density, maintaining time, centrality, closeness of social network members and betweenness, etc. SNA can inform our understanding of Welu basin mangrove ecosystem management community social network formation in community and the types of impacts these networks have on the members. The researcher is interested in study the community social network analysis for specify the social network pattern, indicate the advanced in process, study the characteristics of community social network such as discussion network size of strong and weak ties (Greve and Salaff, 2003) bridge, network density (Greve, 1995) maintaining time, centrality, closeness of social network members, betweenness and use of the social network to support the Welu basin mangrove basin management which leads to higher level of ability to manage the locally mangrove ecosystem and create the ideas to balanced living with nature through foster the conscious, values, knowledge and consume behavior for next community.

2. Methods

2.1 Population and sampling

The areas of Tambon Bangchan, Klung district, Chanthaburi province. The target of this research is the members of this community who join the Welu basin mangrove ecosystem management activity. All folks, government and private offices. Quantitative data collecting, set the sample size by the G*Power program (Faul *et al.*, 2007). The sample size 100 persons and using Simole random sampling. Qualitative data collection, set the sample size by the 8 mainstay persons of Welu basin mangrove ecosystem management and using purposive sampling.

2.2 Research tools and efficiency evaluation

The researcher collects quantitative data from questionnaires and interview by creating the questionnaires from Greve (1995) and Greve and Salaff (2003). By examining the content validity of the questionnaires to be related to the research objectives. Using the questionnaires with 10 samples for examining the understanding and consider of the unclear part to correct and improve.

2.3 Research method divided into 3 parts

Part 1 Analyze the social network on the mangrove ecosystem management of Welu basin consists of collect data by using the questionnaires with the 100 samples, result of the return found there are 51 samples out of 100 that have completely information. In the studies on the role of social network on mangrove ecosystem management, analyze the descriptive statistics, frequency, percentage, standard deviation value and characteristics analysis of the samples, including the discussion network size of strong and weak bridge, network density (Greve, 1995) maintaining time, centrality, closeness of social network members, betweenness by Net Miner II 2.6

Part 2 Analyze the application of social network on supporting community to Welu basin mangrove ecosystem management

Analyze the application of social network on supporting community to Welu basin mangrove ecosystem management by using the average value, standard deviation and standard levels

Part 3 Study the application of social network in supporting community to Welu basin mangrove ecosystem management in propose policy. In terms of qualitative data, researcher use the data analysis of Welu basin mangrove ecosystem and the application of social network on supporting community to Welu basin mangrove ecosystem management in quantitative together with result of qualitative data analysis to summarize studies result and present the proposed policy.

3. Analysis Results

The analysis using the descriptive statistics, frequencies and percentages found that most samples, live in the area of Moo 6 Baan Si Lamtian (41.20%), Moo 2 Baan Paaknam Welu or Baan Rongmai. Most of them are folks, fishermen and cultivate farmers, respectively (35.30%). The majority of all populations are women (70.60%) in the age of 51-60 years old (52.90%), holding under Bachelor degrees

educated (80.40%). The main occupations are fishery (41.20%) and have their own business (31.40%), respectively. The average income per month is in the range of 10,001-15,000 baths (47.10%) and higher than 15,000 baths (27.50%). Persons experienced in mangrove forest maintenance for 10-15 years (43.10%) and more than 15 years (31.40%).

The social network characteristics found that the average discussion network size is 5.169 persons, average strong ties, relations are 3.406 persons, average weak ties are 1.589 persons, the average value of the bridge is 9.693 persons, the average value of network density and maintaining time are 4.157 hours per week. All decryptions are shown in Table 1. It was found that the centrality of social networks is more than 0.5 levels. The mainstay group of Moo 5 Baan Nagoong has the highest at 0.64, government officer in Moo 3 Baan Ethep have 0.54, mainstay of Moo 2 Baan Rong Mai have 0.48, mainstay of Moo 4 Baan Thep Kha Yang, Moo 6 Baan Si Lamtian and Moo 2 Baan Rong Mai have 0.38, 0.30 and 0.28, respectively. The rest of members have lower than 0.25 shown in Figure 1. The closeness of social network members is more than 0.5 levels. The mainstay group of Moo 5 Baan Nagoong has the highest at 0.728, government officer of Moo 3 Baan Ethep, mainstay of Moo 2 Baan Rong Mai and mainstay of Moo 1 Baan Koh Jik have 0.635, 0.631 and 0.591, respectively. The rest of members have lower than 0.5 shown in Figure 2. The resulting analysis of the bridge found that at more than 0.10 levels is cultivation, farmers of Moo 6 Baan Si Lamtian that holds 0.15 and 0.16, respectively. The folks of Moo 3 Baan Ethep get 0.010 and the rest has lower than 0.010 which is shown in Figure 3

The advantage of social network analysis found that the consultant in mangrove ecosystem management, giving information and important data about mangrove forest ecosystem management, guiding the idea of mangrove forest ecosystem management, finding of budget, workers and personnel sources for managing mangrove forest ecosystem, educating the managing process and reference or trust building have the average equal to 3.686, 4.020, 4.000, 3.765, 3.569, 4.157 and 4.059, respectively. The budget source has the value of the medium level, having the average 3.176. Descriptions are shown in Table 2. Qualitative data analysis and hypothesis data analysis found that 1) Bang Chan current problems from the interview: when the population is getting higher so the consumption is also rising up. Besides, they are awakened to develop the areas to be tourist place. They prepare some facilities for tourists. In the private part, they

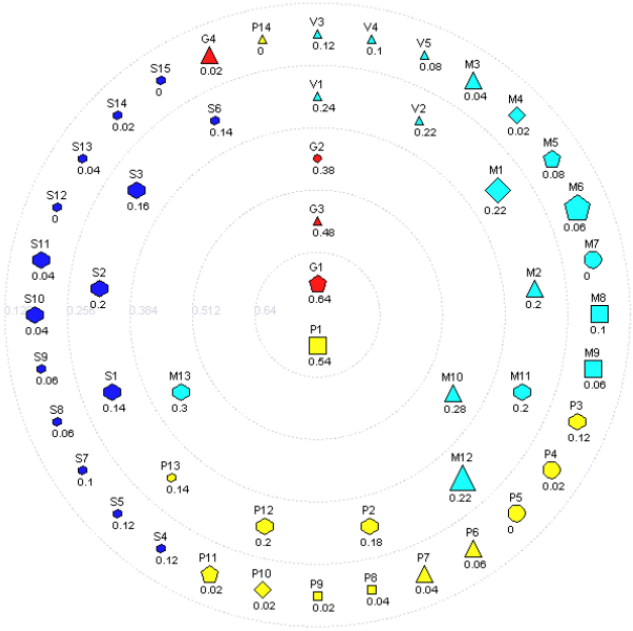

Figure 1. The centrality of social network

Legend	Meaning	Color	Meaning
○	Moo 1 Baan Koh jik	Red	The mainstay group
△	Moo 2 Baan Rong Mai	Yellow	government officer
□	Moo 3 Baan Ethep	Blue	People
◇	Moo 4 Baan Thep Kha Yang	Marine blue	Cultivation farmers
⬠	Moo 5 Baan Nagoong		
⬡	Moo 6 Baan Si Lamtian		

Table 1. Social network characteristics analysis of Welu basin social network for mangrove ecosystem management

Social network characteristics	Mean	Standard deviation
1) Discussion network size (person)	5.169	3.007
2) Strong ties and weak ties relations (person)		
- strong ties	3.406	0.493
- weak ties	1.589	0.493
3) Bridge (person)	9.693	4.366
4) Network density		
- network density	0.131	
- in – degree	6.569	6.912
- out – degree	6.569	4.394
5) Maintaining time (hours per week)	4.157	3.373

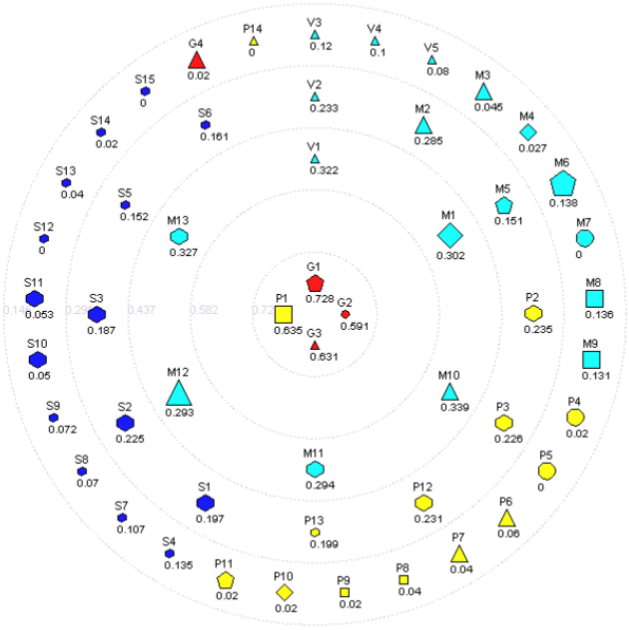

Figure 2. The Closeness level

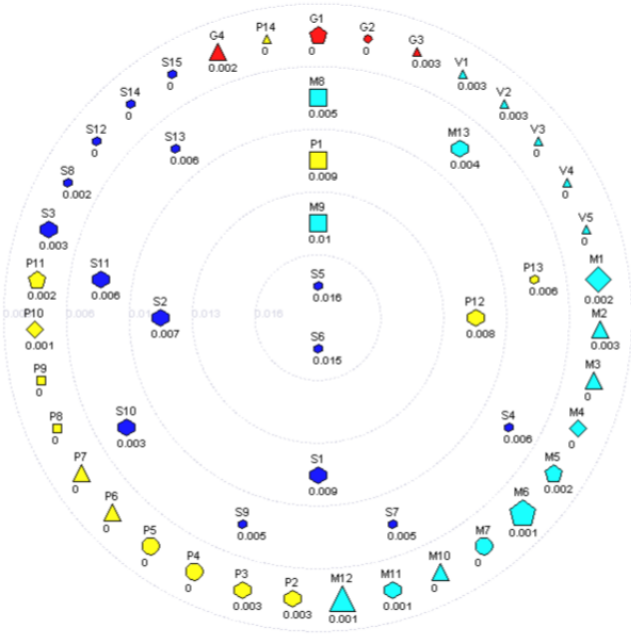

Figure 3. The Bridge level of social network

expand the construction of accommodation as resort, restaurant (rafts or house), more rental boat and tour agent directly contact with the business owners. These cause many problems as lack of human resources for the local area, lack of public utilities that have to be on standard to facilitate the tourists. 2) How are the grains and animal breeds in the current situation?: Mangrove forest in Welu basin was getting better more than 20 years ago. Notice from the growth of aquatics animals and density of mangrove forest which is not as good when the community first setting, but it tends to go in the best way. The folks can get benefits as a food source, medicine. Some people use it as fishery, tools, construct residential and decorate the shop for welcoming the tourists, and 3) How the management should be? When folks and outsiders still go in and out in this Bang Chan and the local folks do not think of any move out so the environment and resource management is the main consider the issue. From the interview of some samples get some guidelines as that It has to be announced as the special area in terms of aquatic managing because now there are many cultivate plots that make the shallows and they do not tend to stop but expand. If we don't get any management, we are going to suffer because it may cut the road.

Table 2. Benefit of social network

Social network characteristics	Mean	Standard deviation	Benefit level
1) The consultant in mangrove ecosystem management	3.686	0.787	High
2) Giving information and important data about mangrove forest ecosystem management	4.020	0.648	High
3) Guiding the idea of mangrove forest ecosystem management	4.000	0.600	High
4) Budget source for managing mangrove forest ecosystem	3.176	0.740	Medium
5) Finding of budget	3.765	0.737	High
6) Finding of workers and personnel sources for managing mangrove forest ecosystem	3.569	0.500	High
7) Educating the managing process	4.157	0.612	High
8) Reference or trust building	4.059	0.580	High

4. Conclusions

Most samples, live in the area of Moo 6 Baan Si Lamtian and Moo 2, Baan Paaknam Welu or Baan Rongmai. Most of them are fishermen and cultivate farmers. The majority of all populations are women in the age of 51-60 years old, hold under Bachelor degrees educated. The main occupations are fishery and own business in order. The average income per month is in the range of 10,001-15,000 baths. Experienced in mangrove forest maintenance for 10-15 years. The average discussion network size 5.169 persons, average strong ties, relations 3.406 persons, average weak ties 1.589 persons, the average value of bridge 9.693 persons, the average value of network density and maintaining time 4.157 hours per week. The highest centralities of social networks are the mainstay group of Moo 5 Baan Nagoong and the government officer of Moo 3 Baan Ethep. The highest closeness of social network members is the mainstay group of Moo 5 Baan Nagoong, the government officer of Moo 3 Baan Ethep, the mainstay of Moo 2 Baan Rong Mai and the mainstay of Moo 1 Baan Koh Jik respectively. The highest bridge is the cultivation, farmers of Moo6 Baan Si Lamtian. The advantage of social network to be the consultant in mangrove ecosystem management, giving information and important data about mangrove forest ecosystem management, guiding the idea of mangrove forest ecosystem management, funding source, and workers and personnel sources respectively.

Welu basin mangrove forest ecosystem management guidelines. In terms of proposed policy can be divided into 3 parts. First, Welu basin resources and ecosystem management as 1) Hasten to control the encroach on forest, fishery tool using and illegal aquatic cultivation and set the policy to educate, give information and coincide planning with the fishery groups for the fishery trap (Pong Pang Lak) issue. 2) Announced the Bang Chan area to be special area for aquatic management to measure with the community in farm and cultivate plot control. 3) Support the sustainable living group setting by having the group plan and propose to the related organization to be response and suggestion. 4) Provide the water consumption management plan for population and tourists. 5) Provide the biodiversity data and specify the level of risk to extinct for control the use of grains and animal breeding which in the risky level. Second, the environment issue is providing the trash management of Bang Chan and nearby by cooperating among local, private, government and folks economics, social, and finally, economics, social and livings consist of following guidelines 1) Set the life and property safety measures in Bang Chan by cooperate of Local and government officer both governors and polices. 2) Campaign, eliminate and giving treatment to drug users and drug sellers leading to Safety community. 3) Educated by related organization and set the standard of clean food. 4) Support the traditional and medical treatment, registered nurse, physiotherapist and other public health personnel to the station in Bang Chan area. Focus on support the youth in the community to be educated though support the emergency medical tools as the international standard and 5) Provide the public utilities follow the tourist place and island are standard for the life and property safety.

5. Discussion

The social network characteristics found that discussion size is in high level compared with samples from the calculation and the real samples with the returned questionnaire. There is a discussion group about Welu basin mangrove forest ecosystem management in average amount of 5-6 persons by having strong ties of 3-4 persons which is high compared with members in group while there're weak ties of 1-2 persons. The average bridges are 9-10 persons and 0.131 of density and average, maintaining time 4.157 hrs/week. The highest centrality is the mainstay of Moo 5 Baan Nagoong and government officers of Moo 3 Baan Ethep. The closeness of social network members, a mainstay group of Moo 5 Baan Nagoong has the highest, government officer of Moo 3 Baan Ethep, mainstay of Moo 2 Baan Rong Mai and mainstay of Moo 1 Baan Koh Jik respectively. The bridge found that cultivation, farmers of Moo 6 that hold the highest, followed by the folks of Moo 3 Baan Ethep. In the issue of the gap between structure, there're less gap which has a low density of the network, but from the density value of all networks is shown as high density. To track the social network has to consider not making any gap more that it would affect the strength of network that get along with Burt (1992) and studies of Thongphubate (2011) which indicate the important qualifications of gap that may lead the problems on information exchange in network. The centrality is the mainstay of Moo 5 Baan Nagoong and government officers of Moo 3 Baan Ethep reflects that the community network must pay attention to these groups because they are definitely effected to the succeed. The advantage of social network which suggests in mangrove ecosystem management, giving information and important data about mangrove forest ecosystem management, guiding the idea of mangrove forest ecosystem management, finding budget, workers and personnel sources for managing mangrove forest ecosystem, educating the managing process and reference is the highest level benefit and be the budget source is at the medium level. Therefore, educating and reference for approaching or trust building is the appropriate method for sustainable improve the social network of Welu basin mangrove forest ecosystem management. The suggestions to take advantage as 1) The characteristics of improve the social network of Welu basin mangrove forest ecosystem management can use to be involved in setting guidelines, especially for gap prevention in structure, support and prepare the bridge representatives and the centrality person, 2) Members of Welu basin mangrove forest ecosystem management able to use characteristics from studies for revise the performance, and 3) Related organization of this topic can use the characteristics as the structure of member relation to plan the supporting plan. The

suggestions for research as 1) Due to the studies main point is the management of Welu basin mangrove ecosystem and select the sample by a simple sample method that get the sample which is not cover all populations. It should have been conducting the studies of all area social network characteristics and widely open the main point of research, such as public health, education, social problems as drugs, etc., and 2) Interesting research aspect and improvement are to provide the course of the management of Welu basin mangrove ecosystem as the adult education with the empowerment idea for creating self-reliance of Welu communities.

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