The role of women in managing sustainable forestry based on local authority and needs analysis of the local agroforestry system in North Sulawesi

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Abstract. Forests have an important role regarding climate change both in mitigation and adaptation efforts. Indonesia is one of the countries with the most extensive tropical forest systems in the world. However, Indonesia experienced the highest level of forest destruction in Southeast Asia. For this reason, Indonesia needs to apply the principles of Sustainable Forest Management to improve the condition of forests through reducing deforestation without compromising the improvement of the welfare of the surrounding community, both men and women. Previous studies prove the involvement of local communities, both men and women, who consider their local knowledge and wisdom is a determining factor for realizing the objectives of Sustainable Forest Management. Previous studies regarding improving the welfare of forest farmers have ignored the needs of both men and women. Similar studies have not been done much in Indonesia or at the global level. There is less research on local knowledge / knowledge that examines how gender differences determine differences in local knowledge / wisdom that men and women have and their respective needs regarding forest resources. For this reason, this study generally aims to increase knowledge about the differences in local wisdom / knowledge possessed and the perceived needs of both men and women who have the potential to rehabilitate forests while improving their lives. This research is the third study in Barangkalang Sangihe Village, located around the protected forest of Mount Sahendaruman. This study uses qualitative data collection methods concerning local wisdom and the needs of men and women relating to forest resources and management. The principle of triangulation is applied to data collection methods and sources. Data collection is done by interview, discussion and observation. Data sources are farmers and village leaders and social organizations. Data analysis uses a qualitative data analysis approach. The results showed that the subconscious of women in particular and the whole community in general who have absorbed the pattern of forest growth that is diverse, structured from high to lowest creeping, is the superiority of the community around the forest. The superiority of this subconscious can be used as a basic capital to develop forest agriculture (agroforestry) that supports each other (mutualistic symbiosis) with protected forests above. Protection Forest can be maintained well only by the community around the forest who can feel the positive impact of the existence of the protected forest, for example as a source of water and as a source of plant seeds (plasma nuftah). Commercial tree crops managed by farmers in the area around the forest cannot be ignored for their biological function for environmental preservation. Because commercial crops, among others, cloves, nutmeg, coconut, and sago, also perennial plants that
have deep roots and are also managed like the growth of forestry plants are not regulated like modern plantations.

1. Introduction

Forests have an important role to play in the control and mitigation of climate change [1,2]. Indonesia is one of the countries that has the largest and most important tropical forest system in the world, however, Indonesia is one of the countries that experienced the highest level of forest destruction in Southeast Asia [3]. For that reason, Indonesia needs to apply the principles of Sustainable Forest Management in order to improve forest conditions through reducing forest land degradation and deforestation.

Previous studies in several countries prove that local community involvement in forest management [1,4], which is mostly a local agroforestry system, especially in Southeast Asia [5] includes in the Pacific region [6], aimed at accommodating differences in gender needs due to differences in the roles of men and women [7–9] and the differences held by men and women (McGregor 2005) in terms of local wisdom in the form of local knowledge that has been applied since centuries ago are important factors in achieving the objectives of Sustainable Forest Management. But in fact similar studies have not been done much at the global level or in Indonesia. And also research on local wisdom regarding local agroforestry has not been done much especially in terms of studying how gender differences lead to differences in local knowledge regarding forest resources owned by men and women. As for local knowledge in this study uses the understanding put forward by Martin [10] i.e. local knowledge is knowledge owned by local communities which is a combination of knowledge that comes from the community itself (traditional cultural knowledge) and scientific knowledge that comes from outside the community, among others, from forestry development institutions (for example scientists). According to Argawal (2014), local knowledge and scientific knowledge must be treated as complementary to provide benefits to local communities in the management of forests in the form of local agroforestry [11].

Various previous studies involving the farming community, for example in India, according to Bhardwaj, Singh and Kumar (2003: 73) that scientists have formulated various research recommendations based on their own research experience and ignore the needs of farmers, their resources and various socio-economic obstacles that are faced by farmers [12]. For this reason, it is necessary to identify the needs of the agricultural community, both men and women. They need to be involved by asking them what their needs are. Information on their needs is used as a basis for formulating policies that are right on target so that they can meet their real needs.

This study aims to identify and document the differences in local wisdom derived from local knowledge that has been applied to both men and women regarding the local agroforestry system that has the potential to rehabilitate forests. The findings of this study are expected to provide recommendations to decision makers related to forestry policies regarding sustainable forest management to be able to improve efficiency and effectiveness in achieving the objectives of implementing programs to improve forest conditions.

2. Literature Review

The definition of gender used in research is the difference in behavior and interactions between men and women as a result of the socio-cultural construction of a particular society. These differences have led to differences in the life experiences they experience [13] and have different consequences. Differences in behavior and interactions between men and women are influenced by the time and place where they live [13] and are determined by social status, religion, ethnicity, caste and class [14].

There are differing views between forestry experts and local communities regarding forest management. For forestry experts, forest management places more emphasis on biological and mechanical practices. Whereas for local communities, biological, mechanical and practice based on social and cultural factors are prohibitions or beliefs related to gender differences [13]. In Southeast
Asia [5] including the Pacific region [6], sustainable forest management practices have been passed on between generations in the form of local agroforestry systems. Contact with outside cultures both directly and indirectly influences the existence and practice of local wisdom. Studies concerning gender and local knowledge find that interactions between men and women in a particular community affect local knowledge held by men and women regarding forest resources including knowledge of trees and non-trees [13]. Thaman et al. [6] distinguish ethnobotanical knowledge possessed by local communities to utilize trees in agroforestry systems in the Pacific Islands according to ecological and cultural functions. Ecological functions include improving soil conditions, habitat and food for forest animals, controlling erosion and flooding, and controlling pest and disease. While the cultural / economic function, among others, is in the form of wood to generate income and to meet their own needs, firewood, materials to be used as agricultural equipment, materials for decoration, materials for making drinks, places to pray, medicines, and musical instruments.

Local agroforestry forms a multi-layer [15] which is useful for maximizing the absorption of rainwater so that the presence of multi-layer in protected forests will improve the function of the water cycle of the protected forest. According to Nair (1993), local agroforestry can be divided into three types based on its dominant component [16]. When dominated by a combination of trees and plants, it is called agrosilviculture. When dominated by a combination of livestock and trees called pastoralisilkultur. Meanwhile, when dominated by a combination of plants, livestock and trees, it is called agropastoralisilkultur.

Research on local knowledge is gathered from a small number of people mainly from men to represent the knowledge of the entire society that has a certain culture (Howard 2003 in Eskeinhemo, 2006) [17]. In generalizing, the risk of finding diversity and possible contributions to the knowledge and practice of different systems and social groups for the sustainability of resource management is ignored. Furthermore, despite the awareness of the importance of local knowledge, it often often takes little or no consideration of Gender differences that affect differences in local knowledge, utilization and management of forest resources [17]. Nygren [18] reports that local knowledge is influenced by culture, environment, economic system and socio-political system in a place [17] vii. Furthermore according to Eskeinhemo (2006), local knowledge is mainly determined by social and biophysical factors where a person or community lives and also is determined by one's attributes such as intelligence and one's sense of interest [17].

According to Eskonhemo (2006), differences in roles and abilities between men and women in a society are determined by various factors in the social context and the ecosystem in which they live [17]. Every factor is different because of the different locations where they live. Likewise the factors determining forestry practices in various regions are determined by gender, the use and management of forest resources, local knowledge and living needs [17].

Men and women differ in their use of forest resources [19,20] and management of forest resources [20]. Women who live in mountain forests in India are the backbone of the economy and the provider of basic family needs. The women are aware that plants are for maintaining the balance of the ecosystem and for the quality of life of their families and communities. Women are more likely to grow various types of plants and not just one species such as wood. In Bolivia there were differences between men and women working in agriculture and using forest resources [21].

Debate in science concerning gender and forests. There are at least two different perspectives that have been the focus of ecofeminists from Shiva (1988) to Rocheleau and colleagues (1996) [14,22]. According to Shiva representing the perspective of ecofeminism, women have more concern than men in terms of environmental sustainability. Rocheleau represented the feminist perspective of ecological politics, arguing that local knowledge held by men and women was different.

According to Nabanoga (2005) forest management practices, especially on trees, can be distinguished in three ways namely biological, technical and cultural [13]. Biologically and technically, including: controlling utilization, protection and maintenance, stimulation to get the expected results, regeneration, and a combination of control methods. Utilization control can be
through harvesting leaves, fruit, branches, or cutting some branches of trees. Protection and maintenance, among others, by fencing trees, buffering and watering and controlling forest fires. Provision of stimulation to obtain the desired production results, among others, through the selection of buds and hanging young shoots. Regeneration includes protection for natural regeneration, propagation by cuttings and grafts and seedling. Combinations of control methods include branch pruning and mulch use. While culturally linked to the taboo system and belief.

3. Method

Qualitative data collection consists of collecting qualitative data concerning local wisdom and concerning the needs of the community, both men and women. This research was conducted for 3 months from July to September 2019 in Barangkalang Village around Mount Sahendaruman, Manganitu District, Sangihe Regency. Village selection because there are community members who are cultivate of trees and non-trees in protected forests to meet the needs of their family life.

This research is a cross sectional study where conducting research at a certain time (Neuman 2007). This research used two types of data, primary data and secondary data. Primary data collected from the village has used a qualitative approach in the form of in-depth interviews with the help of interview guidelines. The main purpose of the qualitative approach is to understand and analyze the community from their own perspective [23]. Secondary data sources came from government agencies, non-governmental organizations / environmental lovers organizations, libraries / internet, and theses conducted at the research location. The research was mainly based on primary data by conducting interviews, discussions and observations.

Primary data collection from research sites used: Individual interviews with forest farmers using interview guides. List of questions will be asked face to face. The number of forest farmers in each village consists of 25 men and 25 women who are not spouses. Therefore the total respondents were 50 participants. This semi-structured interview method was the main method for collecting data in this study. This method was used to explore experiences and how they see it and the meaning of the experience for them according to their own perspective [24].

In-depth interviews conducted with village leaders. Village leaders consist of 4 men and 4 women with different backgrounds, namely government, education, religion, herbal medicine experts who have knowledge of village communities and protected forests. Total key informants were 8 people from village leaders' backgrounds.

Interviews conducted in focus group discussion have many advantages [25]: "The accuracy of the information and the rate at which it is generated are higher in groups."

Each village consists of two groups, namely groups of men and women. One group consists of at least 4 people so that a total of 8 people. Focus groups used community map approaches / tools / methods.

Collecting data regarding gender needs in agricultural communities regarding what they need related to forest rehabilitation while increasing income by opening up opportunities for all components of the community both male and female in the community. The qualitative data collection regarding the needs of men and women in agricultural societies is carried out by means of triangulation both in the method of data collection and data sources. Data collection methods include interviews, discussions and observations. While data sources are from forest farmers, forest village leaders and social organizations at the village level.

Analysis will be carried out with the aim of deepening perspective to answer research questions. The collected data will be analyzed based on a qualitative analysis approach. The qualitative data analysis process consists of five stages (Ulin et al. 2012); namely: (1) reading for data recognition, (2) making coding, (3) selecting relevant data and (4) making various patterns or views based on the data that has been collected, and (5) making interpretations based on patterns or views obtained. The data analysis process has been carried out, in this study, it is not a linear process, but a loop-back process.

4. Results and Discussion
4.1. Profile of Barangkalang Village

4.1.1. The historical origin of the Barangkalang village and its development. It originated from the story that Lahare, as usual in the morning when he was about to go home and he looked into the sea, suddenly he saw something that was not yet clear in the sea. According to his estimation, if it is a sailboat, then it must be a boat owned by a pirate from Suluge and Manghindano. Therefore, the suspicion that he began to worry and he was hiding on the sidelines of the rocky beach. According to him, if it was a pirate boat, he would run and inform the residents, but after seeing the floating objects he was more surprised because the object was closer to the beach the smaller his form. After the object was close to the beach, out of curiosity Lahare finally came out of his hiding place and caught it. After being caught he was very surprised because it turned out that the object that was captured was a living clam. The shells are the size of half a coconut shell. After that Lahare rushed home because it was getting dark. The incident happened right at sunset.

Upon arrival at home he called his father-in-law Durenso then showed the clam that he found was chill to tell the events he experienced. Meanwhile, people from the neighbors began to arrive wanting to see the rare shells. Durenso raised his voice and spoke to Lahare "you are a very lucky person because not everyone can find rare shells like this". Luck is meant that there is something done, that is if you find the shells, then at that time the person immediately dived into the sea while swallowing the meat. Durenso said that the clam was named "Tinggeratu". Then word got out all over the settlement that Lahare found a kukalang (kalang) which means a swim item, namely Tinggeratu shells. In the end the residential area commonly called Lewa’e was changed to "Barangkalang". Whereas a small headland where Lahare stands fishing is called "Tonggeng Seda" seda = Sunset, because when Lahare is holding the Tinggeratu shells, at that time the sun sets.

4.1.2. Geographical location. The distance of Barangkalang Village from the Regency Capital is Tahuna City, which is ± 28 Km. Administratively the boundaries of the Barangkalang Village are as follows:

   North side is bordered by Belengang Village
   East side is bordered by Kampung Ulung Peliang
   South side is bordered by Nagha II Village
   West side is bordered by the Sulawesi Sea

4.1.3. Population of Barangkalang Village. The population of Kampung Barangkalang is 880 people (data for 2019) consisting of 449 men and 431 women. The number of family heads is 278, spread in 4 hamlets. Nearly 50 percent of the workforce in the research villages is poorly educated, ie only graduated from elementary school. There are two main types of livelihoods of villagers, namely as farmers (32 percent) and fishermen (23 percent).

4.1.4. State of the Territory and Land use. The area of Barangkalang Village is ± 334 Km². Broadly speaking, the population differentiates the village police area from the top of the mountain to the coast into 6 regions, namely: (1) protected forest areas that are prohibited from entering, (2) far gardens located in forest areas, (3) areas covered with ferns, (4) nearby gardens, (5) residential areas which are partly used for freshwater fisheries and (6) coastal areas so that most residents make a living as fishermen.

4.2. The Role of Communities around the Forest in Forest Conservation

Forests that are currently deforested must be replanted and forests that are currently intact or partially intact must be maintained for better growth. The future of the earth depends on the forest. If all this time saving the earth has been too concerned about anything other than saving the forest, it means that it is misguided thinking. If humans surrender to the present situation without serious effort, to restore
the preservation of forests, it could be that the balance of the earth will leave 10 percent of humans and flora and fauna. 90 percent will become extinct. Is it true that the remaining 10 percent of humans are wanted? Earth's land surface might be less than 10 percent due to melting ice.

Saving forests can only be done sustainably by people around the forest. Outsiders who are far from the forest sometimes come up with bright ideas and are very theoretical but do not correspond to the conditions on the ground. Only those around the forest know the true reality. Therefore, empowering agricultural communities around forests is the only way that needs to be taken to protect forests from extinction.

The community around the forest needs to know the problem, then together look for solutions to the problem for sustainable agriculture around the forest. The protected forest above (mountain) is made a treasure because of the biodiversity and the source of biological life that is guarded together for the sustainability of the surrounding agriculture. What does the farming community do around the forest if the main source of biological life (humans and plants and animals) is that the water has dried up because the forest is barren?

The farming community around the forest in Barangkalang Sangihe Village understands its dependence on the forest. This becomes the basic capital for the development of future agriculture that is more modern, environmentally friendly, sustainable, saves forests and poverty can be overcome. Communities around the forests in the research area have naturally learned to absorb plant and animal growth models from the experience above.

It is located quite far from settlements around 5-10 km but since long time ago (their ancestors) they have entered the forest. The growth of plants and animals accompanied by the availability of water provided by the forest, gradually absorbed by the human mind around them intentionally or unintentionally. It is better for this pattern of learning and informal imitation in the future to be further intensified by scientific explanations so that the community is stronger in its grip to jointly manage forests sustainably.

The trees will not cut down for the sake of momentary interests. In the midst of the rural community there are experienced figures who are more aware of the existence of the forest. Ordinary people can ask questions and learn from those who are more experienced. The problem is how to organize them so that they become a socioeconomic force for sustainable forest management.

4.3. How do women play a role?
Women have a real role in managing agriculture with sustainable forest patterns. Based on research results from the field, women play an active role in managing agriculture around the house (the yard). Specifically for plants that are related to kitchen needs such as vegetables and herbs, women hold the main control in managing and using them. Growth of plants from trees to shrubs on the ground in the yard is the growth of plants that have a forest pattern: that is, they grow for a long time from their parents until now, the role of multilevel tree canopies so that rainwater does not directly hit the ground hard. This is applied to the experience and pattern of growing in the forest that is applied naturally-locally by the community around the forest. Of course, this is very different from the yard of non-farmer communities in urban areas whose gardens are arranged in a garden pattern, well-organized and with an aesthetic value (beauty). The agricultural community around the forest in the study area prioritizes its hydrobiological function which ensures the preservation of nature and meets the needs of daily life.

4.4. What is the role of women in garden management?
Gardens in the study area are distinguished, near and far gardens. Distant gardens are termed gardens located in forest areas. The community around the forest has changed the types of forest plants with plants of economic value and when harvested only the fruit is taken (not cut down like woody plants in the forest).

Trees in the forest estate that are widely planted are cloves, nutmeg and coconut. This plant is excellent because it is a commercial plant since time immemorial. In general, those who cleared the
forest to replace plants with cloves, nutmegs and coconut were their ancestors since the 1950s and 1960s.

After the annual crops are replaced with commercial plants, the growth patterns still mimic the forest patterns, which are diverse, structured from high to low canopy and plant growth is keep natural. In the garden area of the forest various types of plants daily need are also grown such as vegetables, herbs, food crops of cassava, and fruits.

4.5. What is the role of women in managing gardens in the forest area?

Because in the garden located in the forest area there are plants that are close to the kitchen needs such as vegetables and herbs, women actively participate in managing it. For tree crops such as cloves and nutmeg, the more dominant the men who manage them, women only help clean up the disturbing grass plants.

Because women also enter the forest, their natural reason can be influenced by plant growth patterns in the forest. So the management pattern unconsciously follows the forest pattern rather than the modern monoculture plantation pattern. This is the basis for finding an agricultural model of the community around the forest that can protect the protected forest so that it does not become extinct and also the community can rise up socio-economic because of the results of the garden.

5. Conclusion

This research concluded that the subconscious of women in particular and the whole community in general who have absorbed patterns of forest growth that is diverse, structured from high to lowest creeping, is an advantage of the community around the forest. Then the superiority of this subconscious can be used as a basic capital to develop forest agriculture (agroforestry) that supports each other (mutualistic symbiosis) with protected forests above. Protection Forest can be maintained well only by the community around the forest who can feel the positive impact of the existence of the protected forest for example as a source of water and as a source of plant seeds (plasma nuftah). Commercial tree crops managed by farmers in the area around the forest cannot be ignored for their biological function for environmental preservation. Because commercial crops, among others, cloves, nutmeg, coconut, and sago, also perennial plants that have deep roots, and are also managed like the growth of forestry plants are not regulated like modern plantations.

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