

Local Wisdom as Adaptation Strategy in Suboptimal Land Management at Binongko Island, Wakatobi Indonesia

Aminuddin Mane Kandari^{1*}, Hidrawati², Usman Rianse³,
Muhidin⁴, Marsuki Iswandi³ and Nur Arafah¹

¹Department of Environmental Science, Faculty of Forestry and Environmental Science, Halu Oleo University, Kendari, Southeast Sulawesi, Indonesia.

²Regional Development Planning at Wakatobi Regency, Southeast Sulawesi, Indonesia.

³Department of Agribusiness, Faculty of Agriculture, Halu Oleo University, Kendari, Southeast Sulawesi, Indonesia.

⁴Department of Agrotechnology, Faculty of Agriculture, Halu Oleo University, Kendari, Southeast Sulawesi, Indonesia.

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Agricultural land on the Binongko Island has categories as dry land on the dry climates. Characteristics of land dominated by rocky ground with low fertility and irrigation systems depend on the rainfall. The main problem of agriculture system is low productivity. The effort to improve land productivity is directed towards the application of local wisdom that has economic, social, cultural and ecological advantages. The aim of the research was to explore the local knowledge in agricultural systems. The results showed that Binongko Island communities have local wisdom in the farming system, which applies from land clearing, planting, maintain, harvesting and post-harvest. In the land-clearing phase, there is local wisdom *bhelai'a*, which is a form of respect to natural ruler and petition to obtain abundant harvests. In the phase of planting, there are mixed farming systems as local wisdom and adaptation strategy to sub-optimal soil conditions. Furthermore, the maintenance phase there are local wisdoms that appears in *honowu* action, plant pests and diseases preventive action. Similarly, in the stage of harvest and post-harvest with religious rituals as an expression of gratitude to the grace of God Almighty.

Keywords: Local Wisdom, Adaptation Strategy, Suboptimal Land, Binongko Island.

The potential land availability for agricultural development commodities in Indonesia now increasingly limited. The development of various sectors has led to the conversion of productive agricultural land to non-agricultural purposes, mainly for a road, residential, offices, and other infrastructure facilities because of the increases in the regional growth¹. In connection with that, the using of suboptimal land is an

alternative to increasing the availability of land. Beside that the development of agricultural, particularly in the outer and small island in Indonesia is by using the indigenous habits and farmer values or local wisdom to manage their land and has an adaptation strategy to apply in that region.

Binongko is a small island part of Wakatobi archipelago in Southeast Sulawesi; Eastern of Indonesia has an opportunity to develop of agricultural commodities and forestry. However, the soil condition of the Island is an expanse of rocks and plants grown on the rocky

* To whom all correspondence should be addressed.
E-mail : manekandaria@yahoo.com

ground (litosol). The climatic strongly influenced by seawater hydroclimatic factors. Binongko Island dominated by the suboptimal dry land with dry climates. The dry land in the dry climates has an agroecosystem that never waterlogged or flooded most of the year². Dry land with a dry climate is an area with an annual rainfall below 2,000 mm and dry months (rainfall <100 mm per month) more than seven months³.

The dry land on dry climate faces the problem with low fertility and limited water resources⁴. The source of water only comes from rainfall precipitation and the distributions hard to control as a needed. The timing and cropping patterns, as well as surface water supply in the dry season, becomes an extraordinary effort in the development of agriculture on suboptimal land⁵. The dry land with dry climates can be developed as a potential of agricultural resources through the application of multiple criteria analyze. It is including the optimization of soil and climate characteristics as well as the development of indigenous and local wisdom in the form of customs and social values that embraced by local farmers^{6,7,8}. The local knowledge is needed in land management efforts so that optimizations performed to be efficient and sustainable⁹.

The local knowledge is a personality, cultural identity of the community in the form of values, norms, ethics, beliefs, customs, and special rules accepted by society and proven ability to survive continuously¹⁰. Further explained that local knowledge is in principle a good value and a local culture of excellence associated with the geographical conditions broadly. Many studies in Indonesia on the role of local knowledge in land management reported that each region has diversity and equality that prioritizes the environment as a source of human life ought to preserve. Besides it has the values that embraced by the local community, as well as local wisdom is the ancestral heritage of Indonesia in the values of life and the form of religion, culture, and customs^{11,12,13}.

Almost every community has unique local knowledge as a strategy of adaptation to the environment¹⁴, which can make them survive and succeed and it is practiced from generation to generation¹⁵. The local knowledge can be in the form of understanding (insight), perception and

conscience or feelings (intuition) relating to the environment¹⁶. The local knowledge is a wealth of knowledge and culture which continues to survive and thrive in a society that from local knowledge¹⁷. Based on some of these opinions, the research conducted to explore the local wisdom in the farming system, especially in the management of dry land on dry climates at Binongko Island, since from the land clearing, planting, and maintenance, harvesting, and post-harvest. The biggest problem in agriculture sector at Binongko Island is connecting with low productivity of dry land. It can be seen from the average productivity of the land in the past five years to cassava and corn production. Cassava plants have a productivity every hectare reached 2.2 tons while corn reached by 0.4-ton¹⁸. Meanwhile, the productivity of dry land in Indonesia with the optimal management can achieve productivity every hectare for cassava plants by 20-ton¹⁹ and for corn of 2.61-ton²⁰. The efforts to improve the land productivity in Binongko Island are through the application of local wisdom that could benefit economically, ecologically and socioculturally.

MATERIAL AND METHODS

Research Area

Binongko Island has an area of 156 km² with a population of 15,832 inhabitants, administratively consists of two districts, namely Binongko District (93.1 km²) with a population of 10,532 inhabitants and Togo Binongko District (62.9 km²) with a population of 5,500 inhabitants. Farmers have main livelihood as farmer subsistence, fisherman and inter-island traders in Indonesia (18_BPS Wakatobi, 2015).

Binongko Island is geographically located between 06°00'42"S and 124°00'31"E southern side of Wakatobi archipelago. In the north, west, and south, Binongko Island bordering the Banda Sea, while in the east with the Flores Sea. This situation shows that Binongko Island is surrounded by ocean, which indicates that coastal areas and small islands (Figure 1).

The soil condition in Binongko Island is dominated by dry land with rocky soil structure (litosol) in a dry climate. The average rainfall in Binongko Island annually is reached 1468.37 mm for 134 days, with the air temperature 21.3°C–

35.4°C, type climate C (Schmidt-Ferguson) and agro-climatic-type D₄ (Oldeman).

Research Methods

The research designed qualitatively based on the phenomenological data and took place from August 2015 to August 2016. The data collected from the study literature, field orientation, and observation, also interviews and focus group discussions (FGD). Interviews were conducted on informants purposively determined using a chain information system (snowball). The local wisdom was examined using two main variables, namely the attitude to take an actions and farmers knowledge on farming activities in the suboptimal land where soil fertility and water availability as the limiting factors because of rocky soil and limited rainfall.

RESULTS AND DISCUSSION

Local Wisdom in Agricultural Systems

Binongko Island communities have local knowledge in agricultural systems that can be studied since the phase of land clearing, planting, maintain, harvesting and post-harvest. Application of each stage in the farming system is determined

based on the local knowledge related to right or appropriate time called *kutika*. The right time calculates based on the knowing on astronomy and climatology and give attention to the natural phenomena such as animal behavior, wind direction, the hue color during sunrise and sunset, clouds situation, the location of the constellations and others. It is a case in agreement with *Pranoto Mongso*, the Javanese local wisdom to determine the planting date and other agriculture activity in Java community²¹ or *Parabela* in Butonese community²². The use of knowledge of *Pranoto Mongso* in the Javanese calendar is the wisdom in risk reduction efforts and prevention of high production costs in land management²³. The *Pranoto Mongso* used by relying farmers on the instinct of inherited from ancestors from generation to generation. It is used as a benchmark to cultivate farmland²⁴, which based on natural events as the marker at rainy season, dry, flowering season, the location of stars in the universe, and the influence of the full moon and flow of sea water.

The land-clearing phase begins with the selection of suitable land for farming locations. The selection area based on the fertility indicators such as the vegetation diversity, the depth of soil,

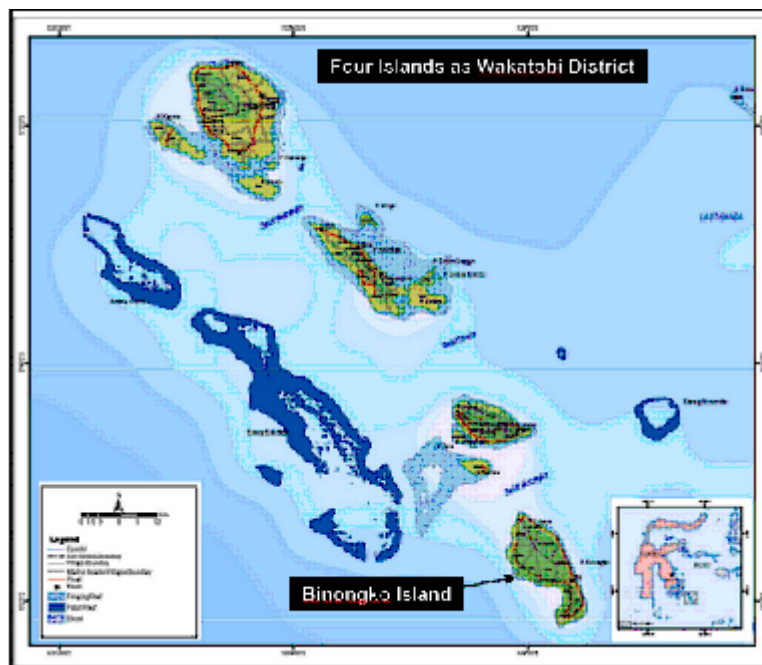


Fig. 1. Research Area of Binongko Island

and the amount of land attached to the rock. The presence vegetation of *Lantana camara* L. characterizes fertile soil, and the presence vegetation of *Imperata cylindrica* L., and *Eupatorium odoratum* L. characterizes less fertile soil. The sound taps the ground with a crowbar knows soil depth. Land attached to rocks in the field identified by taking a few stones that come to the surface. After choosing the suitable land, then made *bhelai'a* tradition. Farmers walked to the middle of the land, then stopped started this tradition, facing the *Qiblah* in the Mecca, holding some grass leaves and said spell/prayer (*mantra/do'a*). This tradition is a form of farmer reward as human beings towards nature and the Creator. The farmers believe that if we respect nature, nature or land will provide benefits in farming results as we appreciate.

Bhelai'a tradition continued with clearing the land and sometimes is burning. However, land burning by the certain way so does not cause fires, and there are still certain vegetation or trees. Land burning is done at the beginning of rainy season or the end a dry season by collecting the trees that have been dried up in one place and make the dividing line (*ilaran*) to ensure the fire does not spread in the other locations. Burning land also attention the weather conditions, wind direction and not to burn woody trees or big tree. Woody vegetation such as trees just trimmed alone and should be left grow. Some woody plants cut down only half, to pole climbing (*kacinae*) of *dioscorea* and *legumes* plant. Besides that, it becomes bird perch place and when the perch, they can release excrement as the source of nutrients or fertilizer for plants.

The planting phase begins after determination the suitable time to plant based on the moon calculations in the sky or on the calculation of good days and bad days. Sometimes, the time planting determine after the calculation of tide condition. In *Cia-Cia* community at Binongko, good planting time determined simultaneously based on the consensus of indigenous institutions (*Sarano Wali*). Before planting, *Waloindi-Haka* performed the ceremony in the *Kapitan Waloindi* cemetery and *Wali* communities holding the *pithado* event. *Pithado* is a common prayer by indigenous leaders in *Baruga*. The aim of this

prayer is to invoke the mercy and blessings of God, so that agricultural activities are free from pests and diseases, and get good harvests

The cropping pattern with a mixed system, where in a farm there are different types of food crops (cassava, corn, taro, sago, and various vegetables and legumes), farm crops (cashew, mango, banana, coconut, etc.) and forestry plants. A farm crop and forestry plants are vegetation that lasts a long time in a farming site. The cropping pattern begins with the planting food crops namely *dioscorea* and then corn. When the corn has five leave, then cassava is planted. If cassava began to grow and the weather showed lightning or thunder, then plant vegetables and legumes. Maintenance stages marked with applying the system of local wisdom namely *honowu* and *pajere*. *Honowu* is a habit to collect litter plant or household waste that transported to the farm and then placed around the base stem on the plant roots.

Pajere is a plant maintenance technique by the farmers with the walk at surrounding farm location and then attention or hold one of each crop type while said spell/prayer (*mantra/do'a*). This prayer is a form of persuasive communication between plants with the farmer and Creator, hope and call to grow and produce abundant fruit. Similarly, in the crop pest management, that is only used to rituals and abiding (*homali*) which the farmer believed. *Homali* is *Pemali* or taboo in the Indonesian language, or a strong social prohibition against objects, words, actions, or those are considered by a group, culture, or society undesirable.

Every kind of plant in the mixed farming system has different time harvest. Some types of vegetables such as beans, squash, and cucumbers harvested early. The next in sequence or depend on farmer needs namely corn, taro, *dioscorea*, and cassava. Harvest festival held at the time of harvest corn with the common prayer at *Baruga*. *Baruga* is the gathering place of the local institutions and the whole society to deliberate or to perform traditional ceremonies.

The fact is relevant to the various statements that the traditional believe provide ecological wisdom in making use of biological resources in their environment²⁵. Further explained that in the rural area, there is a trust in which people

are part of the environment, and environment damage will have an impact on people surrounding.

Local Wisdom as Adaptation Strategies

People as living things have adjusted to the particular geographic environment²⁶. Binongko as small islands and coastal areas have a challenging natural environment, because of a majority seas marine area and in particular season have high waves that make assessing difficult²⁷. The conditions of arid land with dominated rock also have a challenge. Therefore, the local community has adaptation measures strategies on the natural environment. This adaptation measures then became a customs or traditions, which attached as a local wisdom. The change of human conduct given the conformity procedure to nature has brought forth social adjustment²⁸. Cultural adaptations include all inventions and habits that tailored to the environment²⁹, that help populations to survive, including the economic systems, family systems, and the interests of socialization³⁰.

Farmers can see the local knowledge as adaptation strategy on Binongko communities is one of them through the application of mixed farming systems. In a typical farmland, there are food crops, plantation crops, and forestry with diverse types and different timing of planting. The diversity of plants and difference planting time indicates a different crop harvest time. It is a wise strategy for farmers because economically there is a guarantee of availability (stock) the family food sustainability. After collecting one sort of plant, then there more different is harvested to support the requirements of the family. This situation is also supported by the farming community's habit that have more than one field farm. Each head of household has more than one farmland, located in a different place and different time of planting or harvest time. In this context, the economic needs of the family tend to be fulfilled stably. Moreover, in Binongko communities known has food consumption patterns and substitution between foods containing protein (seafood) and foods containing vitamins and minerals (vegetables) and ways of foodstuff storage that are not easily broken.

Second, socially the level food insecurity in this region tends to be avoided because of food supply stability. The habits to manage of land with more than one type of plant, also teach the

people to develop the alternative source of livelihoods. The people in these areas recognize patterns in time division and have multiple types of livelihood, for example, a family head may become farmers, fishermen, sailors and even become merchants. This situation has implications on their ability to be adaptive and can survive even with challenging natural conditions. That why in sociocultural the community binongko known as intelligent, dynamic, and has a solid solidarity. A solid sense of community among one of them reflected through the cooperation or collaboration (*pohamba-hamba*) at an agricultural system³¹. *Pohamba-hamba* wisdom provides space to the whole community to manage the farm, even though they have drawbacks regarding the amount labor and financial. In the big work stage, such as land clearing, planting, and harvesting, the community members may assist them. The family that works with a little of energy, widows or wives abandoned by her husband sail can remain open land and plant various crops types that meet their needs. Hence, agricultural products and consistently guaranteed its accessibility, and the attachment of society is getting stronger. The fact is relevant to the result of another researcher. The social outline and cultural factors that are identified directly related to land use planning are divided into seven groups³², one of which is culture and customs in the management of land, including local wisdom. It identifies with the convention of good land utilizes works on concerning safeguarding of social, itself for production purposes or identified with the preservation of characteristic assets and ecological assurance.

Third, ecologically that the cultivation technique by upholding conservation and sustainable values of natural resources. That can be seen, from (1) the mechanism of clearing land by leaving vegetation trees and cut half; (2) maintenance the plant that can be maintaining the temperature and nutrients around the plant roots. Similarly, the management techniques pest's through certain rituals without using harmful chemicals. The result is supported by various studies reported that the control of pests and plant diseases could be done by applying technical culture without using chemicals. In the implementation, using a local wisdom, namely using ash kitchen or husk, can control pests and keep

the plant seeds free from soil fungal attack, and can even improve plant resistance to pests and diseases³³. The natural enemies and interchange hosts are using for controlling stem borer attack³⁴. The use of trap crops to control rice stem borer³⁵ and partially cutting the plant leaves can reduce the level of damage to rice crops³⁴. The use some plants has potential as natural pesticides to control pests of cabbage and stem borers³⁶. The use of wild plants to control of rice pest³⁷; using plant extracts to control pests armyworm³⁸; the use of betel leaf extract can suppress the development of *blast* pathogen³⁹. The pests and plant diseases control have been demonstrated in Javanese using traditional knowledge *Pranata Mangsa* for a long time⁴⁰. Farmers estimated the beginning of the rainy season semi-quantitatively and the beginning of the dry season, and then determine the right time for planting to avoid pests and diseases.

CONCLUSION

Based on the study concluded that the optimization of suboptimal land on the Binongko Island is through the applying of local wisdom to develop of mixed farming systems. These farming systems proved to be beneficial economically, socially and ecologically and considered as local wisdom. In this context, mixed farming systems that have been done by the people from generation to generation need to be developed to increase the area of agricultural land. Farmland can be expanded to utilize the fallow land or shrubs, which had previously been processed into agricultural land. This effort can be done simultaneously with the increasing knowledge of the community to intensify *honowu*, activities on managing a farm. The activity is expected to increase the ability of soil to provide nutrients so that productivity can be maintained and sustainable.

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