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INDIGENOUS KNOWLEDGE OF BANJERESE FARMERS TO PREDICT THE SEASON IN AGRICULTURE AREA SWAMPLAND

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Abstract

Traditionally, tidal swampland has been used since the ancient Banjar tribe in Indonesia. They have unique local knowledge in rice farming systems in the swampland area. Local knowledge of Banjar tribe farmers make rice farming in tidal wetlands can be sustained until now. The objective of the study was to identify and to describe the local knowledge of Banjarese farmers in tidal swampland for predicting the time of commencement of the farming season. The method used was a qualitative method with an ethnographic approach. Data collection of research used observation, documentation, and in-depth interviews. Subjects in this study were Banjarese farmers as key informants. The technique of data analysis was done by triangulation techniques. The Results showed that Banjarese farmers had local knowledge of the determination of wet and dry seasons. Farmers can predict when the growing season begins by observing the signs of nature. How to identify undertaken by farmers was by observing the behavior of animals, plants that grow in swamps and the start position.

Keywords: Indigenous knowledge, farmer, agriculture, swampland.

1. INTRODUCTION

Wetland resources in Indonesia is available, but this land has not been used optimally for tidal agriculture. Tidal wetlands are one type of agroecology potentially wide enough for the development of agriculture, especially food crops (Haryono, 2013). This is in line with the opinion (Nazemi et al., 2012) that the tidal area has an important role in supporting national food security and development of systems and agribusiness, given the potential the area spacious and management technology that already exists.

Tidal swamp land development for agriculture faces several constraints. According to (Noor, 2010) in biophysics, the main factors that influence the development of tidal swampland for agriculture is stagnant water, low soil pH, the presence of toxic substances, low soil fertility with high diversity, and the topography of the land. This is in line with research (Sarwani et al., 1994) and (Maas, 2002) issue of physics-chemistry on land tidal marsh is a puddle of water, the physical condition of the land, soil acidity and organic acids in the lining of peatland, containing toxic substances, saltwater intrusion, the natural fertility of the soil is low, and the high diversity of soil conditions.

Unfavorable soil conditions do not make farmers of Banjar tribe surrendered to the state. Tidal swamp land use

by farmers of Banjar Tribe particularly in Barito Kuala, South Kalimantan has proven to improve soil quality and increase the production of rice. Based on BPS data of Barito Kuala 2016, rice production has increased significantly from the year 2010 amounted to 329.089 tons to 350.468 tons. One of the success factors of Banjar Tribe farmers in rice cultivation because they have indigenous knowledge tidal cultivate the land. The experience of local communities, especially farmers Banjar tribe group in harnessing tidal land that inherited produce specific knowledge of tidal wetlands.

A study of agricultural systems in wetlands already carried out by researchers from different institutions and organizations both in Indonesia and outside Indonesia, but the results of research conducted by (Pujiharti, 2017; Marpaung, 2016; Mareza, 2016; Helmi, 2015; Jumakir, 2014; Okpolu, 2016; Idiong 2007; Oniah, 2008) is more focused on the aspect of increasing productivity of rice. Rice cultivation in tidal swampland that farmers cultivated Banjar ethnic interesting to study because it has a uniqueness that is not found in other areas with similar soil characteristics. The uniqueness among others: the knowledge to determine the change of seasons, knowledge of the fertility of soil, drains Handil and block to control the water conditions, use trowel to work the land, the application of *tapulikampar* which is a land cultivation minimum, the application transplanting the rice seedlings and tradition of *bairik* when harvesting to minimize grain damage.

Based on the cultural uniqueness of *bahuma* (farm) owned Banjar tribe group, the focus of this research is to identify and describe local knowledge Banjarese farmers in rice farming systems, especially in the tidal wetlands. Assess the importance of local knowledge Banjar tribe farmers to realize the sovereignty of local commodities to grow and anticipated losses due to crop failure due to climate change. Besides, local knowledge owned by farmers can be developed and become inputs to supplement and enrich the model of scientific knowledge (scientific models) farming systems in tidal land.

2 METHODOLOGY

This research is a descriptive qualitative ethnographic approach. The ethnographic approach aims to describe the behavior of people in the cultural environment "ethnic" based on truth "natural". The study was conducted in the Mekarsari District, Barito Kuala, South Kalimantan Province. The research data refers to a field survey conducted in October 2016 - July 2017. The data in the form of research location data, semi-structured interviews, and documentation. To maintain the validity of the research findings in the field do cross-check by observation, interview, and documentation. The data were analyzed using triangulation techniques (data reduction, presentation data, and verification). The results of the interview are reduced by selecting points that correspond to the focus of research. Then the interview that has been reduced to be presented in the form of a matrix. At the same time, we do cross-check the data (verification data) with secondary data.

During October 2016 - July 2017, in addition to field data collection (observation and documentation), I also conducted semi-structured interviews with farmers and extension agents Banjar Tribe (PPL). In total there were 24 informants, 20 farmers of Banjar Tribe and 4 PPL. Local knowledge of farmers Data compiled from interviews with several people who are selected based on the knowledge they have. Information on the local knowledge of farmers on tidal explored through a series of interviews either individually or in groups to the number of farmers who have direct experience. From this process to obtain a comprehensive description of the practices and actions in managing wetlands as well as a variety of conservation efforts.

3 RESULTS

The results showed Banjarese farming system known as *bahuma* has been elaborated by the community for generations. They form a system of knowledge through experience and trials so it is a process that is adaptive to the surrounding environment. Based on the experience of the face of changing nature, Banjar Tribe farmers trying to understand the state of the environment. This is done so that they can survive in the environment where they live which is considered to be of marginal land.

Banjar Tribe farmers have local knowledge which is still applied to the present in rice farming systems in tidal swampland . Local knowledge in the form of knowledge in predicting the season, the selection of land (land which is fertile and infertile), water management, land preparation, seed selection and planting of rice, and the rice harvest. Banjar Tribe farmers to make plants, animals and other natural elements to be used as a sign in the process of farming in tidal wetlands.

3.1. Determination of Drought

The results showed the agricultural system in the village of Banjar tribe Mekarsari is known as "bahuma" has been hailed by the community for generations. They form a system of knowledge through experience and trials so it is a process that is adaptive to the surrounding environment. Based on the experience of the face of changing nature, Banjar Tribe farmers trying to understand the state of the environment. This is done so that they can survive in the environment where they live which is considered to be of marginal land.

Farmers in the village of Banjar Tribe Mekarsari assume that every living creature has the benefit of God's creation of human life. Plants and animals that exist around their neighborhood can be a sign or signal to determine the specific nature of symptoms concerning the business of farming (bahuma). In addition to signs of plants and animals, Banjarese farmers also made stars in the sky to find the weather or time of planting seeds (Paddy). Banjar Tribe farmers have specialized knowledge to predict the arrival of the dry season and the rainy season.

To determine the arrival of the dry season, farmers Banjar ethnic make *hambawang* tree/*Ambawang*/*kuwini* (*Mangifera odorata*) as an omen. As told by Mr. Al (farmers):

> *"…wadah kami ni amun handak mangatahuaini musim kamarau datang, tinggal malihati puhun hambawang atawa kuwini. Bilanya bakambangan artinya pacang musim kamarau tu datang. Amun warna kambangnya habang tuha bararti pacangan lawas tu panasnya, tapi amun warna kambangnya habang anum bararti panasnya pacang satumat haja…".* (Interview Mr. al, 2017)

> At our place, if you want to know the arrival of the dry season, just look at the tree of *hambawang* or *kuwini*. If the tree is flowering means the coming dry season. If the color of deep red flowers mean the dry season will be long, but if the color pink flowers mean the drought is not too long.

Figure 1. Flower of *Hambawang*

Source: Field Documentation, 2017

Sign of the dry season farmers Banjar ethnic group commonly called by the term sign eastern tip. Observations of the star's position are also done by farmers of Banjar Tribe. Emerging *Baur Bilah* starts (Orion) also marks the arrival of the dry season. *Baur Bilah* stars cluster appeared on the western horizon, these star clusters consist of three (in a row) and form a straight line. This constellation, also known as the star constellation plow. This constellation is easily recognizable because there are three twin star in a row forming "Orion's Belt".

Figure 2. Constellations Orion (*Baur Bilah*)

Source: http://pertanianindonesiaku.com

Information from Mr. Aw (farmers) that:

> "… *lamun bintang baur bilah nang babaris itu sasain bahandap pacangan tarik panas…*" (Interview Mr. Aw, 2017)

> If the *baur bilah* star was getting shorter means that the dry season will arrive.

Other information is also written by Mr. Aw (farmers) of the long and the short dry season.

> "…*amun bintang nang paling pa'atasan paling tarang bararti pacangan lawas kamaraunya tapi amun bintang nang paling bawah nang paling tarang bararti kamarau satumat haja…*" (Interview Mr. Aw, 2017)

> If the top looks bright star, there is a long dry season. Conversely, if the star under visible light, dry only briefly.

Another sign in the form of appearance *Karantika* Star (Ursa Major / Big Dipper) on the western horizon at dusk until after maghrib time. Banjar Tribe farmers believe if *Karantika* Stars appear and the water in wetlands will dry. As stated by Mr. Amr (Chairman of Farmers Group):

> "…*bila bintang karantika sasain bahalus atawa basisit/manyisit pacangan tarik panas tu…*" (Interview Mr. Amr, 2017)

> When a star begins to diminish mark karantika upcoming dry season.

Figure 3. Constellation the Big Dipper (*Karantika*)

Source: http://fr.wikihow.com

Karantika star is the star cluster clustered arrangement. The star clusters comprising 9 pieces star although sometimes only seen 6-8 fruits depending on weather conditions and the location of observation. There is also a look at the position between the Sun and *Karantika* stars to predict the length of the dry season.

> "…*bila matahari tu nah muncul taka timur pada ka'andakan bintang karantika bararti kamarau pacangan datang tu…*" (Interview Mr. Aw, 2017)

> When the sun rises slightly to the northeast than the star position karantika will mean a long dry season.

The high tide comes gradually is also a characteristic that determines the length of the dry season. Information from Mr. Al (Farmers) explained

> "…*lamun talu kali banyu pasang datang (pasang-surut, pasang-surut, pasang wan surut pulang) wan dalamnya banyu pasang nang katiga nang paling dalam tibang pasang sabalumnya maka kabiasaannya kamaraunya pacang lawas tu…*" (Interview Mr. al, 2107)

> If within three times the coming tide (tide, tidal, replace) and the height of the tide third higher than the two previous posts, it usually will happen a long dry season.

In addition to watching the stars, the farmers of Banjar Tribe also observe the behavior of animals to be used as

a sign of the arrival of the dry season. Animals used as a sign of drought is the fish and birds that used to live in a swamp area. At the time of the dry season arrives, the fish began to leave the field/marsh area to the river. Results of interviews with Mr. BJR (Farmer):

"…*Amun iwak nang kaya sapat, papuyu atawa haruan mulai baturun ka sungai, partanda musim kamarau sudah parak. Iwak ti marasa banyu di pahumaan mulai sadikit wan barasa panas. Jadi iwak mancari banyu nang tadalam wan tadingin…*" (Interview Mr BJR, 2017)

If fish like *sapat, papuyu* or *Haruan* have started to move into the river, a sign of summer is near. Fish feel the water on the fields began to recede and warm. Therefore, the fish will look for water to survive.

This type of fish commonly found in tidal rice fields, among others: *Sepat* swamp (*Trichogaster trichopterus*), *papuyu*/damselfish (*Anabas testudineus*), and *Haruan*/cork (*Channa striata*).

(a) (b)

Figure 4. (a*) Haruan/*Cork (*Channa Striata),* (b) *Papuyu/*Betok (*Anabas Testudineus*)

Source: http://jejakrekam.com/jpg

Figure 5. *Sepat* Swamp (*Trichogaster trichopterus*)

Source: http://agrowindo.com

In addition to fish, *hayam-hayam* birds (ibises) is also a sign of the arrival of the dry season. Information from Mr BJR (farmers) that:

"…*amun burung hayam-hayam mulai bahintalu dipadang pahumaan atawa di padang parupuk, ngituh partanda banyu pacangan rintak…*" (Interview Mr. Bjr, 2017)

if the *hayam-hayam* bird starts laying on the grass, this means that the water will recede.

From the observations and experiences of Banjar Tribe farmers, eggs of *hayam-hayam* birds will hatch, when the water began to recede so that children birds easily find their prey (small fish).
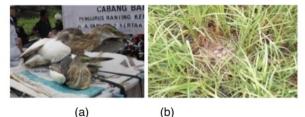

(a) (b)

Figure 6. (a) Bird of *Hayam-hayam*, and (b) Egg of *Hayam-hayam* Bird

Source: Field Documentation, 2017

Whether or not long dry season can also be observed from the movement of the smoke. Usually, when cleaning the area around the fields, Banjarese farmers burning remnants of grass that has been cut off. The results from the burning of grass that would produce smoke. Smoke movement that is a marker for Banjar Tribe farmers. Results of an interview with Mr. Spl (farmers):

> "…*Amun kami mulai babarasih di pahumaan, rancak imbahnya bababanam kumpai lawan ratik nang ada. mun palaknya pina cagat ka atas wan lawas, wayah kamarau panjang tu. Palak nang pina cagat tu karana katiadaan angin nang maniup*…" (Interview Mr. Spl, 2017)

> If we began clearing land by burning grass, usually we will pay attention to the smoke from burning. If the smoke straight up in a long time, then the dry season will last long.

3.2. Knowledge of Rainy Season

Sign of an impending rainy season is also known Banjar ethnic farmers by local knowledge they possess. This sign can be seen from the behavior of animals and plants that grow in wetlands. Signs coming of the rainy season are also known by the term sign western tip. Banjar Tribe farmers also believe in the existence snails in large numbers in wetlands is a sign of the rainy season will soon come. Information from Mr. Al (farmers):

> "…*kalimbuai tu pina banyak sudah kacungulan di pahumaan, pacangan parak sudah datang banyu/hujan*…" (Interview Mr. al, 2017)

> When the snails have started numerous in the area of rice fields, a sign of the rainy season will soon arrive.

As in other areas, Banjar Tribe farmers also believe if the frogs began to ring it will rain soon. Information from Mr. MHR (farmers) that:

> "…*lamunannya kuduk tuh pina kakarungkung babunyian, pacangan hujan tu*…" (Interview Mr. MHR, 2017)

> When frogs start ringing sign will rain soon.

Another sign related to the prediction of the rainy season presented by Mr Smi (farmers), he explains:

> "… *amun burung putih atawa burung laut bamula datang ka padang pahumaan maka pacangan datang hujan*…" (Interview Mr. Smi, 2017)

> If a bird is white/seabirds began coming to the swamp area, according to farmers of Banjar Tribe, rainy season will soon come.

Sign of coming rain season apart from the animal's behavior is described by Mr. Al (farmers), according him:

> "…*amun tanda kapat (hujan-panas-hujan-panas) mulai rancak wan jaraknya kada tapi jauh antara hujan wan panas, kada lawas lagi pacangan datang musim hujan*…" (Interview Mr. al, 2017)

> If signs or phenomena of *Kapat* (rain-rain-hot-hot) occurred within the adjacent, is a sign of the rainy season will arrive.

Further added as well by Mr. Al (farmers) that:

> "…*ampat puluh hari imbah kapat, banyu di pahumaan pacang layap. Amun banyu layap kada lawas lagi bubuhan kami bamumula manaradak*…" (Interview Mr. al, 2017)

> Forty days after the occurrence of *Kapat* usually water in the tidal wetlands will be back in the (low). This *Kapat* phenomenon bodes well for farmers to begin planting rice seeds (*manaradak*).

Banjar Tribe farmers also noticed a plant that grows in swampy areas, a marker to predict the arrival of the rainy season. As stated by Mr. Smi (farmers):

> "…*kumpai papayungan tuh nah ada di pahumaan mun inda manguning wan pina rabahan*

artinya banyu pacangan dalam atawa basurung…" (Interview Mr. Smi, 2017)

If *kumpai papayungan* (Cyperus papyrus) growing in paddy fields begin to turn yellow and falls, it means the waters will increase (*basurung*).

Banjar tribe farmers can also determine the length of the season whether or water abundant in wetlands with respect of *Lumbu* plants (taro plants). Information from Mr. Smi (farmers) that:

"…amun lumbu mulai bakambangan ngituh partanda tatangah musim banyu dalam, wan daun kumpai papayungan nang mulai bawarna pina kuning, bararti banyu pacing lambat batarik…" (Interview Mr. Smi, 2017)

If the plant of *Lumbu* (taro plants) started flowering means that when the mid-season of water increasing. *Pipisangan* grass leaves (*Polygonum sp*) who begins to glow slightly yellow means the water will slowly recede sign *(batarik).*

Through observation of this season, farmers can take into account the length of the Banjar Tribe rice planting season. Due to inaccuracy/wrong calculations can increase the risk of crop failure. Besides, by knowing of the seasons, Banjar ethnic farmers can determine the time to do the planting (*manaradak*).

As an actor who knew the condition of the environment in which he lived and fished, of course, farmers have a variety of specific local knowledge in managing natural resources. Tidal swampland to farmers of Banjar Tribe is an asset for their survival. The timing of the rice planting and appropriate land management is a step that must be taken and realized in practice local wisdom. Close human relationships with the natural environment to make them familiar with the seasonal changes, soil conditions or the land and the nature and terms of plant life.

Knowledge of climate is important for farmers. As explained (Suciantini, 2015) that one component of the environment which is a critical success factor of a business cultivation plant is the climate. Predictable seasonal changes will reduce the risk of crop failure. In line with the (Roncoli 2009) climate prediction is one among many sources of information that can be used by decision-makers to reduce risk and to optimize gains.

Peasant life very close to nature enables them to predict natural phenomena such as the change of seasons. Materer, et al. (2001) describes the importance of climate in our daily lives is shown in the wealth local knowledge based on predicting weather and climate. It is also in line with the opinion (Orlove, 2003) "... that in a climate as in other environmental domains, many populations around the world are close observers of the natural world ...".

Besides Tribe Banjar, Javanese also have local knowledge in reading the signs of nature known as the order of prey. Prey institutions used to determine the calculation of the season that will be used in managing agricultural land. However, the calculation order of prey endangered condition caused by the development of science and technology, technical irrigation, and the reluctance of farmers today to learn the order of prey because of the complexity in its calculation (Fidiyani & Kamal, 2012). Unlike the case of farmers who do Banjar ethnic group, predicted the arrival of the dry season and the rainy season is still there and used until now. With signs of nature, they can predict the arrival of the dry season and the rainy season to anticipate the delay time of transplanting rice.

Based on local knowledge possessed, farmers develop various phrases stored as a "story about the weather" or weather lore (folk-lore). Yunita (2013) describes the "... weather folk-lore is based on the knowledge of the common people acquired through the ordinary observations of nature, animals, plants, etc unaided by instruments ...". Stories about how to predict the seasons change lowered Banjar Tribe farmers for generations. They teach the knowledge and observation of the natural signs such as positions of stars in the sky, the behavior of animals and plants that grow in the surrounding environment. This is in line with the opinions of Orlove (2003) "... visual and sensory perceptions are key elements of the folk epistemology of climate, the human body's senses are important avenues through which people get to know their local weather in its particular manifestations, such as rain, hail, snow, wind, and temperature ... ".

The sustainability of agriculture in tidal swampland to be an indicator of success in managing the ecosystem so that the ecosystem provides results in a relatively long period. This is in line with the opinions of Yunita (2012) that local knowledge is considered very valuable and has its own benefits in the lives of farmers in the swamp

ecosystem. However, the implementation of sustainable agriculture approaches in Indonesia should be in harmony with the environment to maintain productivity growth to meet human needs.

Often the practice of local agricultural systems can give an idea of potential in the utilization and management of existing resources in a sustainable manner (Sunaryo and Joshi, 2003). Extracting information regarding local knowledge society and innovation adopted by farmers can describe the pattern of natural resource management in the vicinity. Besides, it can also be used as input in improving the lives of farmers, both in terms of economic, ecological and social. Local knowledge and innovations adopted by farmers are collected, then assembled and analyzed a model of farmer knowledge that is structured so easily adopted by other communities. The model was built and a developed understanding of farmers can be input to supplement and enrich the model of scientific knowledge (scientific models). Assess the importance of local knowledge of farmers also aims to support the sovereignty of local commodities to grow, anticipated losses due to crop failure.

4 CONCLUSION

Tidal wetlands including marginal land that has great potential for agricultural development. Banjar Tribe farmers have unique local knowledge in rice farming systems (bahuma) in tidal wetlands. Local knowledge owned by farmers of Tribe Banjar applied starting from the determination of the season, the selection of land, land preparation, seed selection and planting, and harvesting. Identification and study of local lore Banjar ethnic farmers are very important, especially in the management of natural resources and environmental tidal swampland to remain stable and sustainable through land conservation with tapulikampar system, anticipating crop failure and food sovereignty.

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