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Conceptualization of Traditional Knowledge for Adoptive and Sustainable Agriculture by the Indigenous Basap Dayak, East Kalimantan, Indonesia

Ndan Imang

Lecturer, Department of Agri-business, Mulawarman University, Indonesia

Nella Naomi

Lecturer, Department of Agri-business, Mulawarman University, Indonesia

Abstract:

This research was conducted in 2019 in the indigenous Basap Dayak community of East Kalimantan, Indonesia. The objectives of the study were to explore the traditional knowledge and wises, and to formulate adaptive and productive agriculture under the external pressures to agricultural land. Data were collected through household survey and Focus Group Discussion, and analyzed using descriptive qualitative method. Research findings were that the Basap community has traditional knowledge in practicing Swidden agriculture at every stage of work from land selection to post-harvesting. The traditional knowledge already formulated to use under the environmental changes and external pressure. The traditional knowledge was still effective to practice in maintaining the productivity of land under the external pressure. It is recommended that young generation of the Basap should be informed to the traditional knowledge, and the external parties including coal mining, industrial forest plantation and even District government should recognize and facilitate the Basap community in sustaining their traditional way of life.

Keywords: Basap, Dayak, traditional knowledge, Swidden agriculture, kandome panuaji

1. Introduction

Traditional knowledge includes types of knowledge about traditional technologies of subsistence, ecological knowledge, traditional medicine, climate, and others. Traditional knowledge has been orally passed for generations from person to person (Djoghla, 2009) and Chandran (2017). Setboonsan (2006) and Mungmachon (2012) describe that traditional knowledge is transmitted through tradition and obtained from both within and outside the community. Traditional Thai communities have sufficient knowledge to depend on their own selves with their own ways of living which in turn depend on nature. Furthermore, traditional knowledge is basic knowledge gained from living in balance with nature. It is used in ways that benefit the community and in ways which it can be passed on.

In 1969, the Basap Dayak community suffered of starving due to failure of harvesting because of long drought and severe pests attack such as monkeys and grasshopper. Therefore they move down to Keraitan area, the existing village by the reason they can ask for rice from nearby villages. During they living in the forest and practicing swidden agriculture for subsistence and also grew some crops, they learned much from their long experience in agriculture. Their experiences and wises to keep their forest and land as well as traditional agriculture are considered very valuable to explore in order to adopt in existing agriculture practices. Regarding the advantage of traditional knowledge to improve the productivity of swidden agriculture, Imang et al (2018) described that the customary people in Matalibaq East Borneo could improve land productivity through *daleh*, a system in which the farmer modified Swidden agriculture cycle more productive and adaptive way.

However, since 2005, some activities such as coal mining have and forest plantation been influencing the economy and agricultural activities of the community. Mapi (2019) mentioned that the massive expansion and exploitation of coal mining has caused social and environmental impact to surrounding communities that caused the vanished of agricultural land and even land for settlement.

The objectives of the study are to explore the traditional knowledge and local wises, and to formulate more adaptive and productive agriculture under the external pressures to agricultural land.

2. Method

Research was conducted in Keraitan Village, East Kutai District, East Kalimantan Indonesia. This village resided by the indigenous Punan Dayak community. Data and information were collected through in-depth interview, Focus Group Discussion with five influential people in the village and household survey of 15 households. Descriptive qualitative analysis was used for data analysis, and presented in tables, graphics and matrix.

3. Results

3.1. Research Site Condition

The current population of research site is 45 households or 123 people. In 2005, a national coal mining started exploration in village area and in 2016 some 25 households were relocated to new settlement in Matirowali, about 25 km away of the original village. Main livelihood are Swidden agriculture (locally called *ladang*) followed by growing cash crops such as rubber and vegetables, hunting and gathering. So far, the main external pressure to the daily life and environment is a national coal mining with massive exploitation area that impacting some 50 surrounding villages. Up to 2010, some ritual ceremonies related culture and agriculture were still practiced. However, after that the ritual ceremonies were slowly faded away due to the external influence in their daily life, and some person in-charged with the ceremonies passed away. An article on Thailand Research Fund (Mungmachon, 2012) implicitly recognized the rule and value of elders who have knowledge that comes from life experiences.

3.2. Dynamic of Economic and Environmental Condition

It is interesting to study the dynamic of economic and environment for the last 10 years in order to support future sustainable agricultural program of the village. Table 1 below shows the response of respondents to the dynamics of agricultural activities. In term the size of shifting cultivation (locally called *ladang*¹), there was no change of the size of 84% of the respondents and only 7% increased and 9% decreased. Respondents described that they still clearing land for *ladang* for subsistence purpose as they used to do and therefore the rice production also no change for the most of respondents. Rice for household consumption also showed that the importance of rice and cacao garden showed increased trend

No.	Response of Respondents	Increased	No Change	Decreased
1	Size of rice field 10 years ago and now	7	84	9
2	Rice production of 10 years ago and now	4	79	17
3	Rice productivity of 10 years ago and now	2	34	64
4	Size of cacao garden 10 years ago and now	73	27	0
5	The importance of <i>ladang</i> rice to household consumption	13	66	21
6	Size of rice field in the next 5 years	4	74	22
7	Size of rubber in the next 5 years	52	47	1
8	Size of vegetables in the next 5 years	41	48	11
9	Number of livestock 10 years ago and now	32	45	23
10	Livestock development in the next 5 years	54	39	7
11	The importance of agriculture for family	7	72	21
12	Development of swallow bird nest in the next 5 years	63	27	10
13	Does local wisdoms still practiced	79	18	3
14	Fallow period is shorter or stable?	0	69	31

Table 1: Socio-economic Dynamic of the Research Site

Source: Field Survey (2019)

For cash income generation in the future, respondents are now starting to increase the size of rubber and oil palm garden, and vegetables for self-consumption and to sell. Even, some respondents have been constructing wooden swift bird nests because the price of bird nest is expensive. One kilogram of bird nest is Rp. 10 million to 12 million per kg (equivalent to USD 900). Earlier, some respondents were the swift bird nest gatherer when stone caves and forest were still benefit. After the forest and caves destroyed by coal mining and other destructive activities that disturbing the bird, there was no more bird nest found in the caves.

Other cash income activities being conducted by respondents are raising livestock such as local chicken that would be sold to company or neighbor villages. Even though the economic life of the respondents is now more dynamic and more open and accessible to outside economy, this community still obeying and practicing local wisdom in daily life especially in agricultural related activities. Data on Table 1 indicates that 79% of respondents still practicing the local wisdoms. Fallow-period of Swidden agriculture indicates that most of respondents (69%) are still similar with earlier fallow period, while 31% mentioned that fallow period became shorter. It is mean that Swidden agriculture still has long enough fallow for soil to recovery of nutrient. The average fallow period is 8.3 year, while the average cycle for the rest of respondents is 7.2 year.

¹Ladang is the Indonesian term for Swidden Agriculture

3.3. Treatment and Protection of Traditional Knowledge

Implementation of traditional knowledge, of course face constraints under modern agricultural system. Therefore, it needs support from both side, the community itself (as internal actor) and from external actor such as government, companies and neighbor communities. The recognition and treatment to traditional knowledge is assessed based on eight criteria as provided by Anonymous (2007) as follows: (1) recognize value; (2) promote respect; (3) meet the needs of holders of traditional knowledge; (4) promote conservation and preservation of traditional knowledge; (5) empower owners of traditional knowledge and acknowledge the distinctive nature of traditional knowledge systems; (6) support traditional knowledge systems; (7) contribute to safeguarding traditional knowledge; (8) prevent unfair and inequitable uses misappropriation and misuse.

Based on the above criteria, some 15 respondents were interviewed using end-closed question to assess their response. A Focus Group Discussion (FGD) with village chief and influence people in the village also conducted, and the important point is shown on Table 2 below.

Table 2 below provides the response of respondents to the traditional knowledge which is would be useful to treat and deal with the implementation of traditional knowledge in the village. Table 2 below also useful for government and surrounding private companies for promotion of traditional knowledge which in turn promoting forest and ecological sustainability. The Basap Dayak have been struggling for forest sustainability since they lived in this area but they less bargaining power to coal mining exploitation.

No.	Aspects of Traditional Knowledge	Satis- factory	Fair	Un-satis-factory
1	Recognition of elders to values (social, spiritual, economic, intellectual, scientific, ecological)	67	28	5
2	Recognition of youth to values (social, spiritual, economic, intellectual, scientific, ecological)	44	49	7
3	Promotion of respect to traditional knowledge			
4	Do surrounding companies meet the needs of holders of traditional knowledge in forest-ecological conservation?	7	27	66
5	Villagers' promotion to conservation and preservation of traditional knowledge	79	16	5
6	Government support to distinctive traditional knowledge systems	8	12	80
7	Company support to distinctive traditional knowledge systems	5	26	69
8	Community's support to traditional knowledge systems	86	9	5

Table 2. Response of Community to Traditional Knowledge

Source: Field Survey (2019)

Data on Table 2 above provides information of the respondents' response to recognition of traditional knowledge that assessed from both sides: the community (internal actor) and external actor such as government and private companies. The table indicates that the elders (more than 55 years old) were more concern to traditional knowledge or wisdoms (67%) compared to the young people even though 44% of the young people still concern and recognize the traditional knowledge.

This fact indicates that there's decreasing trend of recognition to traditional knowledge. Regarding this fact, Djoghla (2009) mentioned that the most important aspect for indigenous and local communities is protection of their knowledge, innovations and practices associated with genetic resources through a requirement that such knowledge is accessed with their prior informed consent or approval. Secondly and of equal importance, is that when such knowledge is accessed, it gives rise to the equitable sharing of benefits

3.4. Environmental and Agricultural Traditional Wises

- *Forest for life*: in the past, the Basap Dayak community used to live as nomadic people in the jungle. During their nomadic journey in the jungle, they collected foods by hunting animals such as wild pig, deer and monkeys. Earlier they not used to fish, but since 1980s as some villagers started to fish, and under customary rule they could only fish using hook. Using net and or other destructive ways of fishing are prohibited by customary rule. For cash, they collecting non-timber forest products such as eagle wood, rattan, swallow nest and *guliga* from monkey and porcupine. For forest sustainability, under customary rule they also can only clear virgin forest under permission of Customary Chief (*Kepala Adat*). The implementation of *kandome panuaji* on the step of "slashing" or land clearing was also a strategy to limit forest degradation. By implementing the local wisdom of *kandome panuaji*, every household was only allowed to clear land at the most one hectare. They learned from earlier experience that rice from one hectare usually enough for subsistence. This wisdom is considered very significant to keep the virgin forest from land clearing.
- *Slashing and fertile soil indicators*: location for the next Swidden field is selected through two criteria: first the indicator vegetation, and second is the soil fertility. When farmer found some species growing in the location,

means that the land is fertile enough. Some indicator species for fertile land are: *Blumea balsamifera*, *Maccaranga trichocarpa*, *Maccaranga triloba*, *Hibiscus macrophyllus*, *Elmerrillia mollis*, *Lindera polyantha*, *Musa acuminata*, *Spatholobus oblongifolius*. For traditional testing soil fertility, the farmers pick up some small sample of soil and then testing the proportion of clay and sand using the edge of fingers. By doing the test, they could conclude whether the soil is fertile or not to grow rice. The combination of indicator species and soil fertility is the criteria to decide location for shifting cultivation.

- *Felling/cutting*: felling method is another strategy to accumulate biomass from the leaves and tress as well as a strategy to protect forest fire when they will burn the field. This felling/cutting method is that the direction of the trees they cutting towards inside field so that they will have much biomass and a perfect burning is believed to mitigate seed of weed and could kill pest, worm, insect that living beneath the soil. The biomass play important role as natural fertilizer for rice. Because fell direction toward inside the field, so when they burn the field, there's no dry material/fuel to burn inside the forest. In this way, they could protect the surrounding forest from wild fire.
- *Weeding*: for the farmers, weeding is not simply to remove weeding from the field. At the weeding time, farmer also trying to sustain, and even to improve the fertility of soil. As mentioned above, during the preparation of planting, the farmer construct simple terrace using fallen trees by set medium and big trees on the terrain so that it can catch humus and protect soil from erosion. The removed weeds are put below the trees so that it could act as small pond when it is raining and then humus will be accumulated in the terrace.
- *Harvesting*: for the Basap customary community, the important thing during harvesting is that the way the farmer harvests rice that would be prepared and stored for seed in the following years. They believe that the productivity of rice is very much depends on the quality of the seed beside other factors. That's why they treated the rice for seed during harvesting very carefully based on traditional knowledge that inherited by ancestors. The criteria of the best rice for seed and the way of harvest are: already mature enough, yellow-gold color and should be harvested in the evening on a shiny day between 12.00 am to 15.00 pm. The seed should be kept inside a bark-box in order to keep the humidity of the seed before the seed would be plant in the following year. They avoid to keep the rice-seed in tin or plastic bag because it can dry and reduce the sprout of the seed.
- Post-harvesting for crops: respondent use the ex-field of rice by growing some crops such as chili and vegetables. For the best product, respondents always grow *dara mata* at the same time and same area with crops. They believed that *dara mata* can keep the crops growing well even in dry season.

3.5. Concept for Adoptive Agriculture

The concept of adoptive agriculture is a concept that adopted from the traditional wisdom and knowledge that believed and already practiced for decades by the customary community of Basap Dayak. Basically this concept is the integrated unit of sustaining the forest and forest ecology, hunting and fishing strategy, gathering and agricultural practices.

- Forest and land management for agricultural purposes: the Basap people believe that forest and forest ecology is the "mother" of foodso that earlier they strickly kepttheir forest for the purpose of ecological balance. They believed and learned that agriculture would more productive and save when the pests of agricultural such as grasshopper, insects, monkeys, etc. have enough food in the forest. The reason was when the pests have enough food in the forest, the pestswould not attack and destroy their plants. So that, they tried to keep the size of plant-able agricultural land narrower than the size of forest. A bad agricultural experience happened in 2015/2016 when their rice field was severely destroyed by pests. They believed that the severe pest attack was happened because of deforestation and land clearing by coal mining. Another importance of forest is that the forest provides raw material especially tree-bark for natural-color of their unique painting "*wakaroros*". National coal mining PT. KPC is now promoting *wakaroros* for the special souvenir of the Basap people.
- Selection for fertile land based on the combination of indicator vegetation as mentioned above and traditional way on how to test the fertile soil. For an ecological balance between forest and agricultural land, the *pandome kanuaji* system can be implemented so that size of land to clear for rice field can be limited.
- Planting species "*dara mata*" for micro-climate system. Farmers learned that this species has some functions: the broad leaves of "*dara mata*" is believed can catch fog in the night and morning and then release it to plants in the form of water; the broad-leaves can protect the plants from direct sun-shine so that the micro-climate is more suitable for plants to grow; in a chili garden, this species is proven can support chili growing well in dry season and to protect from curly disease.
- Setting fallen trees on the terrain in order to protect erosion and at the same time to collect humus as the natural fertilizer for rice. Respondent mentioned that this way is proven can support rice to grow and produce well.
- Rice-seed preparation for the following years should follow the traditional knowledge on how to treat the seed so that grow-capability is high and growing quality is robust against pest and diseases.
- For more productive and effective of land use, chili and other crops should be planted on the ex-shifting agriculture land and *dara mata*species should also be planted on the same area and the same time with the crops for protection from heat and to keep the appropriate temperature for plant to grow.

4. Conclusion and Recommendation

The customary Basap Dayak community has been adopting local wisdoms on shifting cultivation and other agricultural activities for subsistence from generation to generation. External pressure for examples coal mining, Industrial Forest (*HTI = hutan tanaman industri*) and other land-based activities has been influencing the local wisdoms. Therefore, an adoptive and more productive agricultural practice has been formulated based on the traditional wisdoms. The coal mining and industrial forest companies should really respect to the customary wisdoms in keeping the balance of forest and forest ecology with agricultural activities so that agricultural productivity may be improved.

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