

## THE CONTRIBUTION OF FOREST HONEYBEE AS NON-TIMBER FOREST PRODUCTS TO LOCAL COMMUNITIES ALONG THE KAHAYAN RIVER BASIN CENTRAL KALIMANTAN

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### Abstract

Field research was done to evaluate the financial benefits of forest honeybee business conducted by the local community at Kameloh Baru Village, Taruna Village, and Tumbang Nusa Village in Central Kalimantan. These villages studied are known as a natural honeybee-producing center in Central Kalimantan. The local tribe gathers forest honeybee from *Apis dorsata* that have done for generations. The results revealed that the income of forest honeybee gathering people in 2015 amounted to IDR six to ten million once harvest. The owner of a tree of honeybee nest has five times higher income than harvesters. However, after a forest fire in 2015, revenues in 2016 and 2017 dropped dramatically to 25% of the previous year. The depletion of natural food resources is a leading factor in honeybee production decrease. On the other hand, the farmers do not have the initiative to cultivate the host trees and reserve natural food resources. Forest honeybee cannot be harvested regularly, although the market demand for forest honeybee is still tremendous. On the other hand, a proper technique of honeybee harvesting did not conduct so that the resulting honeybee quality decreases. Nevertheless, the local tribe can develop sustainable forest honeybee gathering based on their ecological knowledge as incentives for forest conservation.

*Keywords : Dayak Ngaju; The livelihood local tribe; wetland;*

### INTRODUCTION

There are forest and land fires in Indonesia, including in Central Kalimantan Province in 2015. The fires were massive and caused severe economic and

environmental damage. According to the government, 2.6 million hectares of land and forests have burned between June and October 2015, equivalent to four and a half times the size of Bali Island. In the area,

429,000 ha occur in Central Kalimantan (World Bank, 2016).

The Global Fire Emissions Database version 4 (GFED4) estimates that by 2015, forest fires in Indonesia contribute around 1,750 million metric tons of carbon dioxide equivalent (MMTCDE) to global emissions by 2015. The burned areas are estimated based on the satellite image map, hotspot, and ongoing fire detection (active). In comparison, based on the 2nd National Communication of the United Nations Framework Convention on Climate Change (UNFCCC), Indonesia estimates its annual national emissions to be 1,800 million metric tonnes of carbon dioxide equivalents (MMTCDE) (World Bank, 2016). The impact of these fires forest set Indonesia's target of reducing emissions by 29% (or 41% with international financial support) to keep global temperature not increases exceeding 2 °C.

The estimated economic disadvantage in 2015 due to fires for Indonesia - IDR 221 x 10<sup>12</sup> - is greater than the estimated value of Indonesia's gross palm oil exports in 2014 (IDR 115 x 10<sup>12</sup>) and the added value of all Indonesian palm oil output in 2014 (IDR 168 x 10<sup>12</sup>). The province of Central Kalimantan is the most affected province - 34 percent - half of which comes from agricultural losses, especially oil palm plantations. (World Bank, 2016).

Fire is not only happening in palm oil fields. Fires also occur in agricultural land, natural forests, swamp forests, forest concession areas and other uses. Local people are the most vulnerable to bear the impact of forest fires. Economically, socially and politically, they have the weakest position. Before the timber industry rose in the 1970s - followed by oil palm plantations - non timber forest products became the local product *prima donna* (de Jong, 2000). Natural interaction with local people (Dayak Ngaju) is described as a mutually preserving interaction (Dove, 1994).

In recent developments, local residents have learned how to exploit nature. Destroyed nature can no longer provide life for the people. In this situation people need to be given alternatives in building a sustainable livelihood while providing incentives for environmental conservation activities.

Our research was conducted to explore the contribution of honey bee for local Communities along the Kahayan River Basin of Central Kalimantan base on economic valuation. Honey bee is a non-timber forest product that can continue to be developed in line with the efforts of nature conservation and prevention of forest and land fire.

## METHODS

Our research was survey reserach. Cross-sectional survey design was applied to explore contribution economic dan local knowledge of honey bee collecting by local people. Cresswell (2012) defined cross-sectional survey as research conducted by researchs to collect data at one point in time to examine current attitudes, beliefs, opinions, or practices about current issues or actual behaviour.

Tree local villages in Kameloh Baru (Palangka Raya), Taruna, and Tumbang Nusa (Pulang Pisau) were visited. These villages are located along the Kahayan river basin. These three villages are known as centers of natural honeybee production in Central Kalimantan Province. The three sites studied are riparian villages with a more extended wet period than dry period. Local people have been collected natural honeybee (*Apis dorsata*) from generation to generation.

Six key-informants were chosen as the main respondents in this study. They was the main actors in the natural honeybee collecting and had board knowledge to about honeybee gathering dan hoenybee

production. The interviewees were 1) Four heads of honeybee gathering group, Edi Sanik (47 years old) from Tumbang Nusa Village, Hermanto (29 years old), Suray (34 years old) from Taruna Village, and Junaidi (43 years) from Kameloh Baru Village; 2) Yoanes Budiyana (Budi - 43 years old), head of forest farmer group (KTH) "Lima Saudara" as well as the owner of honeybee farming business "Must Yoan Farm; and 3) Intan (45 years old), Chairman of Lembaga Pendidikan dan Pemberdayaan (eLPaM) companion of honeybee gatherers at the study site.

One-on-one interview required one to three hours to complete tree main questions. Question 1, asked interviewees to explain their honeybee gathering and their local knowledge. Question 2, which asked how forest fires impact on their livelihood, especially in economic impact. Question 3 provided their knowledge to solve their problems.

Content analysis was performed to analyse the one-on-one interview following the survey, using audio records and field notes. Secondary data to support the research results were collected from the records/manuscripts of the eLPaM report during the mentoring at the study site. All data collected were also tested with previous research results both at the study sites and outside the study site. Data triangulation was used to maintain the validity and reliability of the results of the interviews.

## RESULTS AND DISCUSSION

Local resource management includes local technology, social behavior, restrictions and regulatory systems (de Jong, 2000). In managing the collection of forest honey, communities in the study sites still use local resource management principles.

Collected honey is the honey produced by forest bees (*Apis Dorsata*) which is the

largest species of bees in Asia *A. dorsata* is a native Indonesian bee spreading in Sumatra, Kalimantan, Sulawesi, Papua, NTB and NTT (Muslim, 2015). Beehive *A. dorsata* usually depends on the branches of the jingah tree (*Gluta reinghas* L.). The number of nests in each tree varies.

*"... I have two trees that the number of nests about 30 pieces. The tree is big. I also have nine other trees whose nest number is only five to six pieces", (Edi Sanik).*

*"I have a tree with more than 20 nests, if the others are about six to eight nests. My brother-in-law (Suray) has one tree with more than 40 nests", (Hermanto).*

*"Right said Hermanto, I have a tree that is very much. Maybe the number is 50 nests", (Suray).*

*"In the past - we talked a long time ago! - in the middle of the village, there is a jingah tree that contains hundreds of honeycombs. The tree has now been cut down. On average I keep a tree whose contents are six to eight nests only", (Junaidi).*

*A. dorsata* bees tends to choose a tall tree and has many branches to protect their nest from their enemies. The numerous branches also protect the nests from wind and solar heat. They usually prefer in the swamp area to keep the humidity of the nest (Pulunggono, 2000).

Table 1. Potential of *Forest Honeybee* in Kameloh Baru, Taruna and Tumbang Nusa.

Location	Owner	Tree numbers
Kameloh Baru	Junaidi and brothers	Sarang (20 trees) Rampuk (10 trees)
Taruna	Hermanto, Suray and Brothers	Sarang (20 trees) Rampuk (32trees)
Tumbang Nusa	Edi Sanik	Sarang (11 trees)

Society distinguishes between a high beehive and low honeycomb. The top nest is called sarang (the nest). The size is more prominent and lighter (more than 10 m). eLPaM noted that the potential of trees in the study sites is more than 100 trees. The management is a group, and some are alone (Table 1).

*"...if the nest (sarang) is large, it can reach one meter in length. Low nests are called rampuk. Usually, the size is smaller and contains less honeybee. Usually, the rampuk contains only tree to four bottles of honeybee, if the high nest can reach 100 kg once harvest", (Junaidi).*

Honeybee nest on a large tree like *jingah* tree. The *Jingah* tree (*Gluta reinghas*) containing a beehive was maintained and cleaned form shrubs around the tree to make easy on harvesting. Cleaning is only done on shrubs, and large trees are left alone. This practices was a sign of properties. This consequence other honeybee gathers do not harvest beehive.

*"Usually, we already know who owns the tree. But people from outside the village can not know", (Hermanto).*

*"The big tree is (left) for the protector if there are wind, heat and others", (Junaidi).*

Maintenance of the host tree is not limited to cleaning. Some people believed that to increase honeybee production they installed the azimat on the host trees. Azimat

was precious metals or precious stones, i.e diamond, gold, or silver.

*"We put two diamonds—just a little. We buy the market at IDR 100.000. That's our teacher's speak too. Once the diamond is installed, believe it or not, there is a new nest that appears in our tree. The tree that can be installed diamond must be enormous. If not enough (big), when the bees come later, the branch can be broken. We will also installed diamonds in our other trees when host tree grow up", (Edi Sanik).*

In the calculation of Edi Sanik, the required investment value is small compared to the results to be obtained. Junaidi, Hermanto, and Suray do not use Edi Sanik's methods even though they've heard it too.

*"We've heard that way (put diamonds). Some are burying gold. Our parents once told us. But we do not do that", (Hermanto).*

*"We have also been recognized by grandfather about those ways. But we do not use it. We are natural", (Junaidi).*

Instalation diamond on nest tree is Dayak Ngaju tribe belief. Theis method not found in other area in Kalimantan. Central Kalimantan because it is not found in other areas bease on survey conducted by de Jong (2000), and Pulunggono (2000). Edi Sanik obtainde this knowledge from his teacher in Kapuas District. While Junaidi, Hermanto,

and Suray through knowledge transfer across generations. Junaidi, Hermanto, and Suray is indeed a family of honeybee collectors that have been done for generations.

The management of the host tree is the most critical factor in traditional honeybee production. The host tree management not only the host tree itself but also the surrounding environment (Endalamaw, 2005). The Edi Sanik's host tree management can be called "the most orderly" compared to other honeybee collectors. The host tree grow up within the same landscape. He (claimed) has 200 hectares of land where there are about 11 host trees. Thus, legal certainty over ownership of trees is more secure. Whereas, Hermanto, Suray, and Junaidi's host tree grown up on State land (not their property), so this condition affects the management actions to be carried out.

*"In my land, there is growing bungur (Lagerstomia speciosa) tree, galam (Melaleuca cajuputi), and others for bee food. Everything I let and I do not cut", (Edi Sanik).*

*"It's not our land property. . . but people know our family, starting from my grandfather, my father and now I am looking after that tree. They do not want to interfere . . . if people are told to plant trees (to feed bees, I think cannot go on because it is not clear for whom its useful, (Hermanto).*

*"The tree was kept by my father, and it is inherited to me... but if the land belongs to the State. If for planting, ... a bit difficult. When I plant, someone can be felled later because of forest disturbance occurs in everywhere, including in this riparian forest (forest along the river). Now the jingah tree is also cut down for the building, whereas it was not before", (Junaidi).*

This problem of legal standing inhibits the interviewee's initiative to plant the tree even though all interviewees know about the host tree and the natural feed of bee. The honeybee will not able to develop without sustainable of host tree and natural feeding resources.

Honeybee harvest is done once per year only, especially from November to January (rainy season). Usually coincides with the flowering of fruit trees. In other areas, harvesting can be done more than twice (de Jong, 2000; Pulunggono, 2000; Radam et al., 2016).

The process of collection honeybee was done in groups consist of three to five people. Group members usually remain year after year because there is a clear job description. In general, there are three steps in the honey forest harvesting, i.e 1) climbing, done one to two people; 2) take the honeybee derived, done one to two people; and 3) move the honey to the boat, done one person. Edi Sanik is always in charge of climbing trees, while Junaidi, Suray, and Hermanto do not still climb because there are many members of their groups that can raise a tree. Junaidi even felt too old to climb. In local customs, climbing trees to take honeybee can only be done by a specific person.

Honey takes place at night to avoid bee stings. Junaidi and Hermanto do not even dare to climb at the full moon, or the moon is still bright. Edy Sanik and Suray dare to climb; also though the moon is bright even to help the lighting, they put a flashlight on the head. Logically, it takes a particular skill and courage to climb a tree with a height of up to 30 meters at night with light for lighting. The harvest method like this is also implemented in West Kalimantan (de Jong, 2000) and NTT (Pulunggono, 2000).

*"In Central Kalimantan, natural honeybee harvest place at night. This harvest has become a habit of the local*

*community. Collecting honeybee at night can avoid bee stings because the bees are an inactive and limited movement. But the night harvest is also dangerous. Bees are disturbed at night will be returning to nest difficulty so that the nest recovery process is slow. Often the quality of honeybee is not yet ripe, still, dilute. Now there are unique clothes for harvest so that the yield can be done during the day. But their habit is like that (harvest at night)"*, (Budi).

The quality of the harvested honeybee has not been tested yet. But based on the physical, color, and taste analysis, Budi said the quality of forest honeybee from the study site is excellent. The interviewees claimed to maintain the trust of the customer by not mixing the honey produced with other elements.

*"We do not know how their honeybee, but if our honey is guaranteed genuine without mix (with other material). We've been trained for the right way of harvesting and processing. Formerly if the harvest, we cut all the nest. After joining the training, we just cut the "head" only. There's the place that contains honey very much".* (Edi Sanik).

*"We always keep the trust of people because they already believe that our honey is genuine. Testing honey is smooth. Just turn the bottle; if the slow bubble movement, it's original, but if the movement of the bubbles quickly. It has mixed with water",* (Junaidi).

*The forest honeybee around here (Palangka Raya) is excellent. They can sell themselves. The forest honeybee that I often catch comes from other areas. i.e., Gunung Mas and Puruk Cahu. Sometimes it is still diluted, so*

*the price drops because its water content is still high",* (Budi).

The quality of forest honeybee is recognized better than livestock honey. Psychologically, consumers believe that forests are still natural food, forest honeybee is healthier than livestock honey (Muslim, 2015). Radam *et al.* (2016) explained that forest honeybee in Barito Kuala District (South Kalimantan) meets the SNI standard except for solid content, which is still above the threshold. High content of solid material may be due to imperfect screening process. Honeybee can be used to inhibit pathogenic bacteria, and forest honeybee can inhibit bacterial growth higher than randu (*Ceiba pentandra*) honeybee, rambutan (*Nephelium lappaceum*) honeybee, and kelengkeng (*Dimocarpus longan*) honeybee (Hariyati, 2010).

After the honey is pull downed, most of the honey is sold directly without being processed. The consumers more trust direct sales with this nest because it is assured of its authenticity. Only a small portion is squeezed and filtered for personal or family purposes.

*"Harvest the last two years has fallen considerably. Three years ago, during the season, the amount of honey was very much. Two large trees that can produce 300 kg of natural honeybee per a tree, while the small ones can get 50 kg of each tree. Now, in the last harvest (November 2017), one big tree only got 25 kg. Only about ten nests are filled with honey; others are empty. The other trees are also only slightly filled with honey",* (Edi Sanik).

*"By 2015, we can both get one ton of honey together. I can get 300 kg for myself, while my brother-in-law (Suray) got 700 kg. Nowadays, honey is not yet the season, usually in January (2018), a new honey season*

*will start. But last year, we did not harvest because there is no content. Anyway, since the fire (in 2015), the honey fell. Less than 25% compared to before the forest fire", (Hermanto).*

*"For the last three years, we have not harvested. In the previous season, we got honeybee very much, fulling my house. From the rampuk, we can get only two to tree kilograms, but from large trees can be 50 to 60 kg per a tree. There are more than 100 kg of one nest. But that's the talk of the past. Nowadays many people are looking for honey, but the honey is not there", (Junaidi).*

Distribution income for each group is different. Their management income distribution depend on group head. In this study more a half of gatherer divided their income was equal proportion. Based on the rules agreed by each group, the projection the income of the natural honeybee gatherer was not same. The host tree owner had greatest income (Table 2).

*"The distribution of income is not equal. The owner of the tree can be half first, and then the rest is shared IDR. 1,000,000, -. First, IDR 500,000 given to the owner of the tree, then the excess money is divided into five, including me. Because I come to work, take a climb. It is the rules", (Edi Sanik).*

*"We divide the revenue equally. Since we are still a family may be, so the distribution likes that. Indeed, I did not climb; my brothers climb. But after the honeycomb was lowered, then I have to clean up to sell. The results of our sales share in the same portion", (Hermanto).*

*"The revenue of sale is divided in equal among other because we are still a family. So the climbing or the bottom can be the same part. We can take turns because all can climb. Later my wife will sell honeybee to Palangka Raya", (Junaidi).*

Honeybee transaction was conducted at the site and if it does not run out (usually brought to Palangka Raya). Nevertheless now many sellers are looking for natural honeybee on the site. Natural honeybee gatherers never have trouble selling their products.

High levels of income in the past can also be seen from the morphology of the house and their ability to finance their children following education. Edi Sanik has three children, all of them study at higher education in the Palangka Raya. His youngest daughter is studying at a private educational institution, and Edi Sanik paid an entrance fee of IDR 34,000,000. Hermanto and his brother/sister also study in higher education.

*"If the honey season come, the others we leave", (Junaidi).*

The income level of natural honeybee collectors was quite high compared to theregional minimum wage (UMR) of Central Kalimantan Province (IDR 2,300,000 per month). But the problem is, the natural honeybee season only once per year, so the fluctuation of income is very high. Gubbi and MacMillan (2008) also found that non Timber forest products (NTFP) income has a large spread (the US \$  $3.15 \pm SD 4.19$  per day), so NTFP collection as source income for sustainable livelihood is questionable.

Based on studies in Honduras, the Philippine, and Bangladesh, it was found that the key to NTFP's success in contributing to local livelihood is sustainable harvesting, so conservation continues

(Nygren *et al.*, 2006; Mukul *et al.*, 2010). In the context of the development of honeybee, increased production of forest honeybee can still be improved, resulting in a continuous harvest (de Jong, 2000; Pulunggono, 2000; Muslim, 2015).

Interviewees themselves realized that the decrease in natural honeybee production dropped after the forest fire because natural resources of bee food has been lost (down).

They also know that there are plant species that are the natural resource of feed of *A. dorsata*.

*"Natural food sources are usually bungur and galam. In my field many wild bungur plants that I leave it to be bee food (and proven from the analysis, income Edi Sanik group is quite high)", (Edi Sanik).*

Table 2. Estimated Income of Natural Honeybee Gatherers in 2015 (before Forest Fire in 2017)

Group	Production Estimates (x 100 kg)	Revenue Estimates** (x IDR 1,000,000)	Member group	Income per member (xIDR 1,000,000)
Edi Sanik	2 Sarang (@ 3) 9 Rampuk (@ 0,5) Total 10.5	84	6	Head = 50.4 Member = 8.4
Hermanto, Suray and Brothers	10	80	8	10
Junaidi and brothers	6**	48	8	6

Source: Research results. Notes: \*) Price of honeybee (with nest) IDR. 80,000 per kg. \*\*) Including natural honeybee from rampuk.

*"There are plants that are loved by bees, namely tetumbu (Syzgium havilandii) and taya (Nauclea Orientalis). If there are taya flowers, the honey is very much. If there is a bangkal flower, his honey becomes black and bitter. . . the plant can be planted, but as long as it has never been tried", (Hermanto).*

*"There are many local plants for bee food such as belangeran, sapakawu, meranti, putat, tetopi, and jejambuan. If there is a pintik flower, usually the honeybee is very sweet. The plant - as well as jingah - can be grown from their seeds. But it should be kept because someone can be cut down if it's massive. Kameloh is adjacent to Palangka Raya, so much of the bee's food has been felt down (from the analysis, the income of this group is the smallest)", (Junaidi).*

Referring to Endalamaw's (2005) research, the increase of honeybee production should start from the improvement of tree management, both host and feed resources. The management of this tree, according to the author, should start from the legal certainty of the land. The government of President Joko Widodo is concerned with the ownership of land by indigenous peoples. Land-granting programs in various forms, such as building rights (HGB), can help provide land tenure security for forest honeybee gatherers.

The next problem is the provision of feed resources. From various research results, there are many natural sources of bees feed that can provide food throughout the year (Hermita, 2008; Siombo *et al.*, 2014). Plants that are known by the community as the so-called respondents proved tolerant and can live on the wetland. The honey collector only needs to be taught technology to plant various types of plants as well as assistance in the field implementation. In addition to the planting



of natural food sources, planting other trees as protectors should be done. Research in West Kalimantan shows that after open forests (remaining host trees only) production of forest honeybee also decreases (de Jong, 2000).

Another alternative, if land ownership cannot be solved, is to replace the type of bee. *A. dorsata* still cannot be maintained in the box. The Malay Tribe does the most advanced technologies in the domestication of bees on the shores of Sentarum Lake of West Kalimantan (de Jong, 2000). The Malay people make wooden boards called tikung for the place of bees nesting. In this way, they do not need to climb trees and can produce an average of 5.8 kg per board every five to eight weeks (de Jong, 2000).

Natural honeybee produced by *A dorsata* can not be maintained. So to production honeybee other bee can applied. *A mellifera* is alternatif honeybee production. *A mellifera* beekeeping must introduced to local people to source alternative income.

*"Mellifera bee is easier to maintain and can be shepherded if the feed source is running low. If enough feed, the honeybee can harvest once every two weeks or once a month. Mellifera can also be fed artificial food from soybeans if forced. Product marketing is not a problem. I just can not afford to meet the market demand"*, (Budi).

## CONCLUSION

The results showed that the income of natural honeybes gatherers in 2015 amounted to IDR 6 – 10 million once harvest. While the nest tree owner's profit of IDR 50 million once collect. However, after a forest fire in 2015, revenues in 2016 and 2017 dropped dramatically to 25% of revenue in 2015. This income decreasing is due to the natural resource of bee feed is reduced. Farmers do not have the initiative

to cultivate the host tree and bee's natural food even though the market demand for forest honeybee products is still huge. However, natural honeybee harvest also cannot be done throughout the year because the productivity of each forest honeybee hung natural factors, especially natural bee feed preparations. In addition to the problem of natural feed, honey harvesting techniques are also not equal, so the quality of honey is often down. But with high product value, forest honeybee has the potential to be improved. Honey bee gathering can be developed as an incentive for forest conservation activities.

Some of the things that need to be done to realize the forest honeybee as NTFP that can ensure sustainable living are the provision of land certainty, the planting of tree protectors, and the planting of the natural food of bees. If it cannot be conducted, it is necessary to change the pattern from honey collectors to beekeepers.

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