

A mini-ethnography of honey gathering: The practice and its contribution to livelihood systems in rural areas

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ABSTRACT

As part of the people's culture, the livelihood system, various community groups in Indonesia have been practicing stinging bees honey-gathering. Many studies have reported such activities quite widely. In the context of honey-gathering activities and somewhat different from other reports, this study describes the activities of collecting honey produced by stingless bees (*Tetragonula* sp.) practiced by honey collectors in Sumedang Regency, West Java. The study applied the mini-ethnography method to study the honey collection and its economic system, practiced by six groups of honey collectors, by conducting participant observation and in-depth interviews. The description of study results includes knowledge systems, honey-gathering practices, social relations among the collectors, collected honey utilization, and honey-gathering practices in the context of the rural economy. This study suggests that as part of the community's livelihood system, the stingless bee honey gathering generates a significant income for honey collectors and to some extent contributes to the livelihood system in rural areas.

1. Introduction

Honey gathering is believed to existed since paleolithic times, earlier than the discovery of cave wall painting (Crane 1999, cited in Perichon, 2020). Some cave wall paintings in Spain and Africa estimated over 8,000 years old depict human activities surrounded by bees gathering honey from trees or rock crevices (Ghosh and Barik, 2016). Honey is widely consumed food by various societies. Some hunter-gatherer communities make honey the second most important food in their culture after meat, such as the Jarawa people of Andaman Island who consume honey and bee larvae during the dry season (Ghosh and Barik, 2016). In other communities, honey is consumed as medicine and an

additional ingredient in food products, either consumed directly or added to beverages such as tea, milk, and lemon water (Perichon, 2020).

Some cultures have a perspective about honey that extends beyond just food. Language and literature are some of the cultural aspects commonly associated with honey (Levi-Strauss 1973, cited in Perichon, 2020). The important role of honey is sometimes considered part of the norms and taboos. The Jarawa people do not permit honey consumption under certain conditions, for instance, when the sun has set. They also do not give honey to menstruating virgins (Ghosh and Barik, 2016). In some rural communities, there is specific knowledge such as searching, gathering, consuming, storing, and other activities related to honey hunting (Ghosh and Barik, 2016).

Reports on honey gathering indicate that stinging bees (*Apis* spp) honey collection and beekeeping tend to be more common. Although, as indicated by Jákl, (2022), archaeological evidence of beekeeping in Java and elsewhere in Southeast Asia is scarce. Textual evidence of beehives written before the Dutch colonial period in Indonesia is also scant (Crane, 1983, 2000 cited in Jákl, 2022). During the British colonial period in the early nineteenth century, Thomas Stamford Raffles (1830: 61, cited in Jákl, 2022) reported that beekeeping was practiced more by foreigners. Beekeeping was also practiced with simple methods by Arabs and Indians but never by natives. The Arabs and Indians gathered inconsistent amounts of honey and wax.

Beekeeping activities in West Java have also been for a long time. The Pangrango Mountains area and around the Priangan Mountains is one of the histories of beekeeping in West Java. Hoogeveen (1864 cited in Crane, 1999) described how stinging bee (*Apis cerana*) colonies were kept in a bamboo called *Glodok* that was hung in the forest. This *Glodok* would be left until it was filled with swarms of bees to be brought home and then harvested by splitting the bamboo (Crane, 1999). Some reports also described a situation in the Priangan region where similar techniques were used to gather honey Junghun (1857 cited in Crane, 1999) and blackish wax which was collected for their batik industry (Does, 1893 cited in Crane, 1999). Apart from being filled by stinging bees, the *glodoks* were also filled by swarms of stingless bees (Junghun, 1857 cited in Crane, 1999).

Indonesia is one of the countries that are home to many types of stingless bees (*Tetragonula* sp.). There are 37 species spread across Indonesia. The climatic conditions and abundant variety of food allow diversity in this species (Suhendra and Nopriandy, 2021). Each region has different terms for the stingless bees and some communities have local knowledge about this honey bee gathering. In central and eastern Java, *Tetragonula* spp is commonly referred to as *Klanceng* or *Lanceng*, in Kalimantan as *Kelulut*, in Minang as *Galo-galo*, and among the Sundanese of West Java as *Teuweul* (Suhendra and Nopriandy, 2021). These bees have different shapes and nests. They are smaller than stinging bees. Their nest locations can be varied. Some nests are in cracks or crevices in walls and trees. Also, it can be found underground and in open areas on cliff faces, walls, or tree trunks (Rasmussen and Camargo, 2008; cited in Ghosh and Barik, 2016). Despite those potentials, studies on stingless bee honey gathering are rather rare, particularly in the context of cultural and or livelihoods in rural areas.

Some authors reported that wild honey-gathering activity could be an option for rural livelihoods (van der Wal *et al.*, 2022; Schouten, *et al.*, 2019; By and Griffith, 2017; Ghosh and Barik, 2016; van der Wal *et al.*, 2022; Hikmah *et al.*, 2021; Guerin, 2020; Gruber *et al.*, 2019; Kahono *et al.*, 2018; Mazorodze, 2015; Šivic, 2013; Paraiso *et al.* (2012a); Paraiso *et al.* (2012b)). In addition to the economic aspect, some anthropologist provided an overview of cultural and ethnographic studies of honey-hunters (Luttrell, 2017; Berbesque *et al.*, 2016; Ghosh and Barik, 2016; Marlowe *et al.*, 2014; and Crittenden, 2011). Apart from all that, the studies conducted focused on wild honey-gathering or hunting of stinging bees (*Apis* spp).

Studies on the gathering of stingless bee honey were limited. Among the few who have conducted studies related to stingless bees is Perichon (2020) who reported based on ethnozoological surveys carried out in Peru, Brazil, Cuba, Nepal, and Australia, that bee breeding may not be practicable in various geographical, cultural, and religious backgrounds. Earlier, Virkar *et al.* (2014) reported that the collection of honey and other products from natural nests of stingless bees is destructive and threatens their survival.

Considering that there are still few studies on hunting of bee colonies and collecting honey from stingless bees, especially from an anthropological perspective, this research examined the stingless bees honey-gathering activities by some honey collectors in a rural area of West Java. Reports in various print or online media in Indonesia indicate that the gathering of stingless bee honey and the hunting of its colonies were relatively widely carried out in Indonesia including West Java, but studies on it were rare. In this relation, this study attempted to describe the honey-gathering practices, its economic system, the social relation of production system, and its role in the rural livelihood system by taking a case in Sumedang Regency. Sumedang Regency is one of the areas in West Java where stingless bee honey gathering is carried out by the people in rural areas.

2. Method

This study was a qualitative study. The researchers applied a mini-ethnography method that focuses on describing a narrow area of inquiry of small groups while still understanding cultural elements such as rules, norms, and values that apply to their lives (Leininger [1985; cited in Boyle, 1994]) and Boyle [1994]). Mini-ethnography, also known as focused ethnography, is used when the field of inquiry is specific or narrow (White, 2009; cited in Fusch *et al.*, 2017). Werner and Schoepfle (1987 cited in Boyle, 1994) proposed the term to apply to small groups comprehensively studied. In general, the mini-form of ethnography has the advantage of taking less time to conduct a study than a usual ethnography and being more focused on the specific questions and objectives to be explored (Muecke, 1994).

In line with the terms of mini-ethnography mentioned above, this study collected data from six honey-collector groups to describe the practices of honey-collection and its economic system by conducting in-depth interviews with the collectors and other informants in each village. The honey collectors and other villagers are Sundanese, therefore in-depth interviews were conducted using Sundanese language. Sometimes Indonesian was also used.

The study also applied participant and non-participant observation techniques. The researchers several times followed honey collectors to places where there were stingless bees to collect honey and bee colonies. The researchers sometimes also assisted the honey collectors when they dug the land to pull out the bee colonies or to clean the colonies from the stuck soil. At some other times, the researchers observed the collectors' activities without being involved in such activities, observing how they could accurately locate bee colonies underground, in bamboo clumps, or in large hardwood trees. Observations in the field were carried out both during dry and rainy seasons in the period of 2021 and 2023, but mostly during the dry season.

The study analyzed the collected data by following the interactive model of analysis mentioned by Miles *et al.* (2014). During or shortly after in-depth interviews were conducted with one or more honey collectors or other informants, the researchers processed the data and interpreted and concluded. The data obtained was then cross checked with data from other honey collectors or informants to ensure that the data obtained was valid. Triangulation was carried out not only between informants but also between data collected using interview techniques and data collected using observation techniques.

3. Result

- **Stingless bee honey gathering in rural area of Sumedang Regency**

The activity of honey gathering of the stingless bees called *Teuweul* (*Tetragonula* Sp.) has long been carried out by residents of rural Sumedang. However, this activity was carried out only as a part-time activity. An old informant mentioned that when he was young, he often went to the forest to look for fuelwood. If he found stingless bee colonies, he sometimes took its honey to consume at home. Often stingless bee honey was taken to be used as medicine. Honey was not collected for commercial purposes.

Recently, this activity has been carried out intensively by a number of people, as a source of additional income or even as a main source of livelihood. This activity increased especially when the Covid-19 virus pandemic occurred which caused many people, including rural residents to lose their jobs. Meanwhile, honey from stingless bees was considered effective in helping heal people affected by the Covid-19 virus.

In Sumedang Regency, stingless bee honey gathering was carried out in various locations inside or on the edge of the forest, mixed gardens (agroforestry), and bamboo gardens (bamboo-dominated agroforestry). The study identified several locations mentioned by the six groups of collectors studied (Figure 1). The six group of honey collectors who were interviewed in this study came from six villages scattered in the Sumedang Regency area that were close to forest areas on the slopes of Mount Tampomas, Mount Kerenceng, Mount Calancang, Mount Mount Cakrabuana, Mount Canggih, and Mount Jagad.

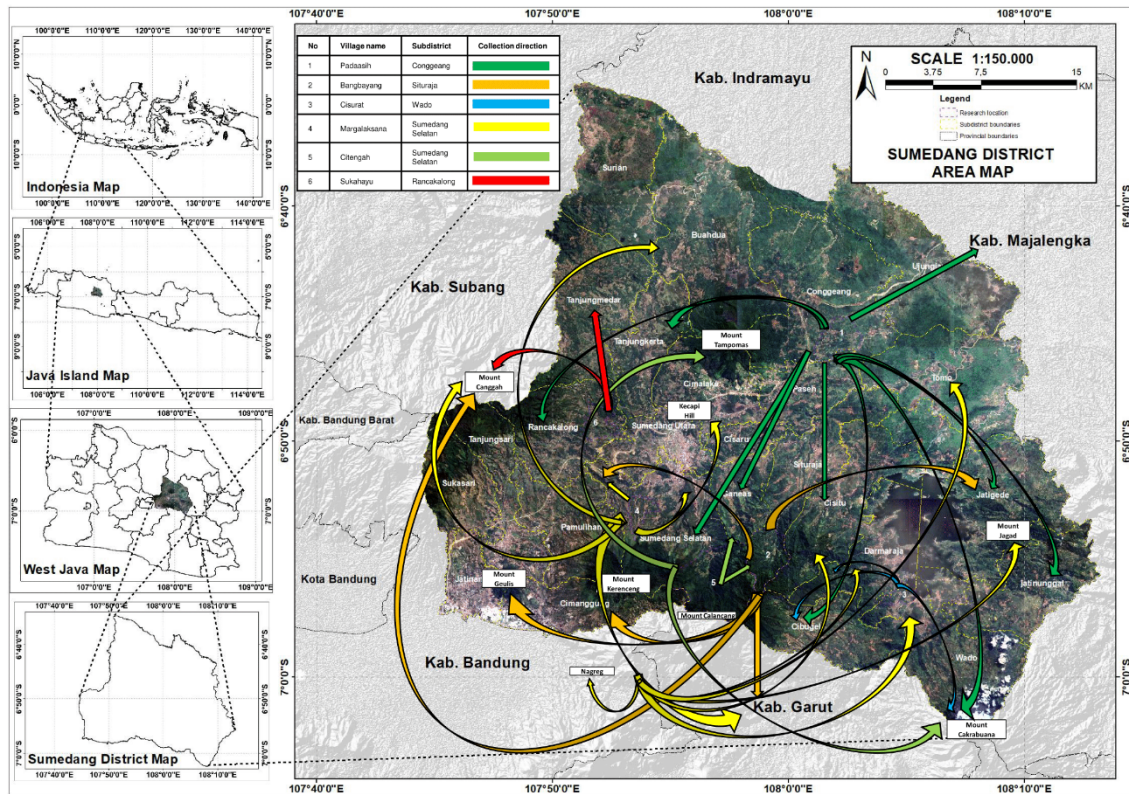


Figure 1. Location of honey gathering sites practiced by honey gatherers in Sumedang

- **Engagement in honey gathering**

The six groups of collectors we interviewed started collecting stingless bees and their honey regularly for different reasons and at different times. Some had been doing it for more than 20 years, selling the honey and bee colonies they collect and being the main provider to beekeepers. Some started by collecting *odeng* (honey bee produced by *Apis dorsata*) and later learned about the benefits and sales opportunities of *teuweul* honey. Some other collectors only started focusing on this activity during the Covid-19 pandemic, the conditions that made them unable to work in their previous jobs required them to look for new jobs. *Teuweul* honey collection became one of the alternatives chosen along with the increasing demand for honey for consumption by Covid-19 patients.

- **Knowledge related to bees and honey**

The honey gatherers in Sumedang have specific knowledge about stingless bees and the honey they collect. The honey collected is produced by stingless bees called *teuweul* (*Tetragona* sp.). In the study site, at least 3 species of *teuweul* were identified, namely *Heterotrigona itama*, *Tetragonula laeviceps*, and *Tetragonula drescheri*. *Heterotrigona itama* (locally known as *teuweul gagak*) has a large body size and usually produces a lot of honey. This type is usually found inside tree trunks. *Tetragonula laeviceps* (*teuweul awi*) has a smaller body size and honey production than *teuweul gagak*. As the name implies, their nests can be found inside bamboo but sometimes also in the ground. *Tetragonula drescheri* (locally known as *teuweul tarompet*) has a similar body size and honey production to *teuweul awi*. Their nest could be found in the ground and bamboo. The collectors also mentioned that some colonies of stingless bees could be found in unusual places, such as in wall cracks, roof tiles, and other

parts of buildings (Figure 2). This can happen when a new colony finds a new nest and makes it their home.

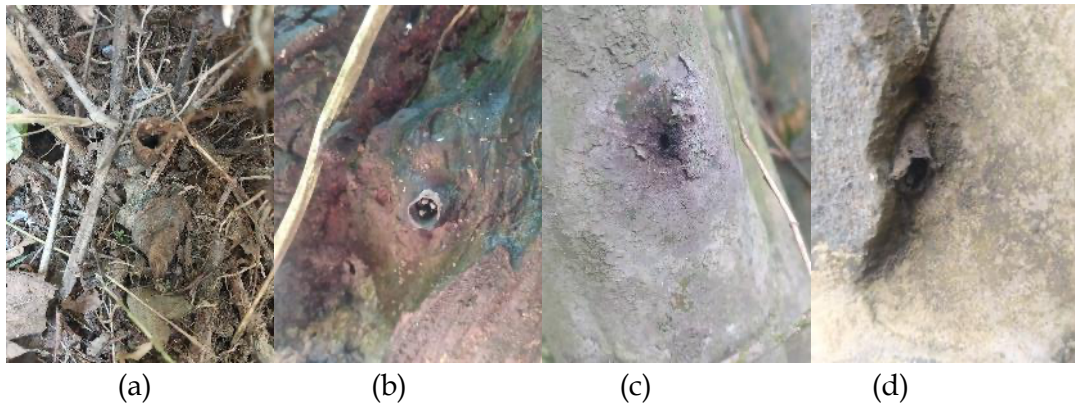


Figure 2. Nests of *teuweul* bees in the ground (a), tree trunks (b), bamboo (c), and building walls (d).

These different bee species also produced different honey flavors, it could be predominantly sweet or sour and a combination of both. The color of the honey could also range from light yellow to deep dark brown. A sweet taste with a slight sourness was usually found in honey with a relatively light color. Conversely, sourness with a hint of sweetness was found in darker-colored honey. However, this was not always the same. Flavor and color could vary depending on what the bees eat, the weather, and the season the honey was made. For example, colonies nesting in mahogany trees had a sour and bitter honey flavor. However, the bees also sought food sources from other plants, so the flavor was not always the same. In pine trees, if there were a colony inside the trunk, the bees would usually produce honey that was brightly yellow colored and had a sweet and sour taste but tended to be more dominantly sweet.

The honey collectors could also identify colonies that had been found, to determine whether it was a good or bad colony and whether it was old or young. This could be seen from the shape of the hive entrance funnel, the amount of honey and bees inside, and where they nest. Good and older colonies usually had the characteristics of a long, hard-textured funnel. On the other hand, short and soft-textured funnels and sometimes even no funnels were newer colonies that were younger and usually unfavorable. Colonies of young bees usually produced little honey and there were not many bees in the hive. Honey and lots of bees tended to be the main focus of gatherers when looking for *teuweul* colonies. Through this hive funnel, they could determine whether the colony was worth to be gathered or not. The place where the colony nest was located was also a consideration when gathering honey. For example, colonies that nest in Kiara trees (*Ficus annulate*) were usually not taken because the trunk of this tree forms a narrow nest for nesting, so the colony was small and the honey produced was also little.

- **Honey and bee colony gathering practices**

Gathering activities usually took place from early morning until noon or evening. Some groups of *teuweul* collectors even stayed a few days to look for *teuweul* in the

forest. With equipment deemed adequate for a few days in the forest, they collected honey and bee colonies from several different bee species. They also collected *odeng* honey produced by stinging bees (*Apis dorsata*), which was relatively the same price as *teuweul* honey.

Related to the season and time of year for honey and colony collection, interviews with collectors indicated that they would search more in the summer. The sunnier weather made the bees more likely to actively fly out of their hives in search of food. In addition, sunny weather conditions and the presence of sunlight made it easier for the collectors to see the flying *teuweul*. During the rainy season, they would choose not to go or only go when the weather was clear. They usually left in the morning and returned in the afternoon when it was cloudy and there were signs of rain.

Bees tended to stay inside during the rainy season so honey production was less because the bees did not go out to look for food. In addition, gathering honey during the rainy season was more difficult for gatherers as they could get caught in the rain and there was a risk of disasters in the forest such as landslides or slips and trips. When the rainy season was over, the bees came out of their hives. The weather in the dry season was more favorable for gatherers to search for honey.

Once the collectors decided on the time, they would determine the gathering location and the equipment to use. Usually, they would choose to gather in timber forests, bamboo groves, or gardens around settlements. The gathering places were not always the same. One location could be close to where they lived and on another day they went to another place quite far and different from the previous one.

The tools they used were machetes and handsaw to cut and open wood or bamboo. This machete was also used for digging nests in the ground. They also brought some empty containers to store honey or colonies. They usually wore long shirts and pants, hats and shoes or boots. To get to the gathering site, if it was close by they would just walk to the area. When the location was far away, they would use a motorcycle so that they could arrive faster and avoid getting tired. The motorcycle they used usually was a modified motorcycle with offroad tires so that it could be used on dirt roads and was suitable for entering gardens and forests.

When they arrived at the location, they started observing with the help of sunlight to see and search for *teuweul* in the air (Figure 3.) *Teuweul* had a simple flight direction from the plants where they looked for food and then back to their nest. The collectors also relied on their hearing to hear the buzzing of the flying *teuweul*. Both senses were used while approaching places where *teuweul* nests were likely to be located such as in the bamboo trunks, trees, and in the ground. They walked around the area until they found the entrance of the nest. Some gatherers looked for plants that bees usually favored for nectar, such as *temu kunci* (*Boesenbergia rotunda*) and *kasungka* flower (*Gnetum latifolium*). They also tried to find and smell the remaining nectar that was on the bees' feet and fell on leaves or other surfaces. One of the gatherers even watered the leaves with his urine to lure the bee colony to the leaves. Other gatherers also mentioned that their sweat could lure *teuweul* to come closer and fly around their bodies. Usually, when they found a colony, there would be other colonies located not

far from the first colony location. They would then focus on searching around where the first colony was found.



Figure 3. Colony search with sunlight (a) and collectors who search together (b)

Once the collectors found the hive they would determine whether the colony could be taken for its honey and the colony. Nests found inside tree trunks and bamboo usually knocked first to hear the buzzing of the bees inside. The louder the sound, the more honey and bees there were. They also looked at the funnel to see if it was a new colony or not. Some types of *teuweul* such as *teuweul tarompot* made a funnel towards the entrance of the hive. New colonies or colonies that were young and had little honey would not be taken. The colony would be left for a few months and then they would return to the location to see how it was progressing.

Colonies that were deemed worthy of being collected, would be taken and opened to collect the honey. Nests in bamboo and wood were opened with machetes and handsaw. This process was done carefully so that the nest was not damaged. The ones in the ground would be dug first until the nest was visible (Figure 4.).



Figure 4. Digging (a), cutting bamboo (b), and trimming tree trunks (c) to get stingless bee colonies

The honey contained in the honey pot would be taken slowly by hand and then transferred into a container (Figure 5.). If they wanted to bring the colony, the nest part of the bamboo or tree trunk would be cut down and put into a sack to be brought home. For colonies in the ground, they would bring the queen or queen-to-be along with some larvae and propolis from the hive to be put into an empty container.

If they found enough honey and colonies, they ended the gathering at noon, but they would continue searching until the afternoon if it was not enough. The timing of honey gathering was flexible as some of them had other jobs such as farming and construction or they would not go gathering when they were sick or had other needs. Once at home, the honey stored in the container would be removed and squeezed. This process uses clean plastic gloves to squeeze the honey through a sieve and then store it in a container. This was to keep the honey clean before putting it into bottles. As for the colonies, they would be hung or upright near the wall of the house. Some would also be put in boxes for beekeeping such as colonies that came from the ground (Figure 5.). In the beginning, the average gatherer could find 5-7 colonies in one day. Some even had 10, 20, and 30 colonies. But nowadays with the increase of gatherers and the demand for honey, on average they could only get 3 to 5 colonies in a day.



Figure 5. Removing colonies from the ground (a), log (b), and bamboo (c)

- **Relation among the gatherers**

In searching for the stingless bee colonies, most gatherers were not always working alone. They worked together in groups of 5-10 people. The members were relatives or people they lived close to and had known for a long time. One of the gatherers in his village had 27 people who usually participated in honey gatherings. Some collectors focused on honey gathering as their daily activity, while others did it on a part-time basis. They could either search for honey individually or in groups. Usually, honey gathering was carried out by at least 2 or more people. It is safer when they do not go alone and it would make it easier to find *teuweul*, especially over a wide area.

Of all the collectors we met, one collector did not work in a group, he always did everything on his own. He traveled from morning to evening to collect honey and colonies. However, sometimes He did search for honey with other people, 1-2 companions who were relatives and people close to him. His role was important because there were beekeepers whose colonies were regularly supplied by him. The profit from the sale of these colonies was his main income, while the honey was not sold regularly, only when a customer requested it.

The majority of gatherers allowed the outsiders who wanted to know how to do honey gathering to join. There were even gatherers who involved children to come

along because the children had good eyesight to make finding *teuweul* easier. Some gatherers felt that there was nothing to hide about *teuweul*, and this was seen as an opportunity to sell their products or gain new knowledge from people they had just met. They chatted and exchanged knowledge related to *teuweul*, but hid the information about the area where the bee colonies were abundant.

However, some gatherers were afraid and wary if someone wanted to come with them to gather honey. They were worried that the person was the ranger who might arrest them for looking for honey in a forest where hunting was forbidden. In other cases, some gatherers mentioned that they were followed by strangers who were also looking for honey and colonies, honey gatherers from different villages. They were worried when in an effort to search for bee colonies, they marked the places where there were bee colonies and they did not immediately pick the colonies up, collectors from different villages might have taken the bee colonies. They felt a loss but could not fully blame those who took the bee colonies considering that no one owned the colonies.

The six groups of honey-gatherers from six different villages studied in this research did not have kinship, friendship, or any other social relationships. But then they built social relations among them related to honey-collecting activities. They sold colonies and honey to each other when some collectors were short of stock to meet consumer demand. However, it was not always harmonious. Some had not paid for the colonies and honey they bought from other collectors. Different selling prices for honey and colonies, different opinions and knowledge in gathering and beekeeping, as well as the purity of the honey sold, were some of the problems among the collectors. These problems were often mentioned by the collectors as constraining factors in developing the association of the honey collectors in Sumedang area.

In addition to relationships between the honey collectors, some had relations and collaboration with other parties. Such as with government agencies, private companies, or other individual persons. In collaboration with the government, they were asked to become trainers in *teuweul* beekeeping activities, provided colonies to be cultivated by government-assisted groups, and had booths at government entrepreneurship fairs. This form of collaboration also occurred with private parties and individuals.

- **Wage and accommodation system**

When it came to profit sharing, they usually implemented a profit-sharing system from the honey they had gathered. It could be in the form of money from the sale of honey and as their wages or the sharing of honey and colonies that had been found. For honey, members or gatherers would be paid based on the amount of honey per kg obtained. Honey was weighed not only for the liquid but also for the hives. The collectors usually get paid around Rp. 50,000 – Rp. 100,000 for 1kg of honey. The heavier the honey, the higher the pay. Colonies, on the other hand, were valued based on the condition of the hive, the honey it contained, and the location where the colony was found. From 1 colony, collectors can get Rp. 50,000 – Rp. 120,000. Certain species such as *Teuweul gagak* (*Heterotrigona itama*), could get Rp. 500,000 – Rp. 700,000 for a

colony freshly captured from the forest. The price can increase to 1-2 million rupiah if they store it first before selling it.

Although seemed similar, some groups had different rules for rewarding their members. One of the gathering groups would pay for honey and colonies found by its members. When the search was conducted by two or more people, only the person who found the colony would be paid. However, there had never been any jealousy because the situation where only one person found honey was rare. Usually, everyone who comes together in a gathering group would also find a colony. It was rare for two people to find the same colony. Even if it happened, the person who gets more money would give some of it to his colleague either in cash or other forms such as cigarettes. Another example is a group that pays wages based on the number of gatherers who go out to look for honey. If they got 5kg of honey and 5 people went to look for honey at that time, the wage would be divided equally to each person. Some groups even set targets for the honey that needs to be gathered. When honey was still abundant, this target could be fulfilled. But now they did not set it because honey and colonies were getting harder to find.

Some gathering groups would provide a budget for their members' needs. Such as food while they were in the forest, cigarettes, coffee, and the cost of traveling to the location. They may also get paid more when they get honey and colonies from distant or difficult-to-reach places and the quality of the honey and colonies obtained.

- **Collection site permits**

In choosing a gathering site, the collectors always ask the landowner for permission when searching on private land. The purpose was not to cause suspicion. They often were invited to explore and shown several locations where the bee colonies were located. Neighboring residents usually permitted them as they felt *teuweul* was not too valuable as there were many of them. One group of collectors even had a special uniform that showed they had come to look for *teuweul*. The collectors usually would not look for honey and colonies from locations that were routinely collected by other collectors. This was because they were worried that the amount of honey and colonies found would be small. They also respected other collectors and didn't want to clash with them. Sometimes, they would be invited to work together to collect if a lot of honey and colonies were found and then share the results.

- **Perspectives on *teuweul* ownership**

Collectors had a similar view of *teuweul* ownership in that there were no specific rules regarding who owned the colonies that had been found. Anyone could take it even if it was first discovered by someone else, hidden or specially marked. However, this was not a concern as they could find *teuweul* even if they had to choose another location due to the increasing number of collectors in Sumedang. This could be a problem in the long term, as collectors now had to look further afield. During the pandemic, they said they could easily find colonies in large numbers. Recently, they said that it was becoming increasingly difficult to find honey and colonies.

- **Belief system**

Honey collectors, like the Sundanese in West Java, were Moslem. Despite this, some of them had beliefs related to the honey gathering. As one of the gatherer elders used to say, when the moon was bright or when the moon was full, honey would usually be abundant in the bee colonies. Regarding this, some collectors made the most important moment to gather honey, but others did not believe in it so much because at least every month they could harvest and collect honey.

Some of the honey collectors interviewed also believed in certain related taboos. They believed that there were areas in the forest where honey collected was not allowed to be sold. In Mount Jagad (Figure 1), a honey collector mentioned that they could take honey and colonies from there but not for sale. They referred to a person who was looking for firewood to sell and became ill afterward.

In addition, some groups prohibited and only allowed certain members to go looking for honey and bee colonies in considered sacred and rarely visited forest areas. This was to ensure that none of its members went there due to the threat of danger and the possibility of getting lost.

- **Honey utilization**

The collectors knew about stingless bees and honey since they were children. Their parents and relatives had shown them the *teuweul* near where they lived. But at that time honey was only consumed when it was found or used for medicine when someone was sick. Fever, cough, and cold were some of the illnesses that could be treated by consuming honey from *teuweul*. Some collectors used to go to the forest, looking for firewood and when they found *teuweul* inside bamboo or wood, the colony would be taken for storage. It would usually be kept in their house or hut in the field.

One of the collectors wife we met shared how her grandfather kept stingless bee colonies that he found while in the forest. When his grandchildren gathered at his house, he would open the bamboo containing the colony, take the honey, and feed it to each of his grandchildren. This was done by her grandfather so that his grandchildren would not become forgetful and have a strong memory. She also shared her mother's habit of using honey as a face mask which made her skin texture more supple and soft. This shows that both *teuweul* and its honey had been known for a long time, especially among the Sundanese in Sumedang Regency They also knew how to obtain and use them.

The bee colonies and honey that had been gathered then be utilized for sale. The three products usually sold were honey, colonies, and other bee products such as propolis and bee pollen. The honey that had been filtered from the hive was put into bottles made of glass or plastic. Usually, the collectors sold in two sizes: large and small, but some sold in medium-sized bottles. The small-size honey was packaged in 100-150ml bottles with a price of around Rp. 35,000 to Rp. 60,000 per bottle. Some collectors used 250ml bottles for the medium size and sold at Rp. 75,000. Meanwhile, the large size was stored in 450ml bottles at a price of around Rp. 130,000 to Rp. 175,000 per bottle (Figure 6.). The price of this honey could change depending on the availability and

quality of the honey obtained. These were usually purchased online or purchased directly from collectors in Sumedang. Some collectors sold honey along with the hives. This honey was favored by the buyers because it was cheaper although they had to filter it by themselves. The price could range between Rp. 100,000 - 120,000. The collectors sometimes also receive special orders according to customer requests. Such as requests for honey of a certain size or from a certain type of bee. The collector could do this when the honey stock was high or the conditions allowed them to fulfill it.

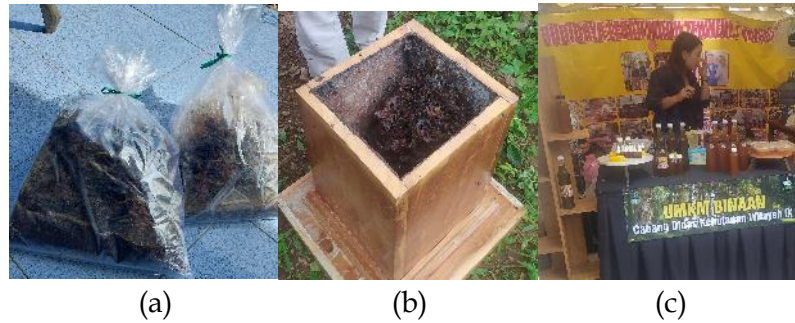


Figure 6. Hive honey (a), bee colony (b), sales of packaged honey at bazaar stand (c)

The price for a bee colony was determined by the species and amount of honey produced. For the bee species of *teuweul tarompet* and *teuweul awi*, the price was usually Rp. 50,000 to Rp. 300,000. Some collectors did not sell the colonies of these species because they would use the colony for the production of propolis and bee pollen. Meanwhile, *teuweul gagak* had a more expensive price, ranging from Rp. 800,000 to Rp. 1,000,000 and even up to Rp. 3 million. The price usually included a box to keep the bees in or use their natural hives from logs and bamboo (Figure 6.). Just like honey, colony prices could change depending on the quality of the colony. Usually, colonies would also be sold if there was demand but there were collectors who only provided colonies to beekeepers.

As for other products such as bee pollen and propolis, not all of them were utilized by the collectors. Some of the collectors sold such products, but not regularly because there was less demand for the products compared to honey and colonies. They sold such products when there was a demand or when they needed it for their consumption.

- **Beekeeping**

From the activity of collecting honey and stingless bee colonies, some collectors began to cultivate the colonies they had found (figure 7). This activity was then further developed by some honey collectors in Sumedang so that they could harvest honey in addition to the honey gathered in the forest. The place where the colonies were kept was usually in the vicinity of residences or private gardens. The funds they used for beekeeping were not small. They needed to prepare a safe place with favorable vegetation as a food source. The funds included maintenance costs for colonies, nesting sites, and tools for harvesting honey.



Figure 7. Beekeeping in boxes (a) and bamboo (b)

- **Contribution to the economic conditions of rural gatherers**

Honey collection and *teuweul* bee farming activities contributed significantly to the income of village-based collectors. During the Covid-19 pandemic, many collectors chose to go to the forest in search of honey and colonies to sell. They could earn more than enough income to fulfill their daily needs. Some collectors made this activity their main job but others did it as a side job activity.

Gatherers' income depends on the number of colonies and honey obtained. For example, with the price of 1 colony Rp. 75,000 and 1 kg of honey Rp. 80,000, at least they could earn Rp. 175,000 from 1 colony and 1kg of honey they collected. In a month they could collect about 10-20 colonies and about 5-8 kg of honey. If they got 10 colonies and 5 kg of honey, their income was around Rp. 1,150,000. in a month.

In addition to income from the collected honey and colonies, some collectors turned their cultivation sites into tourist attractions (Figure 8). Visitors could visit the farm to see the bees and suck honey directly from the hive. The collectors also offered food and beverages flavored with honey. They also sold products of their bee cultivation such as packaged honey, propolis, and other products.



Figure 8. Honey beekeeping tourism area (a and b) and stalls selling beekeeping products (c)

4. Discussion

- **Knowledge of *teuweul* and its utilization**

Based on the description above, it can be observed that rural communities in Sumedang Regency have a knowledge system related to the utilization of natural resources of stingless bees or *teuweul* (*Tetragona* sp.). Collectors have knowledge

about *teuweul* which includes the anatomy of bees, how to find and catch them, and how to use them. This is similar to the knowledge possessed by honey collectors in the Andaman Islands (Ghosh and Barik, 2016), Nepal (Thapa *et al.*, 2018), and Africa (Hollmann, 2015). Even though they are in different areas, there are similarities in knowledge related to honey collection and bee colonies, for example, knowledge about bees, collection techniques, and how to use them.

- **Collection of stingless bees as a source of income**

Initially, honey collection activities were not carried out routinely and were only carried out when the honey was accidentally found or when honey was needed. However, currently collecting honey has become a routine activity carried out by residents in rural Sumedang. In fact, at this time it is not only collected for consumption but also used as a source of income. This is in line with the selling activity of honey and bee colonies in several villages in Sumbawa which was studied by Schouten *et al.* (2019) which tells how some members of the community routinely sell honey that has been collected and the proceeds from the sale could meet their household needs. The results of the same research were also stated by Endale (2020) that selling honey from honey cultivation activities could be a source of income for residents in the Wolmera Woreda region, Ethiopia. This shows that honey obtained from honey-collecting activities in the forest or produced from cultivation activities could be a source of income to meet the necessities of life for honey collectors or honey bee cultivators.

- **Encouraging rural economic development**

The collection of honey and stingless bee colonies has become an economically valuable activity for collectors. However, from what we found, this activity can also contribute to improving the economy in rural areas. The use of stingless honey bee cultivation sites as tourist destinations, to a certain extent, seems to contribute to economic development in rural areas. This type of tourism development has also been carried out in Nepal (Thapa, 2001) by attracting the attention of tourists who come to see directly the honey-gathering activity on the mountain cliffs. Some results of similar studies such as those conducted by Olana and Demrew (2018) in Ethiopia and Adler *et al.* (2023) in Bolivia show that the honey beekeeping program has improved the economy of the community, especially women's groups. In line with these research studies, it could be stated that, to a certain extent, the cultivation activity of stingless bee colonies collected by collectors has the potential to be developed further in efforts to develop the economy in rural areas.

- **The future of the *teuweul* collection**

As an activity that has been carried out by the Sundanese in Sumedang for quite a long time and its utilization is increasing, this has raised several concerns regarding the existence of *teuweul* in nature when there were no specific rules regarding the utilization of this resource. Collectors had complained that it was becoming increasingly difficult for them to find *teuweul* as more and more people were looking for it. The existence of bees, such as *teuweul*, might also be feared by other threats such as climate change which has been studied by Lima and Marchioro (2021) and Giannini *et al.* (2012) in Brazil which mention a decline in population and the threat

of extinction of bees if not treated immediately. Other potential threats such as disease occur in *Apis dorsata* beekeeping in Nepal (Thapa *et al.*, 2018). Some of these threats have the potential to reduce the number of bees in the forest, including the stingless bee (*teuweul*), and also pose a threat to the sustainability of the source of income for honey collectors and bee colonies.

5. Conclusion

The study shows that the stingless bee honey collectors have a detailed understanding of the honey gathering and bee colonies hunting of the stingless bees called *teuweul*. At first, this activity was only a side activity, but recently it has been carried out as an income-generating activity by some villagers in the study area. Apart from being the source of income for collectors, to a certain extent, this activity has contributed to rural economic development.

Apart from that, unfortunately, the study has no detailed data on income obtained from this activity at an individual level. Quantitatively measurable income data has not been obtained. Based on the research results, this study considers that it is necessary to collect this data in order to confirm the claims put forward by the honey collectors. In this regard, this study suggests carrying out further studies that focus on income earned by honey collectors at the individual level.

Conflict of Interest: The authors declare that they have no conflict of interest.

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