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Stingless Bee Beekeeping as a Coping Strategy of Poor Households to Cope with Impacts of Disasters in Lombok Island, Indonesia

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Abstract: Communities in Lombok, especially North Lombok, have faced several disasters in recent years. The disasters include the Earthquake in 2018 and the Covid-19 pandemic that began in 2020, having a social and economic adverse impact. During these disasters, Trigona (stingless bee) was observed of being an income activity that was quickly recovered. This study looks at how Trigona helped beekeepers as a coping strategy after facing disasters. A qualitative study was conducted in North Lombok by conducting interviews using open questions with interview guidance. The interviews involved 35 beekeepers as participants and two key informants who were related to the activities of beekeepers in the society. The data was analyzed qualitatively and the findings were presented descriptively. This study found that Trigona was a household business that was able to help farmers coped with the impacts of disasters in North Lombok. The beekeeping could recover soon after the 2018 earthquakes, and was survived during pandemi because it was supported by five livelihood assets, which were available around them, easy to access, easy to use, and/or profitable. The assets included natural, human, social, physical, and financial assets for both beekeeping and livelihoods. Trigona beekeeping was also supported by institutions, both formal and informal.

Keywords: Beekeeping, Coping strategies, Stingless bee, Sustainable livelihoods, *Trigona*

Introduction

Trigona bee or stingless bee is a potential natural resource developed in Lombok Island, Indonesia (Riendriasari & Krisnawati, 2017). In a relatively short period (10-15 years) since the beekeeping technique and its marketing system were introduced to the community, the beekeeping development has spread widely. The government has also started to focus on making the stingless bee as a focused commodity for development program.

The rapid development of *Trigona* is estimated because there have been various kinds of research on the *benefits* of *Trigona* for health (Agus et al., 2019; Agussalim & Nurliyani, 2019), and economic, which led to higher market demand (Pratiwi et al., 2020). High demand and market prices of *Trigona* products (honey and propolis) have resulted in wider interest in developing them (Pratiwi et al., 2020).

However, North Lombok has experienced two major disasters, the earthquake and Covid-19 which had an unfavorable impact on socio-economic development. Mental traumatic impact during the earthquake has reduced the economic activities significantly, and followed by social distancing and travel restrictions during Covid-19. These have disrupted the socio-economic activities of the community. Many businesses are closed resulting in a lot of unemployment. People in Lombok, especially North Lombok suffered from increasing number of poor people since the devastating earthquake in 2018 (Statistics of Indonesia, 2022), and the vulnerability increased since the Covid-19 outbreak (Statistics of Indonesia, 2020).

However, based on the field observation to date, farmers in North Lombok continued to do stingless bee business after the two disasters occurred, and this has even become an alternative activity to cope with the disasters. However, there

is no research related to whether *Trigona* is indeed a resilient livelihood against the impacts of disasters, and how this is used as a coping strategy. Similar research has been conducted in Nepal but it was more focus on the role of local institutions in helping a community in coping with disasters such as earthquakes and Covid-19 (Gentle et al., 2020) instead of looking at the role of a particular household enterprise in helping a household to adapt to disasters. Therefore, this study provides information and an overview of how *Trigona* plays a role in coping with the impact of stresses and shocks such as disasters in life, and the reasons why its role is the way they are.

Material and Method

Study Area

This study was conducted in North Lombok, Nusa Tenggara Barat Province. This area is located in a small island of 5435 km^2 and 12 masl. Temperature ranges 17.4^{o}C to 34.2^{o}C, and has two main seasons, which are dry season and rainy or wet season.

Sampling Procedure and Sample Size

This study is a qualitative research and presented descriptively. A total of 35 participants were interviewed by using semi-structured interview guidance.

Data collection and analysis

The data collected included general characteristics of households (family size, age of informants, and education of informants, length of experience in beekeeping, and number of colonies). The core data that was collected including the history of disasters in Lombok, socioeconomic conditions of household livelihoods in general, conditions of beekeeping after the earthquakes and Covid-19, and factors that made beekeeping reliable after the earthquakes and during Covid-19. The information gathered was analyzed qualitatively and presented descriptively.

Results and Discussion

General Household Characteristics

The participants of this research are men or women in beekeeping households. The main household characteristics to be discussed in this paper are sex, age, education, family size, beekeeping experience, and number of colonies.

Table 1. Gender of informants

No.	Gender	Frequency (persons)	Percentage (%)
1	Men	18	51
2	Women	17	49
Total		35	100

Table 1 shows that men and women involved in beekeeping. Although the number of men in this study (51%) was higher than women (49%), they admitted that stingless bee beekeeping is easy to be done by both men and women. This activity seems provide opportunity for both gender to be able to increase income of both gender. As the participants revealed that beekeeping of *Trigona* is relatively easy and can be developed around their houses. This is supported by Robles & Benavidez (2020) that the strength of recovery after disasters is by ensuring gender equality in the recovery interventions.

Table 2. Age of the informants

No.	Age of informants (Years)	Frequency (persons)	Percentage (%)
1	> 15	-	0
2	15-64	35	100
3	>64	-	0
Total		35	100

Table 2 is the data of the age of the informants in this study. All of the participants are in productive age for working (15-64 years). The range of age productivity refers to Statistics of Indonesia (2022) that categorized 15-64 years as productive age.

Table 3. Education of the informants

No.	Education	Frequency (persons)	Percentage (%)
1	No education	3	9
2	Primary School	16	46
3	Middle School	5	14
4	High School	7	20
5	College	4	11
Total		35	100

Base on Table 3, most of the participants in this research had very low education, which more than half (54.3%) studied only until primary school. Some of them finished and some others did not finish their primary school. Even, some of them did not go to school at all. According to participants, beekeeping did not require high education to be able to run the business. They could earn income from this activity. This is supported by Minh et al (2020) that formal education was not the main determination of the capabilities of rural people in Vietnam to cope with impacts of disasters when the people have local knowledge to deal with disruptions.

Table 4. Family size

No.	Number of family members	Frequency (persons)	Percentage (%)
1	1-3	1	3
2	4-5	26	74
3	≥ 6	8	23
Total		35	100

Most of the participants in this research had 4-5 members in their family (74%). According to United Nations (2017), this size of the family members is categorized as medium.

Table 5. Beekeeping experience

No.	Beekeeping experience (Years)	Frequency (persons)	Percentage (%)
1	<1	2	5.7
2	1-2	12	34.3
3	3-5	12	34.3
4	6-7	5	14.3
5	8-10	4	11.4
Total		35	100

Table 5 shows that all of the participants had maximum ten year experience. Most of them (74.3%) did beekeeping between several months to five years. According to the participants, beekeeping in North Lombok was relatively new activity that was introduced to them by some bee experts who taught them voluntarily.

Table 6. Number of colony

No.	Number of colonies	Frequency (persons)	Percentage (%)
1	0-25	6	17
2	26-50	13	37
3	51-100	7	20
4	101-500	8	23
5	501-1000	-	0
6	>1000	1	3
Total		35	100

Majority of the participants in this study (54%) had less than 50 colonies, while 45% had between 51 and 500 colonies. Only one farmer had more than 1000 colonies. This person was the only one in this study who did beekeeping as his main income activity, while the rest of the participants considered beekeeping as the supporting income for household. Similar to other South East Asian Countries where livestock is not considered as primary sources of income (Ashley et al, 2018).

The roles of stingless bee in coping with disasters in Lombok Island, Indonesia

The History of earthquakes 2018 in Lombok and the socioeconomic impacts

After the earthquakes, *Trigona* farmers and the majority of people in North Lombok were mentally traumatized. Gempa ini mengakibatkan keluarga peternak luka-luka dan meninggal membuat mereka trauma. Peternak merasakan kepanikan selama berbulan-bulan. Rumah mereka juga hancur dan untuk sementara waktu mereka tinggal di tenda-tenda pengungsian. Economic activities stopped for months.

" ... Pada saat gempa itu, kita tidak berani kemana-mana, khawatir meninggalkan anak istri, rumah hancur, banyak orang yang meninggal, jaraknya sebentar-sebentar gempa. Setelah itu kita hanya bisa diam, tidak bisa bekerja..." (…….) (Wawancara Bapak Hanan, baris 388-390)

The History of Covid-19 in Lombok and the Socioeconomic Impacts

After Covid-19 spread on Lombok Island, including in North Lombok, the Government regulations limited social distancing to prevent transmission led to limited mobility and economic activities. Various service sectors, such as tourism and travel slumped, resulting in many employee being unemployed. There was a decrease in family income while the price of goods remained high, making the burden of family life even heavier. The same as in the agricultural and livestock sectors, their products were difficult to sell outside the region while they had to use their land because being a farmer was their main job.

- Stingless bee as a quick-recovered agribusiness

At a time when economic activity stopped after the earthquakes, *Trigona* was one of the fastest-growing businesses.

"…Kalau gempa ada kendala ketika rumahnya roboh, kemudian kotaknya juga rusak, tapi masyarakat cepat recoverynya, kembali pelihara Trigona cepat dengan keswadayaan mereka…" (Wawancara Ibu Riska Baris 108-110)

The speed recovery was also due to market demand that continued to exist. For example, the volunteers who came looking for and consumed the honey to energize their bodies ordered honey as a souvenir. More farmers began to do beekeeping seeing the phenomenon of the demand for honey.

The demand for *Trigona* during Covid-19 was also high. The participants agreed that this is due to consumers' belief that Trigona honey can protect them from Covid-19 viruses. This is supported by a research result that stingless bee honey (including *Trigona*) could protect people against Corona virus (Mustafa, 2020).

In terms of sales, the existence of an online system helped overcome the problems of transporting the product to markets. Good packaging and shipping costs did not burden consumers or producers, meaning that the marketing system was affordable and did not cause business losses.

For the beekeepers who used to work in other sectors and their jobs were affected by Covid-19, they moved on to do beekeeping because it was relatively easy activity that did not require special skills or high education. Moreover, the produce was easy to sell. Not only honey and propolis could be sold by farmers, but they could also sell colonies.

"…Pada saat Corona barang-barang pemerintah mahal semua, sementara barang kita yang petani ini tidak ada harga, itu yang membuat kita sangat kecewa. Tapi Syukur [Trigona] bisa membantu. Awal mulai menanam kadang kita panen [dan jual madu Trigona] untuk pembelian bibit [tanaman], dan beli pupuk Selain itu, kalau kita butuh uang sekolah untuk anak 100-200 [ribu rupiah] bisa kita ambil kan

dari [menjualkan] satu botol atau 2 botol [madu]…" (Wawancara Bapak Seto, baris 616-617 dan baris 740-753)

Moreover, the market demand for the colony was also high after people began to realize that *Trigona* was a business that has high economic value and did not require high skills to do it.

The role of Livelihood Assets for *Trigona* Beekeeping in Helping Farmer Households Coped with Disasters

This study identified that *Trigona* beekeeping was relatively an inexpensive business because resources were available around farmers living areas and easy to access. Beekeeping is an activity that can ensure sustainable development because it is not only beneficial economically but it is also valuable to improve ecosystem and environmental sustainability (Zambrano et. al., 2022). At least there were five livelihood assets that supported *Trigona* beekeeping to help farmers households coped with the disasters.

Natural Capital

Supporting natural capital includes feed, weather, and land. *Trigona* feed was obtained from plants in the neighborhoods. *Trigona*'s feed was abundant even though parts of this area were dry, and the plants grew well in this type of soil.

"...Kalau makannya [Pakan Trigona] mudah kita di Bayan. Kalau musim kemarau sudah mulai berbunga jambu mete, randu, manga dan kelapa. Kita juga kadang menanam bunga matahari, dan tamanan berbunga lainya dekat kandang. Intinya tidak ada kesulitan kita di Bayan untuk makanan lebah, karena banyak di alam…"(Wawancara Bapak Dion, baris 240-241).

The plants grew and produced flowers as bee forages even though they grew in the areas that lacked water. In addition, shrubs that grew wild around were also a source of feed for the bees. This finding was in line with the results reported by Riendriasari & Krisnawati (2017) regarding feeds and other natural resources, which could support the stingless bees' lives in Lombok Island.

The sustainability of the beekeeping activities in the area of the research was supported by benefits observed by the farmers, which they found the bee production was high and the crops grew better. This information is supported by Zambrano et al (2022) that beekeeping is valuable for environmental sustainability because feeds were available for the bees around so that they can save time and energy to collect feed. Zambrano et al (2022) also added that the bees' activities help the development of other crops through helping pollination. Then, the healthy and strong bees and hives contribute to high production and human can harvest higher yield which related to their economic growth (Zambrano et al., 2022).

Human capital

Everyone could do beekeeping regardless of education level. Table 3 shows that the beekeepers in this study varied from those with no formal education to those who graduated from university.

"…Kalau untuk budidaya Trigona saya sendiri, paling kalau nanti ketika penirisan madunya baru dibantu [Istri]. Saya tinggal panens aja, setelah panen diserahkan ke istri, kemudian istri yang tiriskan dan kemas. Kalau dalam usaha Trigona ini yang penting pengalaman, pendidikan itu tidak menjamin, bahkan disini ada juga yang beternak gelarnya S. Pd. dia hanya pelihara saja tapi tidak dimanfaatkan dan tidak berkembang. Ada teman saya, dia tidak sekolah tapi kotak koloninya melebihi punya saya…" (Wawancara Bapak Haris, Baris, 131-135 dan 240-246)

Nevertheless, it is necessary to do good beekeeping practice and skills (Naz et al., 2022). In this study, farmers' skills improvement was carried out through assistance by field officers who also played a role in helping farmers' businesses by becoming product collectors.

Trigona beekeeping was also a gender neutral activity. The amount of labor required for beekeeping was not much, and it usually employed family members. Naz et al (2022) reported that beekeeping is an activity that can be done by women as the manpower to help men in beekeeping. However, in this study, women did not only could take the position as helpers. They also could own the beekeeping business and sold the product by themselves. In the beekeeping, the men and women in a household had specialized tasks in beekeeping. Men usually prepare the infrastructures, women harvested and packed the yield, and men and women ensure the cleanness of the shelves and health of the colony every day.

Social capital

Based on this research, social capital support in the development of *Trigona* farming includes relationships between keepers, keepers and families, collectors, and farmer groups. These relationships supported farmers in beekeeping and in marketing the *Trigona* products. The similar finding regarding the importance of social capital in supporting beekeepers business was reported in a study in India (Kaur et al 2020).

Physical Capital

Bee keeping techniques could be learned easily because all the materials were readily available and were relatively cheap. According to Khan & Singh (2022) that adequate infrastructure support can inhibit colony development which can result in high production. In terms of physical resources in this study, the facilities and infrastructure that support *Trigona*'s business consisting of boxes, shelves and simple harvesting equipment were available and accessible to increase bee production.

Financial Capital

For financial capital, the finding of this study is in line with Zambrano et al (2022) that beekeeping required low capital compared to other household businesses. Moreover, it was easy to maintain and develop. The cost of making boxes and shelves could be reduced because the material was obtained from around where the beekeepers lived. Beekeepers did not have to spend extra money to buy feed because it was already available in the area where they lived.

Financial capital for raising *Trigona* also included means that had a saving function such as gold or livestock. These savings could be sold for family consumption. According to D'Souza (2020), financial capital is everything related to finance, whether it is obtained from income, savings, debt, and insurance.

The role of Institutions in the Development of Trigona to Support The Socio-Economics of Beekeepers Households

Institutions in this study include formal and informal institutions to assist *Trigona* agribusiness. For formal institutions, the beekeepers formed a group. In marketing, the beekeeping groups were forums to help find marketing channels for *Trigona* products. In addition, the groups also helped provide stock of products for individuals. If there were beekeepers that did not have honey stock to sell then they could ask it from other group members. This is in line with the finding of Syam et al (2022) that farmer groups can help farmers to develop their business and to improve their well-being.

The informal institutions identified in this study were institutions that regulated the relationship between farmers, and collectors. The existence of collectors helped farmers in marketing *Trigona* products. These collectors had a lasting relationship with the beekeepers and they developed trust as the result of the settled relationship. Beekeepers could take advantage of this settled and trusting relationship to make their business easier as supported by Iris et al (2022) that trust and communication can build long-term business relationships with other actors, which also benefit farmers' agribusiness. For example, farmers borrowed money first from collectors and paid it when they harvested honey. Vice versa, if the collectors did not have money but needed honey to sell, they borrowed it from the beekeepers and paid it after the honey was sold.

Conclusions

Based on the results and discussion it can be concluded that; 1) *Trigona* was a household business that was able to survive and able to help farmers coped with the impacts of disasters such as the earthquakes and Covid-19 on Lombok Island. The beekeepers' livelihoods were survived because the capital was available around them, easy to access, easy to use, and/or profitable. In addition, the demand and price of honey in the market remained stable and was not affected by the disaster. The capital included natural, human, social, physical, and financial assets for both beekeeping and livelihoods, whether they owned or could access. 2) *Trigona* beekeeping was also supported by institutions, both formal and informal. This institution supports beekeepers in beekeeping, *Trigona* product marketing, and their livelihoods. The beekeepers group was a form of formal institution that played a role in facilitating individuals in beekeeping. Meanwhile, informal institutions helped beekeepers in earning income, which

involved the relationship between beekeepers as producers and collectors. The settled trading relationship was based on trust that was developed from a long relationship. The income from *Trigona* played an important role in helping beekeepers to meet the daily needs of their households and could support other expenses.

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