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# Trigona Honey Home Industry Development for Economic Recovery in the Time of COVID-19 Pandemic: A Case Study in North Lombok West Nusa Tenggara, Indonesia

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## 2 Authors' contributions

This work was carried out in collaboration among all authors. Author Kholil designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript. Author NA contribute in data collection and managed the literature searches and author DK managed the analyses of the study. All authors read and approved the final manuscript.

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## ABSTRACT

The devastating earthquake on 28 July 2018 in Lombok and the COVID-19 pandemic have put high economic pressure on the community. It is not only the damage to economic infrastructure that stops business activities, but also very strict health protocols, especially social distancing and avoiding crowding that make business activities impossible. Trigona bee farm has been one of the productive activities to support the family economy for the people of North Lombok since decades ago. During the Covid-19 pandemic, which has been running for almost 10 months, the activities of

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Trigona beekeeping are still running; in fact, the demand has actually increased. This research aims to develop the best strategy to make business scale of Trigona honey and community income increase, using the SAST (Strategic Assumption Surfacing and Testing) method and AHP (Analytical Hierarchy Process). The results showed that the demand for trigona honey during the pandemic has actually increased, because this honey has a very complete nutritional content, which can be used to increase immunity against of COVID-19. There are three main problems that were faced by the trigona bee farmers to develop their business: Trigona seeds, cultivation technology, and business management. The best strategy to increase their business and income is cultivation system technology and providing added value.

**Keywords:** *Trigona honey; home industry; collector; sustainable; added value.*

## 1. BACKGROUND

The tremendous earthquake in Lombok in July and August 2018 has caused great loss not only in form of economic facilities and houses, but also a lot of human casualties, reaching more than 4,500 deaths, and 10,239 people lost their houses. The total economic loss was estimated to reach IDR 5.4 trillion [1]. One of the regions experiencing the most serious impact was North Lombok. Due to the damage of economic facilities, most of the productive activities of the community, such as trigona farming, coconut sugar production, and bamboo handicrafts, stopped [2] that would harm the sustainability of regional development.

The pressure on community economy got harder especially during Covid-19 pandemic, Government policies on Large-Scale Social Distancing (PSBB) including social distancing and activity restriction highly affected community activities. Nationally, Covid-19 had affected economic growth into negative 5.2% and made SMEs suffer from the impact so they had to be closed [2].

North Lombok and East Lombok region are the highly potential regions as tourism destination. There are various natural attractions in the regions, among others Tiga Gili consisting of Gili Trawangan, Gili Meno, and Gili Air; Mount Rinjani, Sendang Gile Waterfall, Tiu Kelep Waterfall, and so on. North Lombok suffered from the most serious impact of the disaster on 28 July and 5 August, so most of the economic activities of the community stopped. Therefore, it required development of community productive activities suitable with potential excellences and community culture so they could recover soon [3].

One of the productive activities involving many people was home industry; namely family

economic activities integrated with household activities [4].

Economic recovery in North Lombok had to be done through productive activities involving as many people as possible. One of them was the development of home industry based on excellent resources. Trigona farming and coconut sugar production were the most potential home industries, suitable with the objective condition of the community [5,6]. The main problems faced by trigona farmers were the extremely simple way of farming that resulted in low productivity and the limited access to market. In addition, the community did not medically know what were the specific contents and benefits of trigona honey and how to execute the business process. Therefore, it required intervention of policy by Local Government through business development so businessmen could enhance their production and add the value to increase their income.

In the effort to support the enhancement of business scale and income of trigona honey businessmen, it needed to develop a good and sustainable cultivation model to enhance and sustain the production. Additionally, it also required clinical tests to investigate the medical benefits to increase its sale value when the medical benefits were known.

Trigona honey is the honey produced by trigona (*klanceng*), in Malaysia it is also called as *kelulut*. They are a type of small bees producing propolis known to be highly beneficial for human health. The excellence of this type of bees compared to the other types is because they live freely in forests in colonies consisting of 2,000 to 3,000 bees each. Trigona bee is a type of bee which is small and very active in utilizing various types of flower nectar. These bees are able to enter even tiny flowers that cannot be done by ordinary bees. The strength makes trigona bees easier to cultivate because of the ease in finding food.

Because of the excellence of trigona bees, the honey produced by trigona bees contains a lot of nutrition obtained from combination of various types of nectar. While trigona honey also proves to be a type of high-quality honey. Trigona bees are easy to take care, they do not sting, and they do not need special feed because they eat the nectar of flowers growing around them. Trigona bees have many potentials to cultivate. In addition to their simplicity, they enhance welfare and are also friendly to humans [7].

The main problems faced by trigona bee farmers were the extremely simple way of farming, the limited access to market, and the limited value addition. In addition, the people did not know clearly what medical contents and benefits were and how to execute the business process to increase the value that might increase their income. Therefore, it needed to develop a good and sustainable cultivation model to increase production and it required clinical tests to investigate its medical benefits. This study aimed to investigate the medical contents and benefits of trigona honey and to design a business model that could increase the income of trigona bee farmers.

Geographically, Indonesia is located in the intersection of the earth's tectonic plates, namely Indo-Australia, Eurasia, and Pacific plates, which can produce accumulation of energy with certain threshold when they collide and can cause earthquake. Additionally, in Indonesia there are around 150 active volcanoes, so Indonesia is one of the countries with the highest risk of natural disasters [8]. The impact of natural disaster is very serious, not only destruction of facilities and infrastructure, but also destruction of economic facilities and human casualties [9,10].

Destruction of infrastructure and environment affect the toughness of economic development of a region. Almost in every region experiencing natural disaster, the caused impacts are very complex, not only economic loss, but also a lot of human casualties, loss of productive activities of the community that caused slowdown of economic growth, increase of poverty and unemployment. The ability of a community in responding to a disaster determines the economic toughness of a region [8]. Therefore, the efforts to make the community tough in facing a disaster become crucial. To make the community tough in facing a disaster can include some ways: to make the economic foundation tough with skills based on competencies and

excellent resources and to prepare psychologically so they do not feel down when they face a disaster [11,12].

Disaster management is classified into two types of activities, namely (1) pre-disaster and (2) post-disaster [8]. Post-disaster activities can be in form of disaster response/emergency response or recovery. Pre-disaster activities (preparedness) can be in form of preparedness, risk awareness education, training, spatial planning, and disaster-resistant building design. While post-disaster activities can be in form of disaster mitigation (reduction of impacts). In general, post-disaster activities are classified into two groups: risk management and crisis management. Risk management includes mitigation activities, protection, and early warning. While crisis management includes reconstruction, recovery, rehabilitation, and emergency response. Reconstruction and recovery are the efforts to recover the social and economic activities of the community struck by earthquake. One of serious impacts due to earthquake is mental stress that can cause mental disorder with the result that they do not live peacefully [10,12,13].

Trigona bee farming has been done a lot by the community of North Maluku. Trigona is a species of social insects that live in groups forming colonies of 2,000 to 3,000 bees each. Moreover, they are very social and human-friendly and they live freely in forests. This kind of bees consists of 500 species classified into 5 kinds, namely: melipona, trigona, meliponula, dectylurina, and lestrymelitta. In Indonesia, 37 species are identified, 2 of them are in Lombok, namely *trigona sapiens* and *trigona clypearis* [14]. Trigona honey contains complex and complete nutrients, such as vitamins: (B1), riboflavin (B2), (B3), ascorbic acid (C), (B5), pyridoxin (B6), niacin, pantothenic acid, biotin, folic acid, and vitamin K; glucose, fructose, copper, zinc, and iodine [14,15]. The honey had benefits to improve body immunity, to control blood pressure, to accelerate recovery when wounded and degenerative disease, and can prevent free radicals [15]. According to [16], trigona honey can also treat influenza.

To cultivate trigona bees, it starts with finding the colonies in forests, then placing the colonies in boxes made from wooden boards with size 32x15x15 [6,7]. The requirements of trigona bee cultivation includes: fulfilment of food (from leaves); enough water and far from agricultural activities that use pesticide. The economic

potentials of trigona bee farming are great, the demand keeps increasing, while the production is still limited. Value addition of honey is important aspect for trigona bee farmer to increase their income.

## 2. METHODOLOGY

The analysis of business model of home industry based on local potential excellence for post-earthquake economic recovery and during Covid-19 pandemic involved many actors, among others local government, provincial government, and central government; businessmen, academicians, and local community; so, it was extremely complex. Post-earthquake social and economic recovery was an extremely complex and dynamic activity. Therefore, the approach used could not be reductionist or mono-discipline, but it had to be holistically with multidiscipline. Based on the fact, the approach in the study was combination inductive and deductive approach. Data collection based on expert discussion involved 9 experts represent policy maker (government) 3 people, business actors (3 people), academics (2 people) and NGO (1 people) as a deductive approach, while for inductive approach data collection through questionnaire to 35 selected respondents using a purposive sampling approach.

6 The data analysis used for deductive approach is CAST (Strategic Assumption Surfacing and Testing) and Analytical Hierarchy Process (AHP) with CDP software tool, and statistical descriptive for inductive approach. SAST was chosen to identify the important and strategic factors in developing the business model of trigona honey home industry and AHP was used to identify the most appropriate strategies in enhancing the business scale to increase the income of the community. By the AHP analysis priority

programs according to objective condition can be identified [17,18,19].

## 3. RESULTS AND DISCUSSION

Trigona bee farming has developed for a long time and has become a pedestal for the community of North Maluku, carried out from generation to generation. Based on the result of review in the field, most of the trigona bee farming community ran their business in a very simple way and hereditarily. They started the business by finding the colonies in forests. After finding them, they made boxes with size 15x35x15 as shown in the Fig. 1.

After the bees gathered and there was a lot of honey, it was then harvested by opening each box. Each box contained honey, the paste to make their beehives that contained propolis, and male flower's pollen, as shown in Fig. 2.

Trigona honey home industry is a very prospective activity without capital and maintenance costs, because it only provides a place beside the house and does not have to provide feed, every month it can be harvested. The average production of each box/month ranged from 100 to 1200 ml with price of IDR 300,000 to IDR 400,000/500 ml. Based on the result of survey, most of trigona bee farmers stated that their activities really helped their family economy. The average of their income from trigona bee farming was IDR 5 to 7 million/month. During the earthquake, the activities stopped, but they could be back on the move immediately. The result of interview with the businessmen shows that the activities of home industry did not get impacted by Covid-19, even the demand for trigona honey kept increasing while the production could not satisfy the needs. While other business activities



Fig. 1. Boxes for colonies of trigona bees



**Fig. 2. Boxes of trigona beehives made from wooden boards**

such as restaurants, weaving handicrafts, accessories and clothing have stopped due to the impact of Covid-19. This shows that during the COVID-19 pandemic, suitable business activities to be developed are health products or food based on superior natural resources.

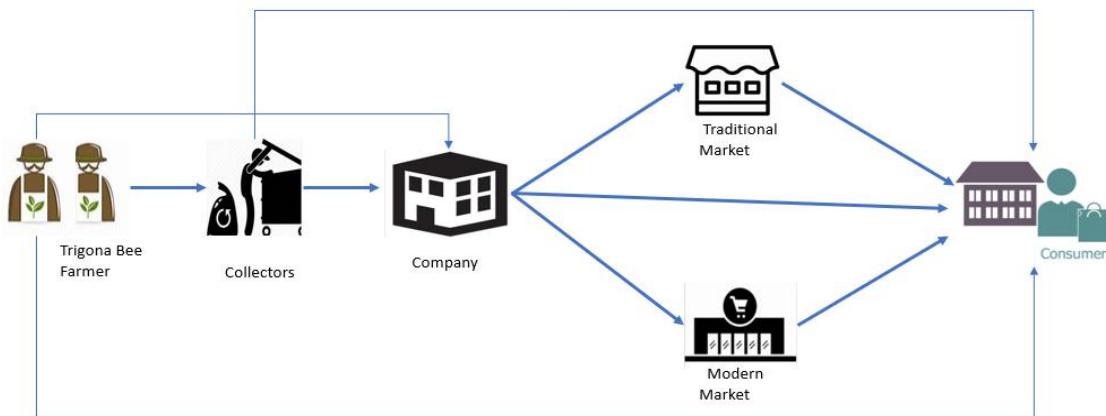
The interview results also showed there are some problems faced by the bee farmers: (1) the traditional cultivation system; (2) the nursery system; (3) no value added; (4) market access, and (5) business management.

The system of trigona bee cultivation could be said as very traditional because they did it by making boxes around their houses with minimum facilities. The bees were left finding their own food from the plants around them without any special feeds. They did not have special care to prevent diseases or other pests. In terms of nursery system, the trigona bee larvae were obtained from the forests by taking some colonies there which consisted of 2,000 to 3,000 bees. The colonies were taken from tree branch, then placed in boxes with size 32x15x15. There was no selection for excellent species of bees, but all of the trigona bees in the colonies were taken. With such natural nursery system from the forests, the trigona bee farmers were unable to improve their productivity. In addition, with traditional cultivation system, there was no

treatment of giving special feeds to produce honey with special flavour.

Lab analysis result showed, that this honey has a complete nutrition content such as : (1) *L-Serin/Phosphatidyl Serin/C<sub>3</sub>H<sub>7</sub>NO<sub>3</sub>* (amino acid), (2) *L-glutamate acid/2S-2-aminopentandoat acid/C<sub>5</sub>H<sub>9</sub>NO<sub>4</sub>*; (3) *L-Fenilalanil (Phenylalanine)/C<sub>9</sub>H<sub>11</sub>NO<sub>2</sub>*, (4) *L-VALIN (Valeriana officinalis) / C<sub>5</sub>H<sub>11</sub>NO<sub>2</sub>*, (5) *L-LISIN/ L-Lysine /C<sub>6</sub>H<sub>14</sub>N<sub>2</sub>O<sub>2</sub>*, (6) *L-TIROSIN/ Tirosina/ C<sub>9</sub>H<sub>11</sub>NO<sub>3</sub>*, (7) *glucose/C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>* and *fructose/C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>*, and others. These nutrients can increase immunity of the body for facing of pandemic Covid-19.

The honey produced was directly sold, without any special treatment or packages, so there was no value added. Market access for the trigona bee farmers was unlimited, their product sold without promotion and marketing because the demand increased during the Covid-19. The result of interview with the businessmen revealed that they ran the business without any special management and there was no special training. There was no special management in terms of business management, financial management, and marketing. Government's attention was not optimal either, especially related to the cultivation system and marketing. In general, the model of trigona honey marketing chain based on the result of analysis in the field can be illustrated as the following:



**Fig. 3. Trigona honey marketing chain**

The trigona bee farmers sold their product to a collector in their village or directly to a honey/herbal company in Mataram City; or even directly to customers who needed it. The price of trigona honey from trigona bee farmer is IDR 200,000 if it is sold to collectors, or IDR 225,000-250,000 to Company, and IDR 250,000 to customer. While the price from collectors to company is IDR 250,000; and from company to traditional market or modern market is IDR 275,000. Customer bought IDR 300,000 both from traditional or modern market. The trigona honey from the company has been added with other ingredients, so that it has better nutritional content and is also packaged in attractive packaging. This marketing chain showed that trigona bee farmer have not got the maximum price, because the price difference to consumers is still quite large.

There is no association or cooperatives at the bee farmers that could accommodate the honey product, or price standardization. The position of bee farmers was mostly weak, they did not have any bargaining power or they were only the price receiver, while the collector who was usually given capital by the company could keep the price down so it was relatively cheap. Direct sales to end customers rarely took place, there were only few buyers.

During the Covid-19 pandemic, the demand for trigona honey continued to double, thus encouraging other people to join in opening up this home industry activity. The number of trigona honey business actors continues to increase, and now almost 70% of the community has been involved in this activity, while other activities such as restaurants, food and beverage

industries have closed due to the COVID-19 pandemic.

By observing the trigona honey marketing chain as in Fig. 1, it required intervention by local government to develop fair marketing chain that gave more benefits to bee farmers. In addition, it also required skill enhancement of the businessmen to be able to conduct treatment that added value to increase their income. More than 90% of business actors expected the availability of trainings on cultivation and business management to enhance and sustain their activities.

Based on the discussion with the experts, there were 14 aspects determining the success of development of home industry of trigona bee farming, namely: (A) Human resources; (B) Cultivation technology; (C) Market access; (D) Price; (E) Support of policy; (F) Institutional of businessmen; (G) Package; (H) Facility; (I) Accompaniment; (J) Nursery; (K) Value added; (L) Land availability; (M) Business sustainability; and (N) Community involvement. From the 14 aspects based on the result of SAST analysis, it shows that Cultivation Technology (B), Accompaniment (I), and Nursery (J) became the most strategic factors (important and certain) to develop the home industry. It means that trigona honey productivity could increase if the larvae used were the excellent ones and their cultivation implemented suitable cultivation techniques through appropriate treatment and feeding, as shown in Fig. 4. To obtain excellent larvae, it required nursery activity done by the government through cross-breeding or others. Cultivation technology could be implemented by trainings or accompaniments provided by the government

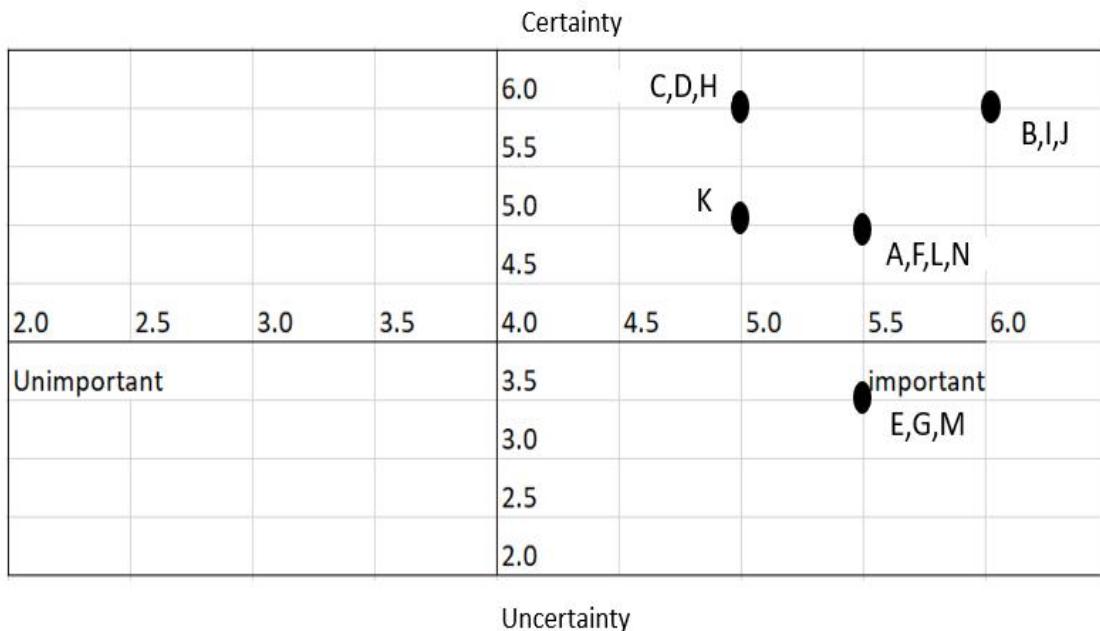
free of charge. Accompaniment was not limited to the aspect of cultivation, but could also include business governance and financial management.

Fig. 4 also indicates that Market Access (C), Price (D), and Facilities (H) were the three factors that had to be certain but their level of importance was low. Market access was not a problem because the results of production were entirely sold at the place. Price was not a problem either because the demand for honey was higher than the production or the demand was unable to be satisfied yet. It was similar to business facility, with whatever there were, they could produce honey anyway. Meanwhile, Support of Policy (E), Packaging (G), and Business Sustainability (M) were three crucial factors but their certainty was low.

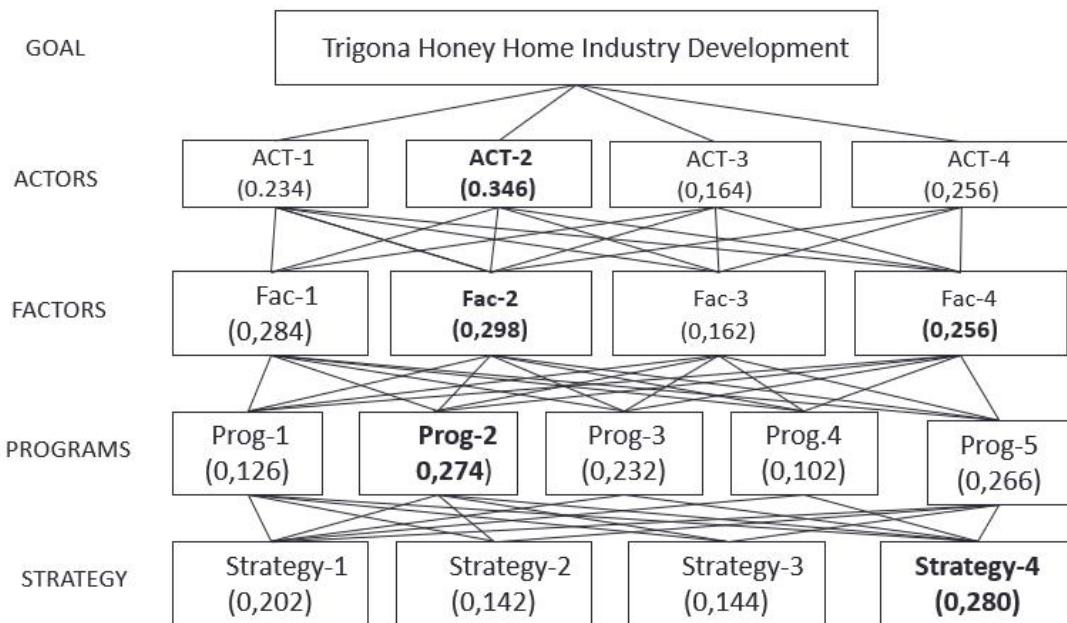
Based on expert discussions involving the government, business actors, academics, collectors, and NGOs each represented by 2 people, showed that there are 4 main actors involved in the development of trigona honey home industry namely : Regional Agency of Planning and Development (ACT-1), Business actor (ACT-2), Regional Agency of SME (ACT-3) and Field companion (ACT-4); while the 4 factors

are (1) employment (Fac-1), (2) sustainability (Fac-2), (3) welfare (Fac-3) and government policy (Fac-4). in addition, there are also 5 main programs and 4 alternative strategies; The 5 programs are (1) training for business governance (Prog-1), (2) nursery (Prog-2); (3) packaging (Prog-3); (4) promotion and marketing (Prog-4) and (5) cultivation training. And 4 strategic alternative are (1) production centers development (Strategy-1); (2) strategic partner development (Strategy-2), (3) Price (Strategy-3) and (4) Added value development (Strategy-4).

Based on AHP analysis showed that business actor (Act-2) have the most decisive role in improving the business of trigona honey home industry, while the sustainability (Fac-2) is the main factor. For increasing their income, the most suitable program in accordance with objective condition is nurseries (Prog-2), to produce superior seeds with high production and resistance to disease. In line with the actors, factors and priority programs, added value strategy is the most appropriate priority. This mean that nurseries program and value added strategy must be the first priority for guidance by the local government, as the Fig.5 shows.



**Fig. 4. Result of SAST analysis to increase production and income of trigona bee farmers**



**Fig. 5. Priority strategy of trigona honey home industry development**

#### 4. CONCLUSION

Trigona bee farming is a type of home industry that has bright prospect in the future, and pandemic Covid-19 has no impact to the demand of trigona honey. Therefore, community economic recovery based on home industry of trigona bee farming can accelerate the growth of community economy. Nursery, and accompaniment are the three factors with the highest level of importance and certainty to develop home industry of trigona bee farming as an effort to sustainably recover the economy after the earthquake in North Lombok. Nurseries and cultivation are the two priority programs that suitable with the objective condition, while value addition is the most appropriate strategy to increase business actor's income.

#### 1 COMPETING INTERESTS

Authors have declared that no competing interests exist.

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