

SUCCESS IN KELULUT HONEY BEEKEEPING (TRIGONA SP.)





DIRECTORATE OF PEATLAND DEGRADATION CONTROL DIRECTORATE GENERAL OF POLLUTION AND ENVIRONMENTAL DEGRADATION CONTROL MINISTRY OF ENVIRONMENT AND FORESTRY OF THE REPUBLIC OF INDONESIA





SUCCESS IN KELULUT HONEY BEEKEEPING (TRIGONA SP.)

"A Story from Forest Outskirts"



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Success in Kelulut Honey Beekeeping (Trigona Sp.)

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Layout: Arian Wicaksana

Published by:

Directorate of Peatland Degradation Control Jl. Dl. Panjaitan No. Kav. 24, Jakarta 13410 Indonesia Phone : 021-8520886 : 021-8580105 Fax www.pkgppkl.menlhk.go.id



Appreciation and dedication:

Directorate of Peatland Degradation Control Directorate General of Pollution and Environmental Degradation Control Ministry of Environment and Forestry of The Republic of Indonesia

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First edition: Jakarta, 2022







Bee Bread	Honeycomb, is a mixture of pollen and bee saliva
Bee Pollen	Pollen collected by bees from various flowers and stored in the hive
Habitat	Where living things live and reproduce
Isolation	Control and prevention of the spread of a disease
Colony	A group of organisms that work together to survive, find food, and reproduce
Wooden Log	Round log
Nectar	The sweet liquid found in the flowers of plants
Pollen	A powdery substance produced by seed plants
Propolis	A mixture of bee saliva and plant sap / resin
Radius	Distance from the center of the area
Resin	The sap secreted by many types of plants
Row Propolis	Propolis that has been thawed and printed
SMPEI	Sustainable Management of Peatland Ecosystem in Indonesia
Stingless bee	Bee that do not have a sting
Stup	Wooden box for beehives
Topping	Placing wooden boxes or plywood on top of logs for storage of beehive and honey

PREFACE

Alhamdulillahi Rabbil 'Aalamiin.

(Praise be to Allah, the Lord of the Universe). We thank *Allah Subhaanahu wa Ta'ala* (May He be praised and exalted) for His grace and mercy that the writing process of a book with the title: **Success in Kelulut Honey Beekeeping** (*Trigona Sp.*) ["A Story from Forest Outskirts"] was completed on time.

This book is part of the the Publication Series: Sustainable Peat - Peatlands Survive, People **Thrives**, which is a collection of best best practices in the implementation of Peatland Ecosystem Protection and Management activities. This book was compiled based on empirical experience in the field during the implementation of the Sustainable Management of Peatland Ecosystems in Indonesia (SMPEI) - Global Environment Facility- 5 (GEF 5) Project, Located in 14 villages in the Peatland Ecosystem Unit in the Peat Hydrological Unit (PHU) of the Kampar River - Gaung River and Gaung River- Batang Tuaka River, located in three district of Indragiri Hulu, Pelalawan, and Indragiri Hilir, Riau Province. References to various related publications have been included in this book to enrich the information provided.

Honey beekeeping in peatlands is one of the best opportunities for communities close to the forest. Opportunities are not only seen from a business perspective but also contribute to sustainability and support the improvement of the peatland ecosystem management Innovation in Kelulut (Trigona SP.) honey bee cultivation is one of the capacity-building efforts to make the peatland community independent and economically, socially and environmentally prosperous. This experience can serve as a lesson learned and inspiration for independent peatland villages activities in other areas located in peatland ecosystems that is also close to the forest area.



The Directorate of Peatland Degradation Control Directorate General of Pollution and Environmental Degradation Control, the Ministry of Environment and Forestry as the executing Agency and the International Fund for Agricultural Development (IFAD) as the Implementing Agency have established good cooperation and collaboration with various agencies and work units of the Regional Government (Environment and Forestry Service of Riau Province, Environment Agency (DLH) of Indragiri Hulu District, Pelalawan District, Indragiri Hilir District, Forest Management Unit-KPH, and other related agencies).

We thank all those who have provided suggestions, feedback and positive contributions during the preparation of this book, either directly or indirectly. This book is still open for suggestions and constructive input for further improvement.

Finally, we hope this book will provide benefits and insight for readers in protecting and managing peat ecosystems. **Caring for Peatland – Growing Hope, Preserving Peat – Safeguarding Civilization**. Jakarta, 2022

Ir. SPM Budisusanti, M.Sc. Directorate of Peatland Degradation Control Project Director SMPEI-GEF 5





EXPLORE THE POTENTIAL OF KELULUT HONEYBEES IN PEATLANDS

Indonesia is blessed with high biodiversity for both sting and stingless honey bees. Honey bees are social insects capable of producing honey as nontimber forest products.

Kelulut honey is a type of honey that is currently popular and become people's favorite in Sumatra and Kalimantan. The name may be not that familiar, but who would have thought that this honey is becoming popular and well-liked.

Kelulut honey is the honey produced by kelulut bees (stingless bees). The name in each region may be different and some sounds uncommon, for example Klenceng (Java), Galo-galo (West Sumatra), and Emuk (South Sulawesi).

Almost everyone knows the benefits of honey for health, for example to help prevent body's immune system, healing wound and tuberculosis, prevent cancer, antivirals, etc.

Initially, people who lived around the forest did not know that kelulut bees they often encountered in the forest had potential benefits. The intervention of the SMPEI program help them aware of this potential.

When compared to ordinary honey bees, kelulut honey has many advantages, not only produce honey, but also produce propolis. It is not surprising that kelulut honey beekeeping become popular.

Honey beekeeping on peatlands is one of the best opportunities for communities living around the forest. Opportunities are not only seen from a business perspective, but also contribute to sustainability and support the improvement of sustainable peatland ecosystem governance.

The innovation of kelulut honey bee farming is one of capacity building efforts to make peat community independent and prosperous economically, socially and environmentally.





GET TO KNOW KELULUT BEES

02





Kelulut bees of Trigona spp. such as Heterotrigona itama, Tetragonula laeviceps, and Tetragonula biroi have been widely found in many tropical peatland ecosystems. The size of the trigona bee is generally smaller than other types of honey bees (about ± 6 mm body length) with black color like a fly, and stingless.

These social insects live in colonies with more than 1,000 worker bees in one colony. In the colony, there are male bees and queen bees which have important task in mating activities and forming new colony eggs which will be cared for by worker bees. Queen bees can be recognized easily by their body size which can reach 3-4 times larger than worker bees.



In natural habitats, trigona bee nests are often found in bamboo trees and in holes or cavities of dead/live logs. Generally, kelulut bees will make nests in places close to water sources. Another interesting aspect of these bees is their skill in making entrances/exits of the colony with funnel shaped hollow.

If kelulut bees are farmed in stup (box-shaped beehive), they are able to produce 100-500 ml of propolis and honey in one harvest/stup. In the market, the price of honey can reach IDR. 250,000.00 / liter, while the price of propolis can reach IDR. 400,000.00/kg.



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Propolis is a kelulut product that has not been widely developed by kelulut beekeepers. When people began to aware that propolis has high economic value, it boosts the popularity of kelulut bees rapidly. Since then, propolis production of kelulut bees is more than the production of honey.



Bee Propolis is made from a mix of bee saliva and highly concentrated plant sap collected by worker kelulut bees. The color of propolis varies from yellow to blackish brown depending on the source of the plant sap. Generally, propolis can be harvested after 2-5 months of maintenance. Propolis has nutritional content such as vitamins (A, B, C, E) and minerals (Ca, Mg, Na, Fe, Mn, Cu, and Zn). Propolis extract has been widely used to treat skin wounds and also for cosmetic ingredients. TK-PPEG group as cultivation administrator in SMPEI program is still developing honey farming and has not been at the propolis harvesting stage.

Even though TK-PPEG group has never been harvesting propolis, the enthusiasm of the Group remains very high to farm kelulut and harvest propolis. Commonly, propolis harvesting must be done with proper procedures for sustainable harvest. A hive full of propolis and honey is usually characterized by more aggressive bees.







COMMUNITY CAPACITY BUILDING

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Beekeeping (apiculture) development activities began with skills training for community groups interested in honey bee farming. The SMPEI program introduced and provided technical skills to the community groups regarding the methods and strategies to farm kelulut or trigona honey bees. Kelulut bee farming do not require special equipment and people can easily practice it. This kind of farming is one of the efforts to support and increase business activities of local community and also serves as protection of peatland ecosystem.

ENVIRONMENTALLY FRIENDLY KELULUT BEEKEEPING



STUP BOX PREPARATION

The selection of locations for kelulut beekeeping is very crucial. The selected location will determine the quality and quantity of the product.

Beekeeping location should at least meet the basic requirements such as being close to water sources and adequate food sources. It has to be far from agricultural areas that use pesticides as they may reduce the quality and efficacy of kelulut products. Kelulut bee farming is found to be easier compared to other honey bees species (such as *apis bees*) because kelulut bees are more resistant to pests and diseases and have higher propolis productivity.





The kelulut beekeeping model in SMPEI program intervention area is generally done with a topping system, by placing stup boxes on top of wooden logs containing bee colonies. The stup developed for beekeeping process is a single stup model. The stup box is made of dry wood planks free of chemicals and odorless. The wood planks are selected based on the level of durability. Board thickness measures \pm 1.5 cm - 2 cm, with the dimensions that can be adjusted as needed.



*stup (box-shaped hive)





KELULUT COLONY PROPAGATION

Kelulut bees (Trigona spp) are wild bees found by searching for them in the wild. The technique of collecting and transferring colonies is done as carefully as possible to prevent them from escaping.

The right time to move kelulut colonies from the forest to beekeeping location is preferably late afternoon or early morning. Late afternoon is when all the worker bees have returned to their hives, or early in the morning before the worker bees come out looking for food. Try not to exceed 2 x 24 hours for the maximum length for bees to be trapped in the closed wooden log.







MAINTENANCE OF BEE COLONY

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Logs that have been successfully transferred from the forest to beekeeping site were then cut using a chainsaw. The wooden logs were cut ± 1 meter on the right and left sides so the colony can still be seen. For propagation purpose, Bee colonies in wooden logs were moved to stup box made of wooden planks and plywood measuring 30 x 40 x 5 cm. At the bottom of the box, beekeeper made a hole with a diameter of ± 2 -3 cm as a connecting door for bees from the wooden log to the topping. Later, these kelulut bees will glued the propolis in the hole and left only a small space for bees' entry and exit.





Before making the topping, the wood log needs to be cut off the top so that the space for honey storage is visible. This aims to shorten the distance between bee colony spaces in wooden logs and the topping. Beekeepers must carefully distinguish the top and bottom of the log to prevent the honey from spilling which could kill the colony inside the log.

After the process of making the toppings, the result can be seen approximately 5 days later by observing directly through the transparent plastic placed on the toppings. If you can see a new hive and a few honey sacks, it means that the process of transferring colonies from wood logs to toppings is successful.

If the bee colony has moved to the topping, colony propagation can be done for other stup. At the time of transfer, the entrance and exit holes must be glued with propolis sap from the old hive to make bees climb up and recognize the new stup above it.



Kelulut maintenance must be carried out to reduce the risk of attack by parasitic pests, predators, and minimize the death of prospective bees. Some parasitic pests that often cause failure in the beekeeping process include ants, fruit flies, spiders, beetles, rats, monkeys, bears and other insects.

To maintain kelulut bee colonies, beekeepers practiced the following: routinely monitor, do the fogging, apply insecticide chalk around the in and out holes, isolate the colony immediately after the attack by parasites, and do not open the stup too often.

Naturally the trigona bee colony will separate and create a new queen, however, it requires a long process and uncertain period, therefore the colony division technique is crucial in large-scale beekeeping activities.

When the colony is in best condition which is indicated by the abundant number of worker bees, eggs, and food reserves, the colony division can then be done.

To split the colony is to divide the colony into two parts, which contain worker bees, eggs and food reserves (honey and pollen). Beekeepers must ensure that they take the queen bee to the new split.





SOURCES OF KELULUT BEE NECTAR



The abundance of food sources will increase the production of kelulut bee honey and propolis. These bees like flowering plants that produce nectar (bee food) and pollen (food source for honey bee larvae and provides protein, vitamins and minerals for bees), and resin (to build and protect hives from disturbances) in a balance quantity.

In kelulut beekeeping activities, it must be ensured that food sources are available within the bee's roaming radius. Ideally as close to the bee farming site as possible. This helps the bee colonies to stay healthy and get enough food so that they can accelerate honey production activities.

The types of flowers that are preferred by kelulut bees are air mata pengantin (*Antigonon leptopus*), tai ayam (*Lantara camara*), pukul delapan (*Turnera ulmifolia*) seduduk (*Melastoma malabathricum*), areca nut flowers (*Areca catechu*), coconut flowers (*Cocos nucifera L*), rambutan flowers (*Nephelium lappaceum*), star fruit flowers (*Averrhoa carambola*), mango flowers (*Mangifera indica*), acacia flowers (*Acacia sp.*) and bunga putri malu (*Mimosa pudica*).

* some flowers' names remained in local names and not translated

The food source will determine the taste of honey produced. The taste of honey produced at each bee farming location in the SMPEI intervention area varies. Although in general the taste of kelulut honey is sour, but according to the TK-PPEG group the level of acidity depends on the food source.

Preferred food sources of Kelulut bees were identified from the TK-PPEG group observations, and also based on the knowledge gained during induction activities. In the morning worker bee colonies will actively seek and collect nectar, then in late afternoon they will return to the hive.

Kelulut bees might fly away from the hive when there is no available food around the bee farming site. The TK-PPEG group made an effort to plant flowers which are the source of bee food (mentioned earlier). One of the flowers that has been successfully planted is air mata pengantin.

HONEY SACK READY TO HARVEST

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Harvesting of kelulut bee (Trigona spp.) honey should prioritize sustainability by minimizing the death of bees, and also ensure the age of honey is suitable for harvesting. Honey pot ready for harvest is characterized by a tight seal and no foam.

Honey harvesting is carried out only when honey reserve is abundant and try not to mix the honey with pollen to avoid accelerating honey fermentation. In ideal conditions with healthy bee colonies, abundant food sources and no disturbance, the harvesting period for kelulut bees can be done every 2-3 months.

To harvest honey, TK-PPEG used suction pump that has been modified. When beekeeping process was underway, TK-PPEG stated that the honey harvest in one suction was around 250 ml – 500 ml.

It is necessary to understand the right time in harvesting honey or propolis. If beekeepers do not know the right time to harvest, they will often find a stup in full condition and the colonies would flee and leave the nest. Knowing environmental conditions is also important, for example bee hive boxes should not be placed in locations exposed to direct sunlight to prevent the colonies from escaping.







VARIOUS STORIES OF KELULUT BEEKEEPING

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The Story of Kelulut Bee Keeping, from wasted item to generating money (Village Head of Rambaian Village, Indragiri Hilir District, Riau Province)

In the past, not many people in Rambaian Village knew kelulut bees as bees that have both economic and environmental benefits. Mr. Hasbi said that initially local people were not aware of kelulut bees.

"Village community has known kelulut bees for years, this information was delivered directly by Mr. Anto Wibowo, Head of TK-PPEG SMPEI Rambaian Village. Many kelulut bees are found in villages and in community forests. The bees live especially in coconut trees, rambutan trees, jengkol (dog fruit or blackbead) trees and other



Pak Hasbi Yardi

forest wood plants. Kelulut bees are not given much attention by the locals and people don't even know that these bees have economic value. The bees were just thrown away when we find them in plantation areas or forests near Rambaian Village. We only use the nest as part of the top game (gasing), a traditional game of Malay people. We put the nest on the top rope to provide a tight grip or as glue for the rope and the top, so that the top can be thrown easily. We did not collect honey from the hives, it was just thrown away but sometimes local people drink as a thirst quencher when they are looking for kelulut honey bee hives in the forest"

Further, Mr. Hasbi said that through training and introduction to the potential of kelulut honey bees given by SMPEI project, the community began to understand the economic benefits of kelulut bees.

"The local people started to know about kelulut bees which so far have been neglected and began to learn the benefits. Apart from the honey which has a high price, another benefit is the bee nest which can be used as raw material for the manufacture of bee pollen and propolis. After knowing the potential benefits and value of kelulut honey, we started farming kelulut honey bees with the help of the SMPEI program, and started with one colony. The hope of Rambaian TKPPEG group is that the development of this program will continue and exploit the potential of kelulut beekeeping to provide an economic value for the people living on peatlands."



The story and hope of Mr. Itam on Kelulut Bees (TK-PPEG of Rambaian Village, Indragiri Hilir District, Riau Province)

Kelulut are environmentally friendly bees that everyone can participate in the farming. Mr. Itam, a member of TK-PPEG Rambaian and head of BUMDes said that "Kelulut bee is indeed unique, it looks like a fly, is small and black, and doesn't sting. Unfortunately, in our village, the economic value of stingless bees is not as good as bees with sting. The nest is also unique, it has an entrance that looks like a small pipe. If we observed further, these bees can be found and live in old, dead and rotten logs. Usually we find them in acacia wood, lidan wood, and meranti (shorea) wood.



"When it comes to bee food, we are close to the areca nut plantations,

and areca flower is one of bee favorite food. In terms of bee food, it should be no problem, it is sufficient. However, seeds remain lacking, and buying seeds is also expensive. It costs hundreds of thousands per log. One day, we had a chance to buy seeds using our own money and we continue taking care of them. Unfortunately, there is no standard benchmark price for seeds. If seeds stock is limited, the price will be more expensive. Mr. Itam added that the price of kelulut bee colonies is also very expensive."

""We received the donation of 2 (two) colonies and we took good care of them. We are very happy and keen to develop this beekeeping, even though the seeds are expensive. If there is more support, we would like to buy more seeds to be multiplied. So far, we have harvested honey from the colony, in the size of 1 small bottle of 330 ml mineral water. When observed further, we found out that the honey sack was separated from the nest for bee larvae. The honey sack is at the top, and the bees are at the bottom. We learned about it during harvest. When we made a hole in one of honey sacks during harvest, the honey has to be collected immediately, otherwise the nesting bees will take the honey straight away and carry it into the lower part of the honey sack. We found bee larvae in this honey sack. Apparently, the honey that we didn't collect earlier was the food brought by bees for their larvae. Furthermore, Mr. Itam said the taste of honey could be different even though they are from the same bee hive.

"there are two colors of bee sack in one hive, light brown and dark brown. It turned out that the honey sack in darker color tasted better, not too sour and had a hint of sweetness. The taste might be different for each bee farming, probably due to different food source. Harvesting was done by firstly piercing the honey sack and then collect the honey one by one." He said further that there will be innovation in procuring seeds.

"Since seeds are expensive, we will try to place some rotten logs close to the colony. Hopefully, the bee will move to the logs as we have not tried to split the colony straight from the hive and move them to another box for fear that the bees will flee."

Pak Rahino's Story About the Strategy to Speed Up the Formation of Kelulut Honey Sack (TK-PPEG Redang Village, Indragiri Hulu District, Riau Province)

According to Mr. Rahino local people in Rendang Village started to pay attention to kelulut beekeeping. The colonies that have been farmed, have produced honey ready to harvest.

"We were very happy when we received donation of kelulut bee seeds for the first time. The selling price of honey here was quite high, and that made us very enthusiastic. Kelulut bees are different from the bees that we often found here, they are more environmentally friendly and that's true. These bees don't have sting so it is relatively safe for children and mothers to help managing bee farming."



Rahino

"We received seed donation in November last year, consisting of 2 colonies from 2 logs. Two months after we received the seeds, we have been able to harvest 1 colony box of approximately 50 ml of honey." Another box will be harvested when a district assistant visits us. We plan to add more seeds, but it is difficult. Our area is in the lowlands and looking for kelulut colonies is not easy. If we want to buy, the price is expensive, around Rp. 800,000.00 – Rp. 1,000,000.00 per log. We hope there will be more donation of kelulut seeds. Further, Mr. Rahino shared a unique strategy in beekeeping.

"We have observed the two bee boxes and we found out that there are differences in behavior and types of bees from the way they go in and out of the box. The bees in one box are more active flying in and out of the hive and have lots of honey sacks. However, another box showed slow production of honey even though the propagation of their colony was fast. Finally, we started to destroy the bee hive little by little to stimulate the less active bee to be active again. In fact, we do not know the bee species farmed in here. I've asked the assistants but they do not seem to know either. As for bee food, we are also still having trouble finding it, such as *air mata pengantin* flower.

"This *air mata pengantin* has many flowers and are bee favorite food. These flowers are difficult to find in this area. We searched for this plant and bought it at our own expense, but were not sufficient. Not many florists here sell air mata pengantin. For maintenance, we put magic chalk in the nest box. Usually we applied 3 times a week, under boxes or other places where ants may come. The profit from the sale of this honey was not much. Some, we consumed ourselves and have not sold it. There are 15 TK-PPEG members, and 2 boxes, were still very inadequate.





DIVERSIFICATION OF KELULUT HONEY

The demand for honey will continue to increase from year to year as people become aware of its various benefits. This promising kelulut honey product become business opportunity and option for additional income. Innovations such as creating packaging labels have been implemented by the TK-PPEG group as a product diversification effort.

Teluk Meranti subdistrict is one example that has started to develop product packaging which indicate a positive achievement in kelulut honey beekeeping. In the future, collaboration with stakeholders needs to be intensified for sustainable development of kelulut honey farming.

KELULUT BEEKEEPING DEVELOPMENT MODEL

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Initially, SMPEI program provided assistance of 2 (two) kelulut bee colonies in selected villages in three districts. The bee-keeping (apiculture) technique practiced by the TK-PPEG group in Indragiri Hulu and Pelalawan districts was topping system, a system introduced during training activities.

Meanwhile in Rambaian Village, Indragiri Hilir District, a new apiculture technique has been developed by using a maintenance box. Kelulut colonies are no longer attached to wooden logs (topping system), but directly transferred from logs to the new stup box.



The bee colonies in this development activity were taken from forest. TK-PPEG group used areca palm trees in the trials of this apiculture technique. Colonies that were already in the box were then tied to the tree.

The colony stup is intentionally tied to a certain height on the areca palm to avoid animal disturbances, and making it easier for bees to collect food. There were 8 colonies that were successfully developed in Rambaian Village, and it continued to show good progress.



SUCCESS STORIES OF KELULUT BEEKEEPERS IN MUARO JAMBI

The kelulut bee farming is carried out by the Jambi Indonesian Beekeeping Association (APIDA JAMBI) which have been successfully developed the *Trigona itama* and *Trigona biroi* species.

According to them, the colony of itama bee species are more commonly found in Jambi forests, while the biroi species can be propagated easily by way of colony division and has high harvest potential. The biroi species are not endemic to Jambi, they are originated from outside Jambi which make the price expensive (around IDR 500,000/colony). This motivates the beekeepers to learn how to do colony division. "We have sufficient amount of bee food, because the bee farming location is close to acacia plantation, no need to plant other flowers for bee food."

"There have been several beekeepers who have succeeded in dividing the colony, but many other are still not familiar with this practice and remain using wooden logs."

"For me it is improper if we farm trigona colonies and keep taking colony logs from the forest. It could damage the forest and loss of tress. We hope to have further training on colony division practice for all beekeepers" (Aaraz Meilin, Member of APIDA Jambi).





LESSON LEARNED KELULUT BEEKEEPING IN MERANTI ISLANDS

Tetrigona apicalis is kelulut bee species developed by beekeepers in Lukun and Tanjung Sari villages, Meranti Islands, Riau. The community believe that this species is more productive than other trigona species. The colonies come from mangrove forest wood logs which are usually cut around 40-100 cm. Sources of food are areca nut, coconut and resin.

Intensification of plantation area is conducted through the cooperation of community partners as an effort to develop beekeeping activities.

Kelulut honey has been marketed by Sari Madu Community Group in bottle of various size, from small 100 ml, to medium 250 ml and larger 500 ml. For now, it was only distributed in local areas such as Selat Panjang, Pekanbaru and Batam. Marketing of kelulut honey become an alternative income for farmers as the selling price of other commodities such as coconut has dropped significantly.

One of challenges faced by beekeeper occurs during rainy season where honey will usually have a high-water content. A technology that can overcome this problem is a dehumidifier which help reduce moisture content.

An important lesson from beekeepers in this area is that if beekeeping is practiced with the "simplicity" principle, it will result in having many less productive bees, shrinking bee hives, and death/escaping bees.

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