KOPERNIK PROJECT REPORT – EXPERIMENTATION PROJECTS

IMPROVING PROCESSING TECHNOLOGIES: FOREST HONEY FILTER PHASE 1

CONTEXT

Forest honey is one of the leading non-timber forest commodities currently prioritized by the Ministry of Forestry in Indonesia.[1] The demand for forest honey in Indonesia is currently at 3,000 - 4,000 tons per year, while the production capacity is only around 1,000-1,500 tons per year.[2] With a total population of 250 million people and the assumption that each person consumes 30 grams[3] of honey per year, Indonesia has the potential to reach a domestic demand of more than 7,500 tons of honey per year.[4]

Although honey production increased by more than 100% from 2014 to 2015 (Figure 5), Indonesia imports honey from other countries to meet the demands of the domestic market. In fact 70 percent of Indonesia's honey supply is imported from other countries.[5] There is therefore a significant market opportunity, particularly when little investment is needed to harvest honey as it largely produced wild in the forest without the cost of constructing or maintaining artificial hives.[6]

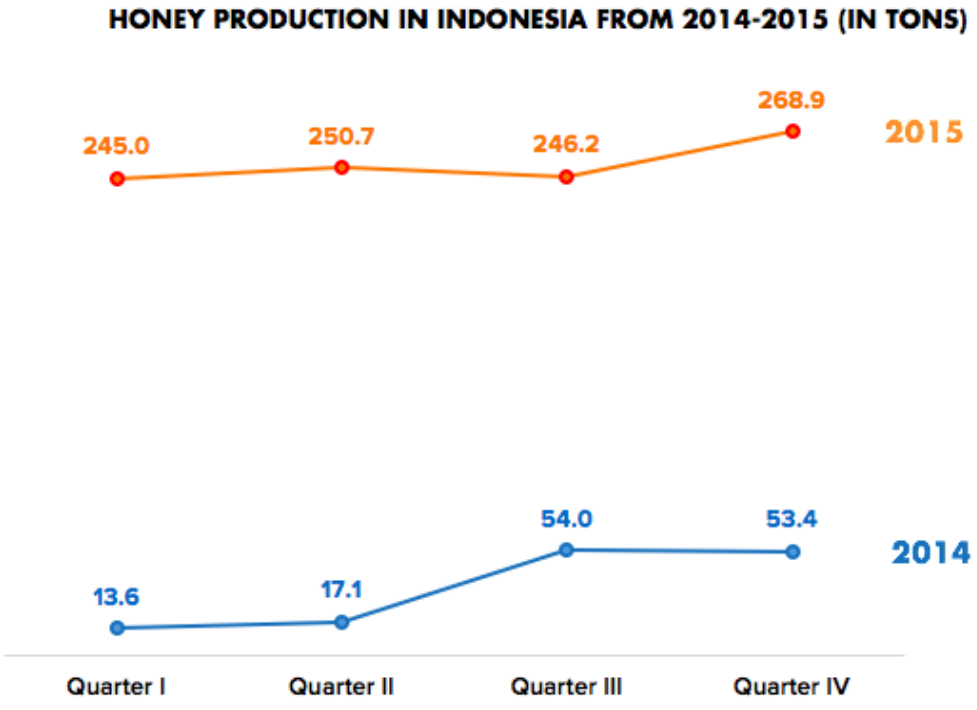

Figure 1. Honey Production in Indonesia from 2014 - 2015[7]

[1] *Novandra, A. & Widnyana, M. (2013). Market opportunities of beekeeping products in Indonesia. Indonesian Center for Non-Wood Forest Product Technology*
[2] *Fatmawati, 2013. Membenahi dan Memoles "Madu Mutis" dengan sistem tiris. Menuju Produk Unggulan Pulau Timor.*
[3] *http://www.forda-mof.org/index.php/download/attach/PELUANG_PASAR_PRODUK_PERLEBAHAN_INDONESIA.pdf/2483*
[4] *Fatmawati, 2013. Membenahi dan Memoles "Madu Mutis" dengan sistem tiris. Menuju Produk Unggulan Pulau Timor.*
[5] *Fatmawati, 2013. Membenahi dan Memoles "Madu Mutis" dengan sistem tiris. Menuju Produk Unggulan Pulau Timor.*
[6] *Kuntadi, 2013. Pengelolaan Lebah Hutan. Pusat Litbang Konservasi dan Rehabilitasi. Bogor.*
[7] *Retrieved from the National Bureau of Statistics (BPS)*

Forest honey collecting practices are often passed down from generation to generation and are heavily influenced by local traditions. Honey harvesting contributes additional income for the collectors, sometimes up to 25% - 50% of their annual income for one household.[8] This income is an important supplement particularly during the off-season for other crop harvests.

Honey production from Flores Island in East Nusa Tenggara province reached 133 tons in 2015.[9] The natural production of forest honey in the district of East Flores alone could potentially reach up to 20,000kg (22 tons) annually but less than 30% of this potential harvest is collected and processed.[10] Kopernik believes this is due to a number of factors, such as a lack of market access, a lack of processing know-how and a lack of product awareness by customers. The natural production of wild honey itself has also been decreasing in this area due to local farmers changing the types of crops they grow and using more chemicals. These new crops are less attractive to the forest bees and has pushed them away to other locations.[11]

A challenge faced by honey collectors is the cumbersome and time-consuming process required to extract the honey from the forest. Traditional practices require a number of tools which are difficult to carry and contribute to loss during the filtration process. Our local partner, the Senoesa Forest Honey Production Cooperative in East Flores district is taking an active role in solving this problem.

Senoesa ensures sustainable harvesting practices and has standardized post-harvest processing to protect and produce high quality forest honey. At present the cooperative works with forest honey collectors from three districts, which include East Flores, Sikka and Alor. Senoesa attracts members by providing information regarding product quality and sustainability to the collectors and, in turn, collectors supply their raw honey to Senoesa. Senoesa processes the honey into a variety of products and distributes under the brand Rumadu, a social enterprise based in Wairterang village.

Kopernik partnered with Senoesa to find what works in order to improve the harvest process. Together we developed the K-Honey Filter prototype (Figure 2), with the understanding that the filter needed to be light and easily folded to transport into the forest.

[8] *(12 December 2017) Retrieved from Rumadu's profile https://www.kuka.co.id/about-rumadu*
[9] *(12 December 2017) Production of Non-Timber Forest Products (HHBK) National in 2015, retrieved from https://data.go.id/dataset/produksi-hasil-hutan-bukan-kayu-hhbk-nasional-tahun-2015.*
[10] *ibid.*
[11] *Retrieved from http://www.floreskita.com/anis-hayong-dan-madu-hutan-flores/*

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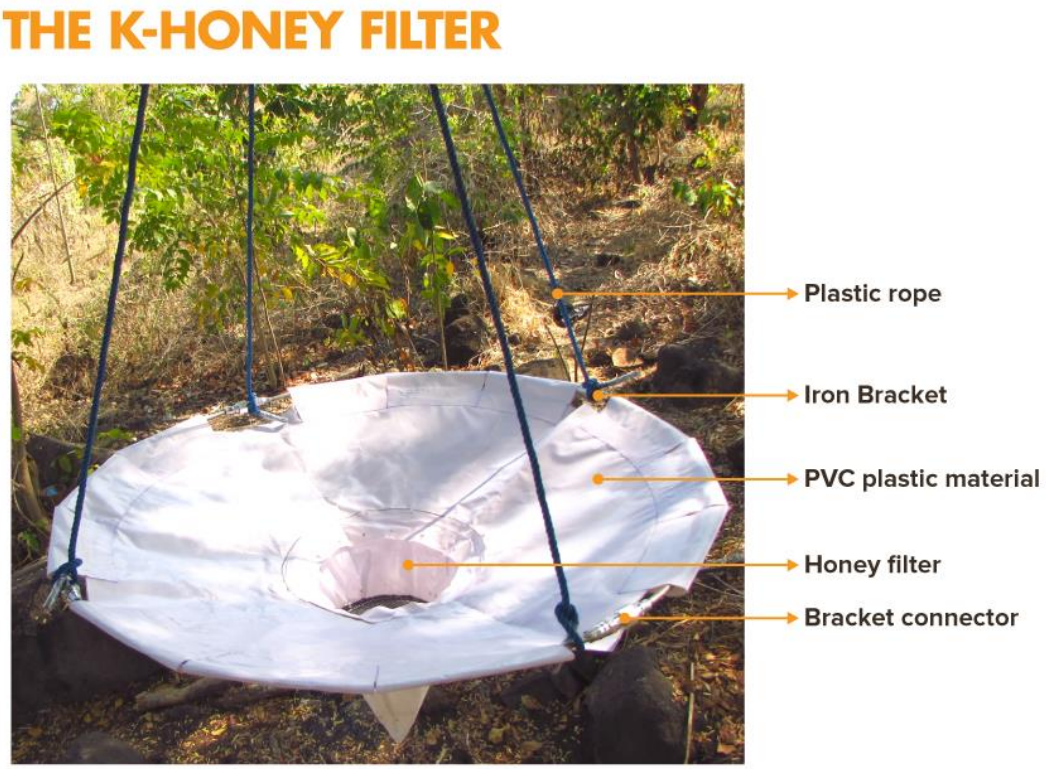

Figure 2. The Kopernik Forest Honey Filter

HYPOTHESIS

We hypothesized that a lightweight, easy-to-carry forest honey filter will increase the productivity of honey collectors, increasing their income.

METHODOLOGY

We worked with local honey collectors who are members of the Senoesa Cooperative to test the K-Honey Filter prototype against the traditional filtration method. (Figure 3):

Figure 3. Comparison of K-Honey filter and traditional honey filtration process

The following table summarizes the experimentation methodology for comparing the honey filtration process (Figure 4):

FILTRATION PROCESS	K-HONEY FILTER	TRADITIONAL FILTRATION METHOD
DURATION	One cycle of filtration (one piece of honeycomb at a time)	One cycle of filtration (one piece of honeycomb at a time)
TOOLS	Stopwatch and scale	
MEASUREMENT	1. Weight of the honeycomb 2. Honey filtration speed 3. Amount of honey produced	

Figure 4. Summary of experiment methodology

Small scale honey collectors commonly use the straining method to process honey. The first step is to cut the honeycomb into smaller pieces and then to lay the pieces on mesh over a bucket. The honeycomb is left to drain the pure honey into a bucket and then smaller bits of wax and other impurities are removed by hand. After that, the honey is poured from the bucket into a jerry can using a dipper and funnel.

With the K-Honey filter, the sliced honeycomb pieces are placed on the edge of the filter and the honey drains directly into a jerry can. The filter placed in the cone of the filter is more fine and removes the wax and impurities directly, and the diameter of the rim is wider allowing for more honeycomb to be drained at a time. The filtering process is more hygienic than the traditional method as the impurities do not need to be removed by hand. The steps for both methods are illustrated below (Figure 5).

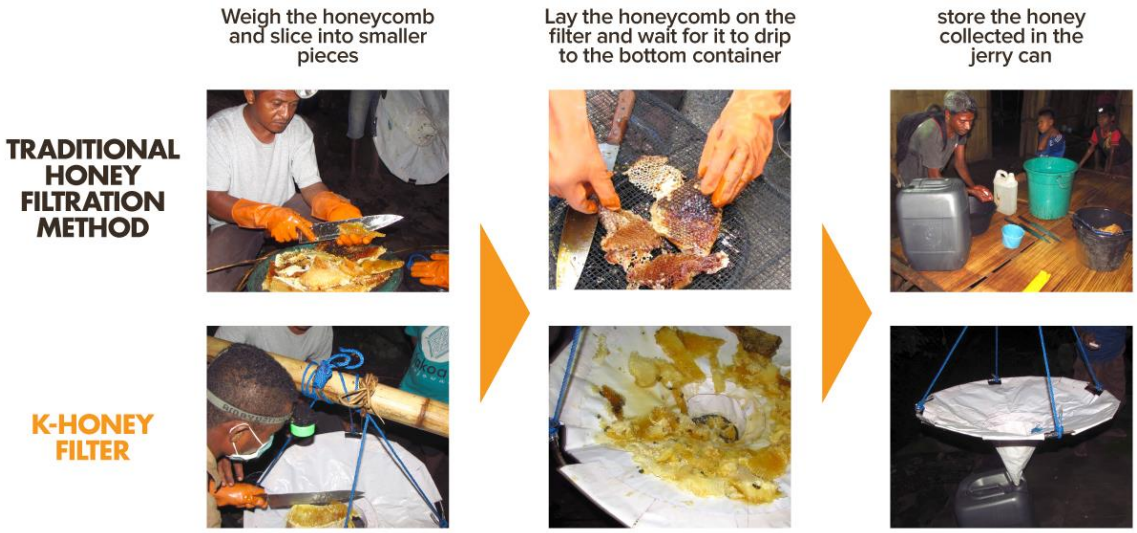

Figure 5.Illustrating the honey filtration process for the two methods

FINDINGS

Efficiency

Our findings are that the K-Honey Filter:

- Filtered honeycomb 37.5% faster than the traditional filtration method;
- Produced **300 grams more honey** when compared to the traditional filtration method; and
- **Shortened the process** to extract honey by reducing several steps, such as collecting pure honey to the bucket and pouring pure honey by using the funnel and dipper to the jerry can.

During the experiment, Kopernik compared the speed of filtration between the K-Honey Filter and the traditional filtration method. We demonstrated that the K-Honey Filter was 37.5% faster than the traditional filtration method, with the K-Honey Filter taking 12.5 minutes to filter 6.4kg of honey and the traditional filtration process, 20 minutes (Figure 6). For local honey collectors, the speed of filtration directly relates to the amount of honey collected on each trip: the faster the filtration, the higher their productivity, the greater their income. The more honey they can collect in one cycle of filtration also minimises the risk of the honeycomb being affected by unfavourable weather conditions.

Figure 6. Time comparison between K-honey filter and traditional filter

Kopernik used 6.4kg of honeycomb for both filtration methods and compared the end results to check the percentage of loss. At the end of the filtration process, the K-Honey Filter had produced 4.8kg of honey while the traditional method had produced 4.5kg, 300 grams less (Figure 7). Both methods produced 1.5kg of beeswax. The K-Honey Filter therefore had a loss of 2.1% (100 grams) while the traditional method recorded 8.9% loss (400 grams).

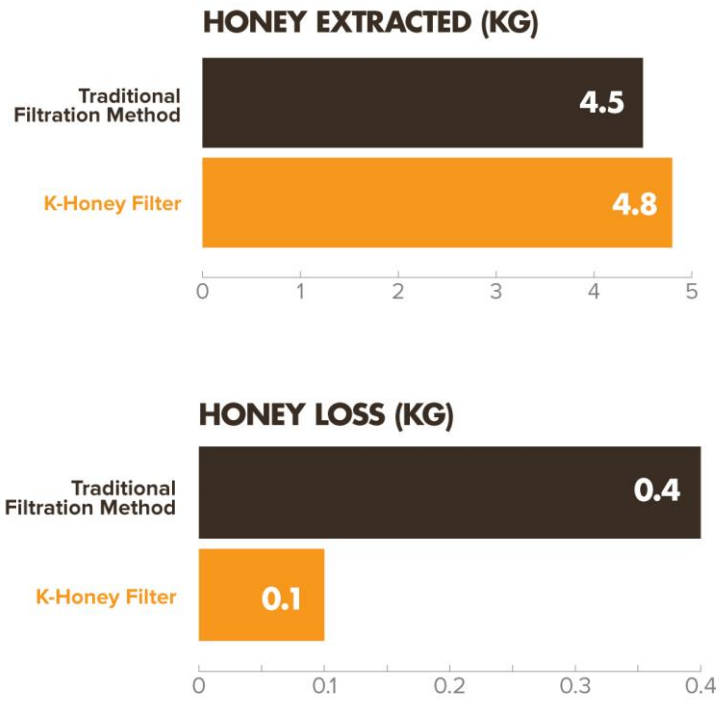

Figure 7. Comparison of honey extraction results between K-Honey Filter and traditional filtration method

Kopernik found that the K-Honey Filter eliminated several manual steps in the process which reduced loss and accelerated the filtration process. With the K-Honey Filter, the honey collector doesn't need to sieve and pour the honey manually from the collection bucket into a jerry can using a dipper and funnel (Figure 8). The K-Honey Filter reduced the honey loss during the extraction process by 75%.

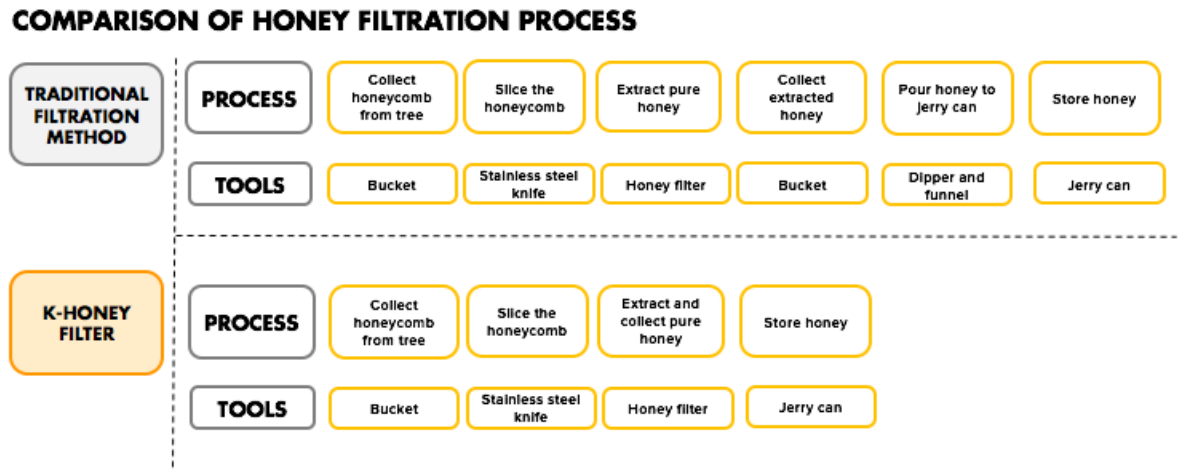

Figure 7. Comparison of honey extraction process between two methods

Economic Impact

When compared to the traditional filtration method, Kopernik calculated that the K-Honey Filter can provide IDR 61,200 (~US$4.52) additional income for the honey collectors per trip (in this case for 6.4kg of honeycomb filtered).

FILTRATION METHOD	HONEY EXTRACTED	PRICE	ADDITIONAL INCOME
K-HONEY FILTER	4.8 kg	IDR 979,200 (US$ 72.26)	IDR 61,200 (US$ 4.52)
TRADITIONAL FILTRATION METHOD	4.5 kg	IDR 918,000 (US$ 67.75)	
*1 kg of pure honey = IDR 204,000 (US$ 14.28)			

Figure 11. Final price comparison of the two filtration methods

With this calculation, Kopernik estimated that each Senoesa honey collector could earn additional income of US$36.78 over one year. This is based on Senoesa's data that on average 64 honey collectors can collect up to 2,500kg of honey in one year, 39.06kg per collector. With 4.8 kilograms of honey earning US$4.52 of additional income when processed using the K-Honey Filter, these collectors can therefore earn **US$36.78** in additional income per-honey collector in one year (39.06/4.8)xUS$4.52.

Design

Kopernik sought feedback from the honey collectors on the design of the prototype in order to perfect its functionality. The feedback given is illustrated in Figure 10:

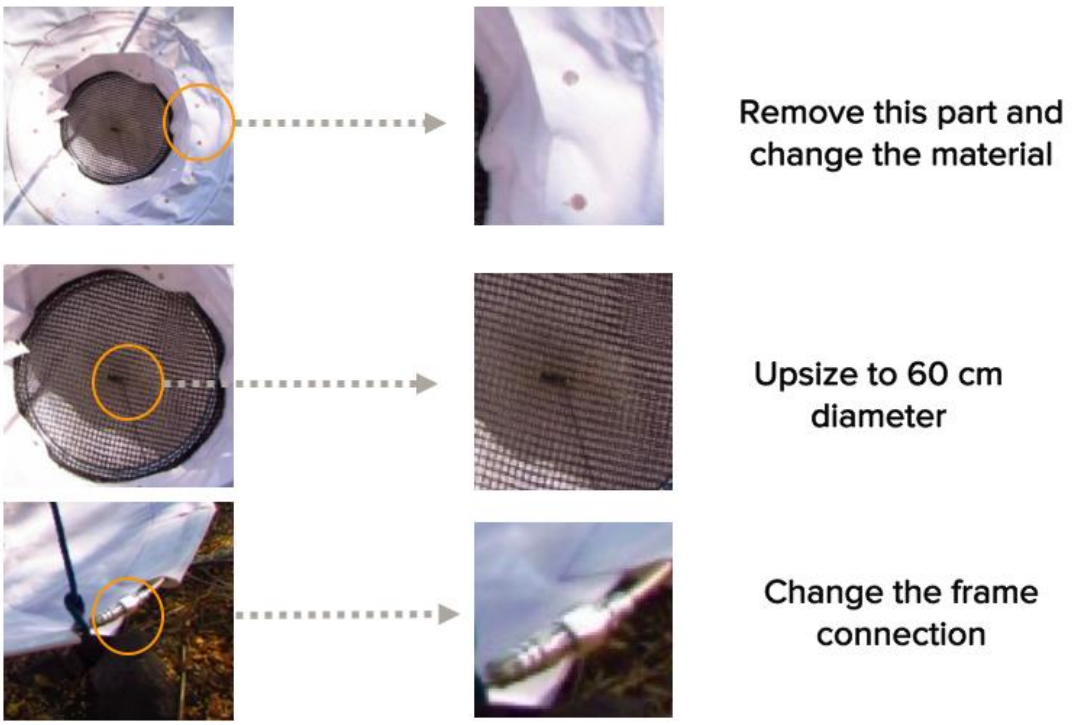

Figure 10. Feedback from the local forest honey gatherers on the prototype of the K-Honey Filter

The honey collectors felt that the fabric used could be improved by changing the white colour of the fabric to a transparent colour so they could better see the honey being filtered to the bottom receptacle. An increase in the size of the filter mesh would also allow more honeycomb to be filtered at one time. The honey collectors and Kopernik learned that disconnecting the frame was difficult when they had honey on their hands after the extraction process and felt a different mechanism would be easier to use. To address hygiene issues, adding a cover on top of the K-Honey Filter could help to protect the sliced honeycomb from contamination during the extraction process.

CONCLUSION

Kopernik demonstrated that the K-Honey Filter achieved accelerated honey extraction results and produced more honey when compared to the traditional method. During Kopernik's data collection trip, honey collectors processed 300 grams more honey resulting in an increase in income of Rp. 61,200 (US$ 4.52). With some small changes to the prototype, the honey collectors felt that the product design would meet their needs and increase their productivity.

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TESTIMONIAL :

The Honey Filter from Kopernik is lightweight and compact. It is portable, easy to carry around, and very useful for the honey collectors. This is the very first time that we used this simple filter, and it's proven to be effective. We are happy to help Kopernik develop a better prototype and are looking forward to introducing this filter. - Yohanes Lewonamang Hayong (Anis), Head of Senoesa Forest Honey Production Cooperative and RUMADU.

RECOMMENDATIONS

Based on the data collected, Kopernik's recommends that:

1. A new version of the prototype be developed based on the feedback provided by the honey collectors. The revised prototype will be tested again to determine whether the design changes have any effect on further increasing productivity.
2. Kopernik investigates the economic viability of a local partner manufacturing the K-Honey Filter design and expanding the products reach locally and eventually nationally.