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Social Innovation for Community Building through Technology Simplification

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Abstract
Social Innovation is a concept of promoting social development of a community through the introduction of innovation to promote the community to change for the better. The innovation here can be technological, economic, social or combinations of these that aims to improve the community standard of living. One way to start a social innovation is by understanding the problems of the community through experiential learning. A Social Innovation through Team Entrepreneurial Learning (SITEL) workshop was held in Kota Kinabalu, Sabah in June 2018 where one project focuses on stingless bee community in Kg. Mitabang, Kiulu. Through experiential learning of living, discussing and befriending the community, a project was born to help the community to improve their stingless bee honey production by the introduction of homemade stingless bee honey pump. The technology simplification uses items obtainable from local hardware store and aquarium shop to build the pump that could be self-made and self-maintained by the community through a training video. The feedback from the community was positive after the initial introduction of the pump where they are reporting honey production every two weeks compared to months prior to using the pumps.

Keywords: Social Innovation, Stingless Bee, Kelulut, Honey Pump, Rural Community

Introduction

Social Innovation is a concept of promoting social development of a community through the introduction of innovation to promote the community to change for the better. The innovation here can be technological, economic, social or combinations of these that aims to improve the community standard of living. One way to start a social innovation is by understanding the problems of the community through experiential learning. The White House, under Barack Obama administration had setup an Office of Social Innovation and Civic Participation to increase focus on social innovation in the United States (Christensen, Kirsch, & Syman, 2009).

In Europe, Social Innovation will gain more importance in the context of Europe2020 strategy as new innovation paradigm is established (Howaldt & Schwarz, 2010).

A Social Innovation through Team Entrepreneurial Learning (SITEL) workshop was held in Kota Kinabalu, Sabah in June 2018 where one project focuses on stingless bee community in Kg. Mitabang, Kiulu. Through experiential learning of living, discussing and befriending the community, a project was born to help the community to improve their stingless bee honey production by the introduction of homemade stingless bee honey pump.

In Malaysia, stingless bees (kelulut) farming are being developed locally for their commercial, environmental, educational and eco-tourism values. This make stingless bee farming as a new and potential booming agro-industry in Malaysia. Nowadays, many agrotourism has stingless beehive to attract tourist offering agro experience due to the harmless nature of the stingless bee. According to Malaysian Agricultural Research and Development Institute (MARDI), there was a huge export market for the honey and it has been labeled as a *superfood* (Abdul Rashid, 2016).

Jabatan Pertanian Sabah is actively promoting stingless to farmers in Sabah (Razan, 2017). During the Social Innovation through Entrepreneurial Learning (SITEL) workshop held in Kota Kinabalu in 2018, the author visited Kg Mitabang in Kiulu, Sabah. The farmers were mostly farming for self-sustenance with the major source of income coming from rubber. During the decline in rubber prices, life was not so good. However, they also had been introduced to the stingless bee farming which could help them to generate additional income.

However, their honey production was not much due to their harvesting method which still requires them to break apart the hive and pour the honey into a bucket. This is not the best practice for harvesting the honey since the practices retards the production and it delays the next harvesting to more than a month.

The current best practice is by using a honey pump. By using pumps, only a small cut is made to each honey pods to put in the suction pipe for harvesting the honey. Two sample pumps were provided to the community after the SITEL workshop. With the introduction of honey pump, the farmers could expect a harvesting cycle every 2 weeks. This had increased their productivity more than consumption and the stingless bee farming could be their new source of income.

The pumps that were provided to the farmers were homemade with materials obtainable from local hardware and aquarium shops. This technology simplification was done to allow these farmers to do the maintenance themselves in case of breakdown.

By using locally source materials self-maintenance is possible and hopefully it would also allow them to build their own pumps in the future to create a sustainable economic ecosystem in Sabah stingless bee farming.

Materials and methods

Pump design

The pump was designed following the basic concept of suction pumps similar to a milking machine. It is a straightforward operation pump and the parts to build the pump can be obtained from the local hardware store and aquarium shops.

The pump is mainly divided to two sections which is the power section and suction section. In the power section, a battery powers two pumps to generate suction. This creates a vacuum which allows the suction section to draw the honey from the honey pods.

The pump was designed to be kept in a waist pouch to allow a single hand operation for the pump. The pump box and the battery were placed inside the waist pouch. The container to collect the honey was set to hang on the waist pouch strap. With this arrangement, the user will only need to hold one suction nozzle to operate the pump. However, this proposed arrangement is a suggestion and is optional and may vary according to user preferences.

Parts

The pumps parts are listed as below:

1. 5V motor (2 units)
2. 4mm inner diameter silicone tube
3. 1L bottle (preferred size)
4. 4mm tee tube fitting
5. 4mm straight tube fitting (2 units)
6. Micro-USB charger cable
7. 3” switch box
8. 3” 1 gang 1 connector switch
9. 10000mAh powerbank

The pump was designed to run on powerbank supplying 5V to power the motors. The design choice here considers that other rechargeable battery types may require a specific charger cable which can be a challenge to find in case of fault. A powerbank utilizes a standard micro-usb cable that is used by an android phone. Hence, this makes it easier to obtain and may even be available in most household.

The two 5V motors used here had the outlet size of 4mm which leads to the choice of 4mm inner diameter tubing for the pump. Silicone or PVC tubing can be used for the pump. The pump had been built with both types of tubing and the difference is only on flexibility of the tubes. This choice will be left to user preference and ease of finding a suitable tube.

A 1-liter bottle was the preferred size based on feedback from user. A smaller bottle requires emptying more often and a bigger bottle is too heavy and is not recommended. The bottle must be hard walled and airtight to obtain the vacuum necessary for pump operations.

In the initial design phase, the pump casing was designed, and 3D printed. However, to suit the aim towards sustainability, a simpler casing was chosen. The 3” switch box and 3” switch was made to be the pump casing. They were sufficient in size to fit the two 5V pumps and the switch also act as the on/off button for the pump. They are easily obtainable, and the assembly is very simple.

Equipment and assembly

A list of major equipment required is as below:

1. Silicone glue
2. Soldering iron
3. Mini drill

The listed equipment above are essential but can be replaced with other suitable materials.

The silicone glue was used to seal the bottle-tube connection to have an airtight connection. The bottle-tube connection can be made by simply drilling a hole on the bottle and sticking the tube to the bottle using silicone glue. Another option is by using a straight connector which will allow tube change whenever necessary without compromising the vacuum of the bottle during operations. However, this is optional based on available materials that can be obtained by the local farmers. The completed pump is shown in Figure I.

Figure I. The completed homemade stingless bee pumps showing six pump boxes and three storage bottles.

Results and discussion

The Pump

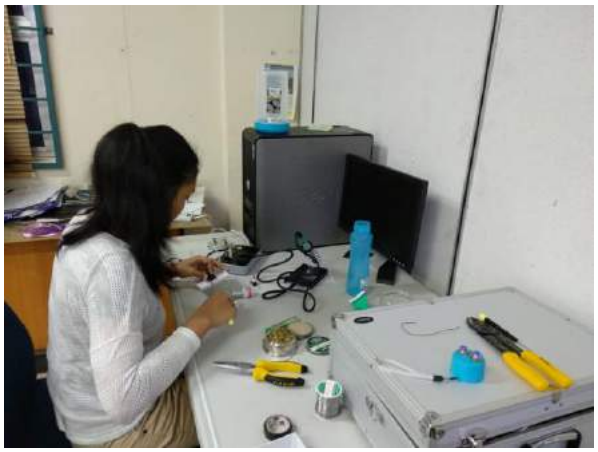
The pump was initially designed to be fitted into a waist pouch bag to allow single hand operations.

This arrangement had positive feedback from farmers in Kg Mitabang. However, a further test and feedback from a farmer in Lenggeng, Negeri Sembilan suggested that the pump be stored in a small bucket instead. The bucket is then to be hang near the stingless bee hive via a nail or screw. This will still allow single hand operations during harvesting but does not restrict movement due to waist pouch. This suggestion in changes in the final arrangements is welcome as it should be decided based on comfort and preference of the users themselves. Another suggested option was using backpack. With backpack, an additional modification to the pump to allow capacity monitoring is required as the storage bottles are situated at the back. A simple level tube installed at maximum capacity of the storage bottle is proposed. Two pumps had been mailed to the Kg Mitabang farmers for testing. The pumps had good feedback and more pumps are requested by the farmers from Kg Mitabang and the neighboring village. Figure II shows a farmer in Kg Mitabang harvesting the stingless bee honey by using the pump. Additional feedback from the farmer confirms the benefit of using pumps which increases his honey production. Currently the farmer can harvest every two weeks compared to more than a month between harvest previously.

Figure II. A farmer in Kg Mitabang using the homemade pump to harvest the stingless bee honey

The simplicity of building the pump was shown during an event, Global I-lead Stem Camp (GISC) and International STEM Olympiad (Istemo) 2018 held in December 2018. During the event, a 16 years old student took up the project of building additional pumps to be delivered to the Kg Mitabang community. During the event, she managed to complete six pumps within a day with additional day of setting up the storage bottles. Figure III shows the pump being built during GISC and Istemo 2018. This shows that the pump design was simple enough to be built by a student and could later be taught to the youth in the Kg Mitabang community moving forward in the project.

Figure III. A student building the pumps during GISC and Istemo 2018 event for Kg Mitabang community



Discussion

The main idea of the pump discussed here in this paper is its simplicity. This simplicity in the pump build is required to allow self-maintenance and is a step towards self-built pump for the rural farmers. In meeting this objective, the pump was built using materials sourced from local hardware and aquarium store. Thus, the basic building material as listed above is suggested based on available material locally in Serdang, Selangor. This will change based on location, but it is not expected to diverse too much.

A step-by-step video for building the pumps is also being planned to guide the farmers in the maintenance and building their own pump in the future. Currently video during the GISC and Istemo 2018 had been recorded. Another video is being planned with undergraduate student of the Department of Biological and Agricultural Engineering, UPM after which the final editing will be done. The video is planned to be provided after the farmers are familiar with the use of the pump in regular harvesting of the stingless bee honey. It is expected that the farmers will get to familiarize themselves with the pump and its parts during usage which will assist them to understand the guided video easier.

The use of the video will reduce the travelling cost compared to teaching the farmers face to face due to monetary limitation of the current project.

Around 20 more pumps will be provided to the Kg. Mitabang community as part of this project. It is hope that the Kg. Mitabang community will in the future be self-sufficient in maintenance and building their own pumps for stingless bee honey farming.

Furthermore, this technology simplification project is hopefully able to be extended to other communities and other crops to improve rural agricultural production. It is also hoped that this project will generate interest in the rural community youth in learning new technology and innovate and renew their interest to stay and contribute to their own community rather than migrate to the city.

Conclusions

A technological simplication for the design of stingless honey bee pump was done. The design had been tested for use by farmers in Kg. Mitabang with positive feedback both on suction capability and waist pouch design to allow single handed operation. Further work on the technological simplification project on the stingless bee honey pump is to provide sustainability by providing more pumps to the community as end user and development of training video for self-maintenance and towards self-building of the pump by the rural community.

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