

Building the Bees: An Exploration of Apiculture Industry in Lipa City, Philippines

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ABSTRACT

The Bureau of Agricultural Research of Lipa City increasingly recognized the beekeeping industry as one of the most profitable agribusiness in Lipa City. Strategic Framework for Beekeeping Development in the Philippines by Baconawa (2007) justified the significance of the beekeeping industry in the Philippines outlining the situational conditions, initiatives, and implementation. This study determined the viability of apiculture or beekeeping industry in Lipa City. Hence, the researchers identified the agencies that support the beekeeping industry in Lipa City; uncovered the programs designed by the government agencies to support the sustainability of the agriculture; assessed the farming procedures done by the beekeepers; identified the problems encountered in the beekeeping; estimated costs involved in starting a beekeeping business; and proposed sustainability programs for beekeeping. The study used a descriptive method by using an interview and observation in data gathering. The key informants of the study were the representatives from Department of Agriculture – Bureau of Agricultural Research (DA-BAR), DA Region IV-Southern Tagalog Integrated Agricultural Research Center (STIARC), City Agriculture Office, Lipa Beekeepers Marketing Cooperative (LBMC), and a bee farmer/member of LBMC. Findings showed that *Apis mellifera* is the most commonly used bees for honey production. Training and research are provided by the government agencies making beekeeping as one way to alleviate poverty. Moreover, people are engaged in beekeeping primarily for honey production. The research discussed different requirements in establishing a beekeeping business. It also found that varroa mites are the pest that kills the colony, and the beekeepers are finding ways to stop the pest infestation. Meanwhile, the study also measured the viability of the business through the presentation of the costs associated with opening the agribusiness. Finally, the researchers proposed sustainability programs to make the beekeeping the number one agricultural activity in Lipa City.

Keywords – Agriculture, Agribusiness, Apiculture, Beekeeping, Bees, Honeybees, Apitourism

Introduction

Apiculture or commonly called as beekeeping is the practice of culturing species of bees in commonly man-made hives. The beekeeper takes care of the bees to collect their honey and other products that hives produce such as beeswax, propolis, flower pollen, bee pollen and royal jelly (Sayre, 2015). Expansion of the beekeeping industry worldwide opens an opportunity for the world to produce the healthiest sweeteners in the world and bringing new pollinators in the ecosystem. With the decline of bees in the world, the beekeeping industry can alleviate this challenge. The Strategic Framework for Beekeeping Development in the Philippines by Baconawa (2007) outlines the assessment of the beekeeping situation considering the natural resources and any other present factors. This framework further outlined the strategic initiatives and implementation, which are important in the beekeeping industry in the Philippines.

Beekeeping is a branch of agriculture widely practiced across the world. Originally, honeybee belongs to Old World-Europe. Beekeeping spread in the new world after 1638 in America, in Australia in 1882 to New Zealand in 1842. In 1851, Langstroth discovered moveable frame hive which boosts scientific beekeeping. After which series of events took place including studying the biology of honeybees, the development of different beekeeping methods, identifying different castes, queen mating and the role of the bees in pollination (Niir Project Consultancy Services, n.d.). Over the years, the beekeeping industry has undergone an extensive change in both equipment and management; however, the basic principles remained. Between the years 1850 to 1900, beekeeping exploded in the new world.

"As beekeepers, we are well aware of the importance of managed honey bees to our food source. Honey bees pollinate nearly one-third of the food we eat. Due to the increased demand for honey bee pollination, livestock haulers are transporting bees all across the country. Extending the house of service for livestock haulers gives bee haulers the added time needed to coordinate with the required daylight driving schedule. We at American Beekeeping Federation understand that safety is always the number one priority and we commend the new safety requirements suggested for livestock haulers" said Tim May, the President of American Beekeeping Federation (2018). To protect the pollinators, California agricultural commissioner regulates the bee registration each year. "Bee Where" program gives agricultural commissioners to check the compliance of bee farmers and impose civil penalties for violators. According to the Bees for Development (2019), people who engage with agribusiness consider beekeeping as a remunerative activity. This business generates income from \$200-\$1000, given that the owner follows the requirements in managing a bee farm.

Beekeeping is vital to the lives of Asians, economically and spiritually. Products include not only food and food supplements but also medicines aiming the promotion of good health. Honeybees play a major role in pollination as well; it can pollinate a large variety of crops as well as wild plants. Beekeeping is also dominant in India but mainly forest-based. The raw materials they are using are mostly free from nature. Most of the beekeepers do this as part-time occupation as they only need to spare a few hours in a week to look after their bee colonies. Beekeeping

provides several benefits: this gives them additional income for rural and tribal farmers, and valuable nutrition in the form of honey (Agrawal, 2018). According to Chuttong, Chanbang, and Burgett (2018), in Thailand, there is a proliferation of a new kind of beekeeping industry. The bees they are culturing are stingless bees, also known as “channarong” There are more than five hundred species of stingless bees around the tropics. It comes from the factory that produces “cerumen”. This new industry is from the products of these stingless bees.

From thousands of years ago, beekeeping has been China’s traditional occupation. In 1987, they were able to produce 214,000 tons of honey; 166,000 of which represent those produced commercially. However, production becomes fewer in 1988 due to dry spring weather in the country. Currently, it is estimated to produce 23kg honey per colony (Feng 2015). However, there is a ban against China in exporting honey to the USA and other European Countries due to contamination of banned antibiotics. Nevertheless, it is an opportunity for the Philippines to penetrate the world market (Department of Trade and Industry, 2011).

The Philippines is a great exporter of honey bee products in the world. According to the Department of Trade and Industry (2011), an average of 200 tons of honey is imported every year, excluding other hive products. It is due to the presence of all species of bees in the country. In Cagayan Valley or Region 2, the volume of honey production in 2011 has reached a total of 1, 101 liters with equivalent sales of P715,650. On the other hand, Guimaras Island in Western Visayas takes advantage of beekeeping in boosting the Mango industry of the province. The advocacy in increasing the bee pollinators will also excite the production of organic mangoes (Lena, 2018). The chairperson of Provincial Agricultural and Fishery Council (PAFC) of Guimaras instigates the mango farmers to also venture in the beekeeping industry to increase the pollinators and avoid using pesticides. This industry is not only beneficial to the agriculture of mangoes but also the environment — for instance, the need for mangroves for pollinators during the flowering stage in producing seeds.

Moreover, in Sorsogon, beekeeping helps in pollinating coconut. Hence, it contributes to higher production of coconuts providing more livelihoods to the locals (Conde, 2018). Due to the small size of the bees, they can penetrate on the flowers of coconut. The farmers saw a higher yield in coconut after six months of using kiwot bees for pollination. As a result, the harvests of coconut have been good even after a typhoon.

Meanwhile, in Bulusan, the Agriculture Training Institute (ATI) adopted a beekeeping project as its flagship agriculture program for 2017. This advocacy helps in increasing the productivity of the farmers. Urbanization has reached Lipa City, Batangas. Commercial establishments, real estate business and industrial parks are mushrooming in the same. However, some residents still chose to stick to its agricultural sector. According to the Department of Agriculture (2017), farming remains the primary source of livelihood in Lipa City. Local farmers cultivate corn, fruits, coffee and other vegetables.

Moreover, some are practicing pig husbandry, poultry, ranches, and beekeeping. According to Luistro (2017) of Bureau of Agricultural Research of Lipa City, beekeeping industry is one of the most profitable and sustained agribusiness in the city putting Lipa in a strategic location for

trade and commerce. Mr Porferio Olan, the driver of Father Lipat, who brought the European bee colonies in the seminary, started farming bees in the 1960s due to the influence of the priest. At the age of 85, Porferio or Ka Periong as fondly called by his friends in the same agribusiness is still active in the beekeeping industry.

On the other hand, native bee or “laywan” is the breed that Brgy. Bulacnin, Lipa City introduced. Laywan is a smaller breed compared to the European bees bred by Ka Periong. At first, Ka Edgar tried to contain the native bees in a box, and he studied how to make them produce more honey. He keeps his bee colonies at his backyard and also sells the hive products at the store he opened in front of his house. To facilitate this agribusiness, Technology Commercialization Project, financed by Department of Agriculture – Bureau of Agricultural Research (DA-BAR) organized Lipa Beekeepers Marketing Cooperative (LBMC). The implementation of this project was successful through the partnership with DA Region IV – Southern Tagalog Integrated Agricultural Research Center (STIARC) and the City Agriculturist Office of Lipa with the help of University of the Philippines Los Baños (UPLB) – Bee Program. Last June 2015, LBMC was officially registered to the Cooperative Development Authority with 25 members as startup and with 40 members dated 2017. Mr Jose Vicente Tarnate is the chairman of the cooperative. The members are composed of bee farmers who culture European bee (*Apis mellifera*) while others farm native honeybee (*Apis cerana*) and the stingless bee (*Tetragonula* spp). The government agencies consistently organize training activities to ensure the sustainability of the beekeeping industry (Luistro, 2017). They also opened an apiary-restaurant as part of the advocacies in promoting beekeeping.

As educators in the field of business and tourism, the researchers conduct this study to determine the viability of the beekeeping industry in Lipa City. Amidst urbanization, it is essential to underlie the factors which make this industry sustainable. Hence, the researchers would like to identify the agencies that support the beekeeping industry in Lipa City; to uncover the programs designed by the government agencies to support the sustainability of the sector; to assess the farming procedures done by the beekeepers; to identify the problems encountered in the beekeeping industry; to estimate costs involved in starting a beekeeping business, and to propose sustainability programs for beekeeping industry.

Methodology

In gathering the data, the researchers utilized a qualitative method. Through an in-depth interview, the researchers were able to gather valuable, relevant, and accurate data. This purely conversational method gave opportunities to the researchers to get rigorous data. The beekeepers in Lipa City also made validation of the interview guide. Moreover, the researchers used a case study in investigating the existing situation of the beekeeping industry in Lipa City. In doing observation in the bee farms, the researchers immersed themselves in the culture and practices through ethnographic research. Meanwhile, in getting the key informants experiences and interpretations of the beekeeping industry, ethnographic research was integrated.

The key informants of this study were the agencies involved in sustaining the beekeeping industry. These included the Department of Agriculture – Bureau of Agricultural Research (DA-

BAR), DA Region IV-Southern Tagalog Integrated Agricultural Research Center (STIARC), City Agriculture Office, Lipa Beekeepers Marketing Cooperative (LBMC), and a representative bee farm who is a member of LBMC. According to LBMC, there are 40 members based on 2017 data. However, these members are breeding different breeds ranging from *Apis dorsata* (pukyutan), *Apis cerana* (laywan/asian honeybee), *Tetragonula* (stingless bee), and *Apis Mellifera* (European bee). Moreover, LBMC manager mentioned that there are ten farm-producers of pure honey in Lipa City. Particularly, they use bees that originated from Europe; the *Apis Mellifera*. Only one farm was visited by the researchers as advised by LBMC. It revealed that these farms had streamlined the process of handling the bees, and they follow the same standard operating procedures in handling the bee colonies. Lastly, to verify the results of the study, a Focus Group Discussion (FGD) was done with the beekeepers in Lipa City, particularly the board members of LBMC. The FGD consisted of six (6) members from the organization was done during the board meeting of LBMC officials. The researchers used the suggestions in enhancing the results and discussions in this study.

The researchers proposed the study to the research ethics board through the Office of Publications, Research, Linkages and Liaison. After careful consideration of the research parameters, the researchers conducted the study to the beekeepers in Lipa City. Informed consent was given to all the key informants to ensure that they fully agree with the conditions and content of the research. However, LBMC Manager and the owner of the farm requested not to include their names in the study. To ensure confidentiality and to safeguard the information of key informants, the interview transcript only showed the position of the interviewees. The researchers analyzed the gathered data through interview and observation by transcribing the interview recordings, documentation analysis, and thematic analysis. The data collected shall be used for academic purposes only. The researchers used the results in proposing sustainability programs for bee farmers.

Results and Discussions

Branding the Bees: Apiculture Ecosystem

Beekeeping is no easy hobby and business. It is about a year-round bonding with the bees, its hive and with nature. Also, this could be a source of income while producing some fresh honey for personal use or business. According to Whittemore (2017), beekeeping is relatively easy to do if you are knowledgeable and hardworking. Moreover, there are needed equipment and land with organic vegetation and trees for the full operation of the business. As a starter, LBMC proposed that a beekeeper may have two colonies for the first time. It will be a trial and error and a source of experience for the hobbyist or a startup entrepreneur. Costs in starting the beekeeping business are not high. There are also quite of few ways for a beekeeper to make the costs lower and find alternatives and help from the experts. Relatively, the cost of training are now accessible because of the help that they are getting from government agencies such as STIARC, DA, City Agriculture Office, and UPLB.

Anna (2018) tackled the best time to start beekeeping. According to her, we can begin beekeeping anytime. Bees are excellent workers for their respective hives help to maintain the environment through pollination and eventually to produce honey, and they are inherently

important to the ecosystem. Moreover, it is indeed vital that the beekeeper checks the environment where he/she would establish the beekeeping business. If he/she has a farm lot with lots of plants, flowers, and vegetation, the aspiring beekeeper is good to go.

Reasons people are engaged in beekeeping

Honey production
Pollination/Increase yield of farms
Apitourism
Opportunity abroad

“Gusto nilang magkameron ng sariling bee colony para hindi na sila bibili ng honey sa iba” (Bee Merry, personal communication, June 10, 2019). (Some would like to have their honey produce that’s why they have their own bee colony.)

Bees are great pollinators. They are excellent pollinators because they need to collect pollen as food for their developing offspring (Department of Entomology, Michigan University). However, modern agriculture has to be strategic in planting crops to avoid nutritional deficiencies of bees. They may alternate crops and other plants to keep them active in the pollination process (Master, 2019). One of the members of LBMC who is from San Salvador, Lipa City, has his farm with a restaurant inside. The owner breeds stingless bees intended for pollination among his plants on the farm. He uses his farm to attract more potential customers for his restaurant and at the same time increasing the production of fruit-bearing trees that he can use or sell.

“We would like to introduce Apitourism in Lipa. What we have is Lomi and Kapeng Barako. Now, we would like to introduce Apitourism in Lipa City” (LBMC Manager, personal communication, June 11, 2019).

Another opportunity that beekeepers see is the potential of farm tourism in their bee farm. It would even empower bee farmers to expand and grow its beekeeping business. One of the aims of LBMC is to produce pure and high-quality bee products and make the people aware that Lipa City continuous to sustain apiculture and alleviate poverty in the city. At the same time, Lipa City would like to expand the tourism industry through agriculture. In this way, they can attract more students, entrepreneurs, and tourists to be interested to beekeeping.

Furthermore, it stated that tourism would boost the income of local beekeepers as their products are marketed more effortlessly through the traffic of tourists. Farm visits are encouraged by owners so that they can reach more of their future clients and business partners. According to Korosec (2015), apitourism is a new tourism platform to promote sustainability of the apiculture. It helps in raising awareness about bees, adding knowledge to people about medicinal benefits and let tourists be closer to nature.

“Lahat ng bata naming members, pumunta na sa abroad dahil sa opportunity ng beekeeping.” (LBMC Manager, personal communication, June 11, 2019)

(Our young members are exploring beekeeping opportunities abroad.)

Undeniably, beekeeping is a great deal in many parts of the world. Many countries continue to nurture the bees because it plays a vital role in pollination. According to LBMC, most of their members, particularly the young ones, have already left the country because of different opportunities abroad for beekeepers. Canada, New Zealand, and Australia are just some of the leading countries that propagate bee products.

“Per year, one colony produces 25-30 kilos of honey depending on the condition of the environment” (Bee Merry, personal communication, June 11, 2019).

Productive bee farming shall consider the ecosystem and the conditions of the immediate environment of the bees. For instance, the bees should be exposed to natural flora and fauna and at the same time, not being fed with artificial sugar to produce honey or increase its yield. The beekeepers make sure that they have sufficient resources and enough farmland to sustain the needs of the bees. Without the needed environment requirements, bee farming may not be successful. Moreover, LBMC provided the table that indicates the major pollen and nectar source and their respective flowering season.

Table 1. Major Pollen and Nectar Calendar

Plants/Trees	Pollen	Nectar	Flowering Season
Coconut	√	√	Year-round
Sunflower	√	√	Sept. to May
Chayote	√	√	Year-round
Cashew	√	√	Dec. to Feb.
Mango	√	√	Dec. to Feb./Apr. to May
Avocado	√	√	Jan. to Feb./Apr. to May
Coffee	√	√	Dec. to May
Citrus	√	√	March to May
Bottle Brush	√	√	March to May
Eucalyptus	√	√	April to June
Duhat	√	√	Feb. to March
Camote	√	√	Nov. to April
Tamarind	√	√	May to June
Acacia	√	√	Feb. to April
Dapdap	√	√	Jan. to March
Camachile	√	√	Jan. to March
Aroma	√	√	Sept. to March
Narra	√	√	April to May
Mahogany	√	√	March to April
Yemane	√	√	March to April

Source: Lipa Beekeepers Marketing Cooperative

Most of the backyard farmers of beekeeping do not have enough trees and vegetation. Also, these farmers breed *Apis cerana* or laywan, and they are not capable of producing more honey as

the *Apis mellifera*. Moreover, laywan are very aggressive, prolific swarmers, and abscond easily. They store little surplus honey and have few worker bees (Baconawa, 2003). As a result, some backyard farmers are feeding them sugar so that these bees would not swarm and would produce more honey-like than they usually do. The table presented shows the major pollen and nectar calendar from the trees and vegetation that bees need. In the case of backyard farming not exposed to these factors, the pollen that the bees need will be insufficient. Feeding sugar will produce honey which is not pure with high sucrose level.

On the other hand, LMBC assures that their members in the cooperative observe the presence of the 3km radius requirement of vegetation and a balcony with 30-100 square meter open space. Another requirement in the 4 square meter area per beehive and the entrance of the colony should not face walls, clothesline, sources of light, southwest, northeast, and pedestrian traffic. Ultimately, the hive entrance should face the morning sun

Birth of the Bees: Humble Beginnings

The influence of priests in 1960 made the people inclined with bee farming as they introduced the European bees. On the other hand, other farmers used native “laywan” as a form of backyard farming. These practices of Lipenos lead to the establishment of Lipa Beekeepers Marketing Cooperative last June 30, 2015.

Lipa Beekeepers Marketing Cooperative has 40 members, but they range from owners of different breeds. However, the cooperative refused to give the names and other personal information of the breeders. According to an interview with manager LBMC, there are only 10 of them who breed imported bees from Europe, the *Apis Mellifera*. And it was claimed that this breed is the best one to use for honey production. The native bees may not produce the same yield as the mellifera. One colony of mellifera can produce 25-30 kilos of honey given that the honeybees are exposed to organic forage in its 3-kilometer radius. The environmental condition of the farm determines the yield of honey.

On the other hand, the researchers visited a farm in Balintawak, Lipa City. The tour gave them the hands-on experience of how beekeeping business works. Researchers were given pretest about their knowledge in beekeeping before the owner gave them theoretical discussion about the bees. At present, the farm has 80 colonies of *Apis mellifera*, a three-hectare farm with plantation of different flowers, fruit-bearing trees, creek and a mahogany forest. The environment really suits the condition that the bees need to produce excellent quality of bee products. LBMC has the Cooperative Beekeeper who makes the rounds in each member’s farm to check the status of the hives. He also makes sure that the hives are in good condition and the colony is still intact. Each hive has one queen, and it lays around 2000 eggs a day. These eggs will undergo its life cycle from eggs to larva, then larva to pupa, from pupa to young bees or nurse bees, then to cleaners or janitor bees, cleaners to guard bees, and the last stage is the foragers. Their life cycle from day 1 of laying eggs is 21 days, and the transition from young bees to foragers takes about 40-45 days. (Bee Merry, personal communication, June 11, 2019). According to Hammond and Blankenship (2009), adult workers can live from 2-4 weeks in the summer. During this season, bees are too busy from

foraging, which makes their life cycle shorter. They go out at 6 am and go back with the pollen that they got from the local flora and go back again to hunt more pollen.

On the other hand, male bees or the drone is for procreation. This bee is larger and stouter than worker bees, with huge eyes and doesn't have pollen basket. Unlike worker bees that take 21 days to be mature, drones take 24 days. Males only survive from 4-8 weeks.

Successful beekeeping doesn't have trade secrets. The only key to be successful in providing the essential needs of the apiary. Moreover, the beekeeper must have knowledge and expertise on the biology, and the behaviour of the bee breeds that they nurture. The composition of honeybee colony has the queen. Its life span is around 2 years, and entirely, it only lays eggs. The viability of the queen is based on its capabilities to lay eggs every day. If the queen is unable to lay more eggs, the hive will die. The queen keeps the colony intact by secreting pheromone. It is a unique scent that each bee recognizes and acknowledges the security of the queen in their hive. When the queen dies, the entire colony may swarm and leave. It is the time when the beekeepers may inject practices in the making the hive intact by uniting colony or requeening.

The following are the plates that a starting beekeeper should know.

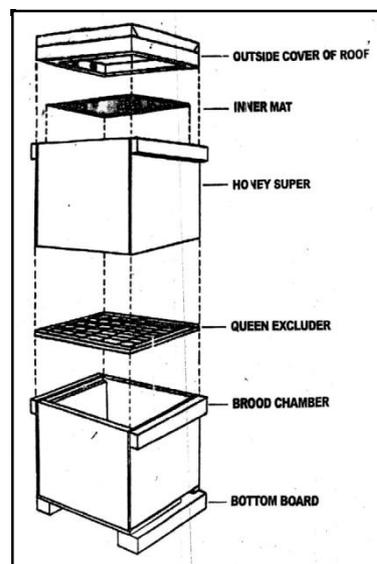


Plate 1. Beehive Box

Source: Lipa Beekeepers Marketing Cooperative (LBMC)

Plate 1 presents the beehive box that the beekeepers are using to house a colony of bees. Beekeepers can acquire it through a local supplier or using the scraps available in their farm. The top cover protects to the hive from external elements that may harm the bees while the inner cover/mat is a lightweight cover used under a standard telescoping cover in a beehive. This inner

mat is used as a stopper to the bees not to extend the comb from the frames to the lid of the hive box. Moreover, it assists the bees in maintaining the right temperature and humidity for the brood (Amazing Bees, 2019).

Moreover, the honey super is a box on top of the brood chamber collects honey. It has frames of comb used to harvest honey from the beehive during the honey flow. To restrict the movement of drones and queens to the specific part of the hive but gives access to the workers, the beekeepers use a queen excluder which may be a metal or plastic device. Through the queen excluder, the queen can only move on the area where the brood or the immature bees are stored. The brood is immature bees that are yet to emerge from their cells. These broods can be in the form of eggs, larvae, pupae of different life stages. The brood chamber stores them and which may have one or more hive bodies with combs inside. Canada Agriculture and Food Museum (2019) also added that the queen excluder prevents queens from laying eggs to honey super where the beekeeper harvests honey while the chamber holds the pollen, nectar or honey, used in feeding the developing brood. Lastly, the beekeepers make sure that they catch the falling components that build upon the beehive through the bottom board. They also check some insects are trying to invade the colony.



Plate 2. Comb where developing broods in different life stages are stored



Plate 3. Comb with honey produce



Plate 4. Food supplement during off-season/Pollen Patty

Below are the costs associated with establishing a beekeeping business. The price and quotations directly came from one of the member farms of Lipa Beekeepers Marketing Cooperative. The name of the farm was not indicated as it was requested by the owner.

Based on the table, one hive costs P19, 945 and per the advice of LBMC, two colonies should be purchased by the starting beekeeper to ensure recovery of the costs after the honey flow season. Therefore, a starting beekeeper will invest P 39, 890. Let's say that each hive will produce 25 kilograms of honey in the honey flow, given that the farm/backyard is an ideal place to provide sources like trees and vegetation. Each kilo of honey is contained in 4 bottles, and each bottle of honey can costs P250-P300. As shown in Table 2, the first year of operation may generate an estimated profit of P16, 110.

Moreover, the listed items in the table may not be bought again in the second year of honey flow because the beekeeper will use the same hives acquired in the previous year. In the following years, through the expertise of the beekeeper and assistance of the cooperative, the hives may be divided into many colonies which will produce more yields in the honey season. After the bees have multiplied, the colony can be divided to form a new one. For the new colony, it needs a young mated queen. One may enquire for any activity that may require expert help through the cooperative beekeeper that roves around the farms that he/she handles. More so, a new beekeeper may purchase second-hand materials for 50% off. It could be another way to lessen the needed capital, but new ones may be good for longer-term use. Through the help of continuous training, learning and the support of LMBC, a beekeeper can achieve this.

Table 2. Costing for One (1) Bee Colony

Items	Price
Starter bee colony composed of:	P 8, 500
One (1) young mated queen	
Three (3) brood comb	
One (1) food comb	
Standard hive composed of:	
One lid	
top cover	700
inner cover	300
One (1) hive box	900
One (1) bottom board	700
Six (6) standard frame (P90 x 6)	540
One (1) division board feeder	700
As your bees multiply and the colonies get stronger, additional equipment is needed:	
One (1) honey super (second floor of the beehive where honey will be stored)	900
Ten (10) standard frames (to fill the super) (P90 x 10)	900
Ten (10) pieces were foundation (P90 x 10)	900
One (1) queen excluder	850
Supplies (per beehive)	
25 kg refined sugar (for supplementary feeding/ bee breeding before honey flow) **price per kilo may vary depending on the market price**	2, 375
As of June 11, 2019, 1-kilo costs P47.50	
Two (2) miticide (to control mite infestation) (P90 x 2)	180
Installation/Set-up cost	1, 500
Total Cost per Hive	P 19, 945
Cost for Two Hives (P19, 945 x 2)	P 39, 890

Projected Income per Hive

25 kilograms = 100 bottles (250 grams/bottle)

P300 srp x 100 bottles	P 30, 000
Less: Bottles (P20.00/per bottle)	2, 000
Total	28, 000
Total Revenue for Two Hives	P 56, 000
Projected Profit	P 16, 110

Table 3. Additional Materials

Items	Price
Bottle with cap	P20 per piece
Materials for honey extraction	
Honey extractor	LBMC can lend this equipment as part of their support to the starting beekeeper.
Uncapping tray	
Uncapping knife	
Nylon Filter, 50 mesh	
Plastic Pale	
Stainless Bowl	
Optional Equipment	
Bee Smoker	DIY and other alternatives may do
Bee Brush	
Hive Tool	
Bee Veil	

Table 3 presents the additional materials that a beekeeper would need in apiary management. However, the materials for honey extraction are available for borrowing only from the Lipa Beekeepers Marketing Cooperative (LBMC). It is one form of support of the cooperative to encourage more beekeepers to join and uplift the agriculture in Lipa City. According to Hilmi, Bradbear and Mejia (2011), beekeeping is a resilient livelihood as it helps to alleviate poverty, particularly in rural areas where other choices of livelihood is not available. It added that beekeeping policy and planning should be a priority. In the case of optional equipment, the beekeeper can find alternatives to save cost. For bee smoker, Bee Merry suggested that coconut husk may be used as a good alternative to calm the bees. The leaves and stalk of Madre Cacao can substitute the bee brush. It is a good way to remove bees from the comb without hurting them. As advised by Buzz About Bees (2010), beekeeping equipment may be expensive. Before investing, one has to think properly and shop around for cheaper ones. If the beekeeper is thinking of buying used equipment, be careful with the selection of the suppliers and proper disinfection of the equipment.

Boosting the Bees: Support Structures

Primary Organizations that Support Apiculture in Lipa City

Department of Agriculture (DA)

Southern Tagalog Integrated Agricultural Research Center (STIARC)

City Agriculturist of Lipa

University of the Philippines Los Baños Bee Program

Lipa Beekeepers Marketing Cooperative (LBMC)

“Marami ang natutulungan ng beekeeping industry in terms of livelihood.” (Senior Science Research Specialist (DA), personal communication, April 30, 2019) (Beekeeping industry helps to uplift the livelihood of people.)

“2012 nag-start yung project namin with UPLB and Bureau of Agricultural Research.” (Last 2012, we started our project with beekeeping in partnership with UPLB and Bureau of Agricultural Research.) (Senior Science Research Specialist (DA), personal communication, April 30, 2019).

Lipa City is getting a lot of support from government agencies in terms of upholding various activities relevant to sustaining apiculture. As the government recognized the importance of beekeeping in the livelihood, Department of Agriculture and Southern Tagalog Integrated Agricultural Research Center (STIARC) launched the Livestock Program with yearly funding to support training programs and other activities intended for beekeeping. Also, the agencies distribute stingless bees and queen bees to help aspiring entrepreneurs in starting their beekeeping business — for instance, last March 12-16, 2018, the Department of Agriculture Regional Field Office No. IV-A Livestock Program thru the initiative of Lipa Beekeeper’s Marketing Cooperative (LBMC) launched an advanced beekeeping course. Thirty (30) participants coming from Batangas and Laguna participated in the training. Bureau of Animal Industry, National Apiculture Research and Training and Development Institute (NARTDI), and University of the Philippines-Los Baños also graced the event. Through the help of Senior Expert in Beekeeping of Programa Uitzending Manager (PUM) Netherlands, there were informative sessions delivered in terms of breeding bees (Llagas, 2018).

“I was with local government unit since 2008, kasi when I entered in this office (City Agriculturist of Lipa), they are already with beekeeping industry. Nag-peak sya nitong mga 2010 or 2011.” (I was with local government unit since 2008, and when I entered in this office (City Agriculturist of Lipa), they are already with beekeeping industry. It was at its peak during 2010 and 2011.)

In 1989, the University of the Philippines Los Baños (UPLB) established its Bee Program. It is a multi-disciplinary, integrated, research and extension program for all related researchers and activities for apiculture (UPLB Bee Program, n.d.). It aims to render dynamic multi-disciplinary research, services to all sectors, and assistance to farmers and entrepreneurs. The beekeeping industry has expanded its facets and continues to produce other products out of honeybees. Its primary concern is how to mobilize the honey production and the beekeeping industry. The existence of this program has paved the way in more studies about the bees. The program covers not only the honey bee production but also genetics, pollination, foraging, and bee biodiversity.

“We send the samples to UPLB, and they examine the chemical composition of our honey” (LBMC Manager, personal communication, June 11, 2019).

The UPLB Bee Program continuously provides training programs about beekeeping as they worked with various agencies such as local government units, beekeepers’ cooperative, state universities, and other higher education institutions (Quilinguing,2019). Aside from the training activities, the program assists beekeepers in terms of the technicalities of farming. They offer assistance for Beekeeping Management and Apiary Establishment, Analysis of Honey and Pollen, and Bee Disease Diagnosis. LBMC Manager further added that UPLB is continuously helping them in making sure that the apiculture in Lipa City is sustainable.

“Our mission is to alleviate poverty through beekeeping, and our vision is to be the leading beekeeping cooperative in the Philippines” (LBMC Manager, personal communication, June 11, 2019).

Lipa Beekeepers Marketing Cooperative (LBMC) was organized which the members may interact in achieving their goals – and one of these is to foster the beekeeping industry in Lipa City. We can take into account that this cooperative strives hard to grow this kind of agricultural activity in the developing City of Lipa. Through its linkages with government agencies and other members, through the help of its Chairman, Mr Joey Tarnate, LBMC has introduced itself in the people who are interested in bee farming or apiculture. According to Llagas (2018), he quoted Mr Tarnate that the cooperative also aims to produce more quality and pure honey. Moreover, they aim to invite more people to be inclined to bee farming because bees also contribute a lot to our ecosystem.

The researchers were able to get in touch with the different agencies mentioned in the previous discussion. Department of Agriculture, Southern Tagalog Integrated Agricultural Research Center, the Local Government Unit of Lipa City, and University of the Philippines Los Baños Bee Program are on the support system of beekeeping. Altogether, these agencies communicate its activities to the group of beekeepers collectively called as Lipa Beekeeper’s Marketing Cooperative (LBMC). It discussed the profiles and background of these agencies in the previous theme. Indeed, they play a vital role in sustaining the beekeeping industry introduced in the 1960s.

Under the Institute of Biological Sciences of the University of the Philippine Los Baños, there is a program actively being implemented to provide livelihood and beekeeping services to all who are interested. UPLB Bee Program does not only support Lipa City but the entire advocacy of expanding beekeeping industry in the Philippines. Primarily, this program aims to help the community to be more aware of the beekeeping and and to introduce to this kind of farming kind of farming. In 1989, the program only organizes one to two training sessions per year, but due to the number of attendees per year, they made it three to four training sessions per year. They partnered with government agencies and other academic institutions (Quilinguing, 2019). This program maintains a Facebook page that farmers, students, teachers, researchers, bee farmers, aspiring farmers, and hobbyist can check for them to be aware of the future beekeeping activities. Aside from beekeepers, these continuous extension programs help fruit trees increase their yield. As we know, bees are excellent pollinator that helps trees bear more fruits. One good example is the mango tree. According Araguas (2019) of UPLB Community/Public Service, beekeeping is the

most in-demand livelihood among entrepreneurs and aspiring entrepreneurs. This program was one of the five awardees in the 3rd UP Gawad Pangulo: Award for Excellence in Public Service.

After seeing the benefits of bees in the environment, says the Senior Science Research Specialist of STIARCH, the agency has launched funding for the beekeepers. Through its DA Livestock Program, yearly funds finance the training and seminar intended for nurturing beekeeping industry. The sessions do not only focus on the technicality of beekeeping management but all the facets of the apiary. This training is also in line with the programs done by the UPLB Program. However, according to STIARC, UPLB now focuses on Research and Development while they focus on the training anchored on the results of the researches.

Moreover, the fund also covers the distribution of stingless bees and other breeds to those people who can finish all the training sessions. Proper allocation of the resources ensures the sustainability of the program. According to De Mesa (2018), the STIARC always update and modernize the services of the research center so that it can help the stakeholders in improving their quality of life and in keeping up with the leaning in agriculture sectors.

“Meron kami nung every Friday dyan sa city hall ground, yung Sinag Kabuhayan Project. Kasama doon ang mga beekeepers, yung tinitinda nila yung mga products direct from producers to consumers” (Every Friday, beekeepers sell their products to their consumers in the City Hall Ground through Sinag Kabuhayan Project.) (City Agriculturist, personal communication, April 30, 2019)

The local government unit (LGU) plays a vital role in sustaining the beekeeping industry in different parts of the country. Bees provide high economic value due to its sought after products like honey, beeswax, royal jelly, pollen, propolis, etc. On the other hand, these products have significance for medical purposes. For these products to reach the market, the local government of Lipa City launched the Sinag Kabuhayan Project which gives a chance to small scale seller to sell their products at the city hall of Lipa every Friday. LBMC members are also participating in this activity. Before, the city agriculture participates in providing training for beekeepers, now the training programs are directly handled by DA, STIARC, and UPLB. The establishment of the cooperative reinforced the training programs. Therefore, the City Agriculturist focused on this Sinag Kabuhayan, where they open opportunity for sellers to reach their consumers easily. Due to limited budget of the program, the City Agriculturist said that they also ask for a supplemental budget from the national government to fund their projects intended not only for beekeeping but also for the entire agricultural projects they have. For instance, La Union was supported by LGU in adopting a culture of honeybees as a component of agricultural programs. The provincial agricultural model helps the LGU in supporting the program. It was in partnership with the National Agriculture Research Training and Development Institute (Sito, 2008).

Nourishing the Hive

Based on the findings presented, the researchers proposed the following sustainable programs which may be considered by the government agencies, LBMC and another third party institutions that are willing to help to make apiculture more sustainable in Lipa City.

Table 4. Proposed Sustainability Programs for Beekeeping/Apiculture

Objectives	Activities	Strategies	Process Owner	Success Indicator
Promote apitourism as a new tourism discipline in Lipa City	Apitourism through farm visits	Marketing activities to raise awareness about beekeeping	LBMC Tourism Council	Tourist traffic quantified per year
Create awareness on different bee farms in Lipa City	Sponsorships to different events	Participation in different city activities to promote the farm to potential tourists	Farm Owners	
Establish linkages and partnership among LGU, Agriculture and Academic Institutions	LGU – Agriculture – Academe Partnership	Seminar to raise awareness about beekeeping	STIARC, DA, LGU LBMC	One seminar per year MOA about the partnership
Strengthen the beekeeping industry through activities that will co-exist with target parties		Memorandum of agreement between parties (LGU and local colleges) to support agriculture as part of extension activities	Higher Education Institution (HEI)	

Obtain funding and assistance to integrate bee products into different Lipeño products	Consultation meeting between DA, LBMC, Beekeepers Planning and strategic planning	Create a partnership with different restaurants and other businesses that may be interested in integrating bee products to their respective outputs Strategic planning sessions among the concerned agencies to establish the goals in the next few years for apiculture	LGU, DA LBMC	Active partnerships
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Table 4 shows the proposal of the researchers in making the beekeeping more sustainable. These activities are products of the interview sessions done with the government agencies, LBMC and select beekeepers. Apitourism is something that each farm owner would like to boost. Integrating bee farm visits in any tourist activities that we have in Lipa City can be a way to improve the tourism in Lipa. Now, Batangas will not only be known for Lomi, Kapeng Barako, Sinaingna Tulingan but also for bee farms that educate the tourists about the contribution of bees in our livelihood, environment, and the entire planet. According to Honey Colony (2015), ApiRoutes or apitourism is an opportunity to experience the wonderful world of bees. In Slovenia, apitourism is so much different. This country has a unique practice by placing beds within the bee houses and transforming this activity into an apitherapeutic chamber. In this place, the tourist can inhale the healing air of beehives. Sagar (2019) also cited the apitourism is the newest way of combining beekeeping and travel by exploring agricultural sector that provides employment opportunity and possible economic growth. It could also be a source of funds in strengthening local beekeeping.

On the other hand, a partnership among LGU, LBMC, and HEI, can be a great way of introducing apiculture to the people of Lipa City, particularly the students. It will pave the way in expanding the reach of apiculture which was previously a silent agricultural practice in the city. Assisting the agricultural sectors can be a great door for the HEI to contribute in terms of their

community extension programs. Like the UPLB Bee Program that supports the beekeepers in research, other HEIs may help them in strengthening the apitourism and invite more people who may be interested in agriculture. Last 2016, Commission on Higher Education (CHED) released a Memorandum Order No. 33, series of 2016 about the guidelines for institutional development and innovation grants under the K to 12 transition program. This program aims to encourage teaching and non-teaching personnel to propose HEI development and innovation projects, particularly under the Inclusive Growth and Sustainable Development. It could be a great platform to create a partnership with LGU and HEI. Moreover, there are other ways on how these institutions may strengthen partnership through community extension services, and seminar.

Lastly, beekeepers are also looking for other opportunities so they can use further their products. In this case, they do not want to limit their business in selling honey, beeswax, propolis, etc. Now, there is an opportunity to make the bee products more accessible to the consumers – and that is by designing strategies on the integration of bee products to Lipeño outputs, particularly food. There should be strategic planning with the concerned agencies as well as active partnerships with other businesses. A bee farm in Bohol promotes organic ingredients in preparing their dishes. This farm highly supports organic farming, and it provides livelihood projects for Boholanos. It is a justification that bees help in pollination (Ignacio, 2015). In India, a restaurant called Honey Hut offers cuisine that has honey in it. It is a nature café devoted to promoting health-conscious society. They offer coffee with honey, nature’s special juices, honey fries, and salads with honey (Honey Hut, n.d.)

This study presented a proposal for the sustainability of beekeeping, and the concerned agencies and institutions may consider the given suggestions. The researchers shall establish a partnership with the involved government agencies to ensure full support to the industry. The researchers, together with the key informants, only aim for the future that beekeeping and apitourism is a norm. A society which properly takes care of bees can help alleviate poverty through this agricultural activity.

Braving the Bees: Challenges and Solutions

Problems Encountered in Beekeeping

Varroa Mites

Seasonal honey flow

Sugar-feeding breeder

Transfer of beekeeping knowledge

“May mga pests, may mga parasites na kung tawagin natin ay Varroa Mites.” (There are pests that we call Varroa Mites.) (Senior Science Research Specialist, personal communication, April 30, 2019).

The main problem that the beekeepers encounter is the Varroa Mites. These are mites that attach the bees and the brood. Based on the College of Agriculture, Food and Environment at the University of Kentucky, the mites suck the blood of adults and developing brood, particularly the drone brood. As a result, it shortens the life span of the bees. Mites develop on the brood of the bee, which results in deformed or incomplete development among its legs and wings. They enter the

brood larva a day before the larva is sealed in the comb. Dark mites can easily be detected on the white pupae. LBMC uses miticide imported from Thailand to cure the infestation of the mites. However, McConnell (2016) added that the use of miticides should be minimal as the chemicals may contaminate the hive products. There are some non-chemical strategies taught like using commercially developed drone comb to capture varroa mites. Suppliers sell a special sheet used as drone foundation for building drone comb. The mites prefer drone blood over the worker blood (Blackiston, 2009).

Moreover, McConnell (2016) added that trapping mites in drone blood may help. It is allowing the mites to invade the drone brood and then removing the mite-infested brood. However, the beekeepers have to examine the mite infestation so that they can apply the best way to terminate the mites in the colony.

Another problem that the beekeepers are encountering is the seasonal honey flow. According to the interview with LBMC, the honey flow may range from November to June, where the major honey flow is from January to May. During the rainy season, bees cannot go out of their hives to gather pollen. As a supplement to their food, LBMC uses pollen patty during the off-peak and rainy season. The best time to manage the beehives before the honey flow season is from September to November. It is also the time to start installing nucs or the small honey bee colony gotten from the larger colonies.

Moreover, the LBMC practices include feeding when necessary, medication of miticide as a curative and preventive way to treat parasites, checking and repairing bee equipment to be ready for the honey flow, uniting weak colonies, and requeening or replacing old queens. The farm that the researchers visited maintains a retirement area for old queen bees.

Meanwhile, after the honey flow, the bee farm should also manage its hives by checking the brood nest condition, compressing colonies, removal of old combs, feeding, medication, repairing and painting boxes and requeening. Harris (2016) also discussed in the journal published by Mississippi State University that seasonal management of beekeeping starts with knowing the colony of the bees and the rate of the food they have in the local flora. During autumn in America, beekeepers are combining weak colonies to avoid losing hive equipment to pests, however not mixing those string colonies with other colonies which were destroyed by other pests. Also, managing the strong egg-laying queen should be considered during this time. In the Philippines, by following the calendar, strategies and activities can be properly laid down.

“Yung problema ngayon dito sa Bulacnin, kasi masyadong marami na ang colony holdings, ang nagiging problem ay yung capacity para ma-support yung bees. Nandun ang cases na nagpapakain sila ng sugar. Yung mga binebenta nila ay hindi na pure.” (The problem in Brgy, Bulacnin is that they feed the bees with sugar due to high colony holdings. The local flora cannot support the bees anymore. As a result, the honey is not pure anymore.) (Senior Science Research Specialist, personal communication, April 30, 2019).

LBMC also sends the sample of their honey to UPLB to ensure that they only produce high-quality products from beehives. Pure honey should only have 5% sucrose or lower and high glucose

and fructose content. According to Thomson (2016), honey has an indefinite shelf life as long as it is pure. It may change its color, and it may crystallize, but the quality is still the same. Also, pure honey doesn't have a consistent color. Most of the available honey products for sale in the streets are yellowish in color, almost the same color as the palm oil but a little lighter. But according to LBMC, the foragers' exposure to its environment determines the color of the honey. The moisture content of the honey should only be at 22% or less. One of the bee farms forms LBMC has 17.5% moisture according to the laboratory tests conducted by UPLB Bee Program. The government agency has to step in making sure that some of the honey producers do not indulge in fast cash by selling fake honey. LBMC call these impure honey products as culinary honey. It can only be used as food ingredients but never for its medicinal purposes.

The last problem enumerated is the transfer of beekeeping knowledge. Although government agencies and LGU provide support, some of the aspiring beekeepers thought that they could acquire knowledge in apiculture and apiary management in an instant. It takes time and practice to master the process of the apiary and the behaviour and biology of the bees. Sometimes, in the first year of beekeeping, bee farmers encounter loss or break even. At the second season, that is the time that beekeepers can add more inputs like supplements, and new queens if need be. Bee Merry (personal communication) added that someone who wants to uphold bee farm should have a love for nature and ready to learn more about bees, plants, and trees.

LESSONS LEARNED, RECOMMENDATIONS AND FUTURE DIRECTIONS

The Philippines indeed has natural resources helpful for fruitful beekeeping. All species of honey bees utilized for beekeeping exist in our country. Although urbanization has reached Lipa City, Batangas, some residents still choose to stick to its agricultural sector.

Based on the results, numerous agencies assist the beekeeping industry in Lipa City. It is evident that beekeepers are getting enough support, and these available training sessions and resources are just waiting to be utilized appropriately by beekeepers. The government agencies also put focus on research regarding bee biology, product components, pollen analysis, and bee disease diagnosis. UPLB brought this research extension program. Moreover, there was an increase in training sessions from two per year to four per year. It was due to persistent demand and the number of attendees per training.

On the other hand, *Apis mellifera* is the most commonly used bee in honey production in so far as LBMC is concerned. It is for the reason that this breed does not usually swarm. Also, the top reason that people engaged in beekeeping is because of honey production. It could be for personal use or commercial use. However, there are some challenges in producing pure honey due to some farmers that feed their bees, particularly the *Apis cerana* or laywan. Another problem encountered is the varroa mites. These parasites are too tiny to be seen but can be treated chemically and organically. The findings also showed that starting a beekeeping business is viable, considering the small amount of capital that they need and how big the support is coming from different agencies. Also, LBMC extends its help to starting beekeepers.

The researchers proposed sustainability programs to help the beekeeping/apiculture, which may be considered by LBMC and government agencies. The results of this study can be further used by HEI to also reach out to the agricultural sector in helping with the alleviation of poverty. Moreover, this may be a way to open linkages among the concerned institutions. Funding may also be sought for further innovation of bees products and for introducing them in the world. Future researchers are encouraged to use other variables for the development of this study. Apitourism is an excellent opportunity to look into as we are aiming to develop Lipa City as a well-known tourist destination. The study might have been more successful if the researchers covered the entire Batangas Province. Ultimately, future researchers may also include bee biology, product components, and further analysis of bee diseases in Lipa City.

Literature Cited

- Agrawal, T. (2014). Beekeeping Industry in India: Future Potential. *International Journal of Research in Applied, Natural and Social Sciences*,2(7), 133-140. Retrieved December 7, 2018, from <https://bit.ly/2E67pcT>.
- Amazing Bees. (2019). The Hive Mat. Retrieved June 16, 2019, from <https://beekeepers.amazingbees.com.au/the-hive-mat.html>
- American Beekeeping Federation (2018). What's the Buzz? Retrieved December 7, 2018, from <https://www.abfnet.org/>
- Anna (2018, September 28). Start a Beekeeping Business: Helping You Getting Started. Retrieved from <https://www.my-business-plans.com/start-a-beekeeping-business/>
- Araguas, K. (2019, March 04). UP honors Bee Program for public service excellence. Retrieved June 13, 2019, from <http://uplb.edu.ph/top-stories/up-honors-bee-program-for-public-service-excellence/>
- Araguas, K. (2019, March 11). Yes, bees do it! They keep entrepreneurship abuzz! Retrieved June 13, 2019, from <http://uplb.edu.ph/public-service/yes-bees-do-it-they-keep-entrepreneurship-abuzz/>
- Baconawa, A. D. (2003). A Guide to Beekeeping in the Philippines (2003). Retrieved from <https://www.apiservices.biz/en/articles/sort-by-popularity/571-a-guide-to-beekeeping-in-the-philippines-2003>
- Baconawa, A. D. (2007). Strategic Framework For Beekeeping Development In The Philippines (2007). Retrieved from <https://www.apiservices.biz/en/articles/sort-by-popularity/892-strategic-framework-for-beekeeping-development-in-the-philippines-2007>.

- Bees for Development. (2019). Bees for development: Beekeeping and income generation. Retrieved from <http://www.beesfordevelopment.org/categories/beekeeping-and-income-generation/>.
- Blakiston, H. (2009). How to Control a Varroa Mite Problem in Your Beehive(2nd ed.). Dummies.
- Buzz About Bees. (2010). Beekeeping Equipment. Retrieved June 16, 2019, from <https://www.buzzaboutbees.net/beekeeping-equipment.html>
- Canada Agriculture and Food Museum. (2019). Life in a Hive. Retrieved June 16, 2019, from <https://bees.techno-science.ca/english/bees/life-in-a-hive/brood-chamber.php>
- Chuttong B., Chanbang Y., & Burgett M. (2014) Meliponiculture, Bee World, 91:2, 41-45, DOI: 10.1080/0005772X.2014.11417595
- College of Agriculture, Food and Environment at University of Kentucky. (n.d.). Varroa Mites Infesting Honey Bee Colonies. Retrieved from <https://entomology.ca.uky.edu/ef608>
- Commission on Higher Education. (2016). CHED Memorandum Order No. 33, Series of 2016 from <https://www.ched.gov.ph>
- Conde, M. (2018, August 16). Beekeeping in Philippine coconut production: Providing livelihoods and promoting conservation. Philippine EnviroNews. Retrieved December 7, 2018, from <https://bit.ly/2rpQgDh>
- De Mesa, A. (2018, April 20). STIARC Crafts Plans for Development. Retrieved June 14, 2019, from <http://rfo4a.da.gov.ph/stiarc-crafts-plans-for-development/>
- Department of Entomology, Michigan University. (n.d.). Pollination. Retrieved June 14, 2019, from <https://www.canr.msu.edu/nativeplants/pollination/>
- Feng, F. (2015, April 01). Apiculture in China, Bee World, 71:3, 104-106, DOI: 10.1080/0005772X.1990.11099046.
- Hammond, G., & Blankenship, M. (2009). Apismellifera (honey bee), Animal Diversity Web. Retrieved from https://animaldiversity.org/accounts/Apis_mellifera/
- Harris, J. (2016). Colony Growth and Seasonal Management of Honey Bees. Mississippi State University Extension Service. Retrieved June 16, 2019.
- Hilmi, M., Bradbear, N., & Mejia, D. (2011). Beekeeping and Sustainable Livelihoods. Rural Infrastructure and Agro-Industries Division Food and Agriculture Organization of the United Nations,1(2). Retrieved June 16, 2019, from <http://www.fao.org/3/a-i2462e.pdf>

- Honey Colony. (2015). Benefits of Bee: Introducing Apitourism in Slovenia. Retrieved June 16, 2019, from <https://www.honeycolony.com/article/benefits-bee-introducing-apitourism/>
- Honey Hut. (n.d.). Honey Hut Cafe. Retrieved June 16, 2019, from <https://www.honeyhut.co.in/menu/>
- Ignacio, M. (2015, November 19). Bohol Bee Farm's Organic Menu and Restaurants. Retrieved June 16, 2019, from <http://www.certifiedfoodies.com/2014/01/bohol-bee-farm-food-restaurant/>
- Korosec, T. A. (2015, June 26). Apitourism - A Fusion of Apiculture & Sustainable Travel Experience. Retrieved June 16, 2019, from <https://beetime.eu/apitourism-travel-experience/>
- Lena, P. (2018, January 19). Beekeeping to boost Guimaras' mango industry. Philippine News Agency. Retrieved December 7, 2018, from <http://www.pna.gov.ph/articles/1022181>
- Llagas, R. (2018, March 20). DA 4A Livestock Program spearheads Advance Beekeeping Course. Retrieved from <http://rfo4a.da.gov.ph/da-4a-livestock-program-spearheads-advance-beekeeping-course/>
- Luistro, A. (2017). Beekeeping a Buzzing Business in Lipa City. Bureau of Agricultural Research,19(January-March), 1st ser. Retrieved December 7, 2018, from <https://bit.ly/2G7fJeX>
- Master, C. (2019, June 10). 5 Amazing Bee Pollination Facts. Retrieved from <https://carolinahoneybees.com/honeybees-as-pollinators/>
- Mcconnell, M. E. (2016). Non-chemical control of varroa mites in honey bee colonies. 2016 International Congress of Entomology. DOI:10.1603/ice.2016.107686
- Quilinguing, K. (2019, March 25). Busy bees for public service: The UPLB Bee Program. Retrieved from <https://www.up.edu.ph/index.php/busy-bees-for-public-service-the-uplb-bee-program/>
- Sagar, F. (2019, April 15). Apitourism (or Bee Tourism) Takes Off. Retrieved June 16, 2019, from <https://americanbeejournal.com/apitourism-or-bee-tourism-takes-off/>
- Sayre, M. (2015, April 15). Could beekeeping hurt me and you? Retrieved December 7, 2018, from <https://bit.ly/2rogupK>
- Sito, A. (2009). Provincial beekeeping industry model: Its application to province of La Union. Philippine Journal of Crop Science (Philippines),16, 98. Retrieved June 14, 2019, from <http://agris.fao.org/agris-search/search.do?recordID=PH200900032>
- The Apiculture Industry in Region 02. (2011). Department of Trade and Industry. Retrieved December 7, 2018, from <https://bit.ly/2zLg2Xs>

The Complete Book on Beekeeping and Honey Processing (2nd ed., Ser. 2015). (n.d.). Delhi: Niir Project Consultancy Services.

Thomson, J. (2016, November 14). 11 Foods That Shouldn't Ever Need An Expiration Date. Retrieved June 16, 2019, from https://www.huffpost.com/entry/foods-that-never-expire_n_57b5f010e4b03d513686cbcb

UPLB Bee Program, Institute of Biological Sciences, University of the Philippines Los Baños. (n.d.). Retrieved June 13, 2019, from <https://aboutphilippines.org/files/uplbbee.pdf>

Whittemore, F. (2017, September 26). How to Start a Beekeeping Business. Retrieved from <https://bizfluent.com/how-6167404-start-beekeeping-business.htmls>