



Value Chain market Assessment

for each priority Area identified in the
Resilient Rural Belize (RRB) Program

**Product 3.8 Value Chain and
Market Assessment of Honey
Production in Belize**

May 2022

VALUE CHAIN AND MARKET ASSESSMENT OF HONEY PRODUCTION IN BELIZE

Conduct of Value Chain and Market Assessments for Resilient Rural Belize

Contract Number: CO002/14/2020/2021

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List of Acronyms and Abbreviations

BAHA	Belize Agricultural Health Authority
BBS	Belize Bureau of Standards
BMDC	Belize Marketing and Development Corporation
CATIE	Tropical Agriculture Research and Higher Education Center
CVA	Climate Vulnerability Assessment
DFC	Development Finance Corporation
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GOB	Government of Belize
IFAD	International Fund for Agriculture Development
IICA	InterAmerican Institute for Cooperation on Agriculture
MAFSE	Ministry of Agriculture, Food Security and Enterprises
PCB	Pesticide Control Board
RRB	Resilient Rural Belize
SIB	Statistical Institute of Belize
VCMA	Value Chain and Market Assessment

1. Executive Summary

Belize is a small tropical country with relative abundance in natural resources such as land and water. It is classified as a Small Island Developing State (SIDS) because it is threatened by many impacts of Climate Change especially to its rural areas which accommodates 54.3% of the country's population. Also impacted by Climate Change is the agricultural sector, a major pillar of Belize's economy, and in particular small-scale farmers focused on the production of vegetables and other non-traditional crops. These challenges along with poor market access, poor infrastructure (such as roads, storage facilities) and underdeveloped production systems have rendered small scale farmers unproductive or with sub-standard produce.

To alleviate the climate induced and productivity limitations faced by small scale farmers, and to strengthen food security, economic development and reduce poverty, the Government of Belize (GOB) sought assistance from the International Fund for Agricultural Development (IFAD), the Green Climate Fund (GCF), to develop a program entitled "Resilient Rural Belize" (RRB) Program. The RRB Program contracted the Tropical Agriculture Research and Higher Education Center (CATIE) to conduct the value chain analysis and market assessment, focusing on eight preselected commodities, namely, sweet pepper, tomato, hot pepper, cabbage, carrot, onion, pineapple and Apiculture (honey production). The analysis will guide interventions across and within the Apiculture (honey production) value chain.

This study focuses on the structure and function of the Honey Value Chain in Belize at the national level, examining all linkages between the actors. It identifies opportunities for strengthening horizontal and vertical linkages within the value chain, identifies end markets and makes recommendations for value chain upgrading strategies including improved production and quality of honey.

The honey market in Belize is estimated at a 100,159 pounds valued at BZ \$441,701.19 (based on SIB 2020 data). The main consumers of honey in Belize are households, restaurants, hotels, bakeries, and some cosmetic and pharmacy establishments.

Honey is produced in all the districts in the country. The Cayo District is the leading producer of honey followed by the Orange Walk and Corozal Districts. Main producers of honey are members of cooperatives; however, there are many individual producers.

The Ministry of Agriculture, Food Security and Enterprises has in its policy to support and prioritize honey production as part of the larger agricultural strategy to conduct import substitution. Technical and financial services are provided by supporters and service providers along the value chain. Most farmers do not use financial institutions for financial assistance because they don't have sufficient collateral such as land as required by these financial institutions.

The strengthening of the Honey Value Chain requires strengthening of the cooperatives which are the main producers of honey. All farmers require knowledge of good apiculture practices such as the use of appropriate equipment, rearing of queen bees (improved genetics), integrated pest management, rational use of agrochemicals, efficient use of the ecosystems especially the flora, reforestation, post-harvest technology, processing, and value-added products. Important also, beekeepers need the knowledge to be more business oriented, in most cases during this study most beekeepers did not have records of cost of production or knowledge if they are operating at a profit or loss.

2. Introduction

Belize is a coastal tropical country which lies on the north-eastern coast of Central America, making it suitable for the cultivation of various horticultural crops. The United Nations has designated Belize as a Small Island Developing State (SIDS) because it has been greatly affected from vulnerabilities and threats like those of Small Island Developing State (SIDS). Impacts from threats such as Climate Change to Belize's agricultural sectors has prompted the adoption of many strategies such as Climate Smart Agriculture (CSA) to the population which is essentially based in the rural areas and whose livelihoods is based mainly in the agriculture sector.

Agriculture is extremely important to Belize's development, providing employment, foreign exchange earnings and is key to food security. Approximately, 172,000 hectares or 7.48 percent of Belize's total land area is suitable for agricultural use. An estimated 122,000 hectares or 5.31% of Belize's total land area is cultivated land (FAOSTAT, 2019). The agricultural sector employs an estimated 12.24% of the total population of Belize and an estimated 5.2% are females (FAOSTAT 2019). Primary industries in Belize include Sugar, Banana and Citrus Products which are normally the highest agricultural income earner. In 2020, the highest contributors to the economic output in agriculture in Belize was the non-traditional sector with grains and legumes being the highest contributor (MAFSE, 2021). The Gross Domestic Product per capita (constant) in 2019 was BZ\$ 7066.09 with the agriculture sector accounting for 8.2 percent (SIB, 2021).

The Agriculture Output Value (at Producer's price) for fruits and vegetables in Belize has been on a fluctuating downward trend; notably, the decrease from 2016 to 2020 is 27 percent (SIB, 2021). In 2019, the dominant commodities in the tuber and vegetables category based on economic value were onion, potato, carrot and sweet pepper ranking from first to fourth places, respectively (MAFSE, 2020). The honey industry started when European bees were first brought in from Mexico in 1957 as pollinators for the sugar industry in Corozal and Orange Walk. Thereafter, seven beekeeping cooperatives were formed to develop a honey industry. In 1977, the Belize Honey Producers Federation of Cooperative Societies Limited was formed and registered, four cooperatives were the founders of the federation. The north of the country became the major producer of honey. In this assessment official data shows that the Cayo District is the leading producer of honey followed by the Orange Walk and Corozal Districts respectively. The FAO in 2016 conducted a value chain analysis of the honey industry with emphasis on "Promoting Agribusiness Development in Northern Belize". In process there is an Apiculture Bill in to be

signed by the government of Belize and a Beekeeping Five Year Strategy Plan 2019 to 2024 developed by the Belize Marketing and Development Corporation (BMDC) and the InterAmerican Institute for Cooperation on Agriculture (IICA). Additionally, the Ministry of Agriculture, Food Security and Enterprises has sought the assistance of local and international partners to strengthen the value chain of Honey production in Belize and by extension improving the social and economic situation of small-scale local producers and also improving food security in Belize.

Harrison (2016) described the history of honey production in Belize. In this report produced by FAO, the introduction of European bees brought in Corozal and Orange Walk from Mexico in 1957, expanded continuously and by 1977 the Belize Honey Producers Federation of Cooperative Societies Limited was formed and registered with four members. After overcoming in the early 1980's, the threat cause by spraying of marijuana fields with chemicals which were toxic to bees, the industry was faced with the appearance of aggressive Africanized bees. Lacking training to deal with these bees, beekeepers felt discouraged from doing beekeeping.

The revival of the industry according to Harrison (2016) came after established beekeepers had been trained in the management of Africanized bees and the resulting hybrids of European and Africanized bees. By 2001, Belize was “estimated to have a total of 129 beekeepers, with 1,791 hives, producing 320 units of 55-gallon drums of honey. Orange Walk and Corozal accounted for 44 percent of beekeepers, 63 percent of hives and 65 percent of honey production respectively” (Harrison, 2016, page 6).

This Value Chain Analysis and Market Assessment (VCMA) for Honey in Belize is being conducted by the Tropical Agriculture Research and Higher Education Center (CATIE) in collaboration with the International Fund for Agriculture and Development (IFAD), the Green Climate Fund (GCF), and the GOB through the Resilient Rural Belize (RRB) Project. Although the value chain will be studied at a national level, the priority area of the assessment is the Orange Walk District which encompasses the village of San Felipe, Trinidad, San Jose Palmar and Yo Creek. The objectives of this VCMA are to (i) map and describe the honey value chain including the role and relationships between the different actors (producers, transporters, packers, processors, traders, retailers and consumers) in the value chain; (ii) market potential; (iii) identify challenges and opportunities for the Honey Value Chain; and (iv) identify and recommend adequate policy interventions based on findings to strengthen the Honey value chain in Belize.

3. Methodology

The Value Chain Market Assessment (VCMA) for Honey is presented in four phases as described by CATIE (CATIE, 2020). The details of the methods used are as follows.

3.1 Description of the Study Area

The area for this VCMA was preselected by the Resilient Rural Belize (Belize) Project when the consultancy was initiated. The target areas in the Orange Walk District is where most beekeepers are organized as cooperatives and some that are in the process to be registered as cooperatives. The Cayo District must be recognized as the major producer of honey and consist of mainly individual beekeeper, mostly belonging to cooperatives.

Table 1. Population of the Target Villages in the Orange Walk District, 2010

Belize Population by Number of Households and Average Household Size, 2020				
Village	Total	Males	Females	No. of HH
San Felipe	1501	771	729	335
Yo Creek	1413	729	684	331
San Jose Palmar	1355	699	656	305
Trinidad	570	286	284	145
San Antonio	1847	933	914	381
Seven Miles/Progreso	483	252	231	96
San Jose Sucootz	2322	1142	1180	472
Benque Viejo Town	6148	3057	3091	1416
Bullet Tree Falls	2124	1058	1066	426
Camolote	2562	1276	1286	560
Cristo Rey	873	441	432	212

3.2 Data Collection

Collection of current and relevant data was done in three steps: Collection of secondary data through desk research; Collection of primary data using targeted interviews.

Collection of secondary data through desk research

There is one pre-existing value chain analysis for honey conducted in 2016 by FAO for Northern Belize. Raw data and information about supplies, production, transformation, and marketing were accessed from various government departments such as the Ministry of Agriculture, Food Security and Enterprises (MAFSE), the Belize Agricultural Health Authority (BAHA), the Statistical Institute of Belize (SIB), Belize Bureau of Standards (BBS), Resilient Rural Belize (RRB) Project personnel, and the online portal of the Food and Agricultural Organization (FAOSTAT). Research and studies published on honey production within the last five years in other countries were targeted to identify innovations and technologies that could strengthen the Honey Value Chain in Belize. The market trends of honey and cultivation of honey across Belize, quality standards, restrictions on the production and/or the marketing of the products were also sought. The main actors in the value chain and relationships between the actors were also identified. The output of the desk research was an initial value chain map.

Collection of Data through Primary Research

Major actors in and outside the value chain were identified based on the preliminary value chain map developed from findings from the desk research. Personal interviews were carried out, but in consideration of the Covid-19 regulations. Most actors preferred electronic or telephone interviews due to the high incidence of Covid-19 during this assessment.

- Personal Interviews: Face-to-face interviews were conducted with lead producers of cooperatives, Extension Officers from the Department of Agriculture, the Cooperative Department and Resilient Rural Belize were interviewed. A visit to the town/city market and supermarkets also allowed to interview vendors/retailers. These interviews allowed the consultant to have a better understanding of how honey is marketed, labour requirements, sources of supply of raw materials, market prices, fluctuations in demand throughout the year, sources of financing and contractual relationships with clients.
- Telephone Interviews: telephone interviews were carried out with persons that could not accommodate a personal interview, mainly due to the high incidence of Covid-19.
- Electronic Interviews: Electronic interviews were done with persons that could not accommodate a personal interview, mainly due to the high incidence of Covid-19.

Limitations of the Study

While Beekeepers were willing to cooperate in the study, in general they had limited records of their production costs and yields. So, they could not verify if they operated at a profit or loss. Hence this study must depend mainly on the national statistics provided by the Ministry of Agriculture to the Statistical Institute of Belize.

Validation of Value Chain Map by Stakeholders

To validate the data and information collected during the desk and primary research, a workshop was carried out in Yo Creek Village with actors from different levels of the value chain. These actors included input suppliers, producers, intermediaries, technical officers from the government departments and NGO's. Some major actors could not attend due to Covid 19 infection or were not vaccinated. The Ministry of Health was adamant that all workshop participants had to be vaccinated.

The Objectives of the workshop were:

- Present the results of the Value Chain and Market Analysis for Honey to stakeholders.
- Validate the results.
- Identify and prioritize potential value chain production, processing, and marketing efficiency improvements benefiting smallholders, women and other actors along the value chain.

Table 2. Honey VCMA double entry matrix with priorities derived by workshop participants

Problems	Finances	Input purchase	Training and TA	Improved Bee Breeding	Road Infrastructure	Marketing
Finances		Finances	Training	Finances	Finances	Marketing
Input purchase			Training	Imp Breeding	Infrastructure	Marketing
Training and TA				Imp Breeding	Training	Training
Improved Bee Breeding					Imp Breeding	Marketing
Infrastructure						Infrastructure
Marketing						Marketing

The VCMA workshop consisted of the presentation of the Honey VCMA and a group work to identify and prioritize needs that will help to improve or strengthen the value chain. As seen in Table 2 training and technical assistance, as well as marketing are priorities, while finances, improved breeding, or supply of queen bees have the same level of importance. Infrastructure was considered important also.

Finalization of the Report

After every validation workshop, meetings were held with the Lead Value Chain Consultant from CATIE, Local Consultants and the Agriculture Marketing Officer from the RRB Programme. During these meetings, further recommendations were made to improve the final document and to meet its objectives.

Value Chain and Climate Vulnerability Assessment Synchronization

The validation workshop of the VCMA was carried out together with the CVA with the idea to receive any comments or questions about climate change that members of the honey value-chain may have.

Synchronization of the CVA and VCMA consultations produced a new section in this report that is not traditionally included in VCMA studies. Section 8 on this report shows the findings concerning the suitability and climate adequacy changes projected in two scenarios. On the other hand, during the workshop in terms of climate change most farmers expressed major concern regarding unexpected droughts during periods of the year and also the change on flowering patterns of the flora. These have affected the production of honey.

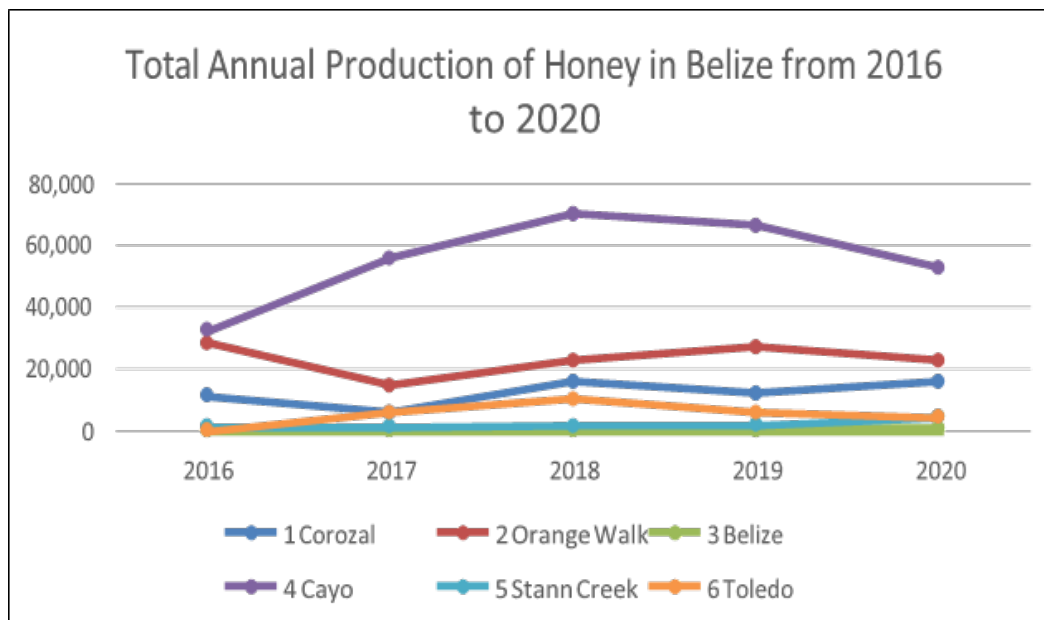
4. History of Honey Value Chain in Belize

What follows is a snapshot of the honey industry in Belize taken from Harrison (2016). The honey industry started when European bees were first brought in from Mexico in 1957 as pollinators for the sugar industry in Corozal and Orange Walk. Thereafter seven beekeeping cooperatives were formed to develop a honey industry. In 1977, the Belize Honey Producers Federation of Cooperative Societies Limited was formed and registered, four cooperatives were the founders of the federation. In 1983, the increase of the drug trade, mainly marijuana, prompted the United States and Belize to sign an agreement for the aerial spraying of marijuana plantations with herbicides, which were toxic to bees. This started a downfall of the honey industry.

In 1987, the influx of the of aggressive Africanized bees led to the further decline of the industry. These bees invaded European beehives at a very fast rate. Beekeepers were well experienced in managing the more docile European bees, but had not been trained to manage the Africanized bees. Beekeepers were discouraged and thereafter the industry collapsed, most cooperatives became inactive, and the Federation of Honey Producers also collapsed. The revival of the industry, according to Harrison (2016), came after established beekeepers were trained in the management of Africanized bees and the resulting hybrids of European and Africanized bees. By 2001, Belize was “estimated to have a total of 129 beekeepers, with 1,791 hives, producing 320 units of 55-gallon drums of honey. Orange Walk and Corozal accounted for 44 percent of beekeepers, 63 percent of hives and 65 percent of honey production respectively” (Harrison, 2016, page 6).

Honey is produced in all the districts in Belize with the Cayo District being the largest producer, see Figure 1, followed by the Orange Walk and the Corozal Districts (MAFSE, 2021). In Figure 1 the production trend for the Cayo District has been on a constant downward trend since 2018.

Figure 1. Total Annual Production of Honey (lbs) in Belize from 2016 to 2020 (SIB)



According to producers, the cost of establishing apiaries, locations, management techniques, lack of a queen rearing program, financing, and marketing attribute to this low production of honey all over the country. However, these producers are willing to continue in the apiculture business, but need technical assistance and financing to improve their production practices and adapt to changes in the market trend and climate change.

The production trends in the other districts are very much constant and all production now is for the local market: no honey is officially exported out of the country.

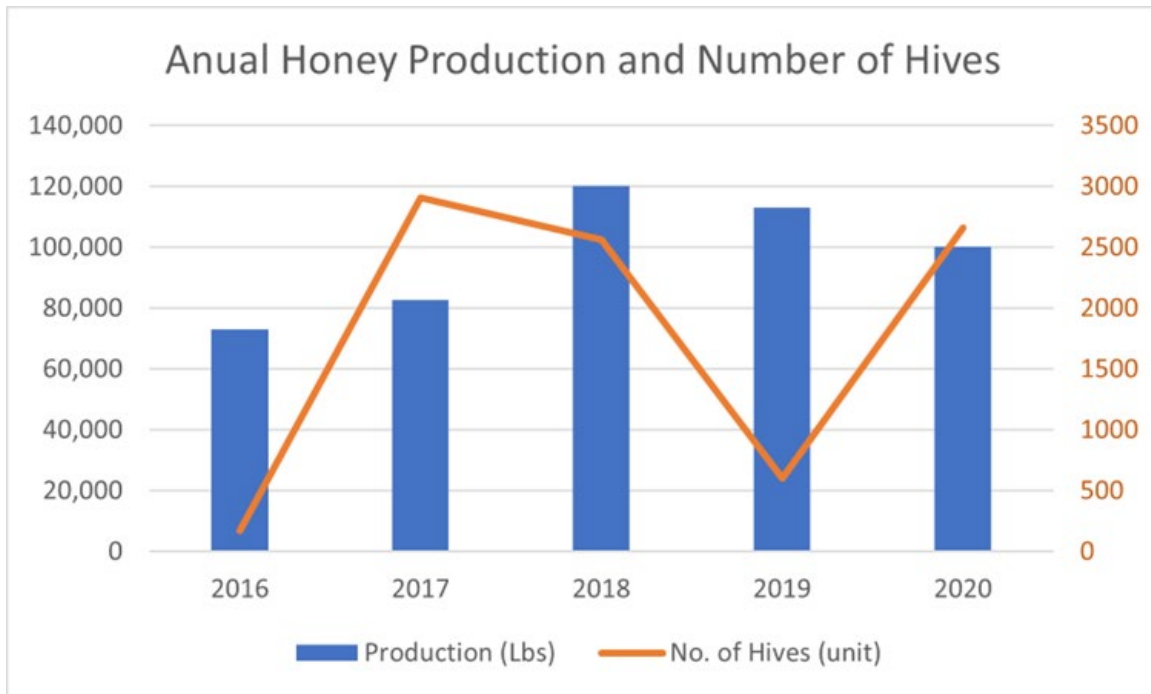
4.1 Honey Production in Belize

Honey production in Belize is for the domestic market and targets households, food suppliers in local restaurants, supermarkets, and resort/hotels in the country. Beekeepers sell the majority of their product by pound to an intermediary supplier (Collector) who resells/distribute to retailers such as market vendors. Some producers sell directly to retailers or directly to consumers such as large upscale supermarkets and restaurants. Contractual arrangements between farmer and collector are informal.

Shown in Figure 2, the national average production of honey from 2016 to 2020 is 20,032 lbs. The average number of hives is 532, this would give an average of 37.7 lbs. of honey produced per hive. During the workshops and meeting with producers much of the data was questioned

and they considered the data inaccurate, and it was also mentioned that honey is being brought in as contraband mainly from Guatemala. According to BAHA, no contraband data is recorded for honey. Although workshop participants questioned the accuracy of the data, this assessment relies on official national data from the Statistical Institute of Belize (SIB). The Ministry of Agriculture supplies agriculture data to the SIB.

Figure 2. Total Honey Production and Number of Beehives in Belize (2016 to 2020)



A final note about the expansion of commercial agriculture (sugar, cattle ranching, rice and papaya), residential housing and tourism developments for beekeeping in the northern districts as reported by Harrison (2016) is appropriate and still relevant. The expansion of commercial agriculture causes deforestation which puts pressure on the honey industry, limiting its ability to consolidate and grow. The use of aerial spraying of agro chemicals, as in papaya cultivation which are toxic to bees, is another example of conflicts that have existed in the past and, according to our information, continue to be relevant for the health of the honey industry. Likewise, when the forest is cut for the agricultural expansion of these commercial products, the loss of biodiversity and feeding spaces for bees is reduced affecting the production of honey.

4.2 Honey Demand in Belize

In Belize between 2016 and 2020 an average of 97,835 lbs. of Honey was produced annually. Table 3 shows total consumption of honey in Belize for the past 5 years. The estimated average weekly consumption of honey between 2016 and 2020 in Belize is 1881.4 pounds. Honey is not imported into Belize, however, during workshops and interviews, farmers argued that there is illegal imports of honey coming from Guatemala. No official importation of honey is reported.

Table 3. Belize Annual Consumption and Production of Honey in pounds (2016 to 2020)

Year	Consumption	Production	Imports	Illegal entry
2016	73,160	73,160	0	0
2017	82,747	82,747	0	0
2018	120,108	120,108	0	0
2019	113,000	113,000	0	0
2020	100,159	100,159	0	0

Source: SIB

4.3 Quality Standards of Honey Production in Belize

The Belize Bureau of Standards is tasked with developing, establishing, harmonizing, and promoting the use of relevant quality standards for key economic sectors/national development. By extension, developing standards for the agricultural sector pertinent to the 8 value chains identified under the IFAD RRB Programme is an opportunity to revise and introduce standards for the agricultural sector.

In 2004, Belize established the national honey standard for voluntary implementation (BZS 11: 2004) which requires revision and harmonization with current best practices. In an effort to establish a level playing field, it will be imperative to ensure that standards and other elements for Quality Systems¹ are introduced and applied in all aspects of the honey value chain.

¹ Quality Systems are made up of high-level institutions providing services in standardization, metrology (such as calibration), conformity assessment (such as inspection, testing and certification) and accreditation to ensure that products and services meet the requirements of customers as well as pursuing other objectives such as industrial development, trade competitiveness in markets of interest, food safety, health, the environment, climate change, among others.

The national standard specification for honey (BZS 11: 2004) can serve as the basis from which to revise and draw national requirements to meet the needs of the Belizean market, namely those requirements relating to honey produced by honeybees, inclusive of requirements of other relevant export markets of interest. The national standard requirements include, but not limited to the following:

- a) honey description classification such as blossom, comb, drained, extracted, filtered, pressed, etc.
- b) no additives.
- c) no objectionable matter, flavour, aroma, or taint absorbed during processing and storage.
- d) moisture content not more than 20%;
- e) water insoluble solids content.
- f) methods of analysis namely for determination of sucrose content, moisture content; added sugars, etc.;
- g) packaging and labelling.
- h) free of contaminants in relation to heavy metals and pesticide residues; and
- i) food hygiene free of microbiological requirements for fecal coliforms, salmonella, yeast and molds, among others.

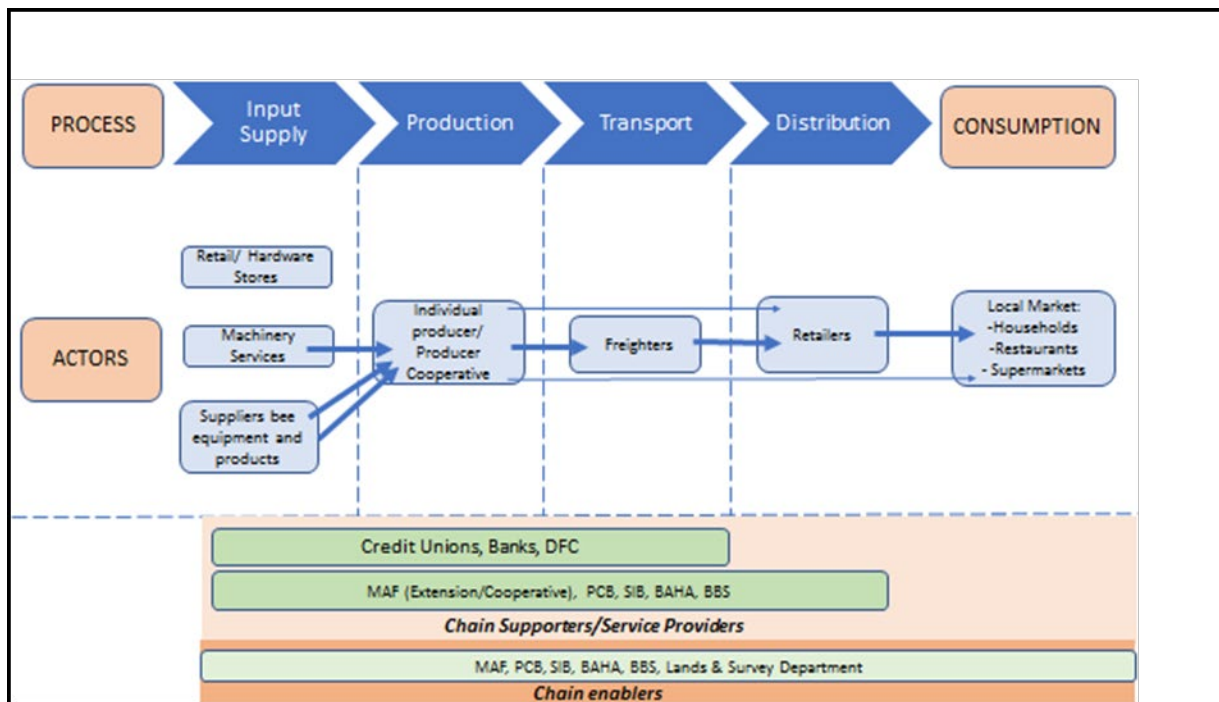
Currently challenges exist in relation to grading, added sugars, packaging and labelling, among others. This underpins the need to ensure that standards and quality systems are embedded in the honey value chain at all levels, thereby not only improving efficiencies and competitiveness, but by ensuring that the buyers and sellers needs are fulfilled.

5. Value Chain Mapping

The Honey Value Chain in Belize consists of input suppliers, producers, Collectors, retailers and consumers. Other actors are classified as supporter and enablers, and they provide financial and technical services or provide support to in developing policies to strengthen the value chain. Presented below in Figure 3 is the map of the Honey value chain in Belize.

5.1 Value Chain Map

Figure 3. Value Chain Map for Honey in Belize



5.2 Description of the Honey Value Chain Actors and their roles

Input Suppliers

The first actors in the chain are the input suppliers. These consist mainly of the machinery services providers, farm equipment companies, fuel service stations, carpentry shops that make the hive boxes, tailors that make the protective suits and hardware stores. Queens are sourced from existing hives or purchased from Mexico.

Producers/Farmers

In the honey value chain, the main producers are in Cayo District followed by Orange Walk and Corozal Districts. Specifically, in Cayo District many villages are involved in the production of Honey as for example, San Antonio, Seven Miles, San Jose Succotz, Benque Viejo, Bullet Tree Falls, CAmolote and Cristo Rey. Small, medium, large-scale apiaries are all intended for the local market, and they have 3 to 5, 50 to 80, and more than 200 hives, respectively. Around 100 beekeepers can be found in the country, 49 of them in Cayo District and 27 in Orange Walk District. (4 of those women).

Historically, there have been cooperatives in the honey sector, as a matter of fact, BCIE reported 5 cooperatives in 2008 (Cayo Quality Honey Producers, Northern Beekeepers, Maya Mopan, Cotton Tree Women Group, and Belize Honey Producers). However, cooperative's processes have not lasted over time and there are few producer organizations currently. The Orange Walk Beekeepers Pre-Cooperative is in the process of being formalized as a cooperative. Founded in 2016, it is comprised of 25 beekeepers. Cayo Quality Honey Producers Cooperative Society Limited (CQHPC) was reported active until 2021.

FAO (2016) states that "Oftentimes, small beekeepers also process, package and market/distribute their own honey". Another finding of this study is that one third of established beekeepers have extensive experience and skills in construction, efficient management of beehives and harvesting of honey, but two thirds lack basic knowledge on beekeeping.

Importers

There is no official data of legal importation of honey between 2016 and 2020. Official data requested from BAHA on the legal and illegal importation/confiscation of honey is not documented. Honey producers claim that contraband of honey does exist from Guatemala into the Cayo District, and Mexico. As official data shows no illegal confiscations have been documented between 2016 to 2020 (BAHA, 2021). BAHA and Customs officials patrol the borders for contraband activities and would do the confiscations at the many porous border entries, therefore, the official data regarding any confiscations is what this assessment will use. Legal importation of other related or by products of honey includes pollen, propolyst, royal jelly, and wax.

Intermediaries (Collectors)

Intermediaries are middlemen who collect and purchase honey locally and who sometimes develop long term relationships with farmers. There are three types of packagers/traders, namely, mixed producer-packager/trader, mixed importer-packager/trader, pure packager/trader, who bottle and distribute honey to the retail stores, market vendors and the hospitality industry. The Belize Marketing and Develop Corporation (BMDC) is also a major intermediary as they purchase in bulk to supply mostly the processors that bottle honey with a brand name.

Processor and Distributors

After Verena Foods left the honey processing industry in 2007, another processor, Hot Mama's, located in Cayo District, produces Orange Blossom Honey and Spicy Orange Blossom Honey from its apiary, however, it has stop operation during pandemic. The honey is sold in bottles of 1.25- and 10-ounce bottles and 8-ounce jars. Its products are only for shipping nationally so international shipping is currently not available.

Retailers

Retailers include market vendors, grocery stores, pharmacies and supermarkets in the major towns and cities.

Consumers

The most significant users of Honey are household users. Other main users include the tourist resorts, restaurants, hotel restaurants, bakeries, and fast-food establishments.

The main uses of honey are in cooking, baking, beverages, sweeteners, and medicine. There is no distinction in the market between smuggled honey and locally produced honey, as end consumers have no way of knowing the origin of the honey they buy from retailers.

5.3 CHAIN SUPPORT SERVICES AND ENABLING ENVIRONMENT

The honey value chain has recently had a series of projects and programs seeking the reactivation and development of the honey sector in the country. The Ministry of Agriculture and its agencies have become a constant source of support articulating projects for training, development, innovation and promotion of the cultivation and consumption of national honey. These projects are mostly a result of international cooperation and funding.

Belize Honey Production Re-Development Support Project signed on November 2018 between the Government of Belize and the CARICOM Develop Fund (CDF) is geared towards the provision of capacity building to new and existing beekeepers in Good Beekeeping Practices and other related topics. The overall objective of the Project is for “the expansion of the honey production subsector in Belize, targeting the delivery of new and additional capabilities to women and disadvantage youth to reap the advantages of employment and empowerment through sector specific knowledge acquisition”. Another project has been implemented by IICA since July 2021. IICA through the regional APP project is training to build the technical know-how on bee keeping of the Cayo Quality Honey Producers Cooperative (CQHPC). This initiative seeks to contribute to the development of the honey-value chain in Belize by improving the entrepreneurial, marketing, and organizational capacities of targeted organization, in this case the CQHPC. In order to complement these trainings, the project also provided the beekeepers with hive boxes that will enable them to expand their apiaries by at least 40%. This project was financed and implemented under the “Caribbean Action under the Programme entitled Agriculture Policy Programme (APP). Also, IICA has been engaged in capacity building with the Ministry of Agriculture technicians to improve services rendered to beekeepers to improve the beekeeping industry in Belize.

At the ministry of agriculture level, the actions of the Government of Belize have several support mechanisms for the agricultural sector in general and in particular for the strengthening of honey producers. Thus, the Apiculture Office in the Ministry offers training for beekeepers and stakeholders in good management practices (GMP) which includes production, disease management and control; capacity building of beekeepers in the processing and packaging of honey for value added and marketing; implementation of a National Honey Certification Program; implementation of a control and treatment program for the Varroa Mite; revitalization of the National Bee Council; conservation of flora and reduction of fires fostered through a more sustainable use and protection of natural resources; and facilitation of beekeeping materials and equipment.

We would like to point out that despite all these activities, producers participating in the validation workshop expressed their opinion that the support from the ministry is not evident and not at all sufficient. This is yet another example of the asymmetry that exists between what the authorities who seek to support the sector say and what beekeepers believe is their reality.

5.4 Profit Margins and Shared Benefits along the value chain

Cost of production and prices across the value chain were obtained by interview with producers and technicians. Table 4 shows an analysis of the profit margins and shared benefits along the value chain using average prices for the 5-year period and discussed with members of the value chain during the workshop and interviews during the last part of the year 2020.

Retailers sell honey to consumers for Bz\$4.37 per pound, honey that they buy from producers for Bz\$3.63 per pound. Retailer's margin of commercialization is Bz\$0.74, around 17% of the consumer price. Honey producers report total input cost of Bz\$2.33 per pound (Table 4).

If we concentrate on the value added that farmers and retailers are responsible for, we could approximate the profit margins for each actor. As value-added is basically defined as returns to labour and capital plus taxes, we will need information on investment and taxes to approximate profits. However, seeing the participation of each actor in the value-added is a proxy to profits. Thus, our analysis indicates that farmers are responsible for 73% of the value added (1.3Bz\$/Lbs.) and retailers for 27% (0.49Bz\$/Lbs) (see figure 4).

Table 4. Profit Margins and Shared Benefits along the Value Chain for Honey

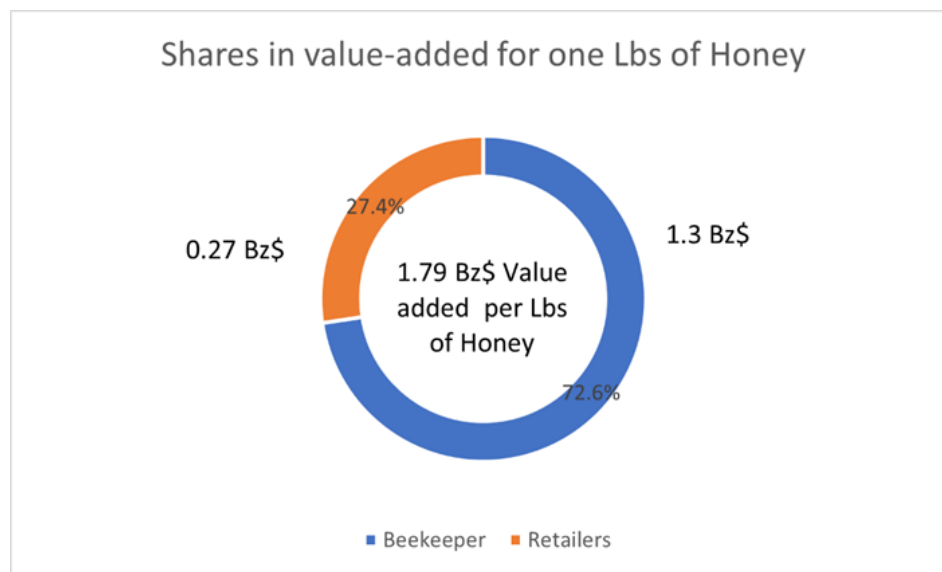
Description	Actors		
	Producers	Retailers	Horizontal Sum
Purchase Price (Bz\$)	0.00	3.63	3.63
Total Input Cost (Bz\$)	2.33	0.25	2.58
Sale Price (Bz\$)	3.63	4.37	8.00
Market Margin (Bz\$)	3.63	0.74	4.37
% share of margin	83.1	16.9	100.0
Profit Margin (Bz\$)	1.30	0.49	1.79
Share of Value-added (%)	72.6	27.4	100.0

*Based on 5-year average consumer price (source: SIB)

Missing from our analysis is the impact that intermediation could have in the sharing of profits (value-added) between farmer and retailer. Interviews and discussions during workshops point out toward transportation services and re-selling of honey by collectors. Therefore, the data here

shows that for the producer the cost of inputs is high, but it must be also considered that it includes other intermediation services and even bottle preparation. We assume here that honey production entails land, equipment, labour cost and in most cases their own bottling and selling. A final note, given the retailers cost structure where honey purchased from beekeepers is an average price of 3.63Bz\$/Lbs, inventory management become paramount for the retailer's business. Bottle size and materials, right labelling, disposal/reutilization of containers, among other issues, were raised in our research. Retailers are inclined to point fingers to producer/beekeepers and producers argue that they have no choice but use the cheaper/more accessible bottles. The value chain approach implemented by the RRB is instrumental to overcome the asymmetric information affecting the whole value chain. It seems like searching for alternative containers and more sustainable options could benefit the honey business for everyone involved in the value chain.

Figure 4. Share of Profit of Actors for Honey Value Chain in Belize.



6. Market Analysis

Honey can be produced in any district of Belize and is available year-round. The main honeybee that is used is the Africanized bee (*Apis mellifera scutellata*).

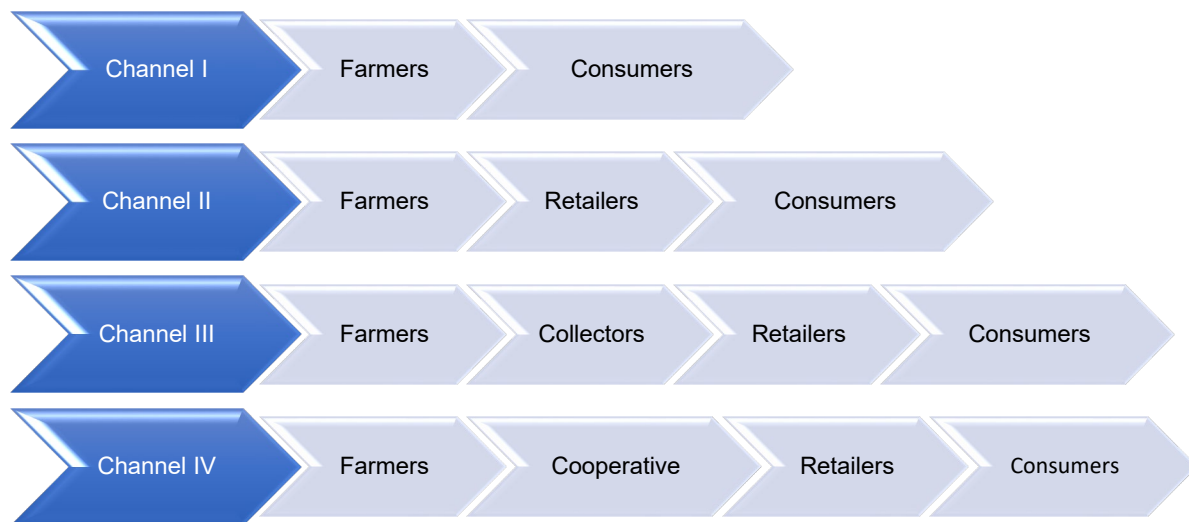
6.1 Market Size

The average weekly consumption of honey in Belize between 2016 to 2020 was 1881.4 pounds. The national average consumption between 2016 and 2020 was 97,835 lbs/year. For the local consumption market, the amount produced may be sustainable to maintain a reasonable market price. In the past, 15 to 25 years ago, Belize exported good quality honey to the American and European markets, there is still the potential for this product, but if contraband is persistent many beekeepers may decide to go out of business.

6.2 Market Channel

The main marketing channels identified from the point of production to consumers through intermediaries for Honey in Belize are as follows.

Figure 5. Main Marketing Honey Channels



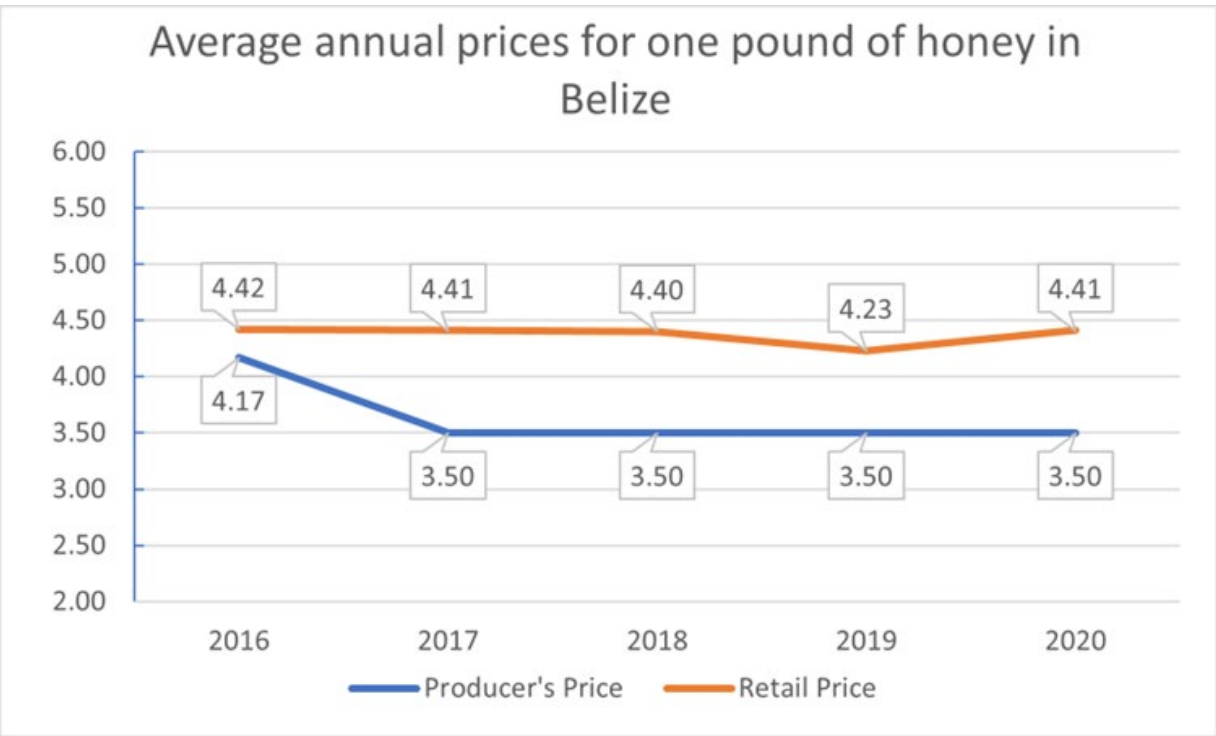
Of these commercialization channels, farmers and technical assistance professionals argue that channel IV should be pursued because it offers the main advantage of reducing costs (collecting, storing, and marketing) and brings the possibility of collective action for marketing, negotiating, and input purchasing. However, not everyone believes that previous and current cooperatives

have demonstrated the capacity to effectively serve farmers well. Their opinion is that cooperatives could be doing better to promote honey production and cost saving.

6.3 Price Trend of Honey in Belize

A review of the official public records on producer and consumer prices per pound of honey reveals, for the period from 2016 to 2020, a constant price of Bz \$ 3.50 for producers and a stable price to consumers (minimum fluctuation) for consumers of around Bz \$4.37/lb. (see Table 5 and Figure 6). On the other hand, this annual data obscures the real market fluctuation in prices found in the retail market. Thus, the consumer price varies as the producers, or retailers, will bottle the honey in many different presentations and set the price accordingly. Some are in pints, quarts or litters, can include fancy labels, or are packaged in containers.

Figure 6. Price trend for Honey in Belize (2016 to 2020) at Producer's and Retailer Price per pound (SIB)



Producer's price in 2016 is reported to have been Bz \$4.17, however, it was not possible to find an explanation as to why the price went down to Bz \$3.50 in 2017 and has remained there ever since. Furthermore, given the reported differences of prices under different presentations (size, appearance, etc.) for honey to consumers, it is puzzling how the Bz \$3.50 number was calculated for the average producer's price.

Table 5. Average Prices for Honey 2016 to 2020

Year	Producer's Price	Retail Price
2016	BZ\$4.17	BZ\$4.42
2017	BZ\$3.50	BZ\$4.41
2018	BZ\$3.50	BZ\$4.40
2019	BZ\$3.50	BZ\$4.23
2020	BZ\$3.50	BZ\$4.41

Similarly, the consistency of the estimates for the retail prices is questionable given the fact that consumers are paying different prices mostly because of perceived appearances of the product. It was impossible to assess if the perceived differences in appearances were connected to issues of quality or just aesthetic attributes.

7. Supply Chain

The supply chain considers the production, profitability, and cost of production across the value chain.

The total production of honey in 2020 in the country was an estimated 100,159 pounds valued at BZ \$441,701.19 (SIB, 2020). The main suppliers of honey in Belize are individual beekeepers or cooperatives. According to a FAO report “individual beekeepers have recorded productivity levels of 1.67 units/55-gallon drums per 10 hives during a year of good conditions, and as low as 0.3 units/55-gallon drums per 10 hives during a bad year.” (Harrison, 2016, page 6).

7.1 Amount Supplied

Table 6 shows the average annual supply of honey for local consumption for the last five years. According to BAHHA there is no importation of honey into Belize. The main suppliers of honey in Belize are individual producers and those organized in cooperatives.

Table 6. Average Annual Supply of Honey (lbs.) (2016 to 2020)

District	Total Annual Production (Lbs.)				
	2016	2017	2018	2019	2020
Corozal	11,220	5,700	15,686	11,915	15,690
Orange Walk	28,420	14,420	22,525	27,015	22,525
Belize	0	25	100	75	855
Cayo	32,350	55,590	70,126	66,365	52,519
Stann Creek	1,170	1,170	1,495	1,695	4,359
Toledo	0	5,842	10,176	5,935	4,211
Total	73,160	82,747	120,108	113,000	100,159

Cayo District leads the rest of the districts in production of honey: 52% of all honey produced in 2020 came from this district. Cayo District is followed in importance by Orange Walk and Corozal. Together they were responsible for 38% of honey production in that year. The northern region of the country concentrates most of the honey production.

Table 7 does not show a stable growth in the production of honey for the past five years. The data presented in terms of production and number of hives was questionable according to the participants at the workshops. As mentioned previously, available national statistical data is what we can analyze now for this VCMA since there is no specific information at the producer level. Inconsistency of official data can be seen by comparing Table 7 and Table 6 data for the year 2019 specifically for the Cayo and Orange Walk Districts. How can that district produce 66,365 lbs of honey with it reporting to have zero hives? In verbal communications with the Cayo Agriculture Department, they stated that there were apiaries in 2019, but for some reason this was not recorded in the national agriculture statistics. The same is applicable for the Orange Walk District.

Table 7. Total Number of Hives in Belize 2016 to 2020

District	Number of Hives				
	2016	2017	2018	2019	2020
Corozal	0	450	363	363	432
Orange Walk	0	704	448	0	448
Belize	0	2	7	14	0
Cayo	161	1,333	1,256	0	1,680
Stann Creek	12	13	27	27	101
Toledo	0	408	459	201	0
Total	173	2,910	2,560	605	2,661

7.2 Cost of Production

The data collected from the Ministry of Agriculture and Statistical Institute of Belize estimates BZ\$ 2.33 to produce a pound of honey. Although this may seem accurate more detailed work is needed in conducting proper feasibility studies for this product. There is so much to gain from understanding different cost structures and a better description of how the price to consumer is determined.

Harrison (2016) reports on financial projections for two types of operations: a 10-hive subsistence farming operation (expanding to 30 after the fifth year) and a 50-hive commercial operation

(expanding to 250 hives after fifth year). Those projections are in Annex 1, *Honey Profit & Loss Estimates*.

Table 8 recaps the breakdown of costs for the subsistence and commercial operations. Cost of production for the subsistence operation when it reaches 30 hives is BZ\$1,006 per drum while for the commercial operation, when it reaches 250 hives, is BZ\$649 per drum. Transforming the production cost per drum (1 drum equals 55 gallon equals 640 pounds) to cost of production per pound, we get a cost of production of Bz\$1.59 and Bz\$1.01 per pound for the subsistence and commercial operations, respectively. According to our analysis, the commercial system could have up to 33% less cost per pound of product than the subsistence system.

As for the cost structure, we see that both systems are similar, the percentage for hives & boxes, transportation, materials, equipment are similar for both systems. The difference between the two systems lies in labour and financial spending. While the subsistence system spends 22% on labour, the commercial system spends half of that. On the other hand, financial expenditure in the commercial system is estimated at 27% of production expenditure while in the subsistence system this is less than 16%. As expected, intensifying the production system requires greater access to financial resources, while a subsistence system relies more on hired and family labour.

Arguably, the cost of production reported by the Ministry of Agriculture is comparable with what Harrison called subsistence operation. However, caution must follow such comparisons since Harrison report data for 2015. Also, the low cost of production (Bz\$1.01) for the commercial operation reported above, is just an indication of how much space for improvement in cost efficiency could be gained. Technical assistance and business management are suggested for achieving cost efficiency in subsistence operations.

Table 8. Cost Structure for Two Honey Production Systems (Subsistence and Commercial) in Belize

	Subsistence Producer (year 5, 30 units)		Commercial Producer (Year 5, 250 Units)	
Hives & boxes	BZ\$ 750	25%	BZ\$ 4,500	27%
Transportation	BZ\$ 685	22%	BZ\$ 3,460	20%
Labour	BZ\$ 685	22%	BZ\$ 1,617	10%
Materials/gears	BZ\$ 147	5%	BZ\$ 732	4%
Equipment rental	BZ\$ 147	5%	BZ\$ 732	4%
Location rental	BZ\$ 147	5%	BZ\$ 1,380	8%
Financing	BZ\$ 500	16%	BZ\$ 4,500	27%
Total cost	BZ\$ 3,061	100%	BZ\$ 16,921	100%
Total number of hives	30		250	
Total honey output	3 DRUMS		23 DRUMS	
Total cost per drum	BZ\$ 1,020		BZ\$ 649	
Cost per Pound	1.59		1.01	

Own elaboration based on Harrison (2016)

8. Climate Change Vulnerability of the Honey Value Chain

While value-chain dynamics is commonly analysed and described in 3, 5 or 10 year periods, and most experts will avoid market prospects or projections beyond the 10 year mark, any climate analysis is described in longer periods. Climate dynamics is rarely described in short periods of years as experts understand the limited predictable value of 3, 5, or 10 year forecasting. In addition, climate forecasting, in general terms, will be useful for the decision-making process in the honey value-chain if it provides relevant information on how the future climate could affect production, productivity, accessibility of resources, or any other variable affecting the livelihood of the honey business.

For this report, we bring in the context of the honey value-chain findings produced by simulation, index, and modelling explained in detail in the CVA reports. Even with the explanation given here, those who want to understand methods and techniques used to obtain these findings should read the CVA reports.

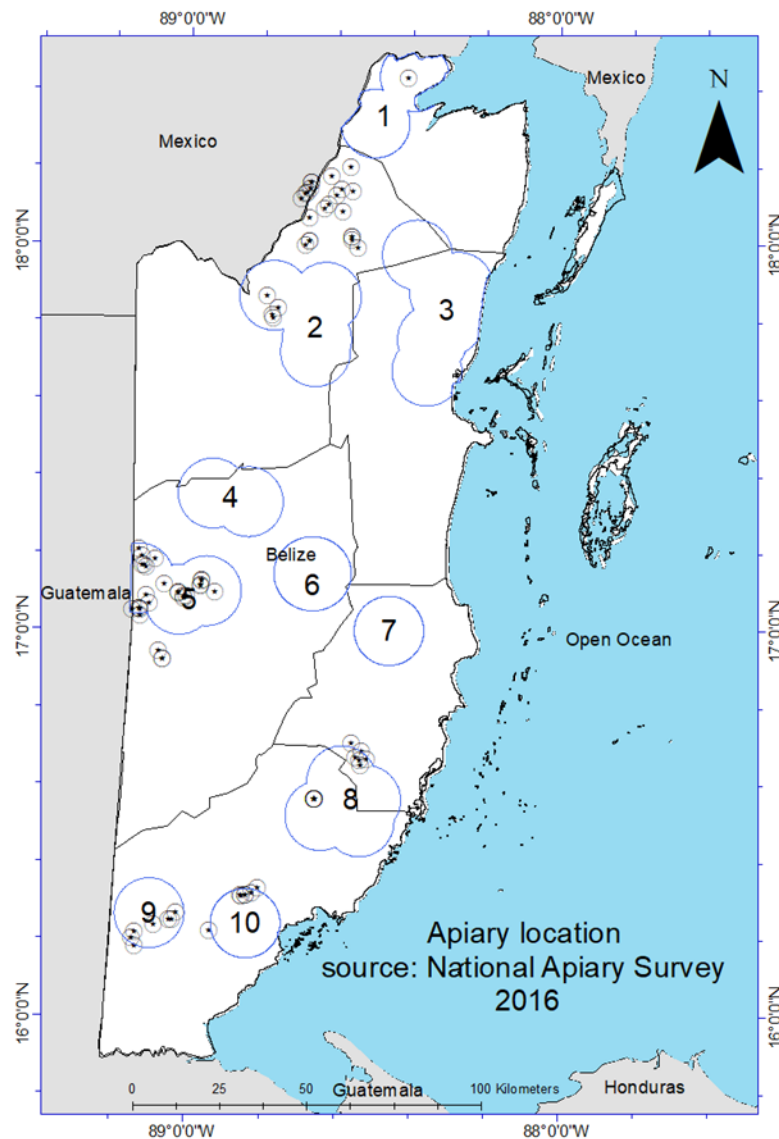
Using maps and a color-coded system to understand those changes, a general futuristic perspective to beekeeping can be described. Second, findings specifically for the 10 intervention areas of the RRB program are presented. Aiming to describe the uniqueness of each area and how this could bring similar or a very different picture of the future for honey production, we identify losses and gains in suitability or adequacy in percentages of the adequacy from the base line data.

8.1 Climate Adequacy for Honeybee (*Apis mellifera*)

Figure 7 shows the map of Belize with the apiary locations, as well as the intervention areas of the RRB programme. In 2016, according to the National Apiary Survey, apiaries were in all districts but Belize and Stann Creek. The majority of apiaries were in the Cayo, Orange Walk and Toledo districts. Figure 7 also shows intervention areas in Cayo (5), and in Toledo (9, 10, 8), with the most significant number of apiaries, respectively. Four of ten intervention areas where the RRB Programme is working, do not reported apiaries. Also, a major location for apiaries is not covered under the areas of intervention of the RRB Program and it's shown in the map in the north-eastern part of the Orange Walk district.

The climatic suitability for the species *Apis mellifera* was calculated using the MaxEnt tool (Phillips et al 2006). This tool uses as inputs a set of data on the presence of the species in which the name of the species and its location must be recorded in coordinates (longitude and latitude) of each collection site and secondly a set with the bio-climatic variables of the area under study.

Figure 7. Location of Apiaries in Belize and of RRB Intervention Areas



MaxEnt runs for the species *Apis mellifera* resulted in the suitability maps shown in Figure 8. The comparisons shown there are based on an assembly of climate projections from 21 climate

models (see CVA report) and two emission scenarios RCP2,6 and RCP8,5. Both scenarios (RCP2,6 and RCP8,5) show increases in the average temperature towards 2050. RCP2.6 shows average temperature values that exceed the baseline between 0.7°C in Belize and Corozal up to 1.5°C in Toledo. On the other hand, the RCP8.5 scenario shows larger increases in temperature ranging between 1.6°C and 2.5°C above the baseline in Belize and Toledo, respectively.

The first map in Figure 8 shows the current suitability for *Apis Mellifera*. Low suitability is present in the northern regions of Belize especially in Corozal and the coast of Belize districts. The other maps in Figure 8 show the evolution in the climatic suitability of Belize for honeybees of the species *Apis mellifera* under RCP2,6 and RCP8,5 scenarios. The increase in areas in which the implementation of hives would present significant climatic challenges in the areas adjacent to the districts of Cayo, Stann Creek and Toledo can be seen. While in the northeast of the country the conditions of suitability would be disappearing the areas with conditions of very low to medium suitability.

Figure 8. Adequacy Index of the species *Apis Mellifera*

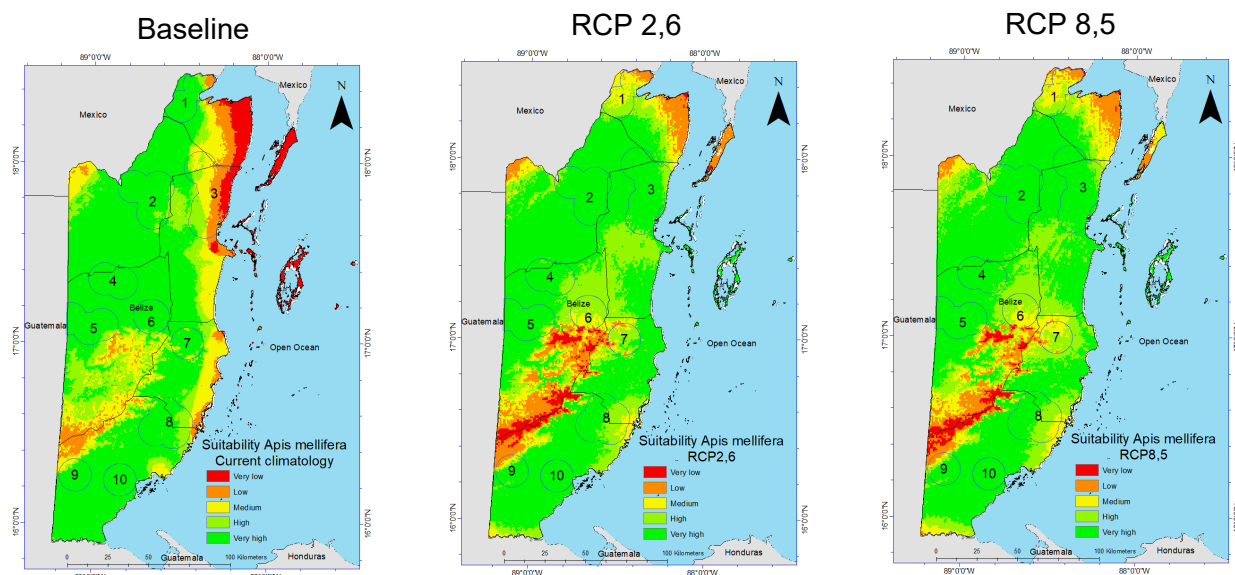
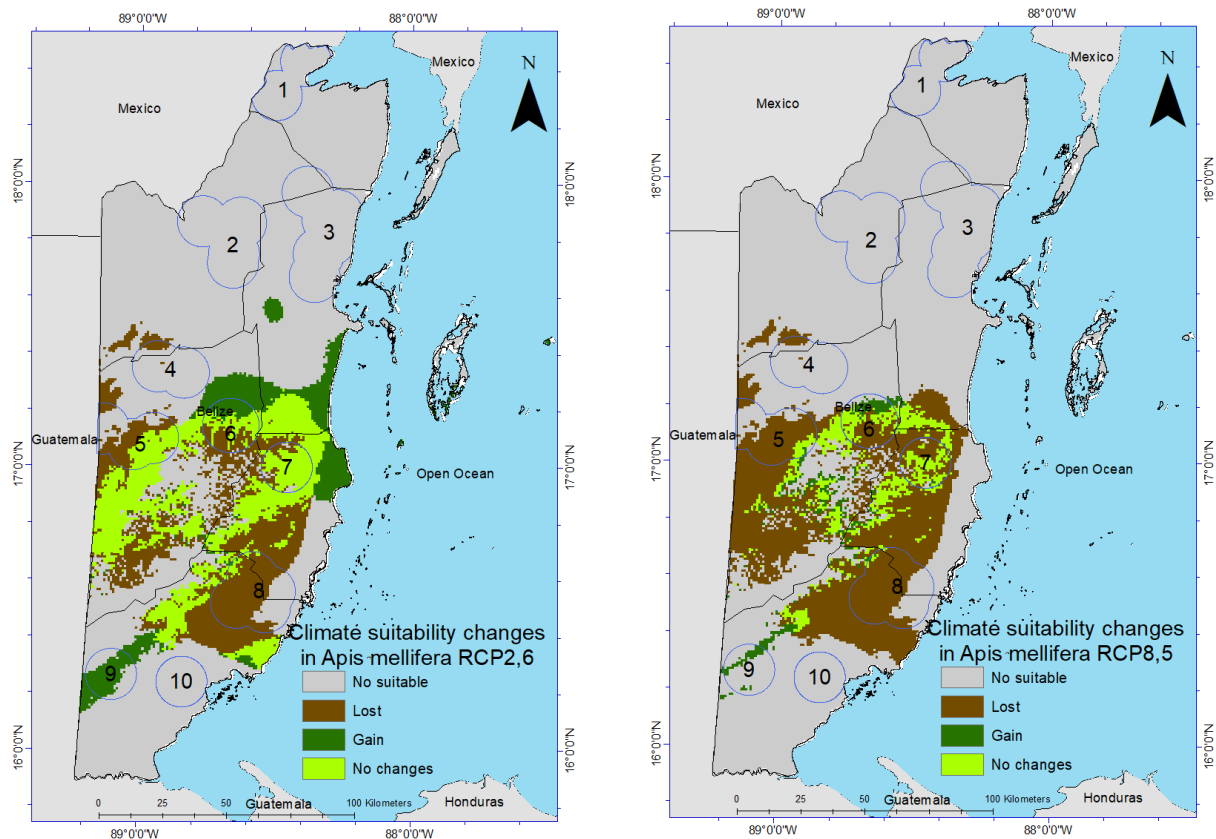


Figure 9 shows gains and losses of suitability for the species *Apis Mellifera* in Belize. Loses are coded with the brown color, gains with dark green. The light green shown in the maps means no changes in the suitability for the species. Again, these gains and losses are built under two different scenarios of how climate change will affect Belize.

Under RCP2,6 scenario, Toledo and Cayo Districts lost suitability, while parts of Belize District will gain. RCP8,5 scenario shows even heavier losses of suitability for the species *Apis Mellifera*. When intervention areas for RRB are the focus, area 5 and 8 will see the major losses of suitability. An interesting case is the area of intervention 10 in Toledo District where projections show areas of gaining suitability.

Figure 9. Changes in Climate Adequacy for *Apis mellifera* by Baseline and Future Climate Change Scenarios



9. Constraints and Opportunities

The production of honey is being given priority by the Government of Belize through the Resilient Rural Belize (RRB) Program. This in itself is very positive for this industry; therefore, all the challenges and opportunities need to be examined in detail to strengthen the value chain. Presented below are constraints and opportunities identified in the Honey Value Chain.

Table 9. Challenges and Opportunities for Honey Value Chain in Belize

Chain link	Constraints	Opportunities
Input Supplies	High costs of inputs: <ul style="list-style-type: none"> • Very high cost of inputs • Cost of fuel 	<ul style="list-style-type: none"> • Farmers' s organizations, like cooperatives, could be engaged in buying volume and transferring cost savings to individual farmers. For the honey chain, a potential reduction in the cost of inputs could help significantly in reducing the cost of production. • The prices of inputs may not change rapidly enough but efficiency in the application could be tremendous. Training on the basics of efficient use could reduce the total bill paid by farmers.
	Queen Bee Quality and Availability: <ul style="list-style-type: none"> • There is a need to constantly change queens in the hive and to have 	<ul style="list-style-type: none"> • Opportunity for collaboration and strengthening of relationships between farmers, agronomists, and local extension services for training in Good Production/Apiculture Practices. • Facilitate importation of quality queen bees and establish a local queen rearing facility to supply Beekeepers.

Chain link	Constraints	Opportunities
	queens be readily available in the country.	
Production	Limited Knowledge on management of apiaries <ul style="list-style-type: none"> Poor knowledge on the control of pests 	<ul style="list-style-type: none"> Training on proper apiary management and pest control. Information sharing on alternative inputs (i.e., organic pesticides) could be promoted by local extension services. The information given to the farmer must be calibrated/reviewed together with the input provider. The training and what the farmer learns whenever they buy inputs need to be correlated particularly for management of queens.
	Annual Production Plan <ul style="list-style-type: none"> Especially if the production will be boosted for the export market and have the capacity to maintain the demand. 	<ul style="list-style-type: none"> Training in APP and/or technical assistance to organize an annual production plan for a constant supply of honey. The export market for honey is a great opportunity for organized beekeepers: support for the consolidation of cooperatives is needed. Informal contracts are one step closer to formal (commercial) contracts and promoting APP could accelerate the qualitative shift in the way the value chain operates. Small-scale beekeepers may not see immediate benefits from implementing an annual production plan because they may be using collectors to get to market. However, it is possible to think that those beekeepers may benefit from coordinating their small-scale operations with a “group” annual production plan, which will bring the possibility to coordinate transportation and direct sales to include better price conditions.

Chain link	Constraints	Opportunities
Harvest and Post-Harvest	Climate Vulnerability <ul style="list-style-type: none"> Farmers depend on the natural flora for honey production and not much emphasis on climate change. 	<ul style="list-style-type: none"> Search for international funding to access grants for construction of beehives and support entrepreneurs exploring models and constructions technics of adaptation to climate change. Need information on climate change and technical assistance on possible reforestation and plant varieties that will flower during the year in addition to feeding methods for bees during seasons without sufficient flowers.
	Road Conditions <ul style="list-style-type: none"> Poor road conditions between distribution and collection centre. 	<ul style="list-style-type: none"> RRB could consult with the Government area representative to address this issue. What should be avoided is a fast deterioration of the road improvements because of lack of maintenance or poor monitoring. Here, communities should be most involved in providing monitoring. Identify funding and storage facilities affordable and appropriate for the beekeeper. Require that business plans supported by RRB include land ownership encouragement: provide information about the process of legalizing ownership.
	Lack of Processing <ul style="list-style-type: none"> Producers do very little processing and value-added products. 	<ul style="list-style-type: none"> Provide technical assistance for beekeepers to enter in more processing and value-added products. Channelling the potential of honey processing requires a) engaging and supporting women enterprises, b) revitalizing beekeepers post-harvest infrastructure allowing storage for longer periods minimizing losses, and c) harnessing local knowledge in crafting-transformation of honey, taking advantage of market trends that seek alternative products to industrial products.

Chain link	Constraints	Opportunities
Marketing and Distribution	Quality of honey is not consistent <ul style="list-style-type: none"> Quality is deficient Need for post-harvest facilities. 	<ul style="list-style-type: none"> It should be explored why there is not a quality premium paid for those beekeepers following the quality standards. If a beekeeper does not perceive the benefit, it will be difficult for him to adhere to standards. Either there is no quality premium possible to offer, or the standards are not clear to beekeepers. If exports increase the importance of the quality standard as a requirement for carrying out business will become even more relevant; quality manual adapted to the beekeeper's language and circumstances should be useful for the future of the value chain. Organized groups or cooperatives need to understand and request the development of standards for the honey market. Current cooperatives may be able to work much easier with the Belize Bureau of Standards, but they need coaching and technical support to discuss the standards. Conduct a study that demonstrates impact of plastic bottles in the environment and options/alternative for retailing.
	Poor Business Practices <ul style="list-style-type: none"> Poor record-keeping results in a poor understanding of the cost of production Lack of formal contracts with intermediary resulting 	<ul style="list-style-type: none"> A beekeeper needs to think and act like a businessman/businesswoman, it is essential for beekeepers to have the knowledge to operate as a business. In most cases, training on record-keeping, cost of production estimation, and knowledge about contracts and negotiation should be the basic content of the training on entrepreneurship for beekeepers. Good business practices training should also be given to the cooperatives. It was argued that cooperatives need to improve their relevance to members who need to see clear examples of why belonging to a cooperative is beneficial. Marketing

Chain link	Constraints	Opportunities
	<p>in a late payment to a beekeeper for honey sold</p> <ul style="list-style-type: none"> No official medium to learn about price information on the market 	<p>of produce, collective negotiation, and saving on the cost of inputs, should be obtainable by strengthening the cooperatives.</p> <ul style="list-style-type: none"> Manuals and simple brochures about business management which are easy to complete/read are necessary for beekeepers. Consistency of services that provide price information to the producer can be achieved using access technologies such as cell phones. Here, it will first be necessary to launch a pilot program to define the ideal format that reaches the beekeeper and that is easy for them to interpret and use.
	<p>Poor access to finance</p> <p>Financial institutions require collateral such as land titles, however, many of the farmers are squatters and do not have land titles to use as collateral to access finance.</p>	<ul style="list-style-type: none"> Poor access to finance is normally a result of limited collateral value to offer to banks, however, access can be improved if the beekeeper can demonstrate administrative skills: bookkeeping, inventories, etc. NGOs and similar sources of financial support should be obtainable with better business practices. Improving cooperative capitalization could translate into better financial access for the beekeeper. Undercapitalization at the cooperative level limits the capacity to provide advance payments or credit to members which are critical for honey harvesting/production. Training in financial management at the cooperative level could increase the capacity to provide those services to beekeepers. Appropriate business training with an emphasis on investment and financial management for cooperatives should reduce the need to find often high-cost credit for the organization. Even if the cooperative has low capitalization, it should not mean that it needs to work with expensive capital: learning where to borrow and

Chain link	Constraints	Opportunities
		<p>knowing how to manage the loans are essential to guarantee that the cooperative is working with the cheapest capital possible.</p> <ul style="list-style-type: none"> Land ownership should be encouraged as much as possible knowing that it could grant beekeepers access to credit and work capital. The Lands department officials may need to train and inform farmers on the process of acquiring land legally. It is recommended that a study be conducted encompassing the 10 intervention areas of the program seeking to explain why farmers do not formalize land ownership.

10. Conclusions

Honey Value Chain Potential. Honey is produced in all the districts in Belize. The Cayo District is the leading producer of Honey followed by the Orange Walk and Corozal Districts. All districts have the potential to produce honey, the west and southern districts may have greater potential given the dense tropical flora and the projected impact of climate change. The northern districts continue their interest in this industry. There is clear market potential for local honey, but inconsistent quality and availability, poor packaging (plastic) and presentation must be improved. Also, contraband of honey has been, and will continue to be, a dangerous reality for national honey production. Post pandemic markets for honey will most likely see the returned threat from illegal honey imports from neighbouring countries.

Despite challenges, local producers can be empowered to supply the local demand and explore potential import substitution of value-added products.

Existing support for value chain development. The Ministry of Agriculture, Food Security and Enterprises has in its policy to support and prioritize honey production as part of the larger agricultural strategy to conduct import substitution and export opportunities. Technical and financial services are provided by supporters and service providers along the value chain. Most farmers do not use financial institutions for financial assistance because they don't have sufficient collateral such as land as required by these financial institutions.

Cooperatives potential to dynamized opportunities in the value chain. Strengthening of the Honey Value Chain requires strengthening of the cooperatives who are the main produces of honey. All beekeepers require technical assistance and training in production/apiculture Good Practices, as well as training in basic apiculture business management. Gains in cost efficiency and collaboration among actors to solve the issues related to the honey bottles are two of the actions where cooperatives could be instrumental. There is a need to develop a national queen bee rearing facility and organize the producers in order to once again be competitive in the international market for honey. Belize is known for many of its good quality agriculture and honey products.

Outside menace to beekeeping future. Expansion of commercial agriculture and real-estate developments is a permanent threat to beekeeping, limiting its growth and putting in danger existing apiaries. Also, losses in suitability because of climate change, in particular for the area of

intervention 5 of the RRB program, should be warnings of tougher times to come for the industry, if scales of adaptation to climate change and interagency cooperation to regulate effectively the use of agrochemicals are not put in place.

Limited processing/post-harvesting capacity. Moving from post-harvest treatments or simple first-stage processing is proving a challenge. Among other things, this reflects lack of technical capacities and skills, low access to capital for investment in processing equipment and machinery, restricted access to services for processing, or reduced opportunities in local markets for higher-value processed products. For value chains oriented to regional and international markets, or with the potential to do so, this involves relatively high risks due to high and rigid sanitary and quality standards (traceability, cold chain, etc.) that are subject to rapid change.

Covid-19 affectation to the honey value chain. Sanitary restrictions for mobility of people and vehicles produced a contraband reduction for several crops mainly from Mexico. Illegal imports, legal imports, and national production before the Covid-19 pandemic was commonplace in major markets, especially the city markets. As reported in the CVMAs studies, contraband has been reduced and national production has benefited in a less competitive market. What will happen if restriction of mobility is eliminated? Nothing in the studies suggested that consumers are finding national production to be of a better quality or that they are ready to give up the imported goods, therefore, RRB should prepare a strategy for when contraband returns. It is expected that without an infusion of training, investment capital, and technical assistance, many of those sectors analysed will return to a downward trend.

11. Final comments on limitations of the study

The following list includes major challenges for achieving the best honey value chain and market assessment.

1. It was observed that **women participating** as members, managers and leaders was limited during the workshops and in the interviews. Although suggested by some participants, Covid-19 restrictions do not seem to explain the gap in participation between men and women, nor between youth and adults. An explicit action plan for gender equity should be drafted, discussed, shared, and put in place with all members working with the value chain approach.
2. **Short sightedness as the new norm.** Covid-19 had everyone focusing on the short-sightedness of the event, losing the potential of the study to reflect long term strategies. For example, having no tourism makes people ignore the opportunities that linking farmers to tourism supply chain represent in the long run. Similarly, many people that lost their jobs, moved to micro farming affecting the normal agricultural supply in many of the products studied. Of course, this is just a logical attitude under crisis mode, but it could imply serious limitations when a value chain approach is used to harness governmental intervention in the sector. Finally, the Belize tourism sectors meltdown under Covid-19 pandemic serves as a reminder of how important diversification is for Belize agriculture value chains targeted by the VCMA studies. Among agriculture officers and extensionists, opportunities to connect farmers to the tourism supply chains were not at all present in discussions and workshops carried out for the VCMA studies. Such inattentive situation, probably due to current emphasis on national consumers and effects of the pandemic, should not diminish the tourism sector as a source of diversification. It is expected that as the tourists return to Belize, opportunities to link farmers to the tourism supply chain will as well return. Here, challenges in quality and acceptance of standards that have been already identified in the VCMA studies will be paramount.
3. We found that **data inconsistency** of official sources is a serious limitation for any VCMA analysis. When data of production, yields and acre-harvested do not match, it is possible that Belize's agencies in charge of collecting the data will need to revisit the way that they

are producing the data. It is suggested that RRB brings this observation to SIB for further consideration.

4. Making sense of working with **value chain approaches**. During the process of carrying out the study, it was clear that not all agriculture extensionist and technicians understood what it is to work with a value chain approach. For some, the approach still works mostly to support farmers, which is a misunderstanding. The guiding principle is to support the whole chain by creating more options to create value. If the creation of value is under the scope of the farmer or with the processor, that is fine with the value chain approach. It was difficult to conduct value-chain workshops were farmers thought it was a space for them to present demands and discuss only issues concerning to them. RRB needs to consciously remind participants and partners the essential features of the value chain approach.
5. The major challenge for making sense while working with the value chain approach is exemplified by the **misrepresentation of what a middleman (collector) does** for the value chain. Ignored are the essential changes on space and time it brings to the value of products: relocating, holding them to times that are more convenient, assuming various risks by stocking inventories. Why is the bias against the middleman so persistent? Part is explained by cultural perceptions as mere cheaters, part the misjudging of how difficult it is to create value of space and time. Farmers having mastered the complexities of the production process have seldom also mastered the very different complexities of inventory management and numerous other services performed by middlemen in the process of relocating products in time and space. Value chain approaches demand integrating middlemen into the negotiation/concertation table where actions for the value-chain are being discussed; having the technical team understand this is paramount.

12. References

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13. Annexes

Annex 1. Honey Profit & Loss Estimates

PROFIT & LOSS PROJECTION (10 HIVES SUBSISTENCE PRODUCER)							
1-Sep-15	YEAR #1	YEAR #2	YEAR #3	YEAR #4	YEAR #5	YEAR #11	
HIVES (10 UNITS @ \$200)	2000						0
BOXES (5 UNITS @ \$150)		750	750	750	750	750	750
TRANSPORTATION	468	515	566	623	685	685	1103
LABOUR	468	515	566	623	685	685	1103
MATERIALS/GEARS	100	110	121	134	147	147	237
EQUIPMENT RENTAL	100	110	121	134	147	147	237
LOCATION RENTAL	100	110	121	134	147	147	237
FINANCING	200	275	350	425	500	500	375
TOTAL COST	3436	2385	2595	2823	3061	3061	4042
TOTAL NUMBER OF HIVES	10	15	20	25	30	30	60
TOTAL HONEY OUTPUT	1 DRUMS	1.5 DRUMS	2 DRUMS	2.5 DRUMS	3 DRUMS	6 DRUMS	
TOTAL COST PER DRUM	3436	1590	1297.5	1129.2	1020.33	674	
PRICE PER QUART (750ML)	9	9.05	9.1	9.15	9.15	9.45	
NO. OF QUARTS	270	405	540	675	810	1620	
REVENUE	2,430	3,665	4,914	6,176	7,412	15,309	
NET INCOME	-1,006	1,280.25	2,319	3,353	4,351	11,267	

Source: by Harrison (2016)

PROFIT & LOSS PROJECTION (50 HIVES START-UP)										
	YEAR #1	YEAR #2	YEAR #3	YEAR #4	YEAR #5	YEAR #11	YEAR #12	YEAR #13	YEAR #14	
HIVES (50 UNITS @ \$300)	1500	1500	1500	1500	1500	0	0	0	0	
BOXES (50 UNITS @ \$150)		750	1500	2250	3000	2250	1500	750	0	
TRANSPORTATION	2600	2600	2860	3146	3460	3806	4187	4606	5067	
LABOUR	780	936	1123	1348	1617	1940	2134	2348	2583	
MATERIALS/GEARS	500	550	605	666	732	769	807	847	890	
EQUIPMENT RENTAL	500	550	605	666	732	769	807	847	890	
LOCATION RENTAL	300	480	780	1080	1380	1449	1521	1597	1677	
FINANCING	1500	2250	3000	3750	4500	3750	3000	2250	1500	
TOTAL	7680	9616	11973	14406	16921	14733	13956	13245	12607	
TOTAL NUMBER OF HIVES	50	100	150	200	250	250	250	250	250	
TOTAL HONEY OUTPUT	5 DRUMS	8 DRUMS	13 DRUMS	18 DRUMS	23 DRUMS	25 DRUMS	25 DRUMS	25 DRUMS	25 DRUMS	
TOTAL COST PER DRUM	1536	1171	883	731	649	589	558	530	505	
PRICE PER DRUM	1300	1333	1366	1400	1435	1470	1506	1544	1583	
REVENUE	6,500	10,664	17,758	25,200	33,005	36750	37,650	38,600	39575	
NET INCOME	-1,180	1298	6,285	12,044	18,084	22,017	23,694	25,355	26,968	

Annex 2. Pictures of Participants for the Workshop in Orange Walk



Honey

Registration List for Value Chain Analysis and Market Assessment

Date: 20/01/2022

Location: Y0 Creek

#	Name	Location	Farmer/Company/GOB	Gender		Vaccinated		Date of Birth	Indigenous		Phone/Email	Signature
				M	F	Yes	No		Yes	No		
1	Manuel Alvarado	O/W	DEC					31/10/85			607-2111	[Signature]
2	Trinidad Ayala	O/W	Beekeeper								602-6584	[Signature]
3	Isabel Cortez	O/W	Beekeeper								674-2206	[Signature]
4	Isabel Cortez	O/W	Beekeeper								6658979	[Signature]
5	Francis Vega	O/W	Coop Dept					16/9/70			623-2195	[Signature]
6	Francis Vega	O/W	Coop Dept					16/12/83			608-7781	[Signature]
7	Francis Vega	O/W	Coop Dept					19/05/93			613-7959	[Signature]
8	Francis Vega	O/W	Coop Dept					29/4/62			6056561	[Signature]
9	Francis Vega	O/W	Coop Dept								6599772	[Signature]
10	Francis Vega	O/W	Coop Dept								669929	[Signature]
11	Francis Vega	O/W	Coop Dept								6356348	[Signature]
12	Francis Vega	O/W	Coop Dept								6656565	[Signature]
13	Francis Vega	O/W	Coop Dept								610-0519	[Signature]
14	Francis Vega	O/W	Coop Dept								6056429	[Signature]
15	Francis Vega	O/W	Coop Dept								666,2202	[Signature]
16	Francis Vega	O/W	Coop Dept								666,2202	[Signature]
17	Francis Vega	O/W	Coop Dept								666,2202	[Signature]
18	Francis Vega	O/W	Coop Dept								666,2202	[Signature]
19	Francis Vega	O/W	Coop Dept								666,2202	[Signature]
20	Francis Vega	O/W	Coop Dept								666,2202	[Signature]

Honey

Registration List for Value Chain Analysis and Market Assessment

Date: 20/6/2022

84/m/y/vv

Location: Yo Creek

#	Name	Location	Farmer/Company/GOB	Gender		Vaccinated		Date of Birth	Indigenous		Phone/Email	Signature
				M	F	Yes	No		Yes	No		
1	Fidelmy S.F		Production					20/1/56			6689648	P.C.
2	Agustina D.V		RSA					15/8/92			64-3193	Agustina
3	Francois Yo-creek		farmer					7/6/66			6608353	Stan
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