

DIVERSIFIED FARM INCOME, MARKET FACILITATION, AND THEIR IMPACT ON CHILDREN: AN EXPLORATION OF HONEY CARE AFRICA

By Heather Esper, Ted London, and Yaquta Kanchwala

Providing agricultural income-generating opportunities through improved farm inputs and market facilitation can increase living standards for smallholder farmers and their families. This case examines the impacts a for-profit enterprise serving the Base of the Pyramid (BoP)ⁱ has on children and pregnant women and how these impacts can be enhanced. Honey Care Africa (henceforth called HCA) of Kenya supplements the incomes of smallholder farmers by equipping them with beehives and harvest management services, necessary to produce high-quality honey. In addition, HCA guarantees a market for the beekeeper's produce at fair trade prices, reducing risk and providing a steady, consistent source of income to single-crop farmers. Beekeepers purchase hives and services (some do so with financial assistance) and generate positive cash flows after three or four harvests (depending on yield).

We looked across HCA's value chain to assess the company's impacts on children age eight and under and on pregnant women. The main impact on HCA beekeepers' children is the increased ability of farmers to provide for their children, as a result of increased income from honey and income stability from a guaranteed market. In addition, bees provide essential crop and plant pollination ecosystem services, which benefit the local environment and the food production

ⁱ The BoP—estimated at approximately 4 billion people—is the socio-economic segment that primarily lives in and operates micro-enterprises in the informal economy, and generally has an annual per capita income of less than 3,000 USD in purchasing power parity (PPP).



system.ⁱⁱ Pollination increases crop yield and quality, resulting in health benefits from the additional foods available for consumption. Honey also delivers nutritional and preventive medicinal benefits which children, above the age of one, can benefit from. Beekeeping provides an opportunity to teach children about the environment and the important role bees play in local ecosystem conservation. However, if parents take out loans to purchase the hives, their ability to provide for their children may be reduced during the loan repayment period. Although the majority of impacts occur on children of HCA beekeepers, HCA staff's children also benefit from increased access to honey, their parents' steady income, conservation of the local environment and their parents' increased social network from working with large numbers of farmers.

ⁱⁱ According to the Food and Agriculture Organization (FAO), "apiculture's unique feature as an activity is the fact that its continuation, through pollination, fosters the maintenance of an entire ecosystem, and not just a single crop or species."

ABOUT THE AUTHORS

HEATHER ESPER is the Program Manager of Impact Assessment at the William Davidson Institute at the University of Michigan and an editor and writer for NextBillion.net. Her research centers on exploring the poverty reduction contributions of businesses and organizations serving low-income markets. Esper works with these ventures to identify, measure, analyze and leverage their impacts in order to develop strategies to better meet the needs of their stakeholders and further contribute to reducing poverty. She holds a Master's degree in Public Health and a Bachelor of Science degree in Global Health from the University of Michigan.

TED LONDON is a Senior Research Fellow and the Director of the Base of the Pyramid Initiative at the William Davidson Institute and is a faculty member of the University of Michigan's Ross School of Business. His research focuses on designing enterprise strategies and poverty alleviation approaches for low-income markets, assessing poverty reduction outcomes of business ventures, and developing capabilities for cross-sector collaborations. He has published numerous articles, reports, and teaching cases, sits on several advisory boards, and shares his research in venues around the globe.

YAQUTA KANCHWALA is a Research Associate at the William Davidson Institute at the University of Michigan. She has worked in multiple sectors: agricultural value chains, agritech, food security, microfinance, and access to energy. Her experiences include developing social enterprise growth strategies and conducting rapid impact assessments. She holds a Bachelor of Science in Engineering from Rutgers University and a Master of International Affairs from Columbia University's School of International and Public Affairs.

ACKNOWLEDGEMENTS

This case was made possible with the support of the Bernard van Leer Foundation. In particular, we would like to thank BvLF's Michael Feigelson for his guidance and continued support. WDI would also like to acknowledge Honey Care Africa, in particular Madison Ayer and Alex Bezbodov, for their assistance in providing information and access to key stakeholders. We would also like to thank WDI's Mary Lowe who conducted preliminary research for the case.

CITATION

Esper, H., London, T. and Kanchwala, Y. (2013). Diversified Farm Income, Market Facilitation, and their Impact on Children: An Exploration of Honey Care Africa. Impact Case Study No. 3. Ann Arbor: The William Davidson Institute.



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ABOUT THE SERIES

UNICEF states that poverty reduction should start with young children (UNICEF. 2000. Poverty Reduction Begins with Children). The first years of life have a large influence on an individual's long-term well-being. Poverty at an early age can cause lifelong damage to children's future and perpetuate the cycle of poverty across generations. Thus early childhood interventions offer an opportune time to influence the poverty cycle. The effects of poverty can be passed on to children through their parents; improving the well-being of parents therefore can also enhance the well-being of their children.

This series was funded by the Bernard van Leer Foundation, a private philanthropic organization focused on improving the lives of children from birth to age eight. The goal of these cases is to gain a greater understanding of the ways in which businesses in emerging markets impact young children's lives and the potential to optimize impact on children. We also hope that these case studies will influence development and impact investing leaders to include metrics related to young children in their measurement systems.

IN THIS SERIES

IMPROVED HOUSING AND ITS IMPACT ON CHILDREN: AN EXPLORATION OF CEMEX'S PATRIMONIO HOY

Patrimonio Hoy provides construction materials to low-income consumers in Mexico, Nicaragua, Costa Rica, Colombia and the Dominican Republic through a 70-week payment plan that allows its customers to build onto their current homes or build new homes room by room.

IMPROVED SANITATION AND ITS IMPACT ON CHILDREN: AN EXPLORATION OF SANERGY

Sanergy builds 250 USD modular sanitation facilities called Fresh Life Toilets (FLT) in Mukuru, a large slum in Nairobi, Kenya, and sells them to local entrepreneurs for about 588 USD. Franchisees receive business management and operations training and earn revenues by charging customers 0.04-0.06 USD per use.

DIVERSIFIED FARM INCOME, MARKET FACILITATION AND THEIR IMPACT ON CHILDREN: AN EXPLORATION OF HONEY CARE AFRICA

Honey Care Africa (HCA) of Kenya supplies smallholder farmers with beehives and harvest management services. HCA guarantees a market for the beekeeper's honey at fair trade prices, providing a steady source of income.

ACCESS TO CLEAN LIGHTING AND ITS IMPACT ON CHILDREN: AN EXPLORATION OF SOLARAID'S SUNNYMONEY

SunnyMoney sells pico-solar products to BoP communities with limited access to electricity in Tanzania, Malawi, Kenya, and Zambia. It markets the lamps through schools and existing entrepreneur networks.

IMPROVED INCOME STABILITY, TRAINING, MARKET FACILITATION AND THEIR IMPACT ON CHILDREN: AN EXPLORATION OF VILLA ANDINA

Villa Andina of Peru produces high-quality agro-industrial food products through its work with local smallholder farmers. The venture trains farmers in organic cultivation techniques and provides guaranteed payment for the crops produced.

IMPROVED HEALTH CARE AND ITS IMPACT ON CHILDREN: AN EXPLORATION OF PENDA HEALTH

Penda Health provides high-quality, evidence-based, standardized primary care, both curative and preventative, to low- and middle-income families in Kenya while also specializing in women's health care.

BUILDING A SCALABLE BUSINESS WITH SMALL-HOLDER FARMERS IN KENYA: HONEY CARE'S BEEKEEPING MODEL

This teaching case study examines Honey Care Africa's transition from obligating farmers to maintain their own hives to providing hive management services. Readers will explore strategies to reduce side-selling and opportunities to generate greater impacts on farmers' families, in particular young children. The case can be found on GlobalLens.com.

Also included in the series is a summary article, *Focusing on the Next Generation: An Exploration of Enterprise Poverty Impacts on Children*, that aggregates findings across the above six ventures.

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EXECUTIVE SUMMARY

Relying on subsistence farming, often based on a single crop, can create financial pressure for smallholder farmers and their families. With no regular income and weather-dependent harvests, farmers frequently face cash shortfalls impacting the amount they spend on their children's needs. Supplemental income creation from diversified farming activities, paired with guaranteed payment for the output, improves the household's ability to withstand economic and household-level shocks. This allows families to increase their spending on food, medicine, and educational needs of their children.

Crop diversification such as beekeeping, when managed correctly, can result in substantial supplemental income gains for smallholder farmers at the Base of the Pyramid (BoP). The BoP—estimated at approximately four billion people—is the socio-economic segment that primarily lives and operates micro-enterprises in the informal economy, and generally has an annual per capita income of less than 3,000 USD in purchasing power parity. We explore the impacts of providing improved farm inputs and market facilitation on children ages 0-8 years and pregnant women living in BoP communities by studying the influence of Honey Care Africa (henceforth called HCA).

HCA invests heavily within communities to ensure a steady and secure supply of honey. The enterprise provides training, as well as resources, such as trucks, motorbikes, extraction equipment, scales, collection centers, and beehive management extension services to its beekeepers. Along with HCA's infrastructure investments in communities, HCA arranges financing for local farmers to engage in beekeeping. HCA guarantees market access and price for the collected honey.¹ This guaranteed market connection eliminates complex systems of middlemen, delayed payments, and information gaps surrounding market demand, and ensures a stable source of income for farmers.² HCA uses modern Langstroth hives to increase honey production. The typical HCA hive has an eight-year lifespan and produces, on average, three harvests a year with a maximum of six harvests (see **Table 1**).

We gained an initial understanding of the impacts that improved farm inputs and market facilitation have on our target population through a literature review and interviews with thought leaders in the farm inputs and services and crop diversification space. We then investigated HCA's impacts on our target population across three dimensions of well-being—economic, capability, and relationship—through in-depth qualitative interviews with key HCA stakeholders in Kakamega, Kenya. Both direct impacts on children as well as indirect impacts on children through their parents and the environment were assessed across the stakeholders (see **sidebar**).

Stakeholders

HCA Beekeepers

HCA sells hives to smallholder farmers, manages hives using a cluster model, and buys the produced honey at market value.

Local Staff

HCA hires individuals from the BoP community to work directly with HCA beekeepers.

Broader Community

Individuals who do not have any relationship with HCA besides living near HCA beekeepers.

Table 1: Honey Yield and Revenues Earned per Hive in Kenyan Shillings (KES) and US Dollars (USD)

Number of harvests per beehive	Output (kg)	Revenues (KES)	Revenues (USD)
One harvest yield	7-10	1,190-1,700	14-20
Three harvests yields (average per beehive)	21-30	3,570-5,100	41.5-60

We found that HCA has the greatest impacts on its beekeepers' children (presented in **Table 2**)

Table 2: Substantial Impacts on Children of HCA Beekeepers

Economic Well-Being	Changes in Wealth: Changes in parental expenditures impact financial resources available for children's needs. Increased income from selling honey to HCA allows HCA beekeepers to meet their household and childcare needs such as nutrition and education (long-term). However if parents take loans to purchase HCA beehives, their ability to provide for their children may be reduced in the short term, during the payback period. HCA's guaranteed market contract also provides income stability to the household, increasing parents' ability to provide resources for their children. Additionally this is often a supplemental source of income and hence diversifies income.
Capability Well-Being	<p>Improved Physical Health: Honey has many medicinal (proven in wound care and cough suppression) and nutritional benefits; children over the age of 1 benefit from having access to honey on a regular basis. Additionally, pollination is an essential ecosystem service required for crop production. Bees are important pollinators that carry out this service, leading to increased crop yields and improved local food security for families.</p> <p>Increased Knowledge: Beekeeping provides an opportunity to teach children about the environment, the importance of ecosystem services, and the important role bees play in food security. In the process, children develop a bond with nature, ensuring love and respect for the same.</p>
Relationship Well-Being	Improved Local Environment: HCA encourages its beekeepers to plant trees and flowers around their property to increase pollination. Children benefit from the conservation of their environment and have a more pleasant environment to live and play in.

Although the majority of impacts occur on children of HCA beekeepers, HCA staff's children also benefit from their parents' increased access to money and honey. HCA provides a stable job with regular wages in the same region as where the employee's family resides. These children also benefit from their parents' increased social network from working with large numbers of farmers and from conservation of their environment.

Children living in the community surrounding HCA's activities are also impacted, whether their parents are HCA beekeepers or not. Increased pollination by bees equates to higher yields and more food for the community/nearby farmers; it also conserves the local ecosystem. Additionally, some HCA farmers mentioned that as income increases from beekeeping they are able to hire more people from the community to work on short-term farming projects.

The impacts we observed on the children of HCA's stakeholders vary by age. In particular, honey can be dangerous for children under age one, especially those ages 2-4 months, due to the potential risk of botulism poisoning. Children ages 1-5 years likely benefit the most from the immune-boosting and health properties of honey. These health benefits include increased weight gain, improved digestion, reduced duration of bacterial diarrhea, and increased calcium uptake. Older children, ages 6-8 years, benefit from their parents' increased ability to pay for school fees as a result of their added and stable income. Older children are also more likely to be aware of and understand the essential ecosystem service that bees provide through pollination of crops.

Based on the likely outcomes that HCA has on children and pregnant women along its value chain, we identify opportunities for the venture to enhance, deepen, and expand its impacts on children age eight and under:



Hanging HCA hives.

- HCA should explore methods to improve its reputation with beekeepers by hiring more technicians to assist beekeepers, especially during harvests and ensure ‘as soon as possible’ revenue payback periods.
- HCA can reduce misinformation about honey by informing beekeepers of the dangers of honey for children under age one year and pregnant women and by exploring training programs for community health workers and local clinics, so that, they can spread awareness on the safety of beekeeping.
- We strongly suggest that HCA should conduct a thorough understanding of why side-selling occurs, through field and SWARM software data collection, and explore options to counteract the negative effects of this issue.
- HCA should continue to spend time, effort, and resources on understanding the beekeepers’ needs and grievances (via feedback collection methods, regular dialogue, and SWARM data analysis), to retain existing farmers in the program and attract new ones, and to explore new models to finance beehives such that smallholder farmers can afford the hives.



Standing HCA hives.

Beyond these key recommendations, we also offer guidance on conducting impact assessments in a systematic and manageable manner.

Note: Due to the similarity in impacts across the six cases and in an attempt to be concise, we only include secondary research supporting and further exploring impacts in the first case study of this series—Patrimonio Hoy. Also, please note that since these cases were developed over the course of 2012-2013, a number of our recommendations to enhance positive and mitigate negative impacts for the venture, have been implemented since we visited the venture. As such, please visit the enterprise’s website for more information on their latest practices.

COMPANY BACKGROUND

THE GENESIS OF HCA

HCA was incorporated in Nairobi, Kenya, in May 2000 by Farouk Jiwa, a fourth-generation Kenyan-Asian, who studied environmental biology at Queen's University in Canada. Upon returning home after graduation, Jiwa sought an entrepreneurial opportunity in the agriculture sector and found the Aga Khan Development Network (AKDN). Jiwa was assigned to a company in Kenya that sourced vegetables from smallholder farmers for export to Europe. The company loaned seeds to farmers, provided extension services including microfinance help, and guaranteed farmers a fair market price for their vegetables.

Through his work with AKDN, Jiwa learned how to scale small-hold farm production while mitigating company risk through donor and microfinance partnerships. He decided to translate this knowledge into beekeeping in Kenya, where most products were either produced locally and were of an adulterated or poor quality, or imported, particularly from Tanzania. During his research into beekeeping he realized there were many market challenges, but he felt that with the right business model he could address many of them. In 2000, Jiwa secured capital commitments of 300,000 USD (2,583,000 KES) through two investors to buy out 'Honey Care International'ⁱⁱⁱ and found 'Honey Care Africa'. HCA's objective was to use better beekeeping technology to improve rural incomes, empower women and youth, and promote biodiversity conservation.



Outside the HCA headquarters in Nairobi, Kenya.

“On graduation, I decided to go back [to Kenya] and see if there was any way that I could get involved in any sector of agriculture in any particular way,” Jiwa said. “Beekeeping made the most sense, because it worked really well for the environment, had no negative impact and, at the same time, it worked quite nicely in developing incomes and generating money for communities.”³

HCA began as a for-profit experiment, using a triple-bottom-line strategy to create economic, social, and environmental value in Kenyan communities. The experiment resulted in the creation of Honey Care's “tripartite model” that looked to develop win-win relationships among private enterprise, the development sector, and rural communities. It was executed using NGO and donor agency assistance.⁴

HCA worked with these partners to fund the purchase of beekeeping equipment it provided to smallholder farmers (partners did not fund HCA overheads or subsidize operating expenses). Next, HCA trained farmers to manage the hives. Then HCA purchased the honey at fair trade prices (cash-on-spot payment directly to beekeepers at the farm gate i.e. transparent ‘money for honey’ policy). The farmers paid lenders with a percentage of the profits from their honey sales.

HCA recognized the need for effective self-financing and developed a hive micro-leasing scheme, under which hives were leased at sustainable interest rates as compared to village banks and other micro financing institutions. At honey collection time, 50% of revenues were remitted toward the loan.

HCA equipped rural smallholder farmers in Kenya, Uganda, and Tanzania with Langstroth beehives (HCA manufactures Langstroth hives to international standards at its headquarters). These beehives can be

ⁱⁱⁱ Launched in 1997, Nairobi, Kenya-based Honey Care International was a small struggling company that had been unable to collect a commercially viable supply of honey to scale its operations. In 1999, the company began to manufacture Langstroth hives (Valente, Michael et al. 2007)



Traditional hives displayed at HCA headquarters.

placed on a stand close to the ground, allowing more women to participate in the industry. In fact, up to 50% of the farmers HCA works with are women.

Traditional beehives, typically used in the region, are log hives, raised 25-30 feet above ground and placed on trees, making it a male-dominated sector. The log hives are made of tree wood or bark, which consumes trees.^{iv} Traditional hives are inexpensive but beekeepers and honey hunters use crude harvesting techniques that produce low yield and poor quality honey. They use fire to extract the honey, affecting flavor and sometimes even killing bees with the smoke. The careless use of fire adds risks to forest conservation and safety.⁵ Additionally, the combs are destroyed during the process and bees have to recreate them for each harvest.

The Langstroth hives are technologically advanced and optimized for commercial honey production. The hives have a double chamber, so there is separation between the brood (bottom) and the super (top) with spaces for the bees to travel between the two boxes. The queen and the brood live separately from where the honey is produced and the honeycombs

are recyclable. The number of combs is not reduced at the end of a season, and the queen bee is not killed. The system generates a continuous supply of honey throughout the year, and allows farmers to produce increasing amounts with each harvest.⁶ HCA has been able to improve honey quality and increase production capacity from 15 kilograms to 40 kilograms per year (amount produced from four harvests) by using these hives.

HCA uses only native and endemic sub-species of bees that are not harmed during honey collection, enhancing insect biodiversity and reducing the displacement of food crop pollinators. HCA encourages its beekeepers to grow flowers, shrubs, and small nectar-producing trees to aid honey production.

INTRODUCING A NEW HCA MODEL

In 2005, Jiwa moved to Canada and stepped away from the day-to-day operations of the organization. At this time, the company was beginning to focus more on retail and was investing in building a consumer brand. Between 2006 and 2007, the company's emphasis on developing a commercial retail sales strategy resulted in a de-emphasis on their field network. Developing a consumer brand was more costly than HCA expected, forcing the company to shift to a cost-cutting strategy from 2008-2010 to preserve cash. At the same time, farmers were not generating yields or levels of income that they had expected. In early 2010, HCA's Board of Directors hired Madison Ayer as CEO to stabilize the company's financial position. Board members felt that Ayer's skill set was a good match for the company's current needs. While he did not have knowledge about honey development or working in Africa, Ayer had valuable management experience in leading start-ups and high growth enterprises in the financial sector.

One of Ayer's first tasks as CEO was to revisit HCA's business model. After an in-depth assessment, Ayer shifted the business away from training farmers to manage their own hives to utilizing clusters of trained

^{iv} According to the FAO, beekeepers in some parts of Africa make bark hives by peeling cylindrical sections of bark from mature trees, which then die.

HCA staff to manage HCA hives for farmers, known as the 'Business in a Beehive' program. To provide more direct support for hive management, the organization rolled out its Scalable Workforce for Apiary^v Resource Management (SWARM) program that allowed the company to monitor hive and harvest status, better coordinate collection logistics, and ensure a more steady market supply. Ayer pulled back operations to Kenya to perfect the model before expanding it to other East African countries. Although the new model is more commercial-based than the previous framework, HCA has retained its commitment to generating social benefits and continues to value cross-sector partnerships with CBOs, micro-finance organizations, and NGOs.

This change stemmed from Ayer's field research that helped him realize that farmers were afraid of bees and were not managing their hives in an optimal manner. Ayer believed that by gaining control of hive maintenance, HCA could secure a stronger aggregate supply of honey, generate demand for its premium honey products in both local and international markets, and produce greater income for each BoP producer household. As part of the restructuring, Ayer emphasized maintaining an end-to-end value chain. HCA, he felt, needed to control both the demand for its products, the supply and the steps in between.^{vi}

As of December 2012, HCA has sold more than 30,000 beehives through its years of operation. On average, local BoP producers purchase two hives at a cost 5,000 KES (59 USD) each. If each hive delivers three harvests a year (average) at 7-10 kg yields, with a 170 KES/kg purchase price, families, on average, can earn between 7,140 - 10,200 KES (84-120 USD) per year from the two hives, through their relationship with HCA.

CONSTRAINTS OF HONEY PRODUCTION IN LOW-INCOME MARKETS

The climate in many parts of sub-Saharan Africa, including Kenya, is suitable for bee colonization, and worldwide demand for honey and honey-based products is high (according to HCA: expected global market is greater than 12 billion USD in 2015).⁷ However, only a small fraction of that area is being used for such activities and only few organized efforts exist to provide marketing or processing support for honey and honey-based products. Africa's farming and beekeeping industries are characterized by information asymmetries, inefficiencies, and limited access to resources. Farmers often have to wait long periods of time before receiving payment for their honey (six to eight months for government payments), limiting farmers' ability to continue operations.

v An apiary is a place where bees are kept.

vi If demand exceeded supply, HCA would have to buy honey on the open market where it could not control the quality or the source of the product. If supply exceeded demand, HCA would face cash flow problems as its inventory of unsold honey grew.

Box 1: A Pregnant Woman's Perspective*

Basham, a smallholder farmer who is pregnant with her second child, purchased four Langstroth hives through HCA over the last two years. She is slowly paying off a 10,000 KES (117 USD) loan, and has noticed that her crop yield of beans increased this year as a result of pollinations by the bees. The cost per hive through HCA is 5000 KES (about 59 USD), and Basham sees about three harvests a year from the hives, at an average of 1190-1700 KES (about 14-20 USD) per harvest. Now that her crop yield has increased, Basham says she is eating more and feels healthier than she did during her first pregnancy, which is good for the development of her baby.

** This fictional account is provided to represent a common HCA stakeholder situation. The narrative sketch is based on information collected during interviews and focus groups.*

To summarize, some of the major constraints facing Kenya's honey industry are:

- **Lack of available forage**
- **Lack of functioning markets/poor market linkages**
- **Limited access to extension services, training, and investment for business growth**
- **Poor production and processing technologies**
- **High transactional costs**
- **Lack of organized producers**
- **Absence of a clear national policy for sector development**
- **Lack of farmers' recognition of the income potential that honey can generate**
- **Side-selling to local brokers**

In addition to these constraints, the local bee population is threatened. Kenya's rapid population growth is causing deforestation (land cleared for agriculture and housing), reduction of floral biodiversity, and displacement of natural pollinators. Traditional beekeeping hives also contribute to the problem when bees are killed during harvesting.

HCA has removed many of the constraints listed above through its SWARM cluster model. The private sector's entry into the market and BoP venture players like HCA are altering the topography of the Kenyan honey market. They focus on the entire market chain, while others, especially small-scale enterprises, only process honey and sell products. As a result, these new entrants are encouraging environmental conservation, and strengthening regional trade markets.

However, side-selling remains an issue. Some HCA beekeepers sell their harvests to mainly Nairobi-based brokers who arrive before HCA technicians and pay marginally higher-than-market-price cash on the spot. Furthermore, these brokers often destroy the combs and hives in harvesting, decreasing the quantity of subsequent harvests, harm the health of the honeybee colonies, harvest at the wrong time, provide no honey consistency in the market, and provide none of the hive management services that HCA provides to its farmers.⁸

HONEY CARE BUSINESS MODEL

When HCA was founded in 2000, the organization's main challenge was building trust-based relationships with smallholder farmers who were accustomed to late payments from corrupt dealers, low profit margins, government interference, technology and financing deficiencies, and a weak market. HCA's tripartite model helped the organization to gain the trust of farmers and establish a demand for its products. With new leadership, HCA revisited its business model on the basis that beekeeping and honey-harvesting are a specialized skillset that require significant time and dedication to develop, prompting a shift to the 'Business in a Beehive' model.

The new model shifted HCA's services in the following manner:

- **HCA provides more dedicated hive management extension services through its technicians.**
- **HCA provides more business training to its beekeepers and also places emphasis on the benefits of a long-term relationship with HCA and associated income opportunities.**
- **HCA provides consistency across the honey value chain – in harvest yields, service extension, pricing and payment to farmers, market access for farmers and a commercially viable aggregate supply.**

In the new model (see **Figure 1**), HCA rolled out its SWARM platform and software that now allows the company to monitor hive and harvest status, better coordinate collection logistics, open access to millions of potential smallholder farmers previously excluded from the honey market, and ensure a strong market supply. These services are implemented by Hive Technicians who work closely with farmers to build trust and a steady stream of income. HCA's Hive Technicians take on the responsibility for individual hive management and support approximately 400 hives in their territories. Each Cluster Supervisor oversees 9-12 Hive Technicians.

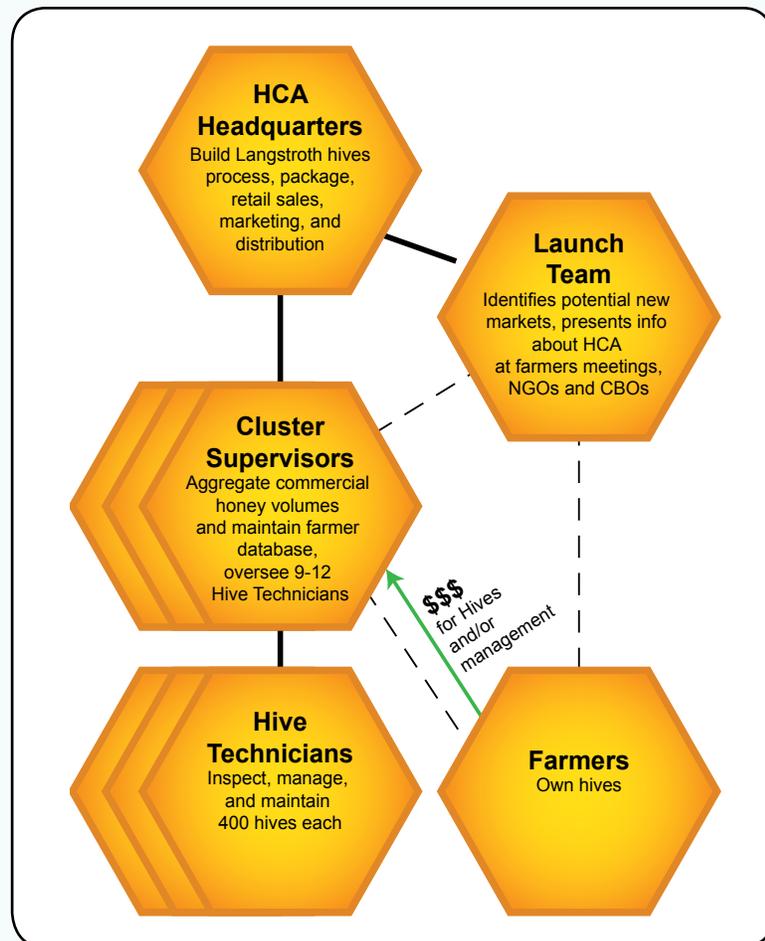
HCA holds informational events to introduce farmers to the potential of honey production as a stable, consistent income-generating activity.^{vii} HCA's guaranteed market connection for farmers eliminates complex systems of middlemen, delayed payments, and information gaps regarding market demand.⁹ The company uses centrifuge extraction machines to extract honey from the combs, mainly in the field. Honey processing, packaging, sales, and retail distribution are carried out at headquarters.

HCA has implemented a number of activities with the goal of securing a steady supply of honey from its farmers and combat side-selling. To ensure farmers sell their honey back to HCA at a fair market price, for example, HCA requests farmers to sign non-binding contracts in the presence of other farmers and a chief or community leader to make the agreement more official.

HCA has also attempted to increase trust with its farmers: the hive technicians build stronger local relationships by quickly responding to any technical questions farmers have. The visibility of an HCA office near a particular community also demonstrates to farmers that HCA is committed to a long-term presence. Through its SWARM Hive Management software, HCA also hopes to gain a better understanding of the size and scope of side-selling and resolve the information asymmetries that brokers exploit. HCA has also updated its training to farmers to emphasize the above points, increased the speed of making payments and in many cases has made cash payments on the same day. HCA plans to develop an electronic payment system via M-PESA for instant payment, in the near future.

vii Kenyan beekeeping is still largely a cultural activity with most families producing honey for their own consumption.

Figure 1: HCA Business Model



As of November 2012, HCA has 50 employees, including 14 Hive Technicians, 4 Cluster Supervisors, and a 4-person Hive Sales Team spread across communities. The remainder of the staff works out of the company's headquarters in Nairobi and includes HCA's management team, administrative staff, hive workshop team, and honey sales and processing teams. HCA operates in Western, Nyanza, Rift, Central, Eastern, and Coast provinces in Kenya, in particular in Kisumu, Kakamega, Kikuyu, Machakos, Rift Valley, and Thika (see **Figure 2** for map of operations).

Figure 2: HCA Operations in Kenya



Organization Structure

HCA HEADQUARTERS

Production of Langstroth hives and honey pasteurization, micro-filtration, quality inspection, and packaging are carried out at HCA's headquarters.^{viii} The extracted honey is processed, and placed into glass containers (hand packaged and labeled). Headquarter staff also manage retail sales, marketing, and distribution functions for the organization.

LAUNCH TEAM

The launch team consists of sales and training staff. The team maps regions for honey production potential and develops regional hive placement plans. The team also identifies potential Cluster Supervisors and SWARM Hive Technicians, and trains the technicians in beekeeping. HCA's trainers sensitize the community to beekeeping as an income-generation activity and to the nutritional benefits of honey through information sessions at farmer association meetings and other community events. The information sessions stress the importance of regular hive maintenance, items to watch for between farm visits, apiary safety, bee handling, how to heal stings, how to educate children about apiaries, animal safety near the apiary, and general bee health and safety information. The company pitches its message of supplemental

^{viii} The honeycombs are sent to headquarters for processing.

income and environmental sustainability to smallholder farmers using murals, posters, signage, radio, and television programming. HCA and the launch team work with farmer cooperatives to increase HCA's presence in local BoP communities and develop partnerships with banks, microfinance institutions, CBOs, and NGOs to provide support and financing to smallholder farmers.

CLUSTER SUPERVISOR

The Cluster Supervisor aggregates commercial honey volumes and maintains beekeeper databases. Using the SWARM platform, the supervisor manages hive networks and ensures consistent and predictable supply. SWARM also includes a live database for tracking honey production and hive maintenance. Each Cluster Supervisor oversees 9-12 Hive Technicians, and builds ongoing family relationships. The supervisors also perform site assessments of smallholder farms. These assessments measure the topography of the land to determine the number of hives that can be successfully placed on the land, the availability of water resources, and the correct placement for the hives.

HIVE TECHNICIANS

Hive Technicians are responsible for the inspection, maintenance, and management of harvests of the approximately 400 hives in their territories. Hive Technicians visit HCA's beekeepers monthly to identify pest and other threats to colonies at an early stage, harvest honey, and check on bees as required. As part of their maintenance duties, Hive Technicians eliminate foliage growing near the bottom of the hives to provide the bees with a clear path into hives. They evaluate the harvest-readiness of combs, identify the optimal time for harvest, and provide honey transport and logistics.

FARMERS

The cost for the hive kit, or HCA's 'Business in a Beehive', is 5000 KES, approximately 59 USD. It includes the hive, SWARM apiary set-up services, and lifetime extension services, if the hive is set up in HCA's cluster area. Farm families receive full technical support for the life of the hive, which includes monthly hive maintenance, repair, and pest control, regular site visits, harvest support, honey transport to a centralized processing facility, and direct payment. Some families with Langstroth hives from other

sources hire HCA to manage and harvest their hives. The BoP smallholder farmers that HCA works with often cannot afford to purchase the hives up front, so HCA partners with institutions to provide financing. Each hive provided through HCA generates on average, an equivalent of 3570-5100 KES (41.5-60 USD) per year over its life of eight years. The typical hive becomes a cash-positive investment after three honey harvests, typically in the first year. In addition to providing a stable income source to farmers, according to HCA, bee pollination can drive 15%-30% larger food crop harvests, and improves crop quality.



A Hive Technician meeting with a potential HCA beekeeper at the Kakamega office.



A Langstroth hive building station at HCA headquarters.



A completed HCA Langstroth hive. The super box is on top and the brood box is on the bottom. Bees live in the brood box and travel to the super box to deposit honey. The drones and the queen stay in the brood box. The mesh between the super and brood boxes prevents the drones from going to the super box and consuming the honey in that section. Instead, the drones eat only honey made in the brood box.



The inside of a completed super box of an HCA Langstroth hive.



Protection that technicians wear when working with bees. When hives are ready to harvest, the technicians collect the honey.



Scraping wax caps off honeycombs to free honey.



Combs are placed in the extraction machine and spun for about 15 minutes. The honey is then drained from the machine and empty combs are placed back in the super box for the next harvest.



At headquarters, the honey is pasteurized to help separate particles. It is then sieved and stored in buckets until cool.



Honey jars are filled manually using a digital scale.



Labeling is carried out by hand.



HCA Premium brand honey.



HCA's honey with natural flavoring additions.

Honey Sales, Financial Returns, and Expected Growth

HCA sells honey primarily in Kenya but plans to sell internationally from 2013 onwards. In Kenya, the packaged bottles are delivered to retailers by HCA in Nairobi and a distributor in Mombasa. HCA honey is sold mainly through supermarkets, with a higher price for the company's premium pure honey products. In the past, HCA sold honey primarily to regional consumer markets. Excess product was sold on the bulk market, enabling HCA to sell large quantities even when retail demand did not match production.

Over the 2012-2013 fiscal year, HCA has invested \$1.6 million in new Langstroth hives, hive maintenance, new hires, technology, and marketing. This has resulted in operating losses for both years. Revenue is expected to jump from 28.8 million KES (335,000 USD) in 2012 to approximately 80.9 million KES (940,000 USD) in FY2014. Ayer forecasts a growth of 1.1 billion KES (12.9 million USD) in 2017 based on the investments, development of new export channels, and a growing honey market in local communities. HCA's goal is to reach 70,000 households within the next six years.

COMPETITION

The honey production and consumption landscape has dramatically changed since 2000, when HCA was launched. In 2000, HCA's competitors produced in two broad categories: poorly harvested and frequently adulterated local honey that was sold cheaply in unmarked plastic bottles, and mass-produced imported products, which were sold at comparable prices. The honey that was sold locally often was unsanitary, and was informally sold along local highways. The imports were frequently synthetic and did not offer the same nutritional benefits of pure honey.

Now, in 2012, locally produced honey is sold along highways, in supermarkets, in herbal clinics, and to traditional breweries. HCA's competition has become increasingly sophisticated and the quality of locally produced honey has improved dramatically with the entry of local players (see **Appendix A**). Amid the competition, brokers are willing to pay honey farmers more for their product, increasing the side-selling occurrence.

The global honey market is projected to exceed 12 billion USD in 2015.¹⁰ To differentiate itself from the competition, HCA has positioned itself as a premium honey producer with its Honey Care Africa (premium pure honey) and Beekeeper's (flavored honey) brands. HCA has also obtained Fair Trade and Hazardous Analysis and Critical Control Point (HACCP) certification to demonstrate the quality of its honey production. Each stage of production from harvesting to packaging is monitored in compliance with Fair Trade and HACCP standards. Although HCA primarily sells its honey in Kenyan supermarkets, it plans to sell internationally from 2013 onwards and is working toward meeting European standards to sell its products to the European food market.¹¹

Box 2: Portrait of HCA's BoP Market

Kenya has one of the world's fastest growing populations, which has more than tripled in the past 30 years, placing increasing pressure on the country's resources. Rapid population growth and a widening income gap have led to erosion in food security, employment, and income gains. In addition, the effects of climate change are undermining the country's resource base and agricultural yields. Episodes of drought in 2009 and 2011 generated food emergencies, while parts of the country were severely impacted by flooding in 2010.¹²

While agriculture accounts for about 30% of Kenya's gross domestic product and 80% of national employment, 75% of the country is arid or semi-arid, making crop farming a challenge. More than 70% of sub-Saharan Africa subsists on income from single-crop, rainfed agriculture. Smallholder farmers provide approximately 75% of total farm production in Africa.^{13, 14} Kenya's rural communities often lack basic communication infrastructures, have weak market and supply chain links, lack access to water and social services, and have minimal formal employment opportunities.¹⁵

Most Kenyans live in areas that have high agricultural potential, in central and western regions, about 18% of the country's territory. Population density in these areas is more than six times the country's average of 55 people per square kilometer. The poorest communities are found in sparsely populated arid zones, mainly in the north, and include small-holder farmers, herders, farm laborers, unskilled and semi-skilled workers, households headed by women, people with disabilities, and AIDS orphans.

FOCUSING ON IMPACTS ON CHILDREN AGE EIGHT AND UNDER

FRAMEWORK AND METHODOLOGY

The BoP impact assessment framework (BoP IAF) provides a structured approach to gaining a holistic understanding of an enterprise's impacts on key BoP stakeholders. It assesses how BoP stakeholders are impacted across three areas of well-being: economic, capability, and relationship. We customized the BoP IAF to analyze HCA's potential impacts on children along its value chain, including children of smallholder farmers, HCA staff, and in the broader community.

We also adapted the framework to explore both direct and indirect impacts on these children (see **Figure 3**). Direct impacts are those that directly result from HCA on children, and indirect impacts are those that occur on children as a result of a direct impact from HCA on their caregivers, another adult, or the environment.

Figure 3: Direct and Indirect Impacts on Children



The customized set of potential impacts we explored across the BoP IAF's three areas of well-being:

- **Economic Well-Being:** These are mainly impacts that result from changes in a caregiver's income, savings and economic stability (expenditures and employment) that create changes in assets and resources provided to children.
- **Capability Well-Being:** These impacts affect children directly, as well as indirectly through direct impacts on their caregivers. Impacts within this area include changes in the child's physical health, psychological health, leisure time, aspirations, skills, and education and knowledge.
- **Relationship Well-Being:** These impacts affect children both directly and indirectly through direct impacts on their caregivers. The impacts include changes in the types of interactions and support children receive from adults and other children in the community as well as changes to their social network. They also include changes in the home and local environment.

To gain an initial understanding of HCA's influence on young children and pregnant women, we conducted a literature review of smallholder farming and beekeeping, and spoke with thought leaders about types of impacts that occur on children from such activities. To gain a holistic sense of HCA's impacts, we conducted in-depth qualitative interviews with key HCA stakeholders in Kakamega and Nairobi (headquarters) to explore the BoP venture's impacts on children across the three areas of well-being. The Kakamega office works with about 150 farmers and serves 1200 hives, of which about 800 are active.

Interviews were conducted with people directly impacted by the venture, such as HCA beekeepers, smallholder farmers who previously owned HCA beehives, and HCA staff. We also spoke with people aware of the venture, but who had not been part of it, such as farmers who have not worked with HCA, BoP honey consumers, BoP sellers of honey, and external organizations that had experience with



beekeeping. The interviews were semi-structured conversations comprised of a standardized set of open-ended questions that allowed us to ask follow-up questions to elicit more detail.

We concluded the interview with: “is there anything else related to this topic that you have not shared with us yet?” This encouraged interviewees (see **Table 3** for list of respondents) to share additional information. We incorporated insights from earlier interviews in the later interviews in order to develop a more refined understanding of impacts. Each interviewee received a small thank-you gift.^{ix}

Table 3: Description of Primary Interview Respondents

Type of Respondent	Number of Individuals
HCA beekeeper	7
Beekeepers who do not work with HCA	2
HCA staff	3
External organizations	6
Honey consumers	3
Honey sellers	3

^{ix} Before the visit we asked HCA staff what would be culturally acceptable gifts and they agreed it would be best to give staff a hat with a WDI logo, external stakeholders a metal pen with a WDI logo and all other stakeholders a plastic pen with a WDI logo.

Methodological Limitations

It is important to note that our evaluation of HCA's impacts on children age eight and under is qualitative rather than quantitative; our findings are interpreted from the qualitative evidence we collected. Therefore, our findings consist of likely outcomes of HCA on its beekeepers, HCA employees, and members of the wider community.

The methodology used in this study does not allow us to substantiate the impacts beyond attributing them to the respondents. Some of our findings may also suffer from recall inaccuracy since we did not measure all impacts at the exact time of occurrence. We informed HCA of the different types of stakeholders we would like to interview and relied on HCA to select interviewees; as a result our sampling may be biased to those who had time or felt strongly about sharing information about HCA.

Box 3: A Child's Perspective*

Eight-year-old Tad always wanted to attend school. His friends in the Nairobi community where he lives all attend the local primary school and Tad wished he could attend to be with his friends during the day. He did not attend because his parents could not afford a new school uniform at 436 KES (about 5 USD). Tad's parents recently purchased three hives through HCA at a cost of 5,000 KES, or about 59 USD each, and are earning an additional 20,400 KES (about 240 USD) a year on the three harvests each hive generates. The money helps his parents buy uniforms so that Tad and his two sisters can attend school. Tad just received his uniform and cannot wait to try it on! Through his father's work with HCA, he is learning more about bees, and how they help preserve the ecosystem through pollination. He is also helping his father plant more trees and flowers near the hives to assist the bees in honey production. Tad said that he hopes he can tell his new school friends what he has learned about bees and the environment when he begins school in a couple of days.

** This fictional account is provided to represent a common HCA stakeholder situation. The narrative sketch is based on information collected during interviews and focus groups.*

This study methodology was adapted from a well-developed approach that has been implemented in Africa, Asia, and Latin America. The adapted methodology was designed to present findings with the objective of demonstrating the value of collecting such impact data in more rigorous ways over time. The Capturing Impacts section demonstrates how to measure the most substantial impacts in a rigorous way in order to quantify them.

IMPACT FINDINGS

The degree to which HCA impacts children differs based on their parents' relationship with the venture. Overall, we found the greatest impacts occur on HCA's beekeepers' children. Children of staff and those in the broader community are also discussed below.

Table 4 summarizes direct and indirect impacts on the children of all HCA stakeholders that we observed on our field visit. Impacts in bold font are explored in detail in the next section, while details of non-bolded impacts can be found in **Appendices B and C**.

Table 4: Summary of Impacts on Children 8 and Under and Pregnant Women Across HCA Stakeholders

	Economic Well-Being	Capacity Well-Being	Relationship Well-Being
HCA's Beekeepers' Children	<p>Wealth</p> <ul style="list-style-type: none"> Increased financial resources available for child's well-being due to increases in parental income i.e. if financial resources are redirected to the child's educational, health, and nutritional needs (Indirect) Changes in financial resources available for child's well-being due to changes in parent's income stability (Indirect) Decreased financial resources available for child's well-being due to household expenditures on beehives (Indirect) Increased financial resources available for child's well-being as a result of parents' improved health (Indirect) 	<p>Physical Health</p> <ul style="list-style-type: none"> Improved child health (age 1 and over) due to benefits from consuming honey (Direct) Improved child health due to increased production of crops due to increased pollination (Direct) Honey causes both benefits and risks for women's health during pregnancy indirectly, affecting the health of the fetus (Indirect) Risk of allergic reaction from bee stings (Direct) Improved child's health due to reduced use of chemical pesticides (Indirect) <p>Education/Knowledge</p> <ul style="list-style-type: none"> Children learn about conservation (Direct) 	<p>Support</p> <ul style="list-style-type: none"> Parents spend increased amount of quality time with children due to less time spent tending to beehives (Indirect) <p>Local Environment</p> <ul style="list-style-type: none"> Children benefit from the conservation of their local environment (Direct)
Children From the Community	<p>Wealth</p> <ul style="list-style-type: none"> Increased financial resources available for child's well-being due to an increase in parental income from non-HCA jobs created in the community by HCA beekeepers (Indirect) Increased financial resources for children through HCA beekeepers' support to non-HCA farmers (Indirect) 	<p>Physical Health</p> <ul style="list-style-type: none"> Improved child health due to increased production of crops due to increased pollination (Direct) <p>Education/Knowledge</p> <ul style="list-style-type: none"> Improvements in environment provide opportunities to teach children about conservation (Direct) 	<p>Local Environment</p> <ul style="list-style-type: none"> Children benefit from the conservation of their local environment (Direct)
HCA's Staff's Children	<p>Wealth</p> <ul style="list-style-type: none"> Increased financial resources available for child's well-being due to increases in parental income i.e. if financial resources are redirected to the child's educational, health, and nutritional needs (Indirect) Increased financial resources available for child's well-being due to parents' increased savings (Indirect) 	<p>Physical Health</p> <ul style="list-style-type: none"> Improved child health (age 1 and over) due to benefits from consuming honey (Direct) <p>Education/Knowledge</p> <ul style="list-style-type: none"> Children learn about conservation (Direct) 	<p>Support</p> <ul style="list-style-type: none"> Increased support of parents due to parents living at home and working in the local region (Indirect) Increased social capital from parents' resources for children (Indirect) <p>Local Environment</p> <ul style="list-style-type: none"> Children benefit from the conservation of their local environment (Direct)

Note: Impacts that are likely to have the largest impact on children are bolded. Bolded impacts are explained in more detail in the following sections whereas explanations of non-bolded impacts can be found in Appendices B and C.

Impacts on HCA's Beekeepers' Children

ECONOMIC WELL-BEING

Indirect Impacts

Wealth: Increased financial resources available for child's well-being due to increases in parental income i.e. if financial resources are redirected to the child's educational, health, and nutritional needs

Honey increases farmers' incomes through sales and increases in crop yields (attributed to pollination). Farmers usually use this income to first supplement their family's food, clothing, and shelter needs and then on their child's education.¹⁶ Some also use it to expand other income-generating activities such as poultry farming.¹⁷ We learned that income from beekeeping activities was mostly dedicated to medication and food.

Beekeeping with HCA is attractive to many farmers since it has high returns and requires low inputs. The costs are set up front and farmers do not need to make additional investments. For the most part, farmers do not spend much, if any, time on the hives,^x as HCA maintains the apiary and harvests them. In addition, beekeeping often pays out better than rearing livestock.^{xi} With an average of two hives costing 5,000 KES (or about 59 USD) each, families earn 170 KES (about 2 USD) per kilogram for the seven to ten kilograms of honey produced by each of the average three harvests per year, or a total of 7140-10,200 KES (about 83-119 USD) in revenues.

Box 4: A Child's Perspective*

Madilyn, age 4, just got stung by a bee from a hive her parents added to their small farm three years ago. She thankfully is not allergic to bees and the sting only left a minor mark. The family purchased the hive through a local dealer. The hive has been poorly maintained. The dealer said he would tend to the hive regularly but the family has seen him only twice over the last three years. As a result the family has left the hive alone, since they do not know how to take care of it, and are afraid of bees due to lack of beekeeping education and training. The bees have now gone wild and are invading other parts of their farm, looking for new places to live, and that is how Madilyn got stung. She hopes her parents find a new company to manage the hives.

** This fictional account is provided to represent a common HCA stakeholder situation. The narrative sketch is based on information collected during interviews and focus groups.*

One of the beekeepers we spoke with has seven children.¹⁸ His youngest child is seven years old, and he has two grandchildren (ages: two years and eight months). He purchased five hives slowly over time, two of which he gave to his daughters to supplement their incomes. HCA harvests his three hives five times per year, which yield eight to ten kilograms per hive, which earns him about 1,360-1,700 KES per hive (about 15-20 USD) per harvest. His main sources of income are harvesting tea leaves, coffee, sugarcane, maize, poultry, bananas, and pineapples. He said that he decided to work with HCA because the hives are inexpensive and produce a steady stream of income. He spends the earned income on his children's school fees^{xii} (a child each in college and secondary school and the rest in primary school^{xiii}) and household necessities.

Another farmer bought hives from a different company but switched to HCA when she saw her income could increase by 10-30% with the enterprise.¹⁹ She also noted that the other company would take the honeycombs during harvest, causing the bees to work harder to rebuild combs before filling them with honey.

HCA's Langstroth design allows the hive to be placed closer to the ground, making the business more accessible to women. In Kakamega, typically, men control how land is used, but with the new Kenyan constitution, more people are being sensitized to men and women having equal roles.²⁰ At the same time, men generally control the money from beekeeping, but since women

x Bees require water; sometimes farmers are required to provide it.

xi A large number of livestock is required to make profits, as feed and treatment costs are increased.

xii Per HCA's fundings, it is difficult for farmers to differentiate school costs between fees, textbooks, and uniforms since all are necessary whether the child is in private or public schools.

xiii Primary school costs 15,000 KES/year (175 USD/year)



Women with hives they purchased as a group.

are increasingly interacting with the Hive Technicians, they are gaining more control over how the money earned is used.²¹ As women earn income, they generally contribute more of their earnings to household needs and children than their male counterparts.

In addition to increased income from honey production, farmers experience about 15-30% increases in their crop yields from the presence of bees on their farms. In addition to larger harvests, farmers noted improvement in the quality of produce. Higher quality yields generate higher incomes.

Wealth: Changes in financial resources available for child's well-being due to changes in parents' income stability

HCA has pioneered beekeeping as a viable supplemental income source for rural families in Kenya's smallholder farming communities.²² For farmers that rely on single crop farming, diversification of income-generating activities helps to break out of the cycle of poverty. Historically in Kenya, bees have not been affected by diseases, compared to the many diseases facing livestock. Therefore farmers do not experience as many risks^{xiv} as when working with livestock such as chickens, which can contract Newcastle disease.

A father of a 2-year-old said that he has benefitted from HCA's guaranteed market access for the honey his hives produce. In the past, the father marketed the honey himself and it would take up to six months to sell a harvest of 20 kilograms. Although his income has not increased since working with HCA, now that he sells through HCA, he is guaranteed payment within 48 hours. He is reinvesting the supplemental income into his business and plans to expand his apiary. The increased income allows parents to spend more on education, nutrition, and health care for their children. For other farmers, HCA has eliminated middlemen, delayed payments, and information gaps regarding market demand.²³

HCA works with women's groups, youth groups, and cooperatives like ACCES (Africa Canadian Community Education Society) to increase and diversify BoP farmers' income. ACCES funded the purchase of six hives

xiv Risks bee farmers face are extreme temperatures, fire, and rain.

for a 15-person cooperative and the group purchased four hives on its own. ACCES began beekeeping in February 2012 and was considering an expansion of its apiary in addition to other agricultural activities. The majority of HCA's partners are women's groups that have approximately 20 members. These groups and cooperatives typically either save the money that they make on their apiaries or start other projects, such as poultry and vegetable farming.

HCA's deinvestment in the field during 2006-2010 did result in some farmers not experiencing the level of service they had expected. As a result, one farmer told us, many farmers refuse to work with HCA. This farmer said that he has not even earned half of his initial investment. He had hoped to harvest honey every two months but has been able to harvest only twice a year. He believes the ratio of beekeepers to Hive Technicians is too high and that is why his hives are not being serviced as regularly as they should be.²⁴

Wealth: Decreased financial resources available for child's well-being due to household expenditures on beehives

HCA estimates that the beehives are a cash-positive investment after about 12 months of operation. Many of the beekeepers we spoke with indicated that paying off the microloans related to their apiaries can lead to reductions in childcare spending e.g. school fees, nutrition, and other necessities. One of the HCA farmers we spoke with took a loan of 20,000 KES (about 233 USD) to buy four hives and finished paying it off within six months,²⁵ while it took another farmer three years because only a quarter of the income earned from honey went into repaying his loan.²⁶ One of HCA's beekeepers started tending hives on her own in 2011, and recently began working with HCA to maintain her ten hives. She purchased the hives from another company at a cost of 4,500 KES (about 52 USD) each with a microloan, and is slowly paying her debt. The beekeeper has decreased the amount she is spending on her children's school fees, other farming projects, and general household expenses. One of her children was sent home from school because she had not paid her fees on time.

In addition to paying off loans for the hives, HCA farmers may spend to set up an apiary. One farmer we spoke with hired a carpenter to build frames around the hives such that the hives were protected from falling off stands and from insects on the ground. The cost was 300 KES (about 4 USD) for two days of labor, with timber supplied by the farmer.²⁷ The interim sacrifice made to pay the debt on microloans and additional investments in building an apiary can have negative effects on availability of resources for children's needs.²⁸

CAPABILITY WELL-BEING

Direct Impacts

Physical health: Improved child health (age 1 and over) due to benefits from consuming honey

Many Kenyans use honey to prevent illnesses and treat coughs and colds. They consume a small amount daily, either directly by a teaspoon or by spreading it on bread. It also serves as an energy booster (see **Box 5** for more information on honey's health benefits). Children in the +1-5 age group benefit most from the immunity-boosting and health properties of honey.²⁹ Considered by Kenyans to be a superfood, honey is given to children regularly to prevent illness. Most people buy honey in order to give it to their children, and many HCA farmers keep some of their harvest for their children to eat. Parents in the regions of Kenya we visited, give their children two tablespoons of honey when they are experiencing coughing problems. One of the grandparents that we spoke with said that her grandchildren, ages one year and three months and one year and four months, eat honey on a regular basis.³⁰ Another has a two-year-old child who eats honey almost every day on bread;³¹ he said that his daughter has not had serious coughs or colds due to this.

The health concern for children younger than one is the presence of botulism spores in honey. These spores can develop into bacteria that produce botulinus toxin, the poison that causes infant botulism. Although younger and older infants may be impacted, the highest risk period for infants is between two and four months. Infant cases of botulism can be mild or fatal.

Box 5: Honey's Nutritional and Health Benefits

Honey has several nutritional and health benefits. A 2012 study published in *Pediatrics* found that honey can be used to treat mild nighttime coughs caused by upper respiratory infections among children ages 1-5.³² Honey also possesses antibacterial, antifungal, antiseptic, and antioxidant properties, and is often put on wounds to prevent infection. It also acts as an anti-allergy medicine in some instances. A one-tablespoon serving of honey provides a variety of nutrients, including 17.3 grams of carbohydrates, a trace amount of potassium and calcium, and 64 calories.³³ Honey is also an antioxidant and an immune system builder. Studies have shown that honey can increase hemoglobin count and treat or prevent anemia caused by nutritional factors; helps arthritic joints; works as a natural laxative; and provides instant energy without the insulin surge caused by white sugar. Honey does, however, have an effect on blood sugar and contains approximately 53% fructose.³⁴ Clinical studies with infants and children have shown that honey shortens the duration of bacterial diarrhea, and did not prolong the duration of non-bacterial diarrhea. Infants on a diet that includes honey had better blood formation and higher weight gain than those who did not consume honey. Studies show that the ingestion of honey causes no erosion of tooth enamel after drinking fruit juice.

Physical Health: Improved child health due to increased production of crops due to increased pollination

Children's health is directly impacted through improved crop yields. Many HCA beekeepers, being smallholder farmers, grow crops to sell in the market and for personal consumption. The increased crop yield from pollination increases local food security. One farmer said he thinks he is getting higher quality and increased yield for fruits as a result of having bees on the farm.³⁵

Education/Knowledge: Children learn about conservation

The smallholder farmers that HCA works with plant more trees and flowers, which provide opportunities to teach children about their environment as well as how to interact with it and respect 'Mother Nature'. Children learn about the importance of the local environment for beekeeping and the long-term benefits of a well-functioning ecosystem from their parents' related activities. Early environmental education assists young children in developing an appreciation for the natural world. Environmentally literate children grow into adults who understand environmental issues and how human decisions affect nature. These children are more likely to make well-informed choices that take into account environmental considerations when decisions are made in adulthood.³⁶

Indirect Impacts

Physical Health: Honey causes both benefits and risks for women's health during pregnancy indirectly, affecting the health of the fetus

Some physicians recommend that pregnant women avoid eating unpasteurized honey to reduce their risk of being exposed to botulism spores. Pasteurization, nevertheless, does not always kill all botulism spores in honey, since the spores can survive even if boiled for several hours. Pasteurizing honey may also damage the fragile enzymes and other beneficial substances that honey contains, reducing its health and nutritional benefits. Because both pasteurized and unpasteurized honey may contain botulism spores, some experts advise to avoid honey during pregnancy.³⁷ Honey has been used to treat dry skin problems during pregnancy and stretch marks. One of the clinics we spoke with gives pregnant women honey as an immune-system booster.³⁸

RELATIONSHIP WELL-BEING

Direct Impacts

Local Environment: Children benefit from the conservation of their local environment

HCA encourages its beekeepers to plant trees and flowers around their property to increase pollination. Children benefit from the aesthetic changes to their surroundings and have a more pleasant environment

in which to move around and play. One farmer said he has planted more flowers around the hives in order to produce more honey.³⁹ Another farmer said she has not cut any trees in the area near her apiary since she knows the bees need large amounts of foliage for their honey production.⁴⁰ Beekeepers tend to advocate for forest conservation and they understand the positive relationship among bees, honey production, and forest cover.

Impact on Children in the Broader Community

ECONOMIC WELL-BEING

Indirect Impacts

Wealth: Increased financial resources available for child's well-being due to an increase in parental income from non-HCA jobs created in the community by HCA beekeepers

Most HCA beekeepers we interviewed told us they had hired more casual workers to assist them with their beekeeping duties.⁴¹ These income-generating opportunities indirectly impact the children of the hired workers, if their parents spend the earned income on their children's needs. HCA provides assistance with building the apiary, but many farmers choose to hire someone for 200 KES or about 2.3 USD per day instead. HCA beekeepers also mentioned that they use their earnings from honey production to hire locals to help occasionally with non-beekeeping activities as well as for basic farm upkeep and milking cows.⁴²

Wealth: Increased financial resources for children through HCA beekeepers' support to non-HCA farmers

HCA beekeepers provide support for one another with money, tools, and time, and are organized around their farming objectives. At times, they pool their resources to purchase hives for families in need. They feel that giving a longer-term source of income is more helpful than simply giving money.⁴³

CAPABILITY WELL-BEING

Direct Impacts

Physical Health: Improved child health due to increased production of crops due to increased pollination

The pollination from beekeeping improves crop yields for the local community and results in higher-quality produce. Children benefit from increased crop yields and receive better nutrition. HCA beekeepers use more organic fertilizers and fewer pesticides. The children who live and play within these environments have less chance of ingesting pesticides or being exposed to crops where too much pesticide has been applied.

Education/Knowledge: Improvements in environment provide opportunities to teach children about conservation

The smallholder farmers that HCA works with plant more trees and flowers, which provide opportunities to teach children across the community about their environment as well as how to interact with it and respect 'Mother Nature'. Early environmental education assists young children in developing an appreciation for the natural world. Environmentally literate children grow into adults who understand environmental issues and how human decisions affect nature. These children, as adults, are more likely to make well-informed choices that take into account environmental considerations.⁴⁴

RELATIONSHIP WELL-BEING

Direct Impacts

Local Environment: Children benefit from conservation of their local environment

Pollination also increases forest cover, cultivating a healthier, greener environment. The increased forest cover is particularly significant; Kenya's forest cover has been degraded due to lumbering. Specific to our case, the tropical rainforest in the Kakamega region has decreased as more trees are cut down, agricultural production slows, and residents move to find more fertile land.

A variety of plants depend on bees only for pollination. These plants create a strong ecosystem, and many provide medicine for the community. Certain trees are used to treat common colds in children and stomach problems, and their leaves are used to treat measles.

Impact on HCA's BoP Staffs' Children

ECONOMIC WELL-BEING

Indirect Impacts

Wealth: Increased financial resources available for child's well-being due to increases in parental income i.e. if financial resources redirected to the child's educational, health, and nutritional needs

The HCA compensation structure for Cluster Supervisors and Hive Technicians encourages maximum honey capture.⁴⁵ One of the supervisors we spoke with said that he can meet his needs and the needs of his 8-year-old twin girls, as well as some entertainment expenses, with the money that he makes through HCA. Before joining HCA he ran a small business, which his wife has taken over. With the income that he earns through HCA, he has been able to expand this business.⁴⁶

One Hive Technician said that his salary allows him to pay school fees, buy food, and build a larger house for his family. The income stability he has, as a result of the opportunity, has reduced pressure on his family. In his previous job, he earned much less and it was harder to provide for his family.⁴⁷

CAPABILITY WELL-BEING

Direct Impacts

Physical Health: Improved child health (age 1 and over) due to benefits from consuming honey

The children of HCA employees enjoy the nutritional benefits of access to honey on a regular basis. One employee we spoke with said that he gives his children packets of honey to take to school daily.⁴⁸

Education/Knowledge: Children learn about conservation

Please see description of impact in the Impacts on HCA's Beekeepers' Children section.⁴⁹

RELATIONSHIP WELL-BEING

Indirect Impacts

Support: Increased support of parents due to parents living at home and working in the local region

As a result of their work with HCA, parents are able to live at home. Many Kenyans (mainly the male head of household) have to search for work in faraway regions and cannot live with their families. Before starting work with HCA, one Hive Technician said that he had to go far from home to find work, due to which, he was unable to spend much time with his family.⁵⁰

Social Networks: Increased social capital from parents' increased social network results in increased resources for children

HCA staff meet many people through their engagement with farmers and thus expand the size of their social networks. As a result, their children have access to resources within these networks. One supervisor said that the community now honors and respects him, and sees him as a valuable resource because he taught them beekeeping. He said that his children benefit from his relationships with farmers because the farmers frequently give his children advice and encouragement and respect them. As a result, his children became role models for how other children should behave. He also mentioned that through working for HCA, he met a headmaster of a good school, who helped him transfer his children to this better school.⁵¹

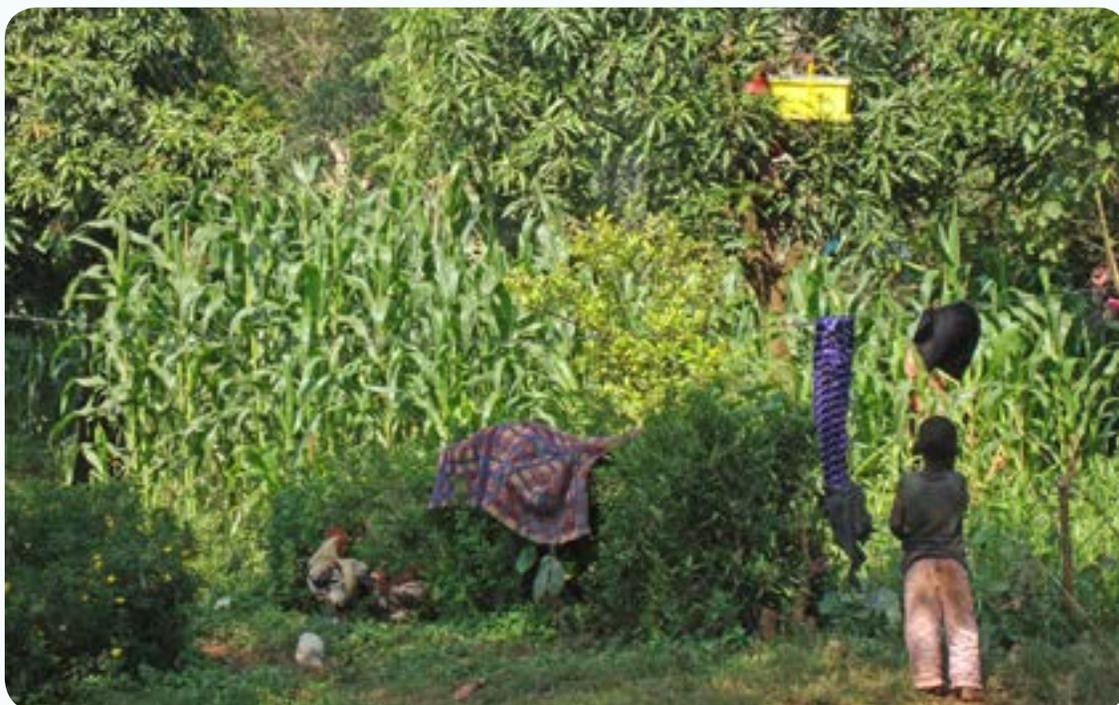
Local Environment: Children benefit from conservation of their local environment

Please see description of impact in the Impact on Children in the Broader Community section.

Box 6: An Exploration of Individuals Who Choose Not to Work with HCA

We found the following reasons, during our interviews, regarding why some families choose not to work with HCA:

- **Fear of Bees:** One of main reasons farmers do not engage with HCA is that do not want bees around their homes, their children, or their livestock.
- **Cost:** The initial cost of the beehive is a large barrier to entry. Many of the community members we spoke with said they were unable to obtain financing to buy HCA hives. HCA is working to establish partnerships with microfinance institutions to secure financing for BoP communities who make less than 1.5-1 USD a day,⁵² where saving 5,000 KES (about 59 USD) and paying up-front for the hive is an almost impossible task.
- **Received Poor Service in the Past:** Some farmers were disappointed with HCA's lack of attention and service during the 2006-2010 leadership change and do not want to rekindle their relationship.
- **Unaware of Income Potential:** Some smallholder farmers are unaware of commercial honey farming and its income potential.
- **Prefer Traditional Hives:** Some farmers choose to use traditional log hives, as they are low-cost (or free if the right tree is found).
- **Live Outside Areas Where HCA Operates:** Some farmers do not live in the cluster area and cannot employ HCA extension services.
- **Pre-existing relationships:** Some farmers have relationships with other honey companies.



A new HCA hive being placed in a tree to attract bees. Once the hive is colonized it will be moved to ground level for easier maintenance.

OPPORTUNITIES FOR GREATER IMPACT

Through the course of our interviews we found that HCA has a broad range of impacts on our target population. Gaining improved access to farm inputs and market facilitation substantially improves the lives of children in the 0-8 age category, and also has impacts on pregnant women. But, we believe HCA has opportunities to further amplify its positive impacts and mitigate negative impacts, as well as increase penetration into its existing markets and expand into new regions. Each of our suggestions can generate more business for HCA, but depend on the resources the BoP venture has at its disposal. **Tables 5-8** present potential ways HCA can enhance, deepen and expand its impacts; prioritized recommendations are bolded.

ENHANCE POSITIVE IMPACTS

Table 5: Opportunities to Enhance Positive Impacts

Opportunity	Potential
Beehive production	Explore providing additional services to further increase honey production
Pride and ownership over honey and bees	Explore methods to make the finished product (packaged honey) available to beekeepers to increase sense of pride and ownership
Inputs to develop ecosystem	Explore selling seeds, cuttings, and fertilizers to grow flowers, shrubs and nectar-producing trees to beekeepers to develop their local ecosystem
Forest conservation advocacy	Explore methods to strengthen advocacy for forest conservation through partnerships
Children's education on environmental conservation	Explore partnerships to work with clubs at primary schools focused on protecting the environment

Prioritized recommendations are bolded.

- Explore providing additional services to further increase honey production**

Explore providing additional services to beekeepers can include teaching beekeepers best practices on honey production and how to build sheds for their apiaries. Sheds help protect hives from the rain that can reduce or even ruin a honey harvest. Additionally, HCA can consider providing a way for HCA farmers to send images of hive issues via mobiles, such that Hive Technicians can diagnose and treat certain problems remotely.
- Explore methods to make the finished product (packaged honey) available to beekeepers to increase sense of pride and ownership**

HCA can explore ways of increasing pride and ownership over bees, hives, and the produced honey among beekeepers by selling HCA's packaged, ready-to-consume honey bottles in HCA field offices. The company could sell non-premium honey at discounted prices or through loyalty programs. Another option is to set up honey tasting sessions during beekeeper trainings at the field office. This would allow beekeepers to taste finished products that they have a primary role in producing. We expect this will increase pride and sense of ownership and hence increase their efforts and care in producing high quality honey.
- Explore selling seeds, cuttings, and fertilizers to grow flowers, shrubs and nectar-producing trees to beekeepers to develop their local ecosystem**

While HCA advises beekeepers to grow small plants to improve the surrounding natural environment, HCA can explore taking on a more active role in this process by selling plant inputs that beekeepers can use with HCA advice. Improving the local ecosystem helps increase pollination and production of regular and naturally flavored honey.

- Explore methods to strengthen advocacy for forest conservation through partnerships**
 The FAO states that there is a positive relationship among bees, honey production, and forest cover. HCA should explore ways to strengthen advocacy for forest conservation through partnerships. Today's overexploitation of tree resources has many consequences, including decreased populations of honeybees, which deprives people of local sources of food and income, and reduced biodiversity (most plants need an animal to visit their flowers in order for them to produce fertilized seeds, fruit, and future generations of the plant. Around half of the animal pollinators of plants are bees).⁵³ HCA can identify, join with, and/or simply mentor partnerships and organizations that dedicate certain resources to this type of advocacy.
- Propose partnerships to work with clubs at primary schools focused on protecting the environment**
 Explore ways to increase children's knowledge of environmental conservation. An early introduction to such issues will allow children to adapt environmental-friendly behaviors early in life. HCA should encourage the creation of eco-clubs or 4K clubs at primary schools to increase the dissemination of this information. Children can then share what they learn at such clubs with their parents to further disseminate the information.

REDUCE NEGATIVE IMPACTS

Table 6: Opportunities to Decrease Negative Impacts

Opportunity	Potential Response
Misinformation about honey	Inform farmers of dangers of honey for children under one year and pregnant women
Fear of bees	Explore innovative solutions for protective gear/suits
HCA's reputation with farmers	Explore approaches to improve trust, respect, and relationships between HCA and beekeepers
Side-selling	Explore methods to increase understanding of why side-selling occurs
Awareness of beekeeping	Explore partnerships with community health workers and clinics to increase awareness of the safety of beekeeping, and place epinephrine at the clinics
Beekeepers' negative experiences	Explore ways to track and rectify beekeepers' negative experiences with HCA and with beekeeping through direct conversations with headquarters or field office supervisors
Financial constraints during loan payment period	Explore partnerships with government and NGOs to reduce negative impacts HCA farmers face during the loan payback period

Prioritized recommendations are bolded.

- Inform farmers of dangers of honey for children under one year and pregnant women**
 There are a number of misconceptions about honey's use and benefits. HCA should explore ways to increase their beekeepers' knowledge of honey, its benefits, and the risks involved. HCA farmers can then informally spread the information to the broader community through their own social networks. Of particular importance is increasing awareness that children under age one and pregnant women should not consume honey due to the heightened risk botulism poses to them.

 HCA might also want to consider providing information about how to assess the quality of honey sold in local markets, since middlemen often add brown sugar, molasses, and water to the honey they sell. HCA can share such information with farmers at information sessions, or when visiting farmers to set up the apiary, clean the hive area, or harvest the honey. HCA could also consider partnering more closely with NGOs and community organizations to disseminate some of this information to the wider community.

- **Explore innovative solutions for protective gear/suits**

To reduce the occurrence of bee stings and the associated harmful outcomes on farmers and their children, HCA can show beekeepers how to make protective suits of old cotton flour bags.

- **Explore approaches to improve trust, respect, and relationships between HCA and beekeepers**

HCA faces many challenges stemming from the break in continuous service to HCA farmers that occurred during 2006-2010. It is essential to rebuild reputation with farmers in order to retain current beekeepers, attract new ones, and rekindle relationships with previous HCA beekeepers. We suggest HCA focus on providing better service, care, and attention to its existing farmers by hiring more Hive Technicians and expanding with care. HCA should also improve its payment system to ensure that money reaches beekeepers in the guaranteed 48-hour period. HCA can also develop a system to ensure the price per kilogram it pays is market-competitive. During our interviews we learned of another company buying honey for 190 KES per kilogram.

- **Explore methods to increase understanding of why side-selling occurs**

We strongly suggest HCA invest time and resources into understanding why side-selling occurs - why some beekeepers sell to non-community-based brokers that they have no relationship with, at what prices, at what intervals (how many weeks before Hive Technicians attend to the farm), and what other benefits, if any, these brokers offer. Data from the SWARM platform would aid in this effort, as would honest and sincere conversations with beekeepers. Cluster Supervisors or dedicated team members from headquarters could conduct such interviews. We further suggest that HCA use the information from this field research to explore options to counteract side-selling, such as beekeeper loyalty programs (platinum, gold, and silver levels depending on quantity of honey sold to HCA), working with the brokers (similar to the TechnoServe dairy model), and better communicating the long-term negative impacts of selling to brokers (i.e. reduced quality of honey and increased honey prices through the value chain resulting in higher costs of hive and extension services in the long run).

- **Explore partnerships with community health workers and clinics to increase awareness of the safety of beekeeping, and place epinephrine at the clinics**

HCA should explore partnering with community health workers (CHW) and local clinics in spreading factual information about bee stings. This can be done through a clinic and CHW training session conducted by HCA. HCA should explore providing epinephrine auto-injectors to clinics. This medical device delivers a measured dose of medicine for the treatment of acute allergic reactions to bee stings.

- **Explore ways to track and rectify beekeepers' negative experiences with HCA and with beekeeping through direct conversations with headquarters or field office supervisors**

HCA could explore ways of collecting beekeeper grievances related to HCA staff or service, or beekeeping in general. This could be done through face-to-face conversations between the beekeeper and headquarter staff or with supervisors at the field offices, including via mobiles. HCA should then work to rectify these complaints in order to retain beekeepers, develop strong bonds with them, and develop stronger Hive Technician training programs.

- **Explore partnerships with government and NGOs to reduce negative impacts HCA farmers face during the loan payback period**

HCA could explore partnering with organizations that can offer beekeepers additional support to mitigate negative impacts they may experience while paying back their loans. Support such as child care while beekeepers work and access to food vouchers could have a large influence on their children's lives. HCA could offer such support by making beekeepers aware of available resources in the community. These could also be valuable to HCA staff with small children.

INCREASE PENETRATION INTO CURRENT MARKETS

Table 7: Opportunities to Increase Market Penetration

Opportunity	Potential Response
Exchange programs to attract new members	Explore setting up exchange programs to introduce new farmers to beekeeping as an income generating activity
Partnerships with existing farmer cooperatives	Explore partnering with farmer cooperatives in HCA-cluster areas

Prioritized recommendations are bolded.

- **Explore setting up exchange programs to introduce new farmers to beekeeping as an income generating activity**

HCA could create an exchange program in which people from other communities visit HCA bee farms and see first-hand the potential for beekeeping as an income generating activity. Through this type of information dissemination and networking, farmers could learn how bees colonize the hives, how and when harvesting takes place, where to access financing for the hives, and about HCA's guaranteed market access program.

- **Explore partnering with farmer cooperatives in HCA-cluster areas**

HCA can explore increasing penetration in existing cluster areas by forming partnerships with existing farmer cooperatives as well as local and regional government, NGOs, and community organizations such as livestock farmer cooperatives. This would also strengthen HCA's ground network.

EXPAND TO NEW POPULATIONS AND MARKETS

Table 8: Opportunities to Expand to New Populations and New Markets

Opportunity	Potential Response
Build on market intelligence	Continue gathering market intelligence through regular dialogue with HCA beekeepers to attract new members and via the SWARM platform
Ability for less wealthy to afford hives	Explore new models of financing beehives
Scale to other locations	Explore scaling to new locations via partnerships with NGOs in the agriculture space. Develop nonfinancial relationships with large foundations and NGOs to leverage their extensive networks and high-quality expertise

Prioritized recommendations are bolded.

- **Continue gathering market intelligence through regular dialogue with HCA beekeepers to attract new members and via the SWARM platform.**

HCA should continue gathering market intelligence through regular dialogue with its beekeepers in order to better understand their needs and grievances. This information, along with patterns recognized by analysis of SWARM data, could help develop new market entry strategies.

- **Explore new models of financing beehives**

Although Equity Bank offers lower interest rates (15%) compared to other banks (25%), the interest rate on loans is still too high for some farmers to request a loan. HCA is pursuing partnerships that will allow it to offer its own financing at a lower rate. HCA is also piloting tying loan repayment to honey harvests through a partnership with Mulago. HCA is rolling out a pilot of 1500 hives in a lease-to-own program in Kakamega and Kwale in partnership with KIVA. HCA should continue exploring

partnership models with different financial institutions in order to provide better financing options for potential beekeepers. HCA should also continue to work with farmers whose piece of land is too small to keep bees by having them set up group hives in the forest or on another farmer's bigger plot of land (cooperative model).

- **Explore scaling to new locations via partnerships with NGOs in the agriculture space. Develop non-financial relationships with large foundations and NGOs to leverage their extensive networks and high-quality expertise.**

HCA should focus on scaling to new locations through partnerships with NGOs in the agriculture and farm inputs space. Scaling would attract further capital and allow HCA to increase quality honey production and sale, and premium brand status in the market, increasing profits and enhancing the sustainability of its business model. HCA should also focus on directly attracting more investment capital to scale to other countries. Non-financial relationships can also provide many benefits to the venture such as access to networks and technical experts, and the ability to leverage other organizations market-creation efforts.

CAPTURING IMPACTS

In this section, we outline at a high level how HCA can quantify a set of impacts identified in the Impact Findings section and move toward regularly measuring its outcomes on its stakeholders and their children ages eight and under. We suggest that HCA consider conducting its own study or commission a study from an outside source (preferred method) to learn more about its impacts. By conducting a thorough assessment of its impact, HCA can:

- **Assess opportunities to enhance its value to its stakeholders.**
- **Create additional revenue generating models to better meet the needs of stakeholders and seek partnerships to facilitate them.**
- **Demonstrate the success of its business model to external stakeholders.**

MOVING TOWARD A SYSTEMATIC IMPACT ASSESSMENT

We recommend that HCA systematically measure its impacts on its stakeholders' children in the 0-8 age category, as well as pregnant women. Although HCA has developed a survey to capture impact and implemented it once, we suggest adding metrics and revising the methodology.

Taking a deeper and quantitative assessment of its impact will allow HCA to gain a more nuanced understanding of the needs of young children as well as how these needs change over time. This will also allow HCA to improve its processes and increase impact. The quantitative findings could be included in an annual report to demonstrate the initiative's value proposition to external stakeholders. Rather than focus on measuring the impact it has on all its stakeholders' children, we recommend that HCA start by first measuring its impacts on its beekeepers' children, and including pregnant women. Once HCA develops a regular system to capture this, the BoP venture can, in a targeted manner, measure its impacts on its employees' children, and those in the broader community.

In order to capture HCA's impacts on children in a manageable way, we suggest that the company develop a short, mostly quantitative set of questions of core impact areas (such as impacts bolded in **Table 4**) for children age eight and under. HCA should survey new farmers at three key intervals: 1) when purchasing an HCA hive, 2) after the first honey harvest, at the respondent's home, and 3) one year after the first survey, also at the respondent's home. This schedule of surveys will help HCA capture both short- and long-term impacts and demonstrate changes in impacts over time. HCA should try to continue to collect impact data from farmers who stop working with HCA. Recording GPS coordinates will help interviewers find respondents' homes at later data collection times.

We recommend that the survey be administered by interviewers rather than filled out by beekeepers. This will help to ensure that respondents fully understand the questions and do not leave questions blank. We also recommend that HCA hire a third party to conduct the interviews to reduce response bias. A less expensive alternative would be to have HCA conduct the surveys. If HCA chooses the latter option, we recommend that it still commission an independent assessment of its social impacts every few years to ensure objectivity of the findings. Regardless of who conducts the surveys, HCA should hold a brief workshop or provide a manual to ensure that the interviewers understand the purpose of each question.

Based on the likely direct and indirect impacts we found in the field on beekeepers' children, we identified core impact areas to consider measuring using subjective questions, many of which can be quantified using Likert scales of 1-5 (see **Appendix D**). Since the impacts are likely to vary by the child's age, we specify which questions should be asked according to age group. The survey should begin with a question about the number of children in the home and their ages so the interviewer knows which questions are appropriate. At the end of the survey, the interviewer should ask an open-ended question to capture any

other differences parents have noticed in their children or in the mother, if she is pregnant. During the survey, the interviewer should observe each child's appearance and behavior, if present. The questions in **Appendix D** are suggestions, and should be pretested with customers for adaptation to the local context.

We suggest that HCA continue to use the BoP IAF to systematically capture its impacts on beekeepers. The tool will provide a structure through which HCA can categorize and track new findings on impacts derived from its surveys. This framework will allow modifications as necessary. HCA may also find the tool helpful if the organization decides to capture impact data on its BoP employees' children and children in the broader community. A benefit of using the BoP IAF is its flexibility—HCA can customize the tool to its needs, which will allow the organization to measure its impacts in a manageable way.

CONCLUSION

Providing supplemental agricultural income-generating opportunities through improved farm inputs and market facilitation improves the quality of life for farmers and their families. We find that the majority of impacts HCA has on our target population occur for beekeepers' children. Many of these impacts are related to the increased ability of farmers to provide for their children as a result of (1) the increased income they receive from honey and (2) the stability honey production provides as a guaranteed revenue source that diversifies their income-generating activities. This ability may be reduced short-term if parents take loans to purchase HCA beehives. Besides economic impacts, pollination carried out by bees increases crop yields and yield quality, resulting in health benefits from additional foods available for consumption from family farms. With the exception of children under age one, children benefit from the immunity-boosting and health properties of honey. Beekeeping also improves children's awareness of environmental conservation, about the necessary and complex ecosystem service bees provide, and about the delicate state of the ecosystem.

Although the majority of impacts occur on children of HCA farmers, HCA staff's children also benefit from increased access to honey, improved local environment, their parents' increased social network from working with large numbers of farmers, and their parents' presence at home due to working in the local region. HCA provides stable jobs in the community, helping parents to provide for their children's needs. Children living in communities surrounding HCA activities are also impacted positively from improvement in the environment and increased pollination by bees.

Based on our findings, we provide methods and questions HCA can use to measure its impact on children regularly. We also provide recommendations to HCA to enhance and deepen its impact on its current stakeholders' young children and to expand to new markets to improve more children's lives. Our key recommendations include:

- **Explore methods to improve HCA's reputation with beekeepers by hiring more technicians to assist beekeepers (especially during harvests), ensuring 'as soon as possible' revenue payback, and paying competitive prices per kilogram of honey.**
- **Reduce misinformation about honey by informing beekeepers of the dangers of honey for children under one year and pregnant women. Explore training programs for community health workers and clinics so they spread awareness on the safety of beekeeping.**
- **Conduct a thorough understanding of why side-selling occurs through field and the SWARM platform data and explore options to counteract the negative effects of this issue.**
- **Continue to spend time, effort, and other resources on understanding the needs and grievances of beekeepers (via feedback collection methods, regular dialogue, and the SWARM platform data analysis) to retain existing farmers in the program and attract new ones.**
- **Explore new models to finance beehives so less wealthy individuals can afford HCA hives.**

Together these suggestions can help HCA improve its operations to meet the needs of children.

APPENDICES

APPENDIX A: COMPETITOR PROFILES

African Beekeepers Ltd.

Founded in 2001, African Beekeepers Ltd., a Nairobi, Kenya-based company, targets the East African region. ABL improves economic development by offering opportunities in agriculture enterprise development. The social enterprise leverages technological advances in agriculture and commodity market opportunities to bring about positive change for farmers, producers, and processors. Like HCA, ABL works in partnership with farmers and development organizations for the production of honey and honey-related products.

The International Centre of Insect Physiology and Ecology (ICIPE)

ICIPE established in Kenya in 1970, provides research on the potential benefits and harmful effects of insects. Through its research, the non-profit organization works to improve food production, and human, animal, and environmental health, as well as to conserve natural resources. Among its many projects, ICIPE improves beekeeping for honey production and wild and domestic silk moth rearing in silk production for more than 10,000 farmers. ICIPE's mission is poverty alleviation, ensuring food security, and improving the overall health of people through the delivery of management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building.

Green Forest Social Initiative

Kisumu, Kenya-based Green Forest Social Initiative (GFSI) is an integrated social development enterprise involved in a number of forestry and agricultural activities. GFSI combines tree farming and beekeeping with smallholder farming undertaken by communities within Gwassu Division of Suba District, Homabay County. GFSI consists of a holding company, The Green Forest Social Investment Ltd., and subsidiaries Green Forest Estate Limited (tree plantations and beekeeping activities in Trust Lands and land leased from the community), Green Forest Processing Ltd. (processing of honey, biofuels, and aloe), Green Forest Carbon Ltd. (sustainable processing of charcoal and briquettes), and the Green Forest Social Investment Trust, responsible for organizing farmers into production units promoted by GFSI. GFSI floods the market with displays and sells its honey products at low prices in local supermarkets.

Other competitors include Mzinga Honey Products, Hotsun Honey Ltd., Youngline Kenya, Musa Solutions, Enrich, Impex LTD., Encom Solutions, Wegan Company Ltd., Frontier, Fiolabchem, Kenzanda, Liverpool Trading Agency, Tangent Ltd. Native Products, Alcare Kenya, Beekeeping Technologies & Services, Honeyfield, Clear Leek Ventures, Innovative Foods Limited, African Fine Commodities Exchange Limited, International Link Networks, Kenia Farm Fresh, and Mache investments Ltd.

Traditional Honey Producers

Many farmers still view honey production as mainly for household consumption and not income generation. The few farmers who do produce honey for income, independently do so by selling it in jugs along-side the road. Some might sell honey in small quantities in the local market.

APPENDIX B: ADDITIONAL IMPACTS ON HCA'S BEEKEEPER'S CHILDREN

Impacts that occur on HCA's beekeepers children that are not bolded in **Table 4** are explored here:

ECONOMIC WELL-BEING

Indirect Impacts

Wealth: Increased financial resources available for child's well-being as a result of parents' improved health

Honey is often consumed by farmers for general wellness and to treat colds and increase immunity. Many HCA farmers believe that honey has additional medicinal properties, ranging from curing high blood pressure to treating ulcers. They also believe that when honey is used to replace butter and jam, honey contributes to reducing obesity.⁵⁴ Honey's benefits can improve the health of parents, allowing them to work more hours during the day and reduce medical bills.⁵⁵ One honey consumer said she uses the money she saves on medical bills to buy more fruit or invest back into her income-generating activities.⁵⁶

CAPABILITY WELL-BEING

Direct Impacts

Physical Health: Risk of allergic reaction from bee-stings

Children, especially those with allergies to bee stings, are directly impacted by the introduction of bees to their environment. If HCA does not manage hives properly then bees can go wild and become more aggressive toward humans.⁵⁷ A mild allergic reaction to an insect sting may cause one or more of the following: pain, redness, pimple-like spots, mild to moderate swelling, warmth at the sting site, and itching. Severe allergic reactions are not common; however, when a person is allergic, the sting can lead to shock, cardiac arrest, and unconsciousness in 10 minutes or less.⁵⁸

Indirect Impacts

Physical Health: Improved child's health due to reduced use of chemical pesticides

One beekeeper said that when he began his relationship with HCA, he started using organic pesticides because he realized chemicals could kill bees.⁵⁹ Decreasing or eliminating the use of pesticides has positive effects on children. Pesticide poisoning disproportionately affects children, due to improper use and storage. Key risks are cancer, birth defects, and damage to the nervous system and the functioning of the endocrine system. Pesticides are known to cause millions of acute poisoning cases each year.⁶⁰

RELATIONSHIP WELL-BEING

Indirect Impacts

Support: Parents spend increased amount of quality time with children due to less time spent tending to beehives

While many smallholder farming activities can be labor-intensive, beehives through HCA are essentially a self-sustaining business. The time that HCA parents do not spend on these supplemental activities can be spent with children. However, many parents use the additional time to invest or work on additional income-generating activities. With HCA's Hive Technician support, there is a very limited time-commitment needed from farmers. The business is less labor-intensive than chicken, dairy, and vegetable farming. One HCA farmer said, "When you set up an apiary you can go to sleep."⁶¹ The time spent with children during early childhood development, especially during ages 1-3, can have effects well into adulthood. Language and cognitive development are especially important during the first six months to three years of life. When children spend their early years in a less stimulating, or less emotionally and physically supportive environment, they can experience social and behavioral delays, leading to difficulties in learning and adapting to complex environments in adulthood.⁶²

APPENDIX C: ADDITIONAL IMPACTS ON HCA'S BOP STAFFS' CHILDREN

Impacts that occur on staff's children that are not bolded in **Table 4** are explored here:

ECONOMIC WELL-BEING

Indirect Impacts

Wealth: Increased financial resources available for child's well-being due to parents' increased savings

One HCA Hive Technician said that as a result of HCA's insurance policy he is able to save money. Although the policy covers only his medical expenses, he is happy to save these costs. He uses the saved income to pay school fees.⁶³

APPENDIX D: ADDITIONAL IMPACT ASSESSMENT SUGGESTIONS

These questions provide a starting set we recommend HCA use to begin regularly capturing its impacts on customers' families. The questions below illustrate how HCA could quantitatively measure some of its key impacts on children. These questions have not been tested and should be reviewed for reliability and for adaptation to local context.

The survey should be structured in order to ensure comparability across respondents. Therefore all surveys should include the same questions, so changes in the customers' children's lives can be compared and measured over time. However, impacts will likely vary based on the age of the child and whether someone in the household is pregnant. Therefore we suggest that the surveys clearly mark questions intended for older children and use skip patterns to only ask questions that apply to the child based on age and whether there is a pregnancy in the household (see **Table 9**). The survey should begin with a question about the number of children in the home and their ages so the interviewer knows which questions are appropriate.

Table 9: Suggested Impacts to Measure and Potential Questions

	Impact	Potential Questions	Question Type
Economic Well-Being	Assets	What job and other sources of income does the male head of household have?	
		What job and other sources of income does the female head of household have?	
		What is your average weekly income?	
		How much crop yield did you produce in the last harvest? How does it compare to previous harvests?	
		Please answer the question using the scale based on how true the following statement is: My household income is stable. <i>Scale: 1=Strongly agree, 2=Agree, 3=Neither agree or disagree, 4=Disagree, and 5=Strongly disagree</i>	
		How many loans do you currently have open? Please tell the amount and when you estimate they will be paid off.	Ask caregiver about both younger and older children; ask pregnant women
		In an average week, how much money do you spend on your child? How much of that is health related expenditures?	
		Over the past week, to what extent were you able to meet your child's clothing needs?* <i>Scale: 1=Not at all, 2=A little, 3=A moderate amount, 4=Very much, and 5 An extreme amount</i> <i>*This question can be repeated to ask about other material needs a child has such as school supplies and fees.</i>	Ask caregiver about both younger and older children

	Impact	Potential Questions	Question Type
Capability Well-Being	Physical Health	How many times has your child gone to the doctor in the last week? The last month?	Ask caregiver about both younger and older children
		How many times did your child have diarrhea in the last month?	Ask caregiver about both younger and older children
		How many times did your child have a cough or cold in the last month?	Ask caregiver about both younger and older children
		How many times has your child missed school due to health reasons in the last month?	Ask caregiver about older children
		Please answer the question using the scale based on how true the following statement is: The quantity of food my child is getting is sufficient. <i>Scale: 1=Strongly agree, 2=Agree, 3=Neither agree or disagree, 4=Disagree, and 5=Strongly disagree</i>	Ask caregiver about both younger and older children; ask pregnant women
	Please answer the question using the scale based on how true the following statement is: The quality of food my child is getting is sufficient. <i>Scale: 1=Strongly agree, 2=Agree, 3=Neither agree or disagree, 4=Disagree, and 5=Strongly disagree</i>	Ask caregiver about both younger and older children; ask pregnant women	
	Education	How much, if at all, has your child's grades improved at school? <i>Scale: 1=Not at all, 2=A little, 3=A moderate amount, 4=Very much, and 5=An extreme amount</i>	Ask caregiver about older children
How much, if at all, has your child's understanding of the importance of conserving the environment changed? <i>Scale: 1=Not at all, 2=A little, 3=A moderate amount, 4=Very much, and 5=An extreme amount</i>		Ask caregiver about both younger and older children	

At the end of the survey, the interviewer should ask an open-ended question to capture any other differences the parents have noticed in their children or in the mother, if she is pregnant. During the survey, the interviewer should also observe each child's appearance and behavior, if present. The above questions are suggested questions and should be pre-tested with customers to adapt them to the local context.

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**William Davidson Institute at the
University of Michigan**

724 E. University Avenue
1st Floor, Wyly Hall
Ann Arbor MI
48109-1234
(734) 763-5020
www.wdi.umich.edu



William Davidson Institute
AT THE UNIVERSITY OF MICHIGAN