

BEYOND THE SWEETNESS OF HONEY; HARNESSING THE SOCIOECONOMIC POTENTIALS OF BEEKEEPING AND HONEY PRODUCTION

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This preliminary research explores the environmental, social, and economic development potentials of honey and beekeeping production in Africa. We argue that financial investments and an effective supply and value chain can help realize these potentials. This publication is a product of the Impact Toolbox's global citizenship fellowship, a global intrapreneurship and peer collaboration program that connects college students to peer collaborators or organizations worldwide to work on mini-research, social entrepreneurship and policy advocacy projects. This edition is implemented in partnership with Appalachian State University. It provides students with opportunities for cultural exchanges, international collaboration experiences, and early exposure to international development projects.

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Beyond the Sweetness of Honey; Business and Development Potentials of Beekeeping and Honey Production - Evidence from Uganda and Ghana

This preliminary research explores beekeeping and honey's environmental, social, and economic development potentials in Africa. We argue that beekeeping and honey production are effective for environmental protection and socio-economic empowerment, especially for rural women. We posit that financial investments and an effective supply and value chain can help realize these potentials. Our focus is on bee farming and honey production in Uganda and West Africa, and our research methodology includes literature reviews and interviews. We recognize this publication presents limited evidence focusing on just Uganda and Ghana, but the ideas and policy suggestions apply to many other parts of the world. Our goal is that this publication will call the attention of the various stakeholders to the enormous potential of honey and beekeeping and inspire more detailed research and advocacy agenda.

Whether cultivated in the wild or through apiculture, the process culminates in the production and subsequent usage of honey has implications for socio-economic, biological, and environmental sustainability (Patel, Pauli, Biggs, Barbour & Boruff, 2020). The economic development of low-income countries in Africa largely depends on exporting mineral and agricultural resources as food sources and raw materials for industries (Diao, Hazell, Thurlow, 2010). Honey-hunting, and to a lesser extent, beekeeping is an essential aspect of the practice of farming in Africa. It has ancient origins and is a crucial component in rural communities' social, economic, nutritional and ecological value across the continent.

Despite being the continent that is mostly unaffected by the global decline in its bee population, African consumer and manufacturing markets are heavily reliant on foreign markets for the supply of honey, and the primary reason for this is due to the untapped potential of the continent's production (Heuer & Ehrensperger, 2015). The key to unlocking these potentials lies in reducing and possibly eliminating the trade bottlenecks that hinder African export, facilitating knowledge transfer that pertains to contemporary trends in honey production and beekeeping, and creating a regulated and agile supply and value chain for the production and distribution of honey.

Bee Keeping and Sustainable Development

The encouragement of sustainable honey production in Africa entails an acknowledgment of the structural and ideological impediments to the attainment of optimum maximization of its potential. The realities of demand and supply implicate market segmentation, inadequate market infrastructure and the unsustainability of current bee production methods as responsible for the lack of development of the industry (Eleni, 2001). As opposed to the more economically viable option of farming, the gathering of honey has placed honey producers in the same category as game hunters and has continued to discourage the participation of critical investors in the industry.

Sustainable honey production, harvest and preservation process is suggested as a valuable mode of farming in developing nations. There is a need to encourage a transition from the unsustainable practice of honey-hunting to a more environmentally palatable alternative to beekeeping in Africa. The typical approach of honey-hunting in most parts of Africa involves the identification of trees with bee nests, cutting down the trees or using smoke (and fire) to get rid of the bees. These practices eliminate entire colonies of bees, are environmentally injurious, can cause wildfires and result in significant bee mortality (FAO, 2011). The harvested honey is subjected to a preservation method that involves boiling, further depreciating its nutritional value (Heuer & Ehrensperger, 2015).

Beekeeping adds value to the ecological realities of communities where it is being practiced and hardly competes for land and water resources with other forms of agriculture (FAO 1990). Beekeeping and honey production creates a value chain that provides opportunities for all business scales, from an individual to small, medium and large scale. Its potential for attaining the United Nation's Sustainable Development Goals (SDGs) is enormous. Patel et al. (2020) opined that bees have the potential to contribute to the attainment of 15 out of 17 SDGs and 30 SDG targets.

In the world's developing nations, there is more confidence in attaining these global goals from the individual than at governmental levels, as most economies are mainly reliant on the exploitation of mineral resources (Taddele & Nejdani, 2008). The end-products of bee-keeping have both personal, community and international utility. They are a potential source of revenue as a side or as a primary investment for small and large business owners.

Africa has an abundance of varieties of wild honey bees. When they are not being hunted, burnt or sprayed to extinction with insecticides, they can on their own thrive and produce honey. However, beekeeping provides the specific environmental conditions necessary for optimum honey production. All

forms of available land resources have inherent value for beekeeping. It is feasible in marginal conditions and can provide supplementary incomes for otherwise employed entrepreneurs and primary income for small and large-scale business persons (Bradbear, 2003).

Patel et al. (2020) explained that bees directly impact the actualization of 15-millennium development goals as outlined thus.

1. SDG1 - No Poverty: In Africa, honey is mainly harvested by some of the most vulnerable rural households whose earnings directly translate to the provision of basic nutritional, health and safety needs, and is also used as a source of medicine for the ailments that are exacerbated by poverty Bradbear (2009).
2. SDG2 – Zero Hunger: The activities of bees are essential to higher crop production and better harvests, and pollination also increases the nutritional value of seeds, vegetables and fruits.
3. SDG3 - Good health and well-being: Honey is a relatively cheap, harmless, and affordable medicine. They are an active ingredient in the preparation of traditional and orthodox medicine. In Africa, honey is used as first aid for burns and in the preparation of beauty products and soap, and bees' pollination also contributes to biodiversity.
4. SDG4 - Quality Education: Teaching modern beekeeping methods and improving the resilience of traditional bee-hunting as a form of vocational training to aspiring and practicing farmers and entrepreneurs (Ekele, Kwaghgba & Essien. 2019).
5. SDG5 - Gender Equality: Beekeeping is neither capital nor labour-intensive and can be exploited as leverage to improve women's participation in economic activities. Even in those societies where property and land ownership rights put women at a disadvantage, beekeeping can be suggested as a means of empowerment Patel et al. (2020)
6. SDG 6 - Clean water and sanitation: The promotion of beekeeping will have an equivalent effect on the discouragement of honey hunting and its attendant adverse effects on forest reserves and the quality of honey. Also, bee pollination is said to contribute to the diversity of water-related ecosystems.
7. SDG 7 – Affordable and Clean Energy: Bee pollination is said to improve the production of low-cost biofuel crops such as *jatropha curcas* and other oilseeds (Patel et al., 2020).
8. SDG 8 – Decent work and economic growth: Bee pollination is said to improve the fields' f agricultural products, boosting local food production and potentially improving the Gross Domestic Product of developing nations. It is also a viable alternative source of revenue for

- farmers and small and medium business entrepreneurship and a means of economic empowerment for disadvantaged populations.
9. SDG 9 – Industry, Innovation and Infrastructure: Honey-related products are elements of Africa's wide variety of cosmetic and health products. Widespread investments in beekeeping will inspire further exploration and development of traditional honey remedies. Furthermore, the mechanism of the movement and organization of bees have inspired human innovations in mechanical and computer engineering (Patel et al., 2020).
 10. SDG 10 – Reduced Inequality: The empowerment of women, unemployed youth, peasant farmers and other small-scale business persons with modern beekeeping methods is a means of socio-economic empowerment. The multiplier effects of improved crop yields through bee pollination can also cause improvements in food security and GDP.
 11. SDG 11 – Sustainable Cities and Communities: Urbanization has implicated significant habitat loss. Beekeeping in urban areas will enhance the viability of urban gardens as bee pollination increases the chances of plant survival. They are also a means of monitoring and improving air quality and can be a source of tourism in the long run.
 12. SDG 12 – Responsible consumption and production: Beekeeping is a sustainable alternative to honey hunting. Honey is also a healthier alternative to fructose and artificial sweeteners. Its wide usage can discourage some of the loss of forestry associated with the large-scale cultivation of sugarcane and other industrial raw materials for sugar production.
 13. SDG 13 - Climate Actions: According to Patel et al. (2020), the use of bees and products of beekeeping for environmental monitoring can contribute to a more robust understanding of the ecological effects of climate.
 14. SDG 14 – Life below Water: Just as beekeeping reduces deforestation through harmful honey-hunting practices, beekeeping encourages the production and consumption of alternative plant-based nutrient sources, reducing overreliance on the aquatic source of similar nutrients and overharvesting of fish (Patel, 2020).
 15. SDG 15 – Life on Land: Bees, through pollination, are significant contributors to biodiversity, and particularly in Africa, beekeeping is a sustainable alternative to bee hunting. It is also a contributor to the sustainability of green urban centers.

Business Potentials of Beekeeping and Honey Production; Evidence from Uganda

Among the growing Agribusinesses in Uganda, beekeeping is at the top. The sector was unpopular before due to traditions and superstitions; however, the industry is picking up and has attracted about 1.2 million people earning a living from it. Honey is the most prominent beekeeping product, but other products are adding to bee farmers' incomes in Uganda which include; propolis, bee-wax, and the most recent trend of bee venom. In Uganda, the most famous areas for beekeeping are West Nile, Kigezi and Teso regions, among others (Roberts, 1971).

The demand for honey in Uganda is higher than the supply, yet the product is also exported informally to neighbouring countries like Kenya, Tanzania and the Democratic Republic of Congo. As a result, many bee-keeping farmers have not had the opportunity to brand their products for the official market. In my interview with Dr. Olivia Aketch, a youth in the bee business in Uganda, she supported this, saying, "Even before the honey is harvested, I am already overwhelmed with orders locally. That is why I have not thought of building a brand for export, supermarkets, wholesale or retail traders". Despite the small capital required to start the bee business, many people avoid this lucrative venture due to its superstitions. Beekeeping was viewed as an activity for men of older age due to the location of the hives in trees that women were not allowed to climb (Roberts, 1971).

The greatest challenge facing the youth and women in this business is the lack of land to set up the business, which according to Dr. Olive, is the essential capital in the bee business. I quote, "The greatest challenge to me is land; I can't expand my business to incorporate more hives," she says. Other challenges to the bee-keeping business are the inaccessibility of equipment used for beekeeping, lack of capital for setting up, lack of collateral to access credit from formal institutions and climatic change (Biryomumaisho et al, 2022). Droughts and rain wither the crops, making it difficult for bees to make honey and slowing down the honey-making process (ibid).

The business comes with advantages of pollination to Agriculture; it holds income to those involved in it for business two to four times a year. When asked about the benefit of this business, Dr. Olive told us that the business is a significant income source for her. Honey business is also a source of employment for women and youth relieving them from idleness in the community. Along the value chain are making bee harvesting clothes, beehive equipment, and candles. The honey product has many health benefits like healing wounds and suppressing cough. It also helps to aid faster food digestion in comparison to sugar.

Honey Value and Supply Chain Recommendations

Our research on the honey industry in Ghana revealed supply chain management as a critical area of concern. We suggest that stakeholders must regulate the honey supply chain to prioritize equity, sustainability, and traceability to harness the business and social impacts of beekeeping and honey farming.

Equity

Equity considerations include guaranteeing buyers, ensuring fair payment, and information sharing between beekeepers. The beekeepers need buyers for their honey to generate profit, yet new farms may struggle to find buyers since they need to establish their reputation. We recommend promoting equity through partnerships with reputable organizations such as Bees for Development which helps upcoming bee farms espouse an excellent status for conducting business. Other solutions that promote equity vary from developing supportive infrastructure to information sharing among beekeepers. A good example is Beekeeper's Companion, a platform where beekeepers worldwide consult each other on efficient methods or discuss revenue strategies. Such as nectar flows throughout the seasons to ensure a sustainable business cycle (Rünzel et al., 2021). As emphasized by Dr. James Wilkes, Beekeeper's Companion may include a payment feature where the farmers receive payments in various currencies to promote fair compensation.

Sustainability

Sustainability should exist in every aspect of running a honey farm. The 4Ps (pathogens, parasites, poor nutrition, and pesticides) need to be avoided, so colony collapse does not occur. The farmers maintain their financial sustainability by protecting their nectar flows tied to bees' health. However, the community or the wider world requires more steps for sustainability.

Honey farms with reverse supply chains, packaging reuse, and Life Cycle Assessments (LCA) surpass their competitors in sustainability. Separate facilities may develop into logistic centers for each municipality for packaging or recycling honey jars. Such facilities in Italy led to a 70 percent reduction in emissions from honey jar packaging by implementing an 85 percent packaging reuse rate (Postacchini et al., 2018). LCA requires lower carbon emissions, equalizing tri-ethylene glycol emissions in water and the soil, equalizing sulphur dioxide emissions in the air, and reducing M2 on arable land per year. While LCA implementation may face infrastructural and cultural difficulties, we suggest that its potential benefits outweighs the cost.

Traceability

Adulteration (mixing of honey with other materials) pervades the honey industry, so a robust method of tracing honey to curb counterfeits is necessary. For example, Dr. Wilkes mentioned how 10% of honey might be mixed with fructose to pass off as natural honey. Recommendations include applications, co-ops, and labels for addressing adulteration. For example, low-cost solutions like the combined use of Beekeeper's Companion and WhatsApp may act as an intelligent supply chain monitoring tool. After algorithms analyze the pollen signature, farmers take a picture, send images over the blockchain, and receive verification to sell their honey to buyers (Rünzel et al., 2021). Developing infrastructures such as a honey collection facility will help prevent adulteration. The facilities simplify production tasks for farmers who only have to bring harvested honey to a collector, then the collector sends it for processing and then packaging. Organizations such as Bees for Development may also advance their work to acting as a 3rd party auditors for the quality of honey products. The socio-economic potential of honey as an exportable commodity depends on ensuring equity, sustainability and authenticity along its value and supply chain. Creating smart supply chains and investing in collection facilities, information sharing and payment systems, and export-oriented logistic centers will benefit all stakeholders and attract critical investments. A thriving beekeeping and honey industry and encouragement of women bee farmers will go a long way in increasing women's economic stake and achieving gender parity.

Conclusion

Sustainable development entails identifying and developing systems that have the potential to uplift the people while causing little to no long-term damage to the environment. Beekeeping is a sustainable model of agriculture and promising non-farm food production activity for individuals and households of all economic statuses. It, directly and indirectly, contributes to households' incomes and the nation's economy. The direct contribution of beekeeping includes the value of the outputs produced, such as honey, beeswax, queen and bee colonies, and other products such as pollen, royal jelly, bee venom, propolis, cosmetics and medicine. Beekeeping in most parts of Africa is still a primitive practice in very rural areas. It requires skills that are scarce among women populations. The major end product of beekeeping, honey has multiple market opportunities, unlike many other commodities. There is household, small, medium large scale and indeed, foreign market demand for honey. It is therefore a scalable means of economic empowerment and environmental protection. Therefore, the advancement of honey production is a good strategy for community development, improving economic capacities and lifestyle practices, economic inclusion and other sustainable development goals.

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