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Apiculture and Conservation Opportunities: The Case of Sayinga-Kasena-Gavara-Kara

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Abstract

It is a concern for many governments and natural resource utilization regulators to maintain ecosystems to function well in order to provide support for livelihoods—especially those in rural developing countries. The Wildlife Division of the Forestry Commission of Ghana quest to improve livelihoods as means of winning support from rural people to conserve natural resources, is the main objective of embarking on collaborative natural resources management. The purpose of this study was to find out how livelihoods and environmental conservation have been impacted by apiculture in Sayinga-Kasena-Gavara-Kara (SKGK) in northern Ghana. A qualitative research approach through a narrative inquiry was applied to gather data. An in-depth interview was conducted based on a conceptual model developed to relate business and environmental opportunities and their barriers in apiculture. Findings suggest the SKGK apiculture has created environmental awareness, engaged participants from activities that degrade the environment, and provided supplementary income. There are investment opportunities for social investors, donors, or private businesses into beekeeping. The environmental benefits of the venture to the larger ecosystem with its added economic benefits into increasing agricultural production through pollination are discussed.

Keywords: apiary, apiculture, biodiversity, renewable, sustainably, wildlife

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1.0 Introduction: Apiculture and Conservation Opportunities: The Case of Sayinga-Kasena-Gavara-Kara

Renewable natural resources support many livelihoods at both subsistence and commercial levels. Due to open access rights of most natural resources, they have been exploited to their near or complete extinction. Biodiversity sustainability has been on the agenda of many nations since the earth summit in Rio de Janeiro in 1992 (Secretariat of Biodiversity Convention, 2001). Included in the biodiversity convention was to determine the best ways of sustainably managing renewable natural resources to inure benefits to local people.

The Wildlife Division of the Forestry Commission of Ghana has embarked on a collaborative natural resource management with local communities for effective management. The objective is to devolve resources utilization rights and its benefits to communities (The Wildlife Division, 2000). The Sanyinga-Kasena-Gavara-Kara

(SKGK) community resource management area in the upper east and west region.of Ghana is one such collaboration. Incorporating improved livelihood strategies for inhabitants in such collaborative resource management areas in conservation programmes is advocated (Eneji, Gubo, Okpiliya, Aniah, Eni, & Afangide, 2012). One such strategy is apiculture.

The honey bee (*Apis mellifera)* occurs in a wide range of ecological zones (Gallmann & Thomas, 2012). Subspecies of the insect have co-evoluted with the flora species of their ranges and the *Apis mellifera adansonii* is found in West Africa. Apiary products include honey, pollen, wax, propolis, royal jelly, bees and queens, bee venom, and pollination services. Most of these products, with the exception of honey, are considered long tail (Afuah, 2009) because they are not readily available in markets due to extraction challenges (Gallmann & Thomas, 2012). The SKGK aims to improve biodiversity conservation by reducing over-exploitation, bushfires, and unsustainable agricultural practices. This study assumed that livelihood support from apiculture can reduce resources over exploitation, prevent bushfires, and increase crop pollination (Valentin, 2012).

Thus, the study sought to answer the question how apiculture can support livelihoods and environmental conservation in the SKGK. Khare, Scherr, Molnar, & White (2005) stated that poverty is one of the challenges of natural resources conservation and that new approaches, such as market schemes, must be used to finance conservation projects. Eneji et al. (2012) asserted that conservation project benefits take long to be realized and that project financiers should include immediate benefits in long term projects. Gallmann & Thomas (2012) elucidated the commercial benefits of apiculture as it has the immediate financial benefits. The study purpose was to assess the SKGK inhabitants' accounts of their apiary impacts on their livelihoods and its contribution to sustaining the ecosystem. Participants' accounts were applied into making projections for commercial production of apiary products in the SKGK.

2.0 Risks and Barriers in Apiculture

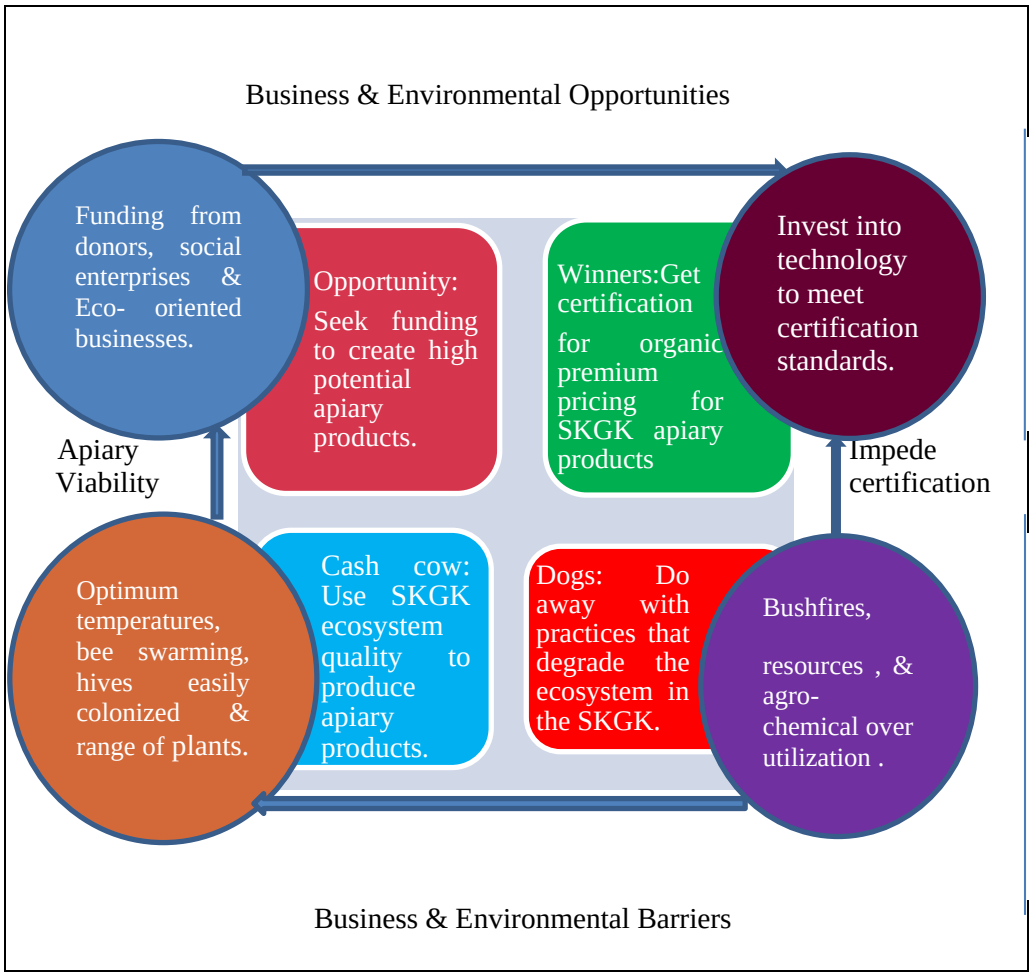
Main threats to apiaries are ants that feed on honey and parasitic mites that kill bees. These threats are believed to be the major cause of bees absconding from their hives (Gallmann & Thomas, 2012). However, simple preventive measures, such as using metal sheets or plastic to cover beehive stands prevent ant invasions, and the occasional application of smoke kills mites. Human fear for bees is eroded after training and wearing of protective clothing. Large scale honey production is yet to start in Ghana. Bushfires and the use of insecticides on farms are major threats to the SKGK apiary. Akangaamkum, Agbenorhevi, & Okudzeto (2010) stated that a lack of a regulatory framework, technical inabilities, poor hive management and packaging, and marketing are major challenges of apiculture development in Ghana.

3.0 SKGK Apiculture and Environmental Conservation Opportunities Conceptual Analysis

A conceptual assessment of the SKGK apiary potential is presented in Figure 1. The assessment is based on the 'cash cow, dogs, opportunity and winners model' (Nugent, 2003). The SKGK ecosystem viability for production of apiary products is its 'cash cow'. It is about how beehives are colonized due to ecological factors in the SKGK. Akangaamkum et al. (2010) reported agro-ecological condition

influence nectar flow and the tropical condition in Ghana is conducive for apiculture development. The negating factors are the 'dogs', which can impede a viable apiculture in the SKGK. Application of insecticides and other pesticides on agricultural fields kill bees and it is one of the major factors for bee population reduction (Valentin, 2012). Chemicals could also enter apiary products which can impede organic certification under fair trade regimes. The 'cash cow' and the 'dogs' segments of the model present the apiary viability and environmental barriers. The SKGK executives must work to prevent the negating factors while promoting the ecosystem quality. The model also takes note of investment opportunities into apiculture in the SKGK. The investment opportunities could be translated to winners' strategies in getting organic certification under fair trade schemes according to the model. The 'opportunity' and the 'winners' segments of the model present business and environmental potential for the SKGK executives and investors interactions.

Figure 1: Conceptual Analysis of the SKGK Apiary Potential and its Environmental Benefits.



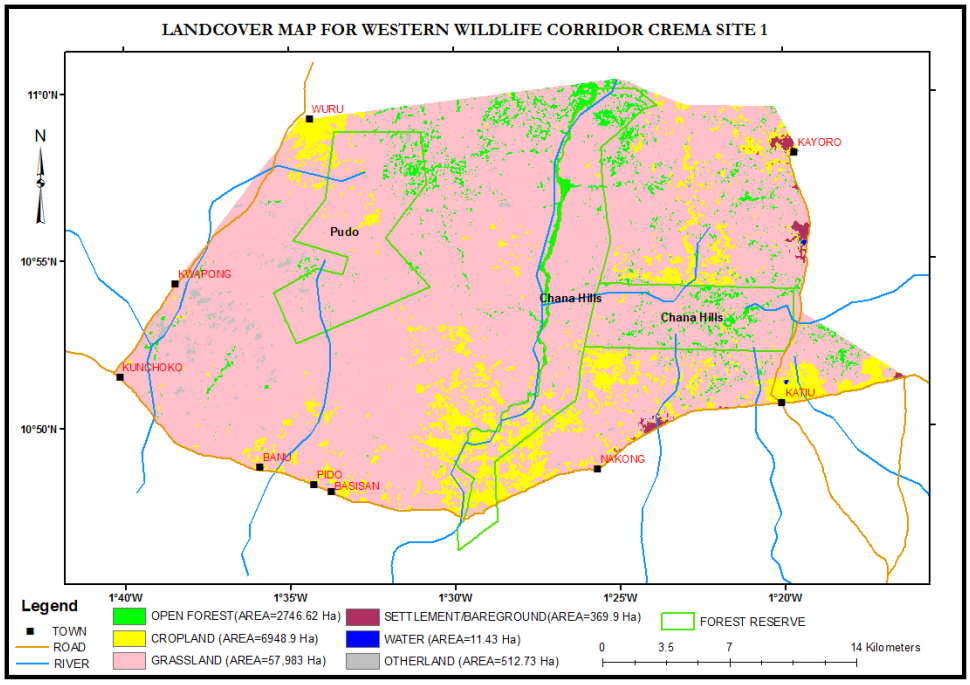
Source: Nugent (2003).

4.0 Methods

4.1 SKGK Location

The SKGK was formerly known as the Western Wildlife Corridor. It has a perimeter of about 114km in length and approximate area of 550km^2. Its nine communities aim at sustainably managing natural resources through green growth strategies such as ecotourism. Due to overexploitation, the populations of wildlife species are low and it will take approximately five years of proper management practices to bring population to levels that can sustain meaningful tourism (Lungren, 2008). To sustain interest and also to improve livelihoods, activities with low or no negative effects on biodiversity is being undertaken in the SKGK. Nakong is one of the SKGK communities undertaking apiculture. Figure 2 shows the map of the SKGK with its participating communities.

Figure 2: Map of SKGK Showing Participating Communities.



Source: Wildlife Division, Bolgatanga Office.

The SKGK inhabitants depend on natural resources for their livelihoods. The main economic activities include farming, livestock rearing, and collection of fuel wood. Picking of fruits such as Shea nuts, Dawadawa, and wildlife hunting are also major economic activities when in season. The SKGK is managed by Community Resources Management Executives (CECs) at the highest level. The Community Resource Management Committee (CRMCs) manages the group at each community. The SKGK is managed with a constitution which provides the governance institutions. Bye-laws are to be enacted and approved by the two District Assemblies the SKGK is located within.

4.2 Narrative Inquiry and Data Analysis

A qualitative research approach was employed to gather data through narrative inquiry method (Loftus & Higgs 2010; Kikooma, 2010). The theory underpinning the approach is the social constructionism theory based on an individual world view perception in constructing knowledge that has been impacted by societal influence. Language description of the SKGK apiculture activities by its participants is not only about its economics but also cultural and environmental practices of the people. Loftus & Higgs (2010) argued that the study of societal influence on workplace practices has overshadowed agency, intentionality, and subjectivity of the individual at the workplace. They asserted that meanings can be drawn from individual stories when mixed with professional stories. Narrations of Nakong apiary was told by the secretary to the group and two others in interviews.

The Secretary to the group was purposely selected because of his influence on the group, his general knowledge about the SKGK livelihood activities and also his knowledge in the customs and traditions of the people. The other two participants have been active members of the group since its inception and have bee hives they managed. Each one was interviewed separately. This was to enhance credibility of the data for dependability and transferability of the findings to the other communities of the SKGK. Narrations were corroborated with field visit to 25 beehives and narrators' stories were pooled in developing themes.

The aim of the narrative inquiry was to determine how apiculture can enhance management of natural resources from narrators' perspectives. An in-depth interview was used for data collection. The narrations were steered towards the conceptual model of the SKGK apiary potential related to the environmental barriers and opportunities that impede or improve apiary viability, respectively. Narrators' views on investment opportunities to enhancing apiary products development were assessed through their stories. Questions were asked on economic benefits and marketing methods of their apiary products. The interview was conducted at the homes of the narrators in the English language. Each interview session lasted less than 45 minutes. Narrations were transcribed verbatim and themes developed for analysis.

Kikooma (2010) mentioned that language, knowledge, and metaphor are important in deducing themes from narratives in analyzing qualitative data. Data was pooled to develop themes from the stories of the narrators on beehive management for the data analysis. Themes developed were on the apiary viability, other livelihood activities impacts on the apiary management, investment, and expansion opportunities to the other communities in the SKGK. Others were the environmental conservation opportunities and challenges associated with the apiary management. Narrators' figures and literature were used in making projections for an investment into an expanded SKGK apiary. A projection of a 50% participation of households of the SKGK into beekeeping is presented. It also contains revenue projections and possible natural resources conservation benefits. A five year investment activity into the apiary is also presented. These are presented in tables.

5.0 Results

5.1 Narrators' Accounts of SKGK Apiary Potentials and Environmental Conservation

This section presents the findings of the apiary potential of the SKGK. Narrators told the SKGK history of producing wild honey. However, collector extraction methods kill bees by fire and honey incubating trees sometimes are cut down before harvesting. Wild collected honey does not meet the quantity and quality demands of the market as well as its reliability and sustainability cannot be guaranteed. Nakong has piloted apiculture in the SKGK and the production of honey has been the main product. The community has a population of 734 (Ghana Statistical Service, 2010), made up of 135 households. All of the households are involved in beekeeping with 200 beehives. Approximate annual total honey production is 7000 kilograms. The monetary value is one hundred thousand Ghana Cedis (GHS 100 000.00 ≡ USD 31 446.54) for 2014. The group has an established market with pharmaceutical companies and research institutions for honey sales. Their business model sells directly to customers thus creating and appropriating value fully.

SKGK is in a semi-arid zone with warm temperatures and ample rainfall before the flowering season (November-March). These conditions enhance bee swarming. Beehive colonization by bees of the 25 beehives visited on the field was 100%, even though there are no services available that provide queens and bees to start new colonies of bees to colonize beehives in Ghana. The secretary to the group narrated how in their attempt to protect the hives, they painted some of them in yellow. They later found out all the yellow painted hives were colonized by bees during the swarming period (late November to late March each year). From then, attracting bees to hives is achieved without any baiting techniques. Currently, all beehives in the SKGK are painted in yellow before they are mounted.

Narrators' related work in the apiary are supplementary to farming and other livelihood activities when asked how they manage their hives and time spent on hive management. Labor is spent on hive maintenance, harvesting, and processing of honey. Beehive maintenance activities include checking that they are mounted correctly, checking for ant invasion into the combs, and clearing bushes to prevent bushfires. These activities were considered past time by narrators. On the challenges to hive management, narrators stated controlling bushfires that kill bees and plants is their major challenge. They reiterated that their community has an anti-bushfire volunteer squad that educates community members and prevents bushfires, but unfortunately most bushfires do not start from their community. They argued how they could start bushfires to erode their economic gains from the apiary. They recounted how income levels of group members have improved because they sell honey to a pharmaceutical company. The company demands some level of quality of honey, which makes them cautious on their production processes including managing the environment. Income from honey sale supplements those from farms and other livelihood activities in paying for health, school fees, and other social demands such as performing funerals of loved ones.

Narrators noted that they understand the degradation of the environment will erode their incomes from the apiary. They specifically mentioned bushfires as the major threat, and accused hunters, nomadic herdsmen, and wild honey collectors as those who normally set fires to the bushes with their activities. They emphasized the need for education, enforcement of laws, and expanding the apiary for others to benefit

from apiculture. To them, that could engage people from negative practices, such as group hunting and using fires to hunt in the dry season, to enhance environmental conservation. They agreed that other communities should benefit from the apiculture project in the SKGK for an effective collaborative resource management among the communities. They welcomed social enterprises, donors and private investors into the SKGK. These findings suggest that green growth strategies such as apiculture can enhance environmental conservation. The findings indicate that apiculture provides supplemental income, promotes environmental conservation awareness, and engages participants from activities that degrade the environment at Nakong.

6.0 SKGK Apiculture Expansion Projections

The above findings suggest that both commercial and environmental viability in apiculture exist in the SKGK. Our conceptual model for the study and the call for expansion of the project by the participants led us to come up with the subsequent sections on the potentials of an expanded SKGK apiary. The model indicates that investors could have investment opportunities in the SKGK and their investment will support the sustenance of the SKGK ecosystem. The next four sections project the cost of expanding the apiculture to about 50% of the households in the SKGK, the cost of establishing a processing plant, market projections for the first year, and a five year development activity plan in establishing the expanded SKGK apiary. Projections are the results of narrators' figures and literature. Table 1 shows the estimated cost of expanding the SKGK apiary project to 50% households.

6.1 Cost of Materials

Table 1: *Authors Estimate for 50% SKGK Hive Expansion. * Nakong has Started Beekeeping*

Community/Item	**No. of households**	**Targeting 50% Households**	**Cost of Hives and other accessories @ USD 65/hive**
Nakong	*135	*200	13,000
Katiu	56	28	1,820
Pido	3	3	195
Bassisan	31	16	1,040
Banu	38	19	1,235
Kwapun	24	12	780
Wuru	58	29	1,885
Kayoro	569	285	18,525
Kunchogo	29	15	975
Sub total			**39,455**
Administrative cost			3,000
Grand Total	**943**	**607**	**42,455**

The estimate is based on the Kenyan top bar hives which are currently being used at the Nakong project. The administrative cost includes negotiations, reconnaissance and sensitization.

6.2 Processing and Packaging Investment Cost

Table 2 shows the cost of establishing a 5000kg/annum processing and packaging centre.

A commercial production of honey and its ancillary products would require a well-established processing centre. Nakong with its pioneering role and accessibility should host the processing centre with an annual capacity of 500 000 kg. It will serve as a resource centre on matters relating to apiary business and could process honey beyond the SKGK. Akangaamkum et al. (2010) indicated profit increases with increasing capacity, thus expanding the apiary will increase economic benefits aside the envisaged cooperation among communities to collaborate in managing the natural resources. The total cost of expanding the apiary to 50% households in the SKGK and the setting up of a processing centre amounts to USD 60,335.00. This excludes figures from Nakong. The processing centre will improve the quality and the quantity of honey and also promote beeswax production. The centre will facilitate attaining the required standards for organic certification to get premium pricing and export.

Table 2: *Estimates for SKGK Processing Centre*

Item	**Quantity**	**Unit Cost (USD)**	**Amount (USD)**
Honey Press	1	1,000.00	1,000.00
Solar Melter	2	100.00	200.00
Wax Processing Tank	1	600.00	600.00
Sump Tank	1	600.00	600.00
Bulk Holding Tank	2	600.00	1,200.00
Filtering & Bottling Tank	2	800.00	1,600.00
Microscope	1	1,000.00	1,000.00
Scale	1	30.00	30.00
Trays	4	25.00	100.00
Refractometer	1	300.00	300.00
Hydrometer	1	250.00	250.00
Other Accessories		500.00	500.00
Contingency		500.00	500.00
Construction of Centre	1	10,000.00	10,000.00
Total			**17,880.00**

Source: Akangaamkum et al. (2010).

6.3 Market Projections

The estimated revenue from honey and beeswax is presented in Table 3. The estimates are based on the first harvest with reference to the Ghanaian market situation. According to Akangaamkum et al. (2010), each kilogram of honey produced yields 14%** of beeswax. Beeswax sells at USD 18.00/kg. Thus, from

Table 3, the beeswax production could be 2974.3 kg amounting to USD 53,537.4. A 25% tax brings a net income on wax to USD 40,153.05. Adding honey and wax revenue brings estimated income to USD 62,904.45. The SKGK apiary could make a profit of USD 45,024.45 after deducting cost of establishing the processing centre from the total income.

6.4 SKGK Apiary Five Year Development Activities

The activities earmarked to expand the SKGK apiary project to 50% more households is expected to be achieved within five years or less if some of the activities could be fast-tracked—especially if negotiations do not prolong. The planned activities start with negotiation with SKGK executives for the modalities of an investment model (social, donor, or private). Negotiations, beehive acquisition, processing centre establishment, and achieving standards for local and foreign markets are the major activities earmarked. The completion of one activity dovetails into the other. However, sensitization and education, as well as evaluation and review activities should continue throughout the project establishment period to win support and improve product development. Table 4 gives a sequential five year activities plan to develop the apiary.

Table 3: *Honey Production Projections and Estimated Revenues per Annum*

Item	**Amount/Number**
Number of hives	607.00
Production per hive(Kg)*	35.00
Total Production (Kg)	21 245.00
Price per kg (USD)*	4.49
Total Gross Income (USD)	95 390.05
Total Cost of hives & administration (USD)	42 455.00
Depreciation of hives @ 25% (USD)**	9863.75
Other expenses (30%) **	12 736.50
Total Expense (USD)	65 055.25
Income before tax (USD)	30 335.20
PAYE (USD) @ 25%	7583.80
Net Income Attributable to Participants (USD)	22 751.40

** Estimates given by the Secretary to the Nakong group (2014), ** based on Akangaamkum et al. (2010)*

Table 4: *Five Year Development Activities for the SKGK Apiary*

Year	Activity
1	a. Negotiations with the SKGK executives on project modalities
	b. *Sensitization and education on the project
	c. Selection of participating households
	d. Reconnaissance survey for hives mounting sites
2	a. Training of selected participants
	b. Hive acquisition and mounting at the selected sites
3	a. Processing centre development
	b. Product certification processes with Ghana Standards Authority
4	a. Identify other marketing centres for the SKGK apiary products
	b. Seek export certification and foreign markets
5	a. Apply for organic certification
	b. *Evaluate and reviewed progress for amendments

7.0 Discussions

This study discussion focuses on the SKGK apiary viability and its possible impact on the ecosystem conservation of the area. The SKGK has a relatively intact ecosystem, right weather conditions for bee swarming, and the yellow painted beehives which attract bees easily. This presents veritable investment opportunities into apiculture. The apiary has first movers' innovation advantage (Henderson, 2006; McGrath, 2008, cited in Galavan, Murray, & Markides, 2008). Investing into honey and other products processed and packaged to meet national and international standards will be rewarding. This will create the winners to get organic certification in the SKGK according to our model. Akangaamkum et al. (2010) mentioned that the export demand of honey from Ghana is 10,000 metric tons, but the country cannot meet the demand, mainly because there is no commercial honey production and the honey produced does not meet international standards. Ghana has the favorable condition to produce honey to meet the market demands, yet it has not, even though it is not difficult to establish apiaries (Roberts, 2010). The size of the market for apiary products in Ghana presents an opportunity for the SKGK apiary expansion.

The investment potential—opportunity—could be taken by social investors or donors who are environmentally conscious, or private businesses in partnership with the SKGK management executives. Akangaamkum et al. (2010) stated that pharmaceutical companies in Ghana import apiary product requirements in their medicines. The authors' analysis of price differential between locally produced honey and imported honey was as much as $ 18.99/kg in favor of the imported honey. The SKGK can be the right investment source to eliminate the import of apiary products because the cost of production will be lower. Pharmaceutical companies can enter into a partnership agreement with the SKGK to supply apiary products according to their (customers') specification (Afuah, 2009). An investor in the SKGK apiculture project will have a first mover advantage, which could be the basis for developing a regulatory framework for apiary products in Ghana.

This study asked how an apiculture development will improve livelihoods that fit into the larger objective of sustainably conserving natural resources of the SKGK. The SKGK has the intention of developing a number of environmental projects such as ecotourism, herbal medicine production, and sustainable hunting. These activities are to be developed together with already practiced crop agriculture and livestock rearing. The apiary could be an immediate venture that can release economic benefits (Eneji et al. 2012) to the SKGK inhabitants, while seeking resources to develop the other projects. Narrators acknowledged the supplementary role incomes from the apiculture play in their lives. An investment into the project to increase the range of products has the potential of the apiary products becoming the main source of income for participating communities. This will enhance the collaborative effort to manage natural resources in a sustainable way not only between communities and the Wildlife Division, but also among the nine communities of the SKGK.

Crop pollination is the immediate eco-benefit that comes to mind with apiaries. It is estimated that in the United States of America, pollination by bees is valued at USD 14 billion annually. Actually, bees have the ability to increase crop yield between 30% and 90%, depending on the crop (Akangaamkum et al., 2010). Encouraging hive ownership in the SKGK is envisaged to reduce negative practices such as bushfires and improper use of agrochemicals. Nakong as a pilot community has governance structures that prevent environmental abuse and unsustainable practices that affect its beehives. This confirms that private ownership of natural resources brings out prudence and responsibility in their management (Waldron, 2004). Wildlife poaching increases during the lean season (January-May) because of little farm work; incidentally it is the period of bee swarming and hive colonization. Investing time and resources into apiculture activities could reduce poaching with its attendant bushfires. Thus, apiculture could improve the SKGK inhabitants' livelihoods and promote environmental conservation.

8.0 Conclusion

Expanding apiculture and improving extraction technology to add on some 'long tail' (Afuah, 2009) apiary products, such as beeswax, is highly recommended to release the SKGK apiary economic potential beside the added environmental benefits. The apiary location qualifies its products to acquire organic certification for premium pricing as well as enhancing its environmental image to consumers of organic products. The SKGK apiary will be entering into a market without regulation. It has to collaborate with other associations to develop Ghana's apiculture business by investing into technologies. The objective of getting organic certification under a fair trade scheme must be pursued with all its vigor. That status will open export opportunities and enhance environmental conservation in the SKGK.

Investments into the SKGK apiary can improve livelihoods based on the projected income and environmental benefits. The streams of revenue will come from honey and beeswax immediately once harvesting starts. It is expected that other products and services could be added onto the business with time. The processing centre with its capacity, for example, can take apiary products from other areas for processing. A partnership with the SKGK executives to access the opportunity is worthwhile. The similarities in environmental conditions, cultural and livelihood activities across the nine communities forming the SKGK allowed the researchers to conclude on project expansion even though data was taken only from the piloting community of Nakong.

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