

Effect of Commercial Charcoal Production on the Availability of Wood Cavity and Survival of Genetic Honeybee's Resource in Imeko, Nigeria

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Abstract: Little information is known about the responses of honeybees to loss of cavity providers through charcoal production as a stressor. The native honeybees are special social insects and very selective in their choice of wood species cavities' nests. However, the charcoal burners are not selective; felling nearly all tree species including shrubs. Therefore, effect of charcoal production on the availability of wood cavity and survival of genetic honeybee's resource was investigated in Imeko/Afon Local Government Area (ILGA) for 4 years using combined on-site survey, field interviews and direct observations. The result indicated a larger negative impact of charcoal production on the survival of the honeybees' colonies and population. The study revealed *Blighia sapida*, *Lophira lanceolata* and *Vitex doniana* as the key cavities flora resources used for charcoal production. The fleeting nature of charcoal production stood in sharp contrast with the conservation of cavities providers and species conservation. These cavity providing species are never allowed to reach hollowness girths for nesting. Consequently, honeybees become guests to homes and schools, hanging on low branching woods hence making people more vulnerable to honeybees' stings risk and death. Habitat loss through charcoal production was recognized as a principal contributing factor to this insecurity phenomenon. The result suggested that charcoal production negatively affected the availability of suitable cavities (nests) and honeybees are more exposed to fire and chemical dangers. These observed ugly consequences heavily outweighed its immediate charcoal economic gain. It is concluded that commercial charcoal burners are avowed enemy of nature. Conserving trees for sustainable ecological benefits and beekeeping as a plausible alternative to charcoal business are highly recommended.

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1. Introduction

Woods are critical flora resources which need to be sustainably managed for the survival of all organisms more importantly honeybees. The importance of beekeeping for local livelihoods and as a means to ensure forest conservation has not been widely recognized in Nigeria. Extraction of woods for charcoal production is considered to be more damaging to forest ecosystem and therefore not compatible with forest and species conservation. Previous studies have shown that Nigerian native honeybees are selective in choice of wood species cavities' nests (Aiyeloja and Adedeji, 2014; Adedeji and Aiyeloja, 2014). However, the activities of charcoal burners in recent times are not selective; felling nearly all tree species including shrubs for charcoal production. The persistent utilization of whole plants in charcoal production is considered inimical because it can create a larger negative impact on the survival of the individual and population of organisms inhabiting cavities in woods especially when there are no ready alternative habitats. The increasingly loss of preferred wood species cavities which serve as quality honeybees habitats has not received any serious reactions and attention in Nigeria especially in ILGA.

ILGA is one of the twenty local government areas of Ogun State, Nigeria nicknamed "virgin land" with projected population of 103,460 based on 2006 population census using 2.8% recent population growth rate. ILGA is situated within Latitude 7° 22'08" and 7°30' 05" N and longitude 2°44' 22" and 2°53' 03" E, with headquarters in Imeko. The land area is about 1,711.43km², undulating with small hills rising between 15 and 70m above sea level. The Yewa River runs through the area from North to South, with its tributaries, the rivers Oyan and Oha. The LGA is bounded in the north by Oyo State, to the east by the Abeokuta North LGA, to the south by the Yewa North LGA and to the west it shares an international border with Benin Republic. The international border is 93 kilometres, and is one of the most accessible stretches of border between the two countries. The Local Government is divided into ten political wards: Imeko, Afon, Ilara, Iwoye/Jabata, Idofa, Owode/Obada/Idi-Ayin, Moriwi/Matale/Oke-Agbede, Agborogbomo, Atapele and Kajola/Agberiodo. Imeko, the LGA headquarters, is about 20 kilometres (12 miles) by road from Ketu, a major trading town in Benin Republic. The second largest settlement, Ilara, merges into Kanga in Benin (Wikipedia, 2013). Farming and trading are

the main economic activities. The vegetation is a mixture of large savannah belt and sparse forests found in valleys. The vegetation is ideal for beekeeping and conservation, with the presence of many native preferred cavities wood species and alternative cavities materials. The climate is tropical with two seasons, the dry season (November to March) and wet season (April to October) with average annual temperature of 27.4°C (Adedeji and Aiyeloja, 2014). The wanton destruction of trees for charcoal production has left the area to be predominantly dominated by grasses and trees of shrub sizes.

Sadly, charcoal production and trade is considered as most viable business (enterprise) in the whole local government area. This could be principally because the wood resources are taken free and the booming markets are readily available. The bulk of charcoal produced in Ogun is from the savannah parts of Yewa/Awori Division of which Imeko/afon is a key producer. With the present economic situations, there is no assurance that charcoal activities will stop because both state and local governments are benefiting through permit issuance by state forestry department and haulage fee by the ILGA respectively. Charcoal production can be an alternative source of income in rural areas in Africa (CHAPOSA, 2002; Anang, *et al.*, 2011; Kwasi, *et al.*, 2012) but never an important sustainable tool as its production does not depict the tenets of sustainability. Harnessing and conserving bee resource is plausible alternative source of income without undermining the quality of environment (Nel, *et al.*, 2000; Oluwalana and Oluwalana, 2012). Interestingly, ILGA is wonderfully blessed with the genetic honeybee's resource but this sustainable golden wealth is increasingly being burnt at the expense of charcoal production. The anthropogenic charcoal activities have forced colonies of honeybees to relocate to homes, schools including palaces and churches, to hang on low trees' branches and barks' cracks. The colonization and adaptation to human habitats are not without losses. It has made the colonies of honeybees to be more aggressive and the communities more vulnerable to bees' stings which often lead to serious injuries and sometimes death. Consequently, mass killing of honeybees' colonies are unquantifiable. However, EMBO (2007) opined that organisms adapting and thriving in close proximity to humans could yield vital information for conservation efforts and help to soften the environmental impact of Business Park and housing.

Before the evolution of commercial charcoal production in ILGA in 2004, *Hymenocardia acida* popularly known as Orupa, in Yoruba was the most preferred traditional cooking fuel wood in the area until late 1989 when the species became extinct from the area. The choice of the species was dependent on indigenous knowledge of having high caloric energy

value, and being shrub with very low moisture content - it can be used after 3 days of felling. *H. acida* wood density has been reported to be 750kg/m² in Uganda (Tabutia, *et al.*, 2003). People shifted to the utilization of other species like *Anogeissus leiocarpus*, *Lophira lanceolata*, *Zanthoxylum zanthoxyloides*, *Cassia siamea*, *Citrus* spp., etc after over-exploitation of *H. acida*. Prior to this, charcoal production was not from direct conversion of woods but rather as secondary embers from used firewood. These embers were used directly for roasting, ironing clothes, quenched and re-used for ironing clothes. The secondary utility for these purposes had no significant negative impact on cavity providers because production preceded firewood's utilization at non-commercial level. Commercial charcoal production was introduced to ILGA in 2004 by charcoal producers and traders from neighbouring Oyo State, Nigeria where most parts of Oke Ogun region have been over exploited for the same purpose. Ajadi *et al.*, 2012 reported more than 65 charcoal producing communities in the region. The people could not resist the temptation of destroying trees for quick immediate economic gain simply because of attendant failure of formal economy to generate sufficient employment opportunities. Traditional and informally self-employed farmers, bricklayers, mechanics, tailors, petty traders, etc abandoned their primary professions and took charcoal production and trade as their main means of livelihood. Initially the choice and selection of wood species conformed to sustainable principles. However, with the booming trade advancement, the choice and selection of species changed to clear felling of nearly all woody trees including shrubs till date. As the production and trade still continue, the ILGA vegetation which acts as honeybee niche is heading for a point of no return or tipping points where sudden and unanticipated ecological changes could bring more disastrous results.

A decline in the population of honeybees continues to be a source of concern in many regions of the world (OPERA, 2013) except in Africa especially Nigeria. The significance of honeybees as nature reproductive and regenerative agent that serve critical function is highly embraced and appreciated as pollinators of many food and forest crops in developed countries (McGregor, 1976; Soldatov, 1976; Levin, 1983; Borneck and Bricout, 1984; Levin, 1984; Winston and Scott, 1984; Benedek, 1985; Matheson and Schrader, 1987; Borneck and Merle, 1989; Robinson, *et al.*, 1989a&b; Southwick and Southwick, 1989; Jay, 1990; Corbet, *et al.*, 1991; Southwick and Southwick, 1992; Pimentel, *et al.*, 1997; Malcolm, 1998; Thorp, 2000; Morse and Calderone, 2000; Gallai, *et al.*, 2009; Johnson, 2010; Breeze, *et al.*, 2011) and their decline is considered a global problem (Byrne and Fitzpatrick 2009). The way the problem was created

and being handled differs immensely from region to region, and very much dependent on weather, culture, economy and politics (Byrne and Fitzpatrick, 2009). Researchers in these advanced countries continually look for answers and politicians seek solutions based on policy (OPERA, 2013), this is not the case in Nigeria.

Many fauna of less importance to improving regenerative capacity of nature (biodiversity) are more protected under the National and International conservation laws as critically endangered, threatened, near extinction, vulnerable, rare, etc. in IUCN red list. Having duly considered the ugly potential or looming consequences of bee decline, America, European member countries and partly East African countries agreed and formed policy initiative platforms that impact on the conservation of world's bee fauna hosted by the Brazilian Government at the University of Sao Paulo in October 1998 with central emphasis on bee habitat protection (Dias, *et al.*, 1999; Byrne and Fitzpatrick, 2009). The Regional Conservation Policy emanated from these initiatives gave birth to varied bee protection laws at national and local levels. Nigeria was not represented at both the global and African Regional Pollinator Initiative Plan of Action (API-POA) fora. Presently, there are no functional existence of policies and legal frameworks to conserve and manage our renewable natural resources such as genetic honeybee's resource. This is an indication that there is nothing in the socio-political sphere of Nigeria as a whole to suggest conservation of genetic honeybee's resource. Nigeria climate is clement, oscillating from dry to rainy season unlike temperate countries with extremity of seasons which many researchers claimed to be responsible for Colony Collapse Disorder (CCD) that has been causing more than 30% bee loss in America since 2006 (van Engelsdorp, *et al.*, 2007; 2008; 2010; 2011a; 2012). Habitat loss and fragmentations, forage habitat loss, pesticides, pests and diseases, genetic diversity and resilience to pests and diseases, climate change and interactions between and among them are responsible for bee decline globally (Thomas and Telfa, 2004; MEA, 2005b; FAO, 2008; IRGC, 2009; EEA, 2010; Potts, *et al.*, 2010; UNEP, 2010). Habitat loss and fragmentations were linked with anthropogenic activities like urbanization and agriculture with little information on habitats (wood cavities) loss through charcoal production.

Despite the high echoes of global bee population decline and conservation necessity, Nigerians are still actively involved in charcoal production, a principal driver of bee decline in Africa. Nigeria ought to be a leading exporter of bee colonies and products to troubled countries of the world. Unfortunately, these busiest unpaid labourers are steadily on the decline and

consequently, in the perfect market abound imported honeybee products instead of the local ones. In view of the attendant global honeybees decline and little information about the responses of honeybees to preferred habitat loss through charcoal production, investigation on the effect of charcoal production on the availability of wood cavity providers and survival of genetic honeybee's resource in Imeko/Afon local government area of Ogun State, Nigeria was carried out.

2. Materials and Methods

2.1 Study area and species

This study was conducted in the Imeko-Afon local government of Ogun State (Latitude 7° 22'08" and 7°30' 05" N and longitude 2°44' 22" and 2°53' 03" E) in Nigeria. The study was carried out in six charcoal production sites axes (table 1) purposively selected and many human dwelling abodes colonized by honeybees between October, 2010 and March, 2014 to assess the responses of honeybees to cavities' losses.

Blighia sapida K. D. Koenig (Isin, Yoruba language) is one of the most important cultivated Sapindaceae family used as shade and food tree in the Cities, villages, farm lands and along some streets of the ILGA. It is widely used as shade and food tree in many public schools while cultivated as agroforestry tree in farm lands in the study area. The tree can grow up or more than 20m in height and 1.5m Diameter at Breast Height (DBH) or more with a very dense crown (Fig.1). Honeybees usually visit the tree four times (May, June, November and December) in year during flowering for pollination. The wood colour ranges from white to butter colour to whitish yellow. The wood is vulnerable to hollowness at older age which provide suitable cavity nest for honeybees. However, the bees are not benefitting because the trees are not allowed to reach hollowness age. The wood is presently threatened as no one (tree) could be found to be naturally occurring in the study area.

Lophira lanceolata Teigh. Ex Keay locally known as "Panhan" is an important Ochnaceae family naturally grown tree with wider application of its parts for varied medicinal values ranging from its: young leaf for malaria fever, stem bark for fertility, root stem bark for fever in the study area. Its traditional acclaimed stem bark effect in curing fertility related problems in men has been explored using rat (Etuk and Muhammad, 2009). Its wood is among the preferred firewood species in ILGA. It is hard wood and highly vulnerable to hollowness as low as at DBH of 30-35cm. Its cavity preference by honeybee colonies in Nigeria has been reported (Aiyelaja and Adedeji, 2014). The wood colour is usually yellow and its cavity is preferred (Fig. 2). The tree enjoys low degree of

preservation in the study area because of its persistent wider application uses.



Fig. 1 *Blighia sapida* K. D. Koenig showing dense crown with unripe fruits
Source: Survey work, 2013



Fig. 2 *Lophira lanceolata* Tiegh.exKeay live trunk cavity showing honeybees colony at Oke-elefun axis
Source: Survey work, 2013

Vitex doniana Sweet (Verbenaceae family) locally known as “Ori” is an important food tree naturally grown and occasionally cultivated as schools ornamental tree in the study area. The tree previously enjoyed preservation in all its range primarily because of its delicacy leaf vegetable food values. The ripe blackish pulps of the fruits are cherished by children as snack. The wood is highly vulnerable to hollowness and highly preferred by honeybees’ colonies in Nigeria (Aiyeloja and Adedeji, 2014).

2.2 Study Design

Reconnaissance investigations were carried out first in late 2009 and early 2010 to determine: (i) the adequate sample size for the charcoal production sites axes survey, (ii) the axes where charcoal production

were common, (iii) the cavity providers’ species used for charcoal, (iv) the responses of bee to cavity loss, and (v) the nature and trend of reactions of the local people to honeybees responses. The reconnaissance surveys revealed *Blighia sapida*, *Lophira lanceolata* and *Vitex doniana* as the key principal cavities providers commonly utilized for charcoal production (table 2) and six charcoal production sites axes were selected and investigated (table 1). 200m x 20m land areas around the production sites were enumerated for tree species population. Generally, the study employed the combined on-site survey, field interviews and direct observations.

3. Results

Table 1: Present status of predominant tree species used for charcoal production

S/N	Production sites axes	Tree species used	Status
1	Moriwi/oke-agbede axis	1). <i>Erythrophleum suaveolens</i> 2). <i>Lophira lanceolata</i> 3). <i>Vitex doniana</i>	Wild/threatened Wild/threatened Wild/threatened
2	Nkunuge axis	1). <i>Blighia sapida</i> 2). <i>Erythrophleum suaveolens</i> 3). <i>Lophira lanceolata</i> 4). <i>Vitex doniana</i>	Cultivated/threatened Wild/threatened Wild/threatened Wild/threatened
3	Obolo axis	1). <i>Blighia sapida</i> 2). <i>Erythrophleum suaveolens</i> 3). <i>Lophira lanceolata</i> 4). <i>Vitex doniana</i>	Cultivated/threatened Wild/threatened Wild/threatened Wild/threatened
4	Oloka axis	1). <i>Erythrophleum suaveolens</i> 2). <i>Lophira lanceolata</i> 3). <i>Vitex doniana</i>	Wild/threatened Wild/threatened Wild/threatened
5	Oke-elefun	1). <i>Erythrophleum suaveolens</i> 2). <i>Lophira lanceolata</i> 3). <i>Vitex doniana</i>	Wild/threatened Wild/threatened Wild/threatened
6	Owode axis	1). <i>Erythrophleum suaveolens</i> 2). <i>Lophira lanceolata</i> 3). <i>Vitex doniana</i>	Wild/threatened Wild/threatened Wild/threatened

Source: Field work, 2013

Table 2: Relative frequency of tree species used for charcoal production

Species	Frequency/sites	Relative frequency (%)
<i>Blighia sapida</i>	2	10
<i>Lophira lanceolata</i>	6	30
<i>Vitex doniana</i>	6	30
Sub total	14	70
* <i>Erythrophleum suaveolens</i>	6	30
Sub total	6	30
TOTAL	20	100

*cavity species not utilized as nest by honeybees but used for charcoal production

Source: Field work, 2013

3.1 Cavity providers’ loss and impacts on environment

Table 2 showed the four major wood species widely utilized for charcoal production of which three were cavity providers with all having threatened status (table 1). *Blighia sapida* is perhaps the only cultivated species and its lower percentage was as a result of its non-availability in all the axes surveyed while other species were naturally occurring. Though *Vitex doniana* represented equal 30% (table 2) but *Lophira lanceolata* is relatively more abundant. Enumeration for tree species population from 200m x 20m land areas around all the six production sites revealed less than 10 tree species of shrub size except *Daniella*

oliveri that were sparingly dominating. The burners explored these wood species throughout the year though the intensity of charcoal production is slightly higher in the dry season. The increasingly aggressive

extraction of these species for charcoal has left the area predominantly dominated by grasses and tree species of shrubs size as shown in fig.3. This is a serious warning indication of desertification.



Fig.3: Charcoal burners producing charcoal mainly from *Lophira lanceolata*, a honeybee's cavity provider and *Erythrophleum suaveolens* woods at Oloka axis
Source: Survey work, 2013

3.2 Responses of honeybees to cavities removal

People of ILGA have seen remarkable advances in charcoal production and trade which have brought appreciable economic changes. Many earn substantial income once thought impossible in shortest time. The population of the local government increased tremendously because of the influx of traders and transporters. All these, however, have not come without an ecological cost (ecological changes). The effect of these ecological changes might be difficult to evaluate. Charcoal production consumed large quantities of scarce woods and exposed the genetic honeybee's resource to dangers, resulting in a significant decline of bee population and making humans to be very vulnerable to bees' stings risk and death. Honeybees have colonized many humans dwelling abodes and adapted well to man proximity. One or more classrooms/offices of the eight public

secondary and primary schools visited were colonized and the colonies were in control. In the cities and towns, honeybees colonized wooden trusses' roofs, wooden cupboards, wooden shelves and wooden lockers. In the villages and farmlands, honeybees hanged in the open and hidden low tree branches. The adaptations of honeybees to human habitat have spelled doom for the people. Within the last six years, five people and one ram (animal) were stung to death while high incidences of injuries as a result of bees attack were equally recorded. Charcoal production and trade are said to be pushing the ecosystem beyond its natural cycles. They are making increasingly notable negative impacts on the ecosystem and survival of genetic honeybees' resources. The potentials of honeybees as a sustainable, economically viable resource for governments and communities are grossly ignored or abused. These insects being threatened in ILGA and Nigerian are a

sin-qua-non in America, Europe and Asia continents economies. The annual value of pollination service attributable to honeybees worldwide in 1999 was estimated US \$ 65-70 billion (Dias *et al.*, 1999), about \$142 in 2013 (Johnson and Corn, 2014) and the most widely used species for this crucial service is the honeybee (*Apis mellifera*) native to tropical Africa. What a huge conservation and business opportunities?

4. Discussion

Pragmatic woodlots establishment for commercial firewood harvesting or charcoal production is unheard in Nigeria except on paper. Charcoal burners have a few choices of wood species and it is assumed or certain that current trend of production in Imeko will not be sustainable in the quick nearest future. *Blighia sapida*, *Lophira lanceolata*, *Vitex doniana* and *Erythrophleum suaveolens* were widely explored for charcoal production. Unfortunately, three of these species were cavity providers and they are never allowed to reach gestation period of providing cavities. *Lophira lanceolata* and *Vitex doniana* were among the reported cavities wood species utilized as nesting habitats by honeybees in Nigeria (Aiyeloja and Adedeji, 2014). While this, study revealed the suitability and utilization of *Blighia sapida* cavity as nest by honeybees when the species was ample with bigger DBH in olden days. The preference for these species for charcoal was probably because of their energy values and availability. *Lophira lanceolata* was more abundance in the area simply as a result of its genetic dispersal potentials over *Vitex doniana* while *Blighia sapida* could be attributed to being widely cultivated for food or shade tree in farm lands. The only cavity of *Lophira lanceolata* found with colony of bees (Fig. 2) was probably because of its proximity to Police check point or the ruggedness of the terrain. The wanton destruction has left the area predominantly dominated by grasses and trees of shrubs size showing imminence of desertification. *Erythrophleum suaveolens* was a sacred species when cultural conservation norms and values were respected and effective. The extraction of these woods species for charcoal production is considered to be more damaging to honeybees habitats and therefore not compatible with forest and cavities nesters species conservation.

A significant proportion of buildings ranging from local government secretariat, hospitals, churches, schools, dwelling abodes etc were colonized by honeybees' colonies and people never consider it necessary to investigate the reasons. Honeybees are very influenced by various factors such as habitat suitability and protection of their habitats. Their distribution is dependent on availability of suitable enclosed systems which are present in cities and town of ILGA. The high density of colonies perturbation

found in the study area can be explained by the natural habitat disturbance through charcoal production. Evidences indicated that extraction of woods for charcoal production was responsible and it has affected the growth and well-being of honeybees' colonies in ILGA environments. The colonization of these buildings trusses roofing's could be attributed to their enclosed systems comprising majorly wood component. Observations showed greater changes in the colonies nesting habitats patterns. The result was strikingly similar to reported findings of: Michelutti *et al.* (2013) that habitat disturbance by human affect the growth of colonies of social wasp in urban environments of Brazil, Samways (2005; 2007) that anthropogenic disturbance of natural habitats was one of the main factors contributing to reduction of the biodiversity in tropical environments. However, not completely in agreement with opinion of Absensperg-Traun and Smith (2000) that modification of natural habitats was mainly to the progress of agriculture and livestock raising, as well as urbanization. This is because the system of farming in the area presents some wood species in suitable state (dead) of which bees might not be preferred in living state. Charcoal production consumed both potential dead and living tree cavities in either farmlands or forests. Many extreme cases of bees colonizing food wooden cupboards and student wooden lockers were observed. The result was similar to observation of Witherell (1985) in Coelho and Sullivan (1994) that one colony of African honeybees in South America was found occupying a food container.

Observations of honeybees colonizing and adapting well with humans habitats suggest that they co-exist by utilizing the same resources either having similar shelter, foods, tolerating same temperature fluctuations or active in the same times. However, their co-existence or proximity to human was without losses. Cases of human and animal (ram) deaths were recorded in villages where colonies of bees hanged in low wood branches or low wood stumps. Hanging in the open made them to be more aggressive than those in enclosed systems. Bees are more aggressive in the dry seasons and this coincides with the hunting periods thus making the people vulnerable to stings risk and deaths than rainy seasons. Apart from the direct killing of bee by the burners, evidences were abounding that colonies in the buildings were constantly facing fires and chemicals. Perhaps, no endemic or epidemic pathogen probably has caused mass death or loss of bees like charcoal burners in the study area. Despite the incessant fires and chemical killings, bees were and are still colonizing buildings in the area. This is stronger indication that the area lack natural alternative cavities and more so, it is an indication that the area still has abundance of genetic honeybees.

The failure of formal economy to generate sufficient employment opportunities was observed as the main cause that has forced the informal economy to increasingly exploit forest resources especially in the trade of charcoal. Governments benefiting from charcoal production through permit issuance by State Forestry Department and haulage fee by the ILGA are indications of complacency on the part of governments to conserve trees and their associated resources and this stood in sharp contrast to Ogun State Government Economic Plan Development 2012-2015 (Ogun State Government, 2012). It is a further indication of their weakness to provide plausible employment opportunities for the people. Absences of protection frameworks or policies are indications of non-importance attached to this crucial insect in Nigeria.

4.1 Implications for conservation

Scarce wood resources are increasingly destroyed for charcoal production. Wood species preferred by native honeybees should be given conservation priority and most valued as honeybees' habitats. One approach for improving the economics of honeybees would be to conserve and utilize some of the tree cavities species preferred in the wild for beekeeping hives construction. Many colonies adapting and thriving in close proximity to humans in the study area are huge opportunities for conservation efforts and booming beekeeping business.

5. Conclusion

The study reflected the colonization and adaptation of honey bees to human habitats as responses to charcoal production. Honeybees' habitats were considerably altered and there are increasing disturbance in the core niches of the forests by the charcoal burners. The losses are many and unquantifiable. The present economic situation gives no assurance that charcoal activities will stop because of the priority given to immediate economic gain by the involved parties. The gravity of habitat loss through charcoal in Imeko in particular demands an urgent proactive responses. The activities of Charcoal burners have negated the nick named of the ILGA "Virgin Land" which has been turned to degraded vegetation. Favourable natural environment existing in the area is ideal for developing sustainable beekeeping and honeybee's conservation as livelihoods that will yield income than charcoal trade without undermining the quality of the environment. Environmentally, commercial charcoal production has bankrupted the ILGA vegetation. In the interest of the public safety and conservation of genetic honeybees, therefore the governments should stop the production and trade of charcoal in the entire area and embrace beekeeping as a plausible alternative enterprise.

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