



ACHIEVING SUSTAINABLE DEVELOPMENT GOALS IN NIGERIA WITH BENEFITS FROM INSECTS

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ABSTRACT

In the bid to address various global challenges, seventeen sustainable development goals (SDGs) were set to replace the defunct millennium development goals (MDGs) in 2000. There is however urgent need to explore different avenues as provided by nature especially with year 2030 set to be the deadline for full achievement of the goals fast approaching. This paper uncovers various different potentials associated with insects that can be explored in achieving SDGs. Honey, beeswax, royal jelly, pollen, propolis and bee venom are products from apiculture which and can be used as food, source of income, employment and also provide healing of diverse ailments. Creation of gainful employment to ever-increasing labour force; treatment of headache, abdominal pain, blood pressure, reduction of blood glucose, treatment of mouth ulcers, fever, anaemia, dizziness, insomnia, hepatitis and constipation are potentials in sericulture that are relevant in achieving some of the SDGs. Edible insect such as bees, wasps, beetles, moths, caterpillars, crickets and grasshoppers are rich in fats, proteins, fiber, vitamins and minerals. They are therefore consumed as food in various part of the world. They are also useful in enhancing immune function, improve gastrointestinal health, prevent incidence of cancer, cardiovascular disease and diabetes in human being. These potentials when properly harnessed can go a long way a means of achieving the SDGs.

Keywords: Sustainable development goals, beneficial insects, apiculture, sericulture, edible insect

INTRODUCTION

At Rio de Janeiro, Brazil in June 2012 the United Nations conference on Sustainable Development set up 17 Sustainable Development Goals (SDGs) to solve the global environmental, political and economic challenges. These goals were to replace the existing millennium Development Goals (MDGs) which were set in 2000. The MGDs were meant to tackle universal world challenges such as poverty, hunger, deadly plague and for the expansion of children education particularly at primary school level. In 2015, at the Conference of all Parties (COP 21) Paris climate conference, the SDGs coincided with another historic agreement reached. Together with the Sendai Framework for Disaster Risk Reduction, signed in Japan in March 2015, these agreements afforded a set of common standards and attainable goals to reduce carbon emissions, manage the risks of climate change and natural disasters.

These 17 SDGs are end poverty by all its forms; eliminate hunger, achieve food security and improved nutrition and promote sustainable agriculture; ensure healthy living and promotion well-being for all; ensure inclusive and equitable quality education and promote life-long learning opportunities for all; achieve gender equality and empower all women and girls; ensure access to affordable, reliable, sustainable and modern energy for all; promote sustained, inclusive and sustainable economic growth full and productive employment and decent work for all; build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation; reduce inequality within and among countries; make cities and human settlements inclusive, safe, resilient and sustainable; ensure sustainable consumption and production patterns; take urgent action to combat, climate change and its impacts; conserve and sustainability use the ocean, seas and marine resource for sustainable development, protect, restore and promote sustainable use of terrestrial ecosystems; sustainably manage forests, combat desertification halt and reverse land degradation and halt biodiversity loss; promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels and strengthen the means of implementation and revitalize the global partnership for sustainable development (SDGR, 2021).

The year by which these goals are to be achieved is between 2020 and 2030 (SDGR, 2021). It is not untrue that some of these SDGs might have been achieved to a reasonably extent, however, the fact remains that some are yet to be achieved. For instance, the first three goals such as end poverty, eliminate hunger, and ensure healthy living for all are still far away from realization, especially in some parts of the world especially Africa and Asia continents. The year 2030, believed to be the time that all these goals must have reached full actualization is fast approaching. To this end, there is need to gear up efforts to achieve the goals.

Nature has helped mankind with resources needed to achieve some if not all of these SDGs, one of such are beneficial insects which are component of the ecosystem. The paper aimed to unravel the potentials embedded in insects to achieve SDGs.

Potentials of Beekeeping practice in Achieving Sustainable Development Goals.

Beekeeping is a small-scale venture with wide range of products and activities that have potentials of achieving some of the SDGs. According to Ajao and Oladimeji (2013), it is an art and a science of domestication of bees in an artificially constructed hive in order to obtain honey and other bee products to address man's social and economic challenges. It is an aspect of agriculture without requirement for large expanse of land, water, feed or fertilizer to thrive.

Beekeeping requires comparatively low capital to start and manage without any drudgery thereby making it favourable for youth and women. This makes the venture suitable in achieving goal 5 (achieve gender equality and empower all women and girls) of the SDGs.

Benefits derivable from beekeeping include income generation from marketing of honey which is the main hive products and other products such as beeswax, propolis, pollen, royal jelly and bee venom. The activities involved in the production of these products, provide a non-gender-biased employment opportunities. The bees are important pollinators of both agricultural crops and fruit trees; and also provide other ecosystems services, thus, playing a significant role in food production and nutrition.

Merits from provision of pollination service, less need for expensive equipment, no need for food as bee forage on pollen and nectar which are viable all through the season of the year, easy-to-learn techniques, less requirement for daily attention, make the beekeeping venture a beacon of hope for all and sundry to address SDGs such as end poverty, eliminate hunger, ensuring healthy living for all and promoting sustainable agriculture. The role of beekeeping product to achieve goal 4 of SDG (ensuring healthy living and promote well-being for all) cannot be underestimated. Notably among the bee products with health benefits are propolis, pollen, beeswax, royal jelly and bee venom. For instance, honey naturally offers healthful properties like antibacterial and antiviral actions, wound-healing effects, dietary antioxidant and anti-inflammatory effects (Debra, 2021)

Natural unadulterated honey contains some compounds that serve as antioxidants as well as phytochemicals, flavonoids and ascorbic acid. All of these reduce oxidative stress in the body by mopping up free radicals. In a development, scientists have attributed oxidative stress to a range of chronic health condition including cancers. The consumption of these oxidant-rich diets drastically reduces risk of chronic diseases (Debra, 2021). Different hive products have roles they play in achieving goal 4 of SGD. Notably are royal jelly which is said to improve fertility in both men and women. In men, it is reported to increase sperm quality while it increases ovules quality in women (Bhalchandra and Yahaya, 2016). Furthermore, bee sting which consists of acid and alkali glands, the secretion of which form the venom and stored in poison sac which opens into stinging apparatus, is used in the treatment of rheumatoid arthritis with a success rate of between 70% and 90% (Son *et al.*, 2007). Propolis is another natural dark sticky resinous materials collected by worker bees from buds and barks of the trees. Several scientists have established that propolis has antimicrobial, antiparasitic, antiviral, anti-inflammatory, antitumor, antioxidant, antibiotic and unaesthetic properties. Owing to these qualities, it is used as a raw material in the production of cough syrups, soaps, skin oils, lotions and toothpastes (Labe, 2017). When properly harnessed, all of these can make goal 4 of SGDs achievable. As further stated by Shakib and Sayad (2016), beekeeping is a venture that is being promoted in the rural areas with the view of improving off farm income and employment. However, it is an unexploited succor with huge potential of rescuing people from abject poverty and starvation when given credence, this will subsequently help to achieve goals 1 (end poverty) and 2 (eliminate hunger) of the SDGs.

Potentials of Sericulture in Achieving Sustainable Development Goals

Sericulture or silk farming is the rearing of silkworms for silk production (Bhattacharjya *et al.*, 2019). Silk is the most elegant textile in the world with unparalleled grandeur, natural sheen and inherent affinity for days, high absorbance, lightweight, soft touch and high durability; and known as the "Queen of Textiles" the world over (Dewangan, 2018b). Sericulture is an agro-based industry with a short gestation period, low investment, continuous cash flow and high pay off. The production of silk from silkworm (*Bombyx mori*) is made possible through feeding of the insect with leaves of mulberry plant (*Morus alba*) (Ashmita *et al.*, 2017).

It is pivotal to state that sericulture is capable of generating more income when compared to other crops such rice, paddy wheat and sorghum just to mention a few because most of these crops can be grown once or twice in a year while sericulture can be practiced 4-5 times in a year, (Dewandan, 2018 b). This is the reason why sericulture is presently settled for by several farmers as a cash crop in the agricultural sector. Being a labour intensive venture, sericulture is ideally suited to developing countries like Nigeria for creating gainful employment to the ever-increasing labour force particularly the women and youths. This potential can be tapped into to achieve goal 5 and 8 (achieve gender equality and empower all women and girls and promote sustained, inclusive and sustainable economic growth full and productive employment and decent work for all) of the SDGs. Several activities involved in sericulture include mulberry cultivation, leaf harvesting, silkworm rearing, cocoon reeling, twisting, weaving, printing, dying, finishing and processing of silk waste. This implies that the industry has great potential to create employment and generate income for people. For instance, for every kilogram of raw silk produced, 12 people that are mostly women are engaged in silk reeling, threading and weaving, fabrication of machines for both the small filature and the big time miller (Prakasam and Ravi, 2014).

In his report, Qiu (2005) stated that in 22 out of 25 provinces in China, 20 million households who cultivated 2 million hectares of mulberry were employed in sericulture and a million workers were employed to operate 2.4 million reeling machines in 1000 silk factories.

Silkworm cocoon spinning and knitting are been practiced in more than 30 countries and are mostly done by smallholder farmers (Ogunlusi and Olaniyan, 2021). These countries include China and India which account for more than 50% of the world production followed by Japan, Korea and Thailand. In Europe, the main producers are Italy and Spain while Zambia, Kenya, Egypt and Uganda are main producers in Africa. Brazil is the largest producers in Latin America with Bolivia and Colombia as smaller producers (Giselle *et al.*, 2017). Nigeria is not on this list but if the potentials embedded in this venture are properly harnessed with support from government and other stake holders, it will go a long way in achieving goals 1 and 7 of the SDGs. The role of silkworm in achieving goal 3 of the SDGs cannot be underestimated. For instance, silkworm's excreta is been used in the treatment of infectious diseases such as headache, abdominal pain and blood pressure (Vimolmangkang *et al.*, 2014). Mulberry plant (*Morus alba*) cultivation is part of sericulture. The potentials from this plant part can also contribute immensely to achieving goal 3 of the SDGs. From their several investigations, scientists have reported antioxidant potential of the extracts from different mulberry plant part such as leaves, fruit, roots and branches (Arfan *et al.*, 2012). In mulberry leaves, notably among the active compound present are alkaloids such as 1-deoxyinijirimycin and fagomine (Hu *et al.*, 2013). As reported by Hao *et al.* (2018) the two alkaloids are known to decrease blood glucose in human. Because of presence of phytochemicals such as coumarins, flavonoids and phenols in mulberry leaf, it is been used as a therapy in blood pressure and cholesterol level reduction in human body (Zhang *et al.*, 2009). Furthermore, mulberry fruits are rich in phenolic compound with flavonols being the most effective among them (Jin *et al.*, 2017). The fruit also contains moranolin, moran (glycopeptides), hydrophobic flavonoids (flavones and flavonone) and 2-arylbenzofuran which have been reported to play role in hypoglycemic action (Fallon *et al.*, 2008). From the findings of Andallu *et al.* (2001), there was a reported improvement in glycemic control and reduction in very low density lipoprotein (VLDL) production in type II diabetic patient when treated with mulberry. All aforementioned benefits can play significant role in achieving goal 4 of SDG (ensuring healthy living and promotion of well-being for all). Several studies have also shown that mulberry fruit juice can be used to treat ailments such as mouth ulcers, fever, anaemia, dizziness, insomnia, hepatitis, constipations. It is also useful in boosting immunity, relieve tiredness and fatigue, and in hair growth enhancement in human (Nazim *et al.*, 2017).

Potentials of Edible Insects in Achieving Sustainable Development Goals

Another benefit of insect that can be harnessed to achieve SDGs is in the edibility of many of them. They have traditionally been consumed as a food source by nearly 2 billion people around the world therefore contributing to many countries' nutrition (Halloran *et al.*, 2014). It is interesting to know that there are about 1,900 edible insects species from which humans eat eggs, larvae, pupae and adults. These edible insects range from bees, wasps, beetles, moths, caterpillars, crickets and grasshoppers. Many edible insects are rich in nutrients such as proteins, fats, fiber, vitamins and minerals which are important in human diet (Raheem *et al.*, 2019). As reported by Dovie *et al.* (2010), in the bid to curtail the menace of poverty and starvation, wild natural resources such as edible insects have been exploited in rural safety-net strategy.

Edible insects are cheap and good sources of protein, amino acid, fats, vitamins and minerals (Hlongwane *et al.*, 2020). In a development, Raheem *et al.* (2019) explained that most insects particularly crickets, measure up or even in most cases surpass the recommended amounts of most of the essential amino acids such as histidine, leucine, tryptophan, lysine, isoleucine, threonine and valine for adults. It was further explained that chitin found in the exoskeletons of many several insects serves as a good source of fiber in human diet and may enhance the immune system. They are therefore being consumed or included to supplement diets particularly during period of hardship and staple food scarcity (Raheem *et al.*, 2019). The ability of most edible insects to enhance immune function implies that they can be integrated as dietary supplements and substitutes in human diets to adequately improve health and general wellness thereby achieving goals 2 (end hunger) and 3 (ensuring healthy living and promotion of well-being for all) of the SDGs. Most edible insects tend to be rich in unsaturated fats, especially polyunsaturated fatty acids (PUFAs) (Dobermann *et al.*, 2017). These PUFAs are heart-healthy fats that tend to be found mostly in plant oil, nut, seeds and fish.

Several components of edible insects such as chitin, short-chain fatty acids, medium-chain fatty acids and glycosaminoglycans have potential to benefit human health. In the study of Stull *et al.* (2018), probiotic bacterium *Bifidobacterium animalis* was reported to increase when human diet was supplemented with 25 grams/day but there was a decrease in plasma tumor necrosis factor (TNF)- α . The relative abundance of this *B. animalis* which is a probiotic associated with the prevention of ailments such as respiratory infections, diarrhea and antibiotic side effects was found very high after intervention suggesting that microbiota produced by cricket supplement has potential to improve gastrointestinal health. Commercial trade of edible insects is a good and lucrative business that generates income and improve livelihoods of people especially those in the rural communities. This is further corroborated by Makha *et al.* (2014) who earlier stated that trade of edible-insect is an excellent commercial business with high and profitable economic returns that can improve the rural economy while also creating job opportunities for many thus achieving goal 8 (promote sustained, inclusive and sustainable economic growth full and productive employment and decent work for all) of the SDGs. When properly explored, the consumption and commercial benefits of insects can be used to achieve goals 1, 2 and 3 of the SDGs which address poverty, hunger and ensure healthy lives.

CONCLUSION

The year 2030 deadline set for the full accomplishment of all the sustainable development goals is fast approaching. The aforementioned potentials from apiculture, sericulture and entomophagy can be fully exploited in bringing this to bear. It is however, important to state that government at all levels and other stakeholders have immense roles to play in achieving SDGs. This can be done by providing grants for further researches, rearing and domestication of insects such as honey bee, silkworm and edible insects as well as other commercial activities. Awareness programmes can also be organized to sensitize and educate people of how all these benefits from insects can be harnessed to achieve SDGs.

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