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Contribution of Apiculture in Ethiopia: A Review

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ABSTRACT

Beekeeping is environmentally sustainable activity that can be integrated with agricultural practices like crop production, animal husbandry, horticultural crops and conservation of natural resources. It is not a labor-intensive activity and can therefore easily be combined with the other daily activities. In view of the economic situation, it is unlikely that farmers were not set aside land for beekeeping and or bee flora production. In the watershed area, after intervention of the technology, the total economic contribution proportions were, Maize (24.6%), teff (21%), wheat (15.1%), potato (20%) and beekeeping (19.8%) are the major crops grown in the watershed. The survey results also depicted some contributions of beekeeping sector as getting additional income, access to improved nutritional values (honey consumption by the family members which directly resulted in improved feeding habit), improved access livestock development (purchase of oxen and cows), pay loans and save money, purchase of household goods, building of houses in towns and the likes. These all indicate that beekeeping activities are promoting the livelihood of the farmers. Therefore, to enhance the production of beekeeping to alle*via*te poverty and job creation the government should be promote policies that support self-employment opportunities in off-farm activities such as beekeeping, value chain development, agricultural service provision and agribusiness activities. However, it is estimated that around one million farm households are involved in beekeeping business using the traditional, intermediate and modern hive production practice.

Key words: Beekeeping, Job creation, Pollination, Poverty alleviation.

Ethiopia is an agrarian country where smallholder farmers produce around 95% of the country's agricultural output also has been experiencing chronic food insecurity (Alemayehu and Abera, 2017). Hence, about 29 per cent of the population lives below the national poverty (Atsbaha *et al.,* 2015). The ability of the nation address the food and nutritional insecurity, poverty and to stimulate for sustain national economic growth and development is highly dependent on the performance of agriculture. Therefore, from agriculture, livestock contribute up to 20% to Ethiopia's GDP and livelihoods of 60-70% of the population. Beekeeping, which is one of the important livestock subsectors, contributes significantly to the improvement of the livelihood's economy (Atsbaha *et al.,* 2015). It serves as economic, social and cultural and nutrition benefits to all actors in the value chain and plays an important role in improving crop productivity all over the world (Chimdessa *et al.,* 2020).

Generating employment opportunities that can absorb the large number of youths reaching working age is a development challenge (Admassie *et al.,* 2015). The problem is more pronounced in rural areas where more than 84% of the youth did not complete primary school and their access to productive resources such as land and credits is limited (World Bank, 2017). Rural youth are often employed in family works (>50%) and self-employed (about 40%) and the nature of their employment is considered low quality due to low payments and lack of secure contracts (Bekele *et al.,* 2017). This situation is unfortunate considering the potential of the agricultural sector in employment creation for rural youth in livestock, cash crops, food crops and non-farm activities such as agro-industry and value chain (Boulanger *et al.,* 2019).

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Beekeeping is a good source of off-farm income to farmers in our country and it plays a significant role in supplementing the annual income and has potential to increase incomes of the beekeepers through sell of honey, beeswax, colonies and serving as a healthy food for the consumers. It provides not only direct job opportunities, cash income and food in the rural areas, but also assists the increased agricultural production of various crops through pollination effect of honey bees. As very little space is needed, beekeeping is ideal for people who have no land, little space and money. The net return from a well-managed beekeeping is generally thought to be significantly large (Teklu, 2017).

Contribution of beekeeping for job creation

The exact number of people engaged in the honey sub-sector in Ethiopia is not well known. However, it is estimated that around one million farm households are involved in beekeeping business using the traditional, intermediate

and modern hives. It could also be observed that a large number of people (intermediaries and traders) participate in honey collection and retailing (at village, district and zonal levels). Thousands of households are engaged in Tej-making in almost all urban areas processors are emerging and exporters (Chala *et al.,* 2013).

Beekeeping practices create job opportunities for landless men and women for their livelihood, as it needs low capital to start (Abdi, 2016). It can also serve as job opportunities to local carpenters and organized youth in construction of beehive. Beekeeping subsector has significant role in generating and diversifying the income of subsistence smallholder farmers mainly the small land holders and landless toward poverty reduction in rural areas (Gezahegn, 2001).

The program targeted at improving the income and livelihoods of farmers (youth and adults) in areas identified as high potential for bee keeping. It focused on improving the quality and quantity of honey production using innovative methods from input use to post harvest handling. The program also facilitated farmers' access to market by establishing business networks in the apiculture value chain (Bekena and Greiling, 2017).

Contribution of beekeeping for poverty alleviation

Beekeeping is environmentally sustainable activity that can be integrated with agricultural practices like crop production, animal husbandry, horticultural crops and conservation of natural resources. Thus, it would be one of the most important intervention areas for sustainable development of poor countries like Ethiopia (Bekena and Greiling, 2017). According to (Beyene *et al*., 2007) reported that on non-farm business activity that has immense contribution to the economies of segments of the society and to a national economy as a whole.

It is not a labor-intensive activity and can therefore easily be combined with the other daily activities. Beekeepers on the study watershed were agreed and started forming and organizing themselves in Beekeeping Associations, improve their techniques, increase production and strengthen their position on the market (Teklu, 2017). However, forages could be grown as hedges around field edges and on soil bund, particularly on the sloping land. In the watershed area, after intervention of the technology, the total economic contribution proportions were, maize (24.6%), teff (21%), wheat (15.1%), potato (20%) and beekeeping (19.8%) are the major crops grown in the watershed (Teklu, 2017).

The beekeeper's annual income from producing honey is the sum of net cash flows after financing, excluding all costs of family labor, rental costs of land and costs associated with the maintenance of the beehives. In poverty-prone countries like Ethiopia, the increase in yearly income enables higher food security and increased purchasing power. This type of income increase goes in hand with the main objectives of international assistance organizations in developing countries: poverty reduction and increased food security (Mikhail *et al.,* 2017).

In addition to the source of income from the sale of honey product, the families are consuming honey with average annual consumption of 4.6 kg per household with standard deviation of 3.79 (Nauseant, 2015). In Case of Tigray Regional State, Northern Ethiopia A question was raised to the sample respondents whether beekeeping activities improved the livelihood 90% of the sample respondents say that there is change in livelihood due to the involvement in beekeeping activities while the remaining 10% respond that there is no change in livelihood brought by their involvement in beekeeping activities (Nauseant, 2015). Beekeeping has that help beekeepers to improve their well-being from the following products.

Honey

Honey, the natural product of honeybee, has many times been described as man's excellent sweetest energy source of food contains more than 180 elements (Haftu *et al.,* 2015). In Ethiopia, much honey has traditionally been fermented to make 'Tej which about 85% of the total honey estimated to be brought to market is used for 'Tej' production and 15% of the total honey produced is consumed at home (Beyene Tadesse and Marco, 2014). Moreover, from the total honey produced in the country beekeepers are estimated to earn about 360-480 million Birr/year (Kumsa and Takele, 2014).

The current annual honey production of Ethiopia is estimated to be about 43,373 tones. This makes the country the leading honey producer in Africa and one of the ten largest honey-producing countries in the world. Ethiopia is the principal honey and beeswax producer worldwide and the regional leader in Eastern Africa in bee product business development due to its highest number of bee colonies and surplus honey flora. In terms of volumes of honey and beeswax harvested and traded, Ethiopia exceeds other countries in Africa by far. The country produces about 43,373 metric tons of crude honey per year, thus sharing 23.5% of African and 2.35% of the world's honey production (Table 1). This makes the country rank 1st in Africa and 10th in the world (Seid and Solomon, 2015).

Table 1: Export of honey 1998-2003.

Year	Honey (in tons)	Value (in Birr)
1998	1781.10	78,188
1999	100.80	29,245
2000	761.20	221,363
2001	129.00	30,922
2002	333.90	93,269
2003	340.30	79,087
Total	1843.30	532,074
Average	307.22	88,679

Source: Ministry of Trade and Industry, Annual External Trade Statistics; 1999-2003.

According to Shibru *et al.* (2016), honey has value for both domestic and export markets and is an important part of some cultural traditions. Honey has considerable socio-cultural significance. In the region, the community for their sweet products appreciates beekeepers. Moreover, the production of honey mead (Tej) as a local festival drink and Honey is a highly regarded product and is widely used in different cultural, religious and ritual ceremonies and traditional medication (Bekena and Greiling, 2017).

Bees wax

In Ethiopia, wax is largely collected from traditional hives rather than moveable frame hives. The wax yield from traditional hives is estimated to be 8-10% of the honey yield, compared to 0.5% - 2% from frame hives (Nahusenay Teamer Gebrehiwot, 2015). The use of beeswax for the making of votive candles is an integral part of the cultural heritage within the many ethnic and religious groups.

In several regions of the country, beeswax collection is not significant and the beeswax produced by bees, which could be harvested by beekeepers, is wasted. The wax is mostly left or thrown away because beekeepers do not bother to collect it since it is of little practical value for beekeepers and the people do not know the local beeswax is generating attractive money (Haftu *et al.,* 2015).

Nevertheless, the annual beeswax production of Ethiopia is estimated at 3,658 tones (Fig 1) but this makes Ethiopia the fourth largest beeswax-producing country in the world after China, Mexico and Turkey (Chala Kinati *et al.,* 2013). Beeswax supports the national economy through foreign exchange earnings. Presently, beeswax is one of the major exportable agricultural products. Ethiopia is the third largest beeswax exporter in Africa and the annual average value of beeswax is estimated at 125 million Birr. Like honey, beeswax is also a multipurpose natural bee product, which is used in the manufacture of more than 300 commodities. Honey and beeswax also play a big role in the cultural and religious life of the people of the country (Gezahegn, 2001).

Contribution of beekeeping for pollination

Beekeeping is directly impacts on agricultural sector through pollination (Kumari and Kumar, 2019). In order to ensure pollination, many fruit crops-such as blueberries, apples, blackberries, cranberries, cherries, pears, raspberries, plums and strawberries-need an insect pollinator. An abundant supply of pollinators during flowering is necessary to yield a harvest that can be sustained. Proper pollination accelerates fruit maturity, increases fruit size at yield and creates a more symmetrical fruit shape. Higher pollination rates on flowers result in more seeds and larger fruit. Smaller and more asymmetrical fruits result from improper pollination because the ovarian tissue is not encouraged to expand around the seedless portions. Plants have evolved strategies for transmitting and receiving pollen since they are sedentary creatures. Bees are primarily responsible for livestock-facilitated pollination in agriculture. Because honeybees are very easy for humans to keep and relocate, they are the most widely used pollinators in agriculture (Kumsa and Takele, 2014).

Because of their large colonies-up to 60,000 workers in the summer-honeybees may be more efficient pollinators than other bee species, although native bees are also significant pollinators and occasionally even more effective than honeybees on an individual basis. However, since agriculture depends more and more on honeybees maintained by beekeepers, the number of native bees is decreasing. A producer can boost the possibility of appropriate pollination and make up for the decline in wild bee populations by renting honeybee colonies (Shibru *et al.,* 2016).

There are now more income prospects due to the increasing recognition of the ecological and economical value of natural insect pollination, which enhances crop

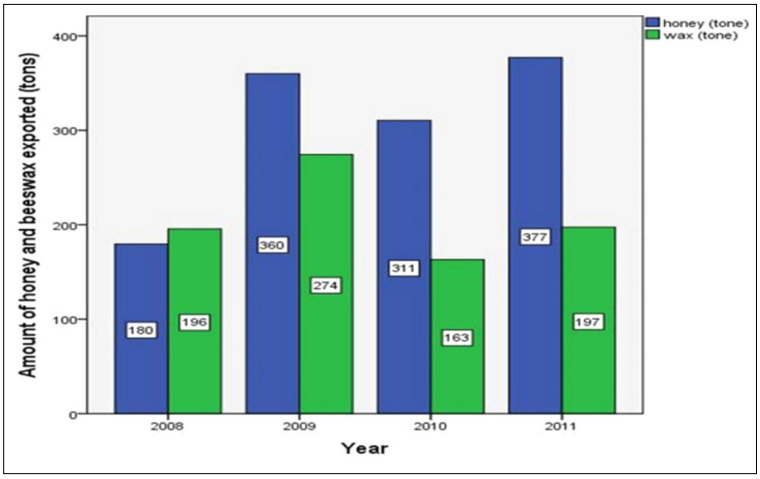


Fig 1: Export of honey and beeswax (in tons) (Gezahegne, 2012).

quality and quantity. A forest or wild grassland with natural pollinators close by can increase the productivity of agricultural products by roughly 20%, including apples, almonds and coffee. A basic illustration of the economic worth of ecological services is the possibility that forest owners will demand payment for their role in the increased agricultural results due to the advantages of native pollinators. A vital component of the agricultural system is bees. Honeybees have a major role in enhancing national food supply and plant species regeneration, even though their value in crop pollination is underestimated. The world's most important pollinators are honeybees. It is more harder to measure their utility, but their pollination service is thought to be worth nearly 15 times the value of all hive products combined (Sisay *et al.,* 2015; Shibru *et al.,* 2016).

Honeybees are thought to contribute significantly to Ethiopia's economy by way of pollination services. One of the most crucial elements influencing agricultural seed production is pollination. A study carried out in Ethiopia to ascertain the impact of pollination on Niger (*Guizotia abyssinica*) revealed that honeybees enhanced the seed output of Niger by approximately 43% (Sisay *et al.,* 2015). An estimated one-third of all plants or plant-derived foods consumed by humans depend on bees for pollination, either directly or indirectly (Beyene Tadesse and Marco, 2014). Certain crop varieties feature flowers that might only receive pollination for a brief time. A crop of such kind will lose its blossoms and not produce any seeds, berries, or fruit if it is not pollinated during that period. The crop that has been pollinated must have a enough quantity of bees (Kumsa and Takele, 2014).

In addition to producing more fruits, berries, or seeds, bee pollination may also improve the quality of the food. Effective flower pollination may also help shield crops from pests. The growth of all the seeds within a fruit results in a superior weight that is caused by adequate pollination. The fruit will be larger and more uniformly formed the more seeds that have fully developed. An intriguing finding from bilberry research was that 89.1% of the blooms on bilberries planted near an apiary underwent fertilization and bore fruit. Fertilization and berry production were just 47.5% in a bee-free environment. For the bilberries near bees, the average berry weight was 0.578 grams, whereas for the berries far from bees, it was 0.348 grams. Out of 100 blossoms, 51.1 grams of berries were harvested when there were bees in the area, compared to only 16.8 grams when there was none (Kumsa and Takele, 2014).

Challenges

The challenge faced in the apiculture industries are price fluctuations for honey export; delay in repayment of loans by producer organizations; limited follow up and technical support of partners; limited capacity of local level government institutions; inadequacy of technical staff to enforce standards and regulations on produce; requirements for establishing laboratories; and low-level of awareness on quality assurance (Gezahegn, 2001).

Beekeepers are experiencing high colony losses due to the unwise application of pesticides and climate change (Aynalem and Mekuriaw, 2017). Insecticides and herbicides have been reported as significant causes of death and absconding of the honeybee colonies and their food source (Kerealem, 2009). Due to the misapplication of these chemicals, honeybee mortality and reduction of honeybee colonies, which eventually results in a reduction of bee products and crop yield, are faced due to low colony population for pollination service (Melisie *et al.,* 2015).

Most farmers use pesticides when honeybees a reactively foraging for nectar and pollen on flowering plants, which causes them to poison themselves or contaminate the hive's supplies. The use of pesticides has a growing negative influence on honey production, floral plant mortality, pollination effectiveness and honeybee population. Generally, Pests, Disease and Predators; weather problem; Shortage of bee forage; Absconding; shortage of trained manpower; shortage of equipment; poor management practices; chemicals; weak research and extension; poor infrastructures and *etc*. are constraints of honey production in Ethiopia (Goshme Dagnaygebaw and Ayele, 2020).

Recommendations

Based on the above conclusion, the following tasks are recommended: Awareness shall be created to crop producers and other stakeholders on the role of honeybees for crop production, seed quality improvement, ecosystem conservation, job creation and poverty alle*via*tions. Apiculture experts, plant experts, beekeepers and plant growers shall work in collaboration to protect honeybees from chemical poisoning by implementing wise use of agrochemicals application. The government, non-governmental organization and other should be give emphasize and attention for development of the beekeeping industries.

CONCLUSION

In Ethiopia, the diverse agro-ecological zones and rich flora offer significant potential for beekeeping activities. The country's favorable climate, geographical location and variety of plant life provide an ideal environment for the growth of the apiculture sector. Beekeeping, as a non-farm business activity, plays a crucial role in improving the incomes and livelihoods of rural communities, especially youth, while contributing to the local and national economies. Given its importance, it is essential for the Ethiopian government to give greater attention to the apiculture sector. By doing so, it can fully harness the potential of beekeeping in the fight against poverty and in creating sustainable employment opportunities. Strengthening this sector can contribute substantially to

the socio-economic development of rural areas and the country as a whole.

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Disclaimers

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Informed consent

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Conflict of interest

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