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Economic Losses in the Traditional Honey Production System in Oromia Region, Ethiopia

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ABSTRACT

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In Ethiopia, traditional beekeeping systems with low productivity and quality predominate in the beekeeping industry, which contributes only less than 1.3% of Ethiopia's agricultural GDP. Despite government extension services, farmers resist adapting to the improved technology due to high prices and accessibility. Hence, this study was conducted to estimate the amount of economic loss due to the use of traditional technology using 165 randomly selected beekeepers in three purposefully selected zones in the Oromia regional state in Ethiopia. The study found that about 83% of the respondents have been relying on traditional beehives for both honey and colony survival. However, the traditional beehive production system is associated with lower productivity, lower quality, higher post-harvest losses, and lower income rewards. In practice, most MFH [1] and KTB [2] hives are managed nearby homes, whereas 63% of traditional hives are fixed on trees in the forest or nearby homes. This causes the beekeepers to harvest only once from traditional beehives, which also contributes to colony loss and a lower honey harvest. With this practice, the beekeepers in regions, in general, lose about 15 billion ETB [3] annually due to lower productivity of the technologies, traditional beehives, and colony losses. Thus, the region can recover these losses through better management and less reliance on conventional beehives.

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INTRODUCTION

Ethiopia leads honey production in Africa (Sahle *et al.*, 2018), but the country is not generally benefiting from the sector (Nega and Eshete, 2018). Even though it is one of the export commodities of Ethiopia (NBE, 2017), the share of the sub-sector in the GDP has hardly been commensurate (Tesema, 2016). The beekeeping sector accounts for only 1.3% of agricultural GDP, though over a million households keep honeybees (Ababor and Tekle, 2018). Regardless of past interventions, more than 95% of the sectors are dominated by traditional production systems (Legesse, 2015) with low productivity and quality (Bekena, 2016). As a result, the supply of honey to the world market remains very low (Shiferaw and Gebremedhin, 2015), regardless of the growing world's demand for quality honey (Norman, 2018). Though Ethiopia was listed as a third country permitted to export honey by the Europeans, its export status was not more than 2% of the total production (Nega and Eshete, 2018). The larger share (>85%) of honey has been consumed largely for making mead (Desalegne, 2011), regardless of the potential for certified natural organic honey production (Bekena, 2016). Generally, honey value chains are characterised by weak (Jagiso *et al.*, 2017) and long local value chains (Trienekens, 2011).

However, the traditional production system was characterised by limited access to and use of new technologies (David and Rui, 2016), which led to low productivity and quality (Bekena, 2016). This limits the beekeeping sector to a traditional food value chain in agricultural transformation (Reardon and Minten, 2018). However, still, the sectors support the 2013–2025 Industrial Development Roadmap to build diversified (Tesema, 2016) and globally competitive with environmentally friendly industrial sectors (Stephen *et al.*, 2017). Beekeeping is an investment option in Ethiopia that needs little investment (ITO, 2014) with no harmful effect on the environment (Partap *et al.*, 2017).

Moreover, regardless of government extension services and the introduction of improved beekeeping technologies (Haftu *et al.*, 2015) farmers have continued to resist adapting to modern beehives due to their high price and accessibility (Tsehaye, 2018). This process has been continuing to cost the countries in different directions, though it has huge potential to supply the world with organic honey at a better premium price. However, these events should not continue in such a manner, as the country has been suffering from higher unemployment graduate, shortages of foreign currency, food insecurity, and poverty. Thus, the main target of this study was to indicate the gross economic losses from the traditional production system and technologies in Oromia, with a great implication for Ethiopia.

METHODOLOGY

This study was conducted in three potential zones of Oromia regional state in Ethiopia, where the number of districts and the number of PAs were selected purposefully based on the number of honey hone producers and the number of beehives. With this aim, two districts per zone with two PAs per district were selected. Finally, 165 sample households were selected at the precision level to be used (5%). The primary data was collected from beekeepers using semi-structured questionnaires, in addition to key informant interviews and focus group discussions with beekeepers of different social and age groups. Finally, secondary data was used from different data sources, such as Ethiopian Statistical Services (ESS) and administrative data from the Oromia Bureau of Agriculture.

In the data analysis, descriptive and gross revenue comparisons were conducted. Additionally, to estimate the amount of gross economic losses (loss index), a ratio of expected marginal analysis was used. Accordingly, the comparison was made with the current practices of farmers obtained from field surveys against average technology potential conducted in a similar environment.

$$EL_{MG} = \frac{R_{TP} - R_{FP}}{R_{FP}} * 100\%$$

Where,

EL_{MG} = Economic loss index (productivity decline due to management gap)

R_{FP} = Technolgy potential in a similar environment

R_{TP} = Productivity of beehives on beekeepers' management

To calculate the value of economic loss, we need to calculate the gross revenues under both beekeepers' practices and technology potential, which helps to compute the technology gap. In this case, higher gross revenue can be achieved by improving management. Additionally, the loss due to the use of traditional beehives could be calculated using the productivity gaps between MFH and traditional hives, which helps to indicate the benefit of transforming the production system from traditional to modern technology. In this case, the productivity of the hive was based on farmer practices, which makes the comparison very practical. Accordingly;

$$EL_{TG} = \frac{R_{MFH} - R_{TH}}{R_{TH}} * 100\%$$

Where,

EL_{MG} = Economic loss index (productivity shortfall due to use of traditional hive)

R_{FP} = Estimated revenue for using MFH

R_{TP} = Estimated revenue for using traditional hives

RESULT AND DISCUSSION

Overview of honey production practices

On average, the beekeepers have about 21 beehives, with a range of 1-225 beehives. From the total colony, 88%, 63%, and 35% of the households have traditional, MFH and KTB hives, respectively (Table 1). Generally, the households have about 10, 7, 14, MFH, KTB, and traditional hives, respectively, with a total of 21 hives. From the total beehives, 55%, 28%, and 17% are traditional, MFH, and KTB, respectively. The beekeeping practices are dominated by traditional hives, where 63% of traditional beehives are fixed on a tree either nearby home or in a forest. The dangerous part of forest beekeeping is that it is hardly possible to harvest honey from the beehive as many as possible due to partially or complete removed combs from beehives. Dominantly, it is only possible to harvest once from traditional hives fixed in the forest due to the partial or complete removal of combs from the hives. Additionally, at least the colony will be lost to traditional beehives once a year if fixed in the forest. In modern and transitional beehives, the possibility of inspecting colonies can also ease multiple honey harvests, unlike in traditional colonies.

Generally, about 98% and 88% of the MFH and KTB, respectively, are managed nearby, either under shade (inside the house) or in the backyard, which makes beekeeping management very easy with lower risks of theft and security (Table 2). However, only 37% of the traditional hives are managed nearby, whereas 63% of the traditional hives are fixed on a tree, either nearby or in the forest. The implication is that most of the colony managed on the tree is harvested once a year, and at least the colony is lost once a year. Within the existing potential, more than half the beekeepers were harvesting at least twice a year. However, while a larger proportion of traditional hives are harvested once, a larger proportion of MFH and KTBs are harvested twice a year. From this field data, 34% of all hives were harvested once years, of which 66% were shared by traditional hives (Table 3).

The average honey yield in the study is not harsh due to the good potential of the study site. On average, households harvested 142 kg of honey from 12 beehives, with an average productivity of 18 kg per hive yield (Table 4). In farmer practices, the modern beehive can yield three folds of traditional beehives and twice as many traditional beehives. The implication is that the farmers strongly know why they could not transform the traditional hives into modern hives. Among the major reasons the farmer seeks a challenge are:

- High relative prices of modern technology
- Lack of local supplies
- Poor access to modern beehive accessories

As stated above, about 83% of the beekeepers are dependent on traditional beehives as both a source of honey and a colony. Most dominantly, the traditional colonies are destroyed during honey harvest as well as when a condition is not in a good position. The chance of survival for a traditional colony is hardly expected unless the colony is fixed in the backyard or inside the house.

Economic losses in honey production

Indirect economic losses

In Ethiopia, the importance of honeybees is associated with honey and wax, though the pollination role of honeybees is immeasurable. In the world, studies indicated that there is a need to increase understanding of pollination as a critical element in the world's food supply (Klein *et al.*, 2003). In the world, 87 crops—that is, 70% of the 124 main crops used directly for human consumption—are dependent on pollinators (Klein *et al.*, 2007). The study conducted in different countries shows that the pollination of honey bees increased the yield of cotton and sesame in Faso by 37% and 59%, respectively (Stein *et al.*, 2017), the yield of Coffee arabica by 50% in Panama (Roubik, 2002), cotton yield by 62% in sub-Saharan Africa (Stein *et al.*, 2017), the yield of green gramme, beans, cowpea, sunflower, tomato, Bambara, groundnut, passion fruit, and capsicum by 40% in Kenya (Kasina *et al.*, 2009), and coffee by 50% in South India (Khalifa *et al.*, 2021). Similarly, in Ethiopia, 33 (62.2%) out of 54 crops produced are dependent on biological pollinators (Alebachew, 2018), where honeybees contribute 80% of pollination services. The studies conducted in Ethiopia show that the pollination of honey bees increased the seed yield of Niger (*Guizotia abyssinica*) by about 43% (Admassu & Nuru, 2000) and Apple (*Malus sylvestris*) by 50% (Tura *et al.*, 2021). However, the significance of honeybee pollination was hardly accepted in Ethiopia though the demand for animal pollination service is rising simultaneous with the decline in pollinator abundance and diversity in the world (Altieri *et al.*, 2015).

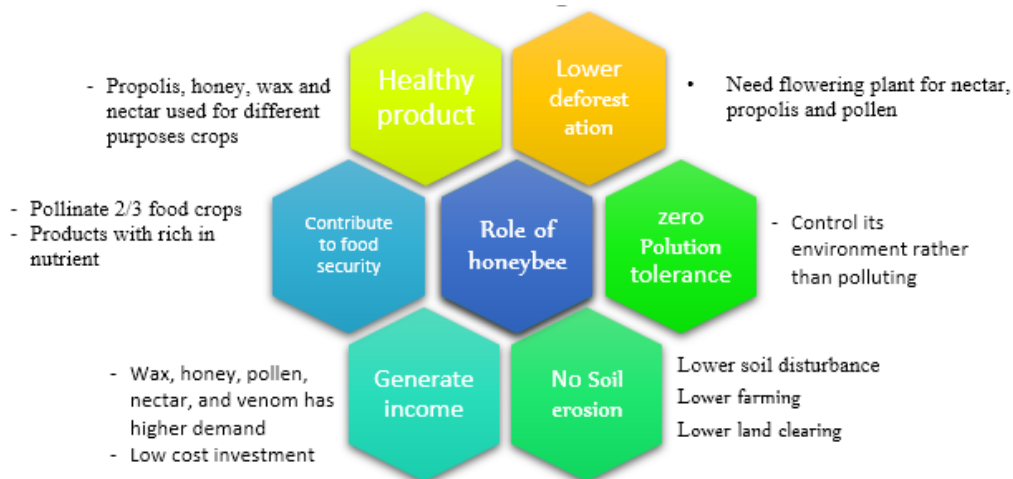


Figure 1. Multiple role of honeybee

Generally, honeybees are considered significant pollinators due to the mutualistic relationship between plants and honeybees in exchange for nectar and pollen (Hung, 2018). However, its role in agricultural production was hardly communicated in Ethiopia beyond its direct product, honey, and wax (Figure 1). As a result, the loss of honeybees has escalated due to the expansionary use of agrochemicals among the major.

Direct economic loss

In Ethiopia, particularly in Oromia, the share of traditional colony from the total colony is higher, reaching 96% (ESS, 2022). However, traditional hives are associated with lower honey yields, colony losses, poor honey quality, and lower harvesting frequencies. With current practices, however, Oromia is not able to fruitage rational economic incentives from beekeeping, which is far below its potential. The data from the Ethiopian Statistics Service (ESS) Agricultural Sample Survey shows that the Oromia region shares about 57%, 65%, and 36% of the traditional KTB and MFH of the country, respectively. Yield-wise, the region shares 53%, 63%, and 63% of the traditional KTB and MFH of the country, respectively. On average, the region shares 57% of the total beehive and 53% of the total yield of the country, with 3.3 million, 65 thousand, and 44 thousand traditional, KTB, and MFH, respectively, of beehives in Oromia. Using these numbers of beehives, the total gross revenue was calculated using the average productivity of both the technology potential found in experiments in similar environments and the farmers' productivity average obtained from field surveys.

In revenue computation, the average farmgate price was used from a field survey conducted in 2023. In this analysis, the economic losses associated with honey production in the region were classified as losses associated with technology gaps, the use of traditional hives, and colony losses.

Income loss due yield gap

With the current honey prices, the farmers lost about 32%, 17%, and 395% of the honey yield harvested from MFH, KTB, and traditional, respectively, with an average loss of 119% from the technology potential (Table 5). This loss was associated with poor technology management, lower harvesting frequency, and intensive use of traditional technologies. From the field survey, the average farmgate honey price from MFH, KTB, and traditional hives was 235, 188, and 219, respectively, with an average farmgate price of 212 ETB per kg (Table 6).

In this situation, thinking of global competition is a dream without a complete transformation of the sector into a market-oriented quality production system. With the current production practices, the region lost about 9.4 billion ETB due to the lower productivity of the existing technology (Figure 2). Within the existing technology in production, the region can recover this amount of income by improving the management of the beekeeping system to harvest the amount of honey above its potential.

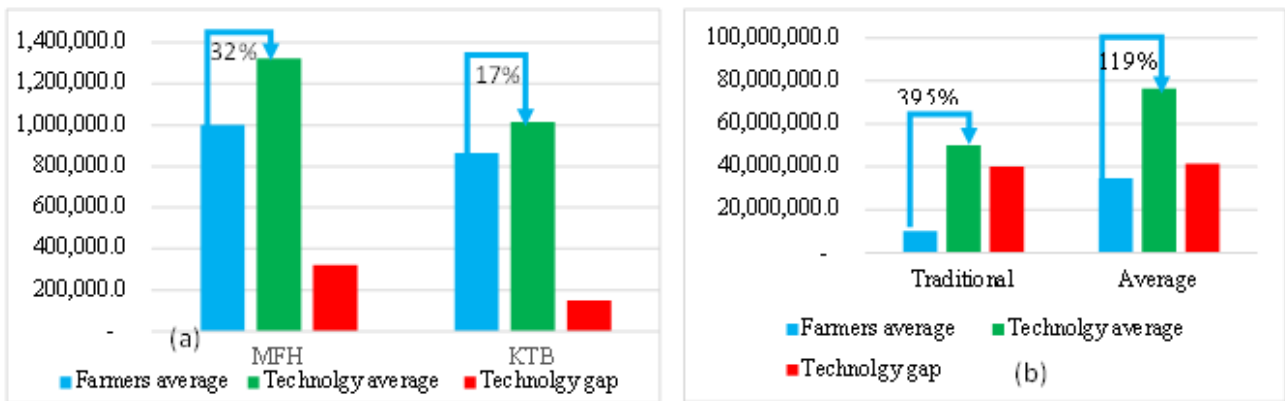


Figure 2. Yield disparity of farmers practices Vs technology potential (in tons)

Source: Own computation from own survey, literature and ESS data

Income loss due technology gap

In the region, the traditional colony shares about 97% of the colony, with a 92% share of honey production (ESS, 2022). However, the productivity of traditional hives is less than 14% of the yield of MFH. Hence, the region can boost honey production by transforming the traditional hives into MFH by more than 395%, which can be equated to 9.4 billion ETB, whereas on average, the beekeepers in the region can increase the honey yield by more than 119%. However, the transformation of beehives to MFH could not transform the production of honey unless otherwise supported by the technical capacity development of the beekeeper.

In monetary terms, the region could increase its regional income from honey production by more than 500% on average by changing to MFH (Figure 3). In terms of monitoring value, the region could gain more than 15 billion ETB by transforming the sector where it was a loss in current practice. With these facts, the contribution of beekeeping was undermined. Additionally, even though the country could generate a huge amount of foreign currency from honey, its export capacity remains very minimal due to fragmented traditional practices and poor quality honey product management.

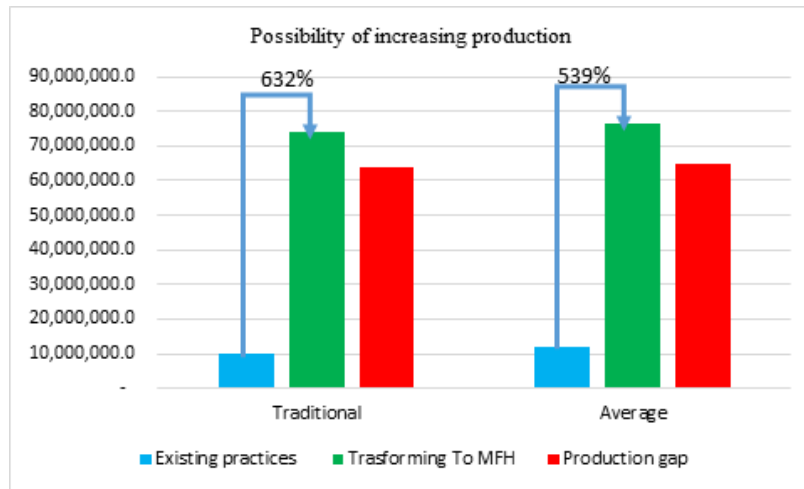


Figure 3. Potential gain of transforming from traditional to MFH

Income loss due colony loss

Forest beekeeping is commonly a kind of modernized hunting where the hunters have no idea about the sustainable uses of the colony. Rather, the field survey shows that bee hunters completely or partially destroy the comb in the traditional hives which could enforce the colony to move after harvesting honey. With this fact, 16.78% of the hives are fixed on trees in the forest, which equates to about 547,847 colonies. During harvesting, almost all these colonies would be destroyed. Using 722 ETB average prices of colony, annually the beekeepers lost a colony worth about 395 million ETB. The colony loss, on the other hand, has implications for honey production loss, which again is a loss to the country in terms of unproduced honey.

Generally, the monetary and non-monetary losses due to the traditional production system and traditional hive are implications for the country to rebuild a better beekeeping extension system. In the current production practices, the losses have become very severe, besides the augmented use of agrochemicals.

CONCLUSION

The dominance of the traditional beekeeping system has been costing the beekeepers in the Oromia region more than 119% of their income from beekeeping practices. Moreover, due to the uses of tradition beehives, the countries has lost more than 15 billion ETB though there was a possibility of improving honey production by more than 500% by using MFH. This implies that the beekeepers in the region can at least double their production by using technology to their potential or changing the traditional technology to MFH. Moreover, the loss can also increase as the use of agrochemicals expands in the region if honeybees are not protected. Hence, it needs an extension system to focus on market-oriented beekeeping development. Additionally, intensive intervention to boost productivity and transform beekeeping is very important. However, to boost the productivity of all beehives, the technology needs a value chain approach for more intensive operations.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

REFERENCES

1. Bekena N, 2016. Quality Focused Apisector Development in Ethiopia. Rome, Italy, s.n.
2. Desalegne P, 2011. Ethiopian honey: Accessing International markets with inclusive business and sector development, s.l.: SNV.
3. Tsehaye HB, 2018. The status of beekeeping practices and honey production system in Ethiopia-a review. *International Journal of Engineering Development and Research*, 6(2).
4. Ababor S and Y Tekle, 2018. Beekeeping Practice, Opportunities, Marketing and Challenges in Ethiopia: Review. *Journal of Dairy and Veterinary Sciences* , 5(3).
5. Admassu A and A Nuru, 2000. Effect of honeybee pollination on seed yield and oil content of Niger (*Guizotia abyssinica*).. Addis Ababa, Ethiopia, Ethiopian Beekeepers Association,, pp. 67-73.
6. Alebachew W, 2018. Economic value of pollination service of agricultural crops in Ethiopia: Biological Pollinators. *J Apic Sci*, 62(2), pp. 265-73.
7. Altieri MA, CI Nicholls, M Gillespie, B Waterhouse, S Wratten, G Gbèhounou and B Gemmill-Herren, 2015. Crops, weeds and pollinators: Understanding ecological interaction for better management. .. Rome, Italy: FAO.
8. David S and B Rui, 2016. Fostering inclusive outcomes in sub-Saharan African agriculture: Improving agricultural productivity and expanding agribusiness opportunities. , Rome,, Rome,Italy: s.n.
9. ESS, 2022. Agricultural Sample Survey report on Livestock and Livestock Characteristics (Private Peasant Holdings). Volume II,, Addis Ababa, Ethiopia: Ethiopian Statistics Service (ESS), Federal Democratic Republic of Ethiopia.
10. Haftu K, D Daniel, B Gebru, G Tsegay, A Guash, G Guesh, Z Muluaem and G Gebrekiros, 2015. Analysis of Honey Bee Production Opportunities and Challenges in Central Zone of Tigray, Northern Ethiopia. *International Journal of Scientific and Research Publications*, 5(4).
11. ITO Y, 2014. Local honey production activities and their significance for local people: a case of mountain forest area of southwestern Ethiopia. *African Study Monographs. Suppl, Volume 48*, pp. 77-97.
12. Jagiso B, E Geta and L Zemedu, 2018. Honey Value Chain Analysis and Producers Financing in Damot Gale District, Southern Ethiopia. *Food Science and Quality Management, Volume 78*.
13. Kasina J, J Mburu, M Kraemer, and K Holm-Mueller, 2009. Economic benefit of crop pollination by bees: A case of kakamega small-holder farming in Western Kenya. *J. Econ. Entomol*, Volume 102, p. 467–473..
14. Khalifa SAM, EH Eishafiey, AA Shetaia, AA El-Wahed, AF Algethami and SG Musharraf, MF AlAjmi, C Zhao, SHD Masry and MM Abdel-Daim, 2021. Overview of Bee Pollination and Its Economic Value for Crop Production.. *Insects*2021, 12, 688. <https://doi.org/10.3390/insects12080688>, Volume 12, p. 23.
15. Klein , A., Vaissière, B. and Cane, J., 2007. Global pollinator decline a literature review. *Ecology for a crowded planet*, Volume 304, pp. 1251-1252.
16. Klein AM, SF Ingolf, and T Teja, 2003. Bee Pollination and Fruit Set of *Coffea Arabica* and *C. Canephora* (Rubiaceae). *American Journal of Botany*, 90(1), pp. 153-157.
17. Legesse GY, 2015. Honey Production and Marketing in Ethiopian. *American Journal of Life Sciences*. 3(1), pp. 42-46.
18. NBE, 2017. 2016/17 Annual Report, Addis Ababa, Ethiopia: s.n.
19. Nega T and Y Eshete, 2018. Review of Ethiopia's Global Position in Honey and Other Bee Products Production and Marketing: Analysis of Sectoral Opportunities and Limitations. ., *Biomedical Journal of Scientific & Technical Research*, 10(3).
20. Norman CL, 2018. Special issue: honey. *Journal of Apicultural Research*, 57(1), pp. 1-4.
21. Partap U, CE Halder, JK Rema, KR Gurung, NB Tamang, S Wangchuk, E Hussain and S Hussain, 2017. Pro-poor value chain development for Apis cerana honey: Potential benefits to smallholder Apis cerana beekeepers in the Hindu Kush Himala, Kathmandu: s.n.
22. Reardon T and B Minten, 2018. Food value chain transformation in developed and developing regions. In: K. Otsuka & S. Fan , eds. *Agricultural Development: New Perspectives in a Changing World.. s.l.:s.n.*
23. Roubik D, 2002. The value of bees to the coffee harvest.. *Nature*, Volume 417.

24. Sahle, H., G Enbiyale and A Negash, 2018. Assessment of honey production system, constraints and opportunities in Ethiopia. *Pharm Pharmacol Int J.*, 6(1), p. 42–47.
25. Shiferaw K and B Gebremedhin, 2015. Technical efficiency of small-scale honey producer in Ethiopia: A Stochastic Frontier Analysis, s.l.: s.n.
26. Stein, K., D Coulibaly, K Stenchly, D Goetze, S Porembski, A Lindner, S Konaté and EK Linsenmair, 2017. Bee pollination increases yield quantity and quality of cash crops in Burkina Faso, West Africa. *Sci. Rep.*, Volume 7, p. 17691–17700.
27. Stephen D, A Asferachew, B Mohammed, D Bekhechi, S Danyo, A Asferachew, M Bekhechi, G Köhlin, H Medhin, A Mekonnen, A Fentie, T Ginbo, B Negede, H Tesfaye and A Fentie, 2017. Realizing Ethiopia's Green Transformation: Country Environmental Analysis, Environment and Natural Resources Global Practice.: World. Washington, DC: World Bank..
28. Tesema BA, 2016. "Constraints and Opportunities of Honeybee Production and Honey Marketing Systems: A Case of Guji and Borena Zone of Oromia State. *EC Agriculture*, 3(3), pp. 635-645..
29. Trienekens J, 2011. Agricultural Value Chains in Developing Countries: A Framework for Analysis. *International Food and Agribusiness Management Review*, 14(2), p. 51–82.
30. Tura B, A Admassu, W Kibebew and K Tolera, 2021. Dynamics of nectar secretion, honey production potential and colony carrying capacity of *Coffea arabica* L.. *Rubiaceae*, 115(1), pp. 125-138.
31. Hung, KLJ, JM Kingston, M Albrecht, DA Holway, and JR Kohn, 2018. The worldwide importance of honeybees as pollinators in natural habitats. *Proceedings of the Royal Society B: Biological Sciences* 285: 20172140.