

Review paper

Review on Bee hive Inspection Trend and Honey Harvesting Practice: Ethiopia

Merhun Lamaro Lango

Wolaita Sodo University Department of Animal and Range Sciences, Dawuro Tarcha, Ethiopia
Email address: meri.lamaro@gmail.com

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This review was conducted with the objective of putting updated recent information on bee colony inspection trends, purpose of hive inspection, honey harvesting seasons and honey harvesting frequency in Ethiopia. In beehive management (follow up, checking against enemy, cleaning the environment, supplying additional feeding, watering and honey harvesting) bee keepers had experience to different degrees. Beekeepers inspect their bee colony for different purposes i.e. to prevent the loss of honey product due to pest attack, to check if the hive was occupied with bees or not, to prevent against bee enemies, for confirmation of hive occupation by bees and to check the bees' existence, to clean the areas around the box beehives and to put ash under the hives to avoid small ant and ant like insects from climbing the box beehives to follow up the progress of the bee colonies problems, examine the condition of brood, check food store, attachment of top-bar with the wall of hives, honey ripe, pests and predators attack and look for sign of diseases. Beekeepers mostly practice external hive inspection to different degrees. Majority of beekeepers in different districts/zones of Ethiopia visit their bees daily while some of them visit their bees at every 2 to 5 days. Internal hive inspection is almost not practiced by most of the farmers due to the difficulty of fixed comb of the traditional hives for internal inspection. Unlike traditional bee hives, transitional and modern bee hives have movable combs so that the beekeepers easily can open their hives and inspect bee colonies.

Key words: Bee Colony, Beekeepers, Ethiopia, Hive, Honey

INTRODUCTION

In beehive management, bee keepers had experience to follow up, checking against enemy, cleaning the environment, supplying additional feeding, watering and honey harvesting to different degrees. Beekeepers in Hadiya zone of Southern Ethiopia believe in that visiting the apiary and hive during rainy season causes diseases (Haftu and Gezu, 2014). Experiences show that external colony inspection can be done at any season, however, caution is required in what season and at what frequency the internal inspection should be conducted.

Beekeepers visit their bees for different purposes i.e. to check if the hive was occupied with bees, check against bee enemies (HaftuKebede, Daniel, D., Gebru, B., Tsegay, G., Guash, A., Guesh, G., Mulualem, Z, Gebrekiros, G,2015),for confirmation of hive occupation by bees and to check the bees' existence Berhanu

(2016), for harvesting Welay and Tekleberhan, (2017) to check the presence of the hive & to check the hive was occupied by bee (Getachew, 2018), for observing bee's activities on the hive entrance (Shibru Dereje, Asebe Getahun, Megersa Emana, 2016).On the other hand, beekeepers inspect apiary to clean the areas around the box beehives and to put ash under the hives to avoid small ant and ant like insects from climbing the box beehives (Assefa, 2009;A. Abera, H Yakob, GYasin,, 2016).In Ethiopia, there are generally two honey harvesting seasons: the main honey harvesting season that lasts from October to December and the second honey harvesting period is from April to June (Tesfa Assemu, Ejigu Kerealem, Kebede Adebabay, 2013; Nuru, 2007; Shibru Dereje, Asebe Getahun, Megersa Emana,(2016).

Honey harvesting periods mainly depends on the type of flowering plants and rainfall patterns in different agro-ecologies (Nuru, A. 2007), botanical origin of honey in their locality and associated with the flowering seasons of various trees, bushes and grass species found in the vegetation cover of the area (MoARD, 2003; Addisu Abera, H Yakob, G Yasin, 2016).

The frequency of honey harvesting varies within the same zone and also from one zone to another zone as well as from region to region within the country depending on colony management practices and the flowering condition of honeybee flora [Kajobe, R., Agea, J. G., Kugonza, D. R., Alioni, V., Otim, S. A., Rureba, T., Marris, G., 2009, Yirgaand Teferi, 2010].

Different research reports agreed that honey can be harvested mostly once or twice, while in some cases even three times in a year largely depending on the availability of bee forage from traditional beekeeping system (Kumsa and Takele, 2014; Chala Kinati, Taye Tolemariam, Kebede Debele, 2013; Tesfa Assemu, Ejigu Kerealem, Kebede Adebabay, 2013; Kebede and Tadesse, 2014; Addisu Abera, H Yakob, GYasin, 2016).

Regarding the agro-ecology, the frequency of honey harvest is more in the highland area than other two agro-ecologies due to the availability of different bee forage, honeybee colonies and availability of water due to sufficient rain fall distribution that continued raining from four to five months conducive weather condition for bees etc. However, in the low land areas that leads to low frequency of honey harvest per annum in traditional, transitional and modern beehives (Kalayu Aregawi, Wondifraw Zewdu, Tiruneh Workineh, 2017).

Reports showed that majority of beekeepers visit their bees externally every day (Tesfaye and Tesfaye; 2007; Addisu Abera, H Yakob, G Yasin, 2016; Haftu Kebede, Daniel, D., Gebru, B., Tsegay, G., Guash, A., Guesh, G., Mulualem, Z, Gebrekiros, G., 2015). Majority of beekeepers visit their bee hives monthly and inspect their beehives externally but, they do not inspect internally at seasonally unless to check either the hive was filled with honey or not.

In general, discussions on the Bee hive inspection trends and honey harvesting practice is important to plan development and research activities and bring improvements in the productivity of beekeeping activity. Even though there are different research reports on the case in different parts of Ethiopia, these results needs to be compiled in more understandable way which may be used as an input for different stakeholders involved in beekeeping agriculture and for improvements activities including backyard beekeepers: summarized and synthesized information for the beneficiaries and users. Therefore, the objective of this review is to put recent and updated document on Bee hive inspection trends and honey harvesting practice in Ethiopia.

REVIEW

Bee hive Inspection Trends

In beehive management (follow up, checking against enemy, cleaning the environment, supplying additional feeding, watering and honey harvesting), bee keepers had experience to different degrees. Inspection of hives and apiary is indispensable to safeguard honeybee colonies from different natural disasters and various hazards (pests, diseases and chemical poisoning) Welay and Tekleberhan (2017). Regular assessments and rapid detection of honeybee pests at their respective areas has paramount importance to prevent the loss of honey product due to pest attack (Desalegn and Amsalu, 2012). Beekeepers also believe in that visiting the apiary and hive during rainy season causes diseases (Haftu and Gezu, 2014; Tessega, 2009). For this reason, during rainy seasons the apiary is covered with grasses which may intern serve as a hiding place of pests of honey bees. Experiences show that external colony inspection can be done at any season, however, caution is required in what season and at what frequency the internal inspection should be conducted. In this regard, training beekeeper farmers is essential (Tessega, 2009).

Beekeepers practice external hive inspection to different degrees in different parts of the country. Majority of beekeepers in different parts of Ethiopia visit their bees daily while some of them visit their bees at every 2 to 5 days (Tesfaye and Tesfaye, 2007; Assefa, 2009; Haftu Kebede, Daniel, D., Gebru, B., Tsegay, G., Guash, A., Guesh, G., Mulualem, Z, Gebrekiros, G., 2015; Addisu Abera, H Yakob, GYasin, 2016; Haftu and Gezu, 2014; Getachew, 2018; Kebede & Tadesse 2014). Berhanu (2016) reported that almost all beekeepers perform external hive inspection at varied frequency in Guji and Borena zones of Oromia region. On the other hand; Tessega (2009) reported that 46.7% of beekeepers inspect their colony rarely in Amhara region. Similarly, about 72% of the respondents did not seasonally undertake inspection of their bee colonies (Teklu Gebretsadik, Dinku Negash, 2014, 2014). In contrast to external hive inspection, different research reports agree that internal hive inspection is almost not practiced by most of the farmers (Kerealem, 2005; Tesfaye and Tesfaye, 2007; Assefa, 2009; Chala, 2010; Addisu Abera, H Yakob, GYasin, 2016; Shibru Dereje, Asebe Getahun, Megersa Emanu, 2016) due to the difficulty of the traditional hives for internal inspection i.e., fixed combs attached to the body of traditional beehive. Similarly, Gebretsadik, Dinku Negash, 2014 and Berhanu, (2016) reported internal hive inspection is limited to those honeybee colonies placed at backyard and under the eaves of the house. In contrast to this according to Welay and Tekleberhan (2017) internal inspection was done by

about 46% of the respondents. Unlike traditional bee hives, transitional and modern bee hives have movable combs so that the beekeepers easily can open their hives and inspect bee colonies. In line with this report about 46.7 and 20.6% of beekeepers inspect their colony internally if necessarily, every month and every fifteen days, respectively (Tessega, 2009).

Purpose of Bee Hive Inspection

Beekeepers inspect their bee colony for different purposes according to their timely interest. Regular assessments and rapid detection of honeybee pests at their respective areas has paramount importance to prevent the loss of honey product due to pest attack (Desalegn and Amsalu, 2012). According to Tesfaye and Tesfaye (2007); Addisu Abera, H Yakob, G Yasin, (2016); Assefa, (2009); Shenkute, Awraris Getachew and Getachew, Yemisrach and Assefa, Dejen and Adgaba, Nuru and Ganga, Gebeyehu and Abebe, Workneh (2012), beekeepers visit their bees to check if the hive was occupied with bees and at least during honey harvesting seasons. Beekeepers practice daily follow up and check their beehive against bee enemies in central Zone of Tigray (Haftu Kebede, Daniel, D., Gebru, B., Tsegay, G., Guash, A., Guesh, G., Mulualem, Z, Gebrekir os, G, 2015). Similarly, Berhanu (2016) reported that beekeepers in Guji and Borena zones of Oromia region perform external hive inspection for confirmation of hive occupation by bees and to check the bees' existence. According to Welay and Tekleberhan, (2017), respondents also inspect their hives for harvesting.

On the other hand, Beekeepers inspect apiary to clean the areas around the box beehives and to put ash under the hives to avoid small ant and ant like insects from climbing the box beehives Assefa, (2009). Similarly, beekeepers inspect for the purpose of cleaning their apiary and putting ash (cinder) under the tree to prevent insects like ant and termites from climbing the tree (Addisu Abera, H Yakob, GYasin, 2016). According to Shibru Dereje, Asebe Getahun, Megersa Emanu, (2016), beekeepers did external hive inspection for observing bee's activities on the hive entrance, which is an accumulation of swarm on hive entrance due to either for swarm preparation, ants or other enemies attack or indicating ripening of honey. Getachew, (2018), reported respondents visit the apiary occasionally just to check the presence of the hive & to check the hive was occupied by bee swarm and to check the colony is safe.

Honey Harvesting Season

In Ethiopia, there are generally two honey harvesting seasons: the main honey harvesting season that lasts from October to December and the second honey

harvesting period is from April to June (Tesfa Assemu, Ejigu Kerealem, Kebede Adebabay, 2013; Nuru, 2007). In the first honey harvesting period, the main reasons might be the presence of flowering crops and in the latter period, potential flowering ability of Eucalyptus tree which agrees with Nuru (2007) and Kerealem, et al. 2009 who states that Eucalyptus tree is the main dominant and potential honeybee flora. Similarly according to Shibru Dereje, Asebe Getahun, Megersa Emanu, 2016 honey is mostly harvested in October to January and April to June of major harvesting periods of Godere and Abolworeda of Gambella region, respectively. However, in addition to these major harvesting periods, there are many small harvesting periods which depend on the type of flowering plants and rainfall patterns in different agro-ecologies (Nuru, A. 2007), which experienced beekeepers and local people easily associate the harvesting season with the botanical origin of honey in their locality (MoARD, 2003). In line with this Addisu Abera, H Yakob, G Yasin, (2016) reported that the period of honey harvesting is also found to be associated with the flowering seasons of various trees, bushes and grass species found in the vegetation cover of the area..

Honey Harvesting Frequency

The frequency of honey harvesting varies within the same zone and also from one zone to another zone as well as from region to region within the country depending on colony management practices and the flowering condition of honeybee flora [Kajobe, R., Agea, J. G., Kugonza, D. R., Alioni, V., Otim, S. A., Rureba, T., Marris, G., 2009, Yirga and Teferi, 2010]. According to Kalayu Aregawi, Wondifraw Zewdu, Tiruneh Workineh (2017), the minimum and maximum frequency of honey harvesting per annum of the traditional, transitional and modern hives were: 1 and 3, 1 and 2, 1 and 2, respectively in North-East of Amhara Regional State. In Koneba District of Afar region about 62.5% of the sampled beekeepers reported to harvest twice a year, which is similar to the harvesting frequency reported in different parts of Ethiopia (Gebrehaweria Kidane Reda, Shishay, Girmay, and Belets Gebremichael, 2018). Similarly, different research reports agreed that honey can be harvested mostly once or twice, while in some cases even three times in a year largely depending on the availability of bee forage (Kumsa and Takele, 2014; ChalaKinati, Taye Tolemariam, Kebede Debele, 2013; Tesfa Assemu, Ejigu Kerealem, Kebede Adebabay, 2013; Kebede and Tadesse [2014]; Addisu Abera, H Yakob, GYasin, 2016).

In contrast to this result, Gebrehaweria Kidane Reda, Shishay, Girmay, and Belets Gebremichael, (2018) reported about 40.9% of the sampled respondents in Berahle District of Afar region reported to harvest four

times per year and 31.8% reported to harvest five times per year. On the other hand Kalayu Aregawi, Wondifraw Zewdu, Tiruneh Workineh, 2017 reported lower frequency of honey harvested in modern beehives because of the large size and volume of beehives that bees could not fill the beehive within a short period of time and short duration of rain fall season as well as lack of pure bee wax's, pest and predators (wax mouth)..

Regarding the agro-ecology, Kalayu Aregawi, Wondifraw Zewdu, Tiruneh Workineh, 2017 also reported the frequency of honey harvest was more in the highland area than other agro-ecologies due to the availability of different bee forage, honeybee colonies and availability sufficient rain fall distribution

CONCLUSION

Beehive management includes different activities like; regular follow up for checking against enemy, cleaning the environment, supplying additional feeding, watering and honey harvesting. Bee keepers had experience to these activities especially in traditional beekeeping practice.

Bee hive inspection has crucial role in beekeeping practice not only to check honey harvesting but also to follow up the progress of honey productivity and improve other managerial activities. Majority of beekeepers do external hive inspection at different frequency for traditional hive but there is rare internal hive inspection trend in Ethiopia.

Beekeepers inspect their bee colony for different purposes like to prevent the loss of honey product due to pest attack, to check if the hive was occupied with bees or honey, against bee enemies, to clean the areas around the box beehives and to put ash under the hives to avoid small ant and ant like insects from climbing the box beehives to follow up the progress of the bee colonies problems, examine the condition of brood, check food store, attachment of top-bar with the wall of hives, honey ripe, pests and predators attack and look for sign of diseases.

Generally, from this review it can be concluded that hive inspection trend and honey harvesting management in Ethiopia is at its young stage which needs further recommendation for improvement.

RECOMMENDATIONS

From the above conclusion of this review, the following recommendations can be forwarded:

➤ Governmental and non-governmental organizations should give attention for the improved beekeeping system with technical and financial support

due to its better productivity and ease of management (regular inspection).

➤ Beekeepers should adopt new technologies (modern and transitional hives) which are easier for management (inspection and daily follow up) as well as providing better productivity

➤ As most of beekeepers inspect their hive with the purpose of harvesting i.e whether the hive is occupied by honey or not, they should be trained for general and specific management of the hive and its environment.

➤ As the availability of bee flora increases the honey harvesting frequency and hone productivity, beekeepers and other stakeholders should be involved and encourage planting different flowering plants.

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REFERENCES

- Abera A, Yakob H, Yasin G (2016). Assessment of Production System and Constraints of Bee Keeping Practices in Damot Gale Woreda, Wolaita Zone, Southern Ethiopia. *Journal of Biology, Agriculture and healthcare* www.iiste.org ISSN 2224-3208 (Paper) ISSN 2225-093X (Online) Vol.6, No.11.
- Addis G, Malede B (2014). Chemical analysis of honey and major honey production challenges in and around Gondar, Ethiopia. *Aca. Journal of Nutrition* 3, 06–14.
- Ambaw M, Teklehaimanot T, (2018). Characterization of beekeeping production and marketing system and major constraints in selected districts of Arsi and West Arsi zones of Oromia region in Ethiopia. *Children* 6, 2408–2414.
- Assefa A (2009). Market Chain Analysis of Honey Production: In Atsbi Wemberta District, Eastern Zone of Tigray National Regional State (unpublished)
- Beyene T, Abi D, Chalchissa G, Mekonen WT, Zeway ME (2016). Evaluation of transitional and modern hives for honey production in the Mid Rift Valley of Ethiopia. *Bulletin of Animal Health and Production in Africa* 64, 157–165.
- Beyene T, Abi D, Chalchissa G, Mekonnen WT (2015). Evaluation of Transitional and Modern Hives for Honey Production in Mid Rift Valley of Ethiopia. *Global Journal of Animal Scientific Research* 3(1):48-56.
- Beyene T, David P (2007). Ensuring small scale producers in Ethiopia to achieve sustainable and fair access to honey markets. Paper prepared for international development enterprises (IDE) and Ethiopian

- Society for Appropriate Technology (ESAT), Addis Ababa, Ethiopia.
- Birhanu TA (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 (2016).635-645.
- Bureau of Agriculture and Natural Resources (BoANR), 2004. Water Harvesting Progress Report; Annual report: BoANR, Mekelle, Tigray
- Central Statistical Agency (CSA), (2006).Statistical Abstracts. Addis Ababa, Ethiopia.
- Central Statistical Agency (CSA), (2012).Statistical Abstracts. Central Statistical Agency. Addis Ababa, Ethiopia.
- Central Statistics Agency (CSA), (2009). Ethiopia, Statistical Abstract 2002.. Addis Ababa, Ethiopia. Enumeration, Executive Summary, Addis Ababa, Ethiopia.
- Chala K (2010). Honey production, Marketing and Quality assessment in Gommaworeda, South western, Ethiopia.pp.1-102.
- Chala K, Taye T, Kebede D (2013). Assessment of Honey Production and Marketing System in Gomma District, South Western Ethiopia, *Greener Journal of Business and Management Studies*; 3(3):099-107. www.gjournals.org
- Desalegn B, Amsalu B (2012). Apiculture research achievements in Ethiopia, Oromia Agricultural Research Institute, Holeta Bee Research Center.
- Edessa N (2005). Survey on honey production systems in West Shewa Zone. Fourth National Annual Conference of the Ethiopian Beekeepers Association (EBA), Addis Ababa, Ethiopia. 2005, 60-69.
- FAO STAT, (2005) Statistical Database – Livestock. <http://faostat.fao.org/default.aspx>
- Gebreaweria KR, Shishay G, Belets G (2018). Beekeeping practice and honey production potential in Afar Regional State, Ethiopia
- Gebru YG (2015). Characterization of Beekeeping Systems and Honey Value Chain, and Effects of Storage Containers and Durations on Physico-Chemical Properties of Honey in Kilte-Awlaelo District, Eastern Tigray, Ethiopia. Addis Ababa University, College of Veterinary Medicine and Agriculture
- Getachew A (2018). Assessment on the Constraints & Practices of Beekeeping, and Post-Harvest Honey Handling in Gesha District, Keffa Zone, South-West Ethiopia.
- Gezahegne T (2001a). Beekeeping (In Amaharic), Mega Printer Enterprise, Addis Ababa, Ethiopia
- Haftu K, Daniel D, Gebru B, Tsegay G, Guash A, Guesh G, Muluaem Z, Gebrekiros G (2015). Analysis of Honey Bee Production Opportunities and challenges in central zone of Tigray, Northern Ethiopia. *International J. of Scientific and Research Publications*, V. 5(4):p1-9.
- Haftu K, Gezu T (2014). Survey on honey production system , challenges and opportunities in selected areas of hadiya zone, Ethiopia. *Journal of agricultural biotechnology and sustainable development* 6(6):60-66
- Kajobe R, Agea JG, Kugonza DR, Alioni V, Otim SA, Rureba T, Marris G (2009), National beekeeping call[0endar, honeybee pest and disease control methods for improved production of honey and other hive products in Uganda. Research report submitted to Natural Agricultural Research Organization (NARO), Entebbe Uganda
- Kalayu A, Wondifraw Z, Tiruneh W (2017). Beekeeping Practice and Honey Production in North-East Dry Land Areas of Amhara National Regional State, Ethiopia. *Poult Fish WildlSci* 5: 187. doi: 10.4172/2375-446X.1000187
- Kebede H, Tadesse G (2014). Survey on honey production system, challenges and Opportunities in selected areas of Hadya Zone, Ethiopia. *Journal of Agricultural Biotechnology and Sustainable Development*, 6(6), 60-66
- Keralem E (2005). Honey bee production system, opportunities and challenges in Enebse Sar Midir Woreda (Amhara Region) and Amaro Special Woreda (Southern Nations, Nationalities and peoples Region), Ethiopia. M.Sc. thesis, Alemaya University, 133p.
- Nuru, A. (1999).Quality state of grading Ethiopian honey. In: Proceedings of the First National Conference of the Ethiopian Beekeepers Association, Addis Ababa, Ethiopia
- Keralem E, Tilahun G, Preston TR (2009). Constraints and prospects for apiculture research and development in Amhara region, Ethiopia. *Livestock Research for Rural Development* 21(10) available at <http://www.lrrd.org/lrrd21/10/ejig21172.htm> Morse, R.A. and R. Nowogrodzki, 1990.
- Kumsa T, Takele D (2014). Assessment of the Effect of Seasonal Honeybee Management on Honey Production of Ethiopian Honeybee (*Apis mellifera*) in Modern Beekeeping in Jimma Zone
- Malede B, Selomon S, Zebene G (2015). Assessment of Challenges and Opportunities of Bee Keeping in and Around Gondar.
- Mekonen T, Gidey Y, Tewelde H, Solomon A (2011). Prospects of beekeeping in the Northern Ethiopian highlands *Scientific Research and Essays* Vol. 6(29), pp. 6039-6043, Available online at <http://www.academicjournals.org/SRE>
- Miklyaev M, Glenn PJ, Richard RB (2013). Honey production in Ethiopia. Accost benefit analysis of modern versus traditional beekeeping technology. Ministry of Agriculture and Research Development (MoARD), 2003.Honey and Beeswax marketing and development. IN DEVELOPMENT, M. O. A. A. R. (Ed.) Plan 2003. Addis Ababa, Ethiopia.

- Ministry of Agriculture and Research Development (MoARD), 2007. Livestock Development Master Plan Study. Phase I Report - Data Collection and Analysis, Volume N - Apiculture. Addis Ababa, Ethiopia, Ministry of Agriculture and Rural Development.
- Nuru A (2002). Geographical races of the Honeybees (*Apis mellifera* L.) of the Northern Regions of Ethiopia. Rhodes University, South Africa.
- Nuru A (2007). Atlas of pollen grains of major honeybee flora of Ethiopia. Holeta Bee Research Centre. Commercial Printing Enterprise. Addis Ababa, Ethiopia. Pp 152.
- Paulos D (2011). Ethiopian Honey: Accessing International Markets with Inclusive Business and Sector Development. Post Implementation Review Report, November 2011.
- Serda B, Zewudu T, Dereje M, Aman M (2015). Beekeeping practices, production potential and challenges of beekeeping among beekeepers in Haramaya district, eastern Ethiopia. *Journal of Veterinary Science and Technology* 6:255
- Shenkute, Awraris Getachew and Getachew, Yemisrach and Assefa, Dejen and Adgaba, Nuru and Ganga, Gebeyehu and Abebe, Workneh 2012. Honey production systems (*Apis mellifera* L.) in Kaffa, Sheka and Bench-Maji zones of Ethiopia. *Journal of Agricultural Extension and Rural Development* Vol. 4(19), pp. 528-541, November 2012 Available online at <http://academicjournals.org/JAERD> DOI: 10.5897/JAERD12.088
- Shibru D, Asebe G, Megersa E (2016). Identifying Opportunities and Constraints of Beekeeping: The Case of Gambella Zuria and Godere Weredas, Gambella Regional State, Ethiopia. *Entomol Ornithol Herpetol* 5: 182. doi:10.4172/2161-0983.1000182
- Teklu G, Dinku N (2014). Honeybee production system, challenges and opportunities in selected districts of Gedeo zone, Southern nation, nationalities and peoples regional state, Ethiopia *International Journal of Research – Granthaalayah*, Vol. 4, No. 4 (2016): 49-63.
- Tesfa A, Ejigu K, Kebede A (2013). Assessment of current beekeeping management practice and honey bee floras of Western Amhara, Ethiopia. *Inter J AgriBiosci* 2: 196-201.
- Tesfaye, K, Tesfaye L (2007). Study of Honey Production System in Adami Tulu Jido Kombolcha district in Mid Rift Valley of Ethiopia
- Tessega B (2009). Honeybee production and marketing systems, constraints and opportunities in Burie District of Amhara Region, Ethiopia. A thesis submitted to the Department of Animal Science and Technology, School of Graduate Studies, Bahirdar University.
- Welay K, Tekleberhan T (2017). Honey-bee production practices and hive technology preferences in Jimma and Illubabor Zone of Oromiya Regional State, Ethiopia. *Acta University at is Sapientiae Agriculture and Environment* 9, 31–43.
- Yetimwork G, Berhan T, Desalegn B (2015). Honeybee production trend, potential and constraints in Eastern Zone of Tigray, Ethiopia. *Agric. Biol. J. N. Am.*, 2015, 6(1): 22-29.