



**BUSITEMA
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**DETERMINATION OF THE CONSTRAINTS TO BEE KEEPING AND ADOPTION OF
THE BEEKEEPING TECHNOLOGIES IN MANAFWA TOWN COUNCIL, MANAFWA
DISTRICT**

By

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February 2024

DECLARATION AND APPROVAL

I, Khamuka Irene, declare that this thesis is my original compilation. I further declare that this thesis has never been submitted to any university for the award of any degree.

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DEDICATION

To God almighty, for the power in His word and His ability to keep me alive to see this accomplishment, He's granted me good health, cared for, and protected me through this entire period of my course. I truly believe that without Him I am nothing.

To my lovely husband who has been there for me in every situation and all my lectures who have mentored me and guided me academically may the almighty lord bless them.

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ABBREVIATIONS

Dr	Doctor
DRC	Democratic Republic of Congo
IFI	Individual Farmer Interview
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
SPSS	Statistical Package and Social Science
TC	Town Council
USA	United State of America
UGX	Uganda

ABSTRACT

Beekeeping is the rearing of honey bees for the production of bee products like honey, bee wax, propolis and royal jelly that can be sold to generate income for bee farmers. Honey bees are ecologically more important as they are effective pollinators of flowering plants. Despite the benefits of beekeeping and honey production, there was low honey production in Manafwa town council. So there was a need to determine the constraints to beekeeping and the adoption of scientific bee keeping practices in Manafwa Town Council.

A mixed-methods approach, comprising surveys, interviews using questionnaires and field observations to validate what was got from the interviews using the observation checklists which was employed to collect data from 80 beekeeping farmers who at least owned three beehives and above and these were selected using purposive sampling. The data collected was cleaned, edited, coded and entered in SPSS for analysis.

Results indicated that cultural norms significantly impacted beekeeping engagement, with traditional gender roles influencing low participation of women in the bee keeping practice. Education levels were found to have contributed the adoption of modern beekeeping technologies, emphasizing the need for targeted educational programs. Honeybee diseases, notably American foulbrood, Nosema, and European foulbrood and pests like ants and termites were identified as major concerns affecting bee colonies resulting to absconding of bees, death of bee and loss of honey and lack of adequate bee forage in the apiary site was also observed. The study also revealed prevalent constraint in honey processing was lack of quality honey processing equipment's by all the respondents. For the case of marketing of honey, it was found out that the major challenge faced by bee farmers was lack of reliable market for their honey whereby most of the bee farmers could end up selling their product to local shops and just few of them sold on town market. In terms of beekeeping technologies, a noteworthy finding was the predominant use of modern hive types, particularly among educated beekeepers. However, challenges in acquiring these technologies were evident due to financial constraints and limited awareness.

According to the findings, it was concluded that the involvement of women in beekeeping activities within the surveyed households was significantly lower compared to males. The study

indicated that the first constraints to bee keeping were in bee production as most of the farmers lacked managerial skills, secondly, were the constraints faced by beekeeping farmers in honey processing which were due to lack of honey processing equipment's and lastly, were the constraints faced by the beekeeping farmers during honey marketing which were due to unreliable market for the produced honey. Finally, the current study showed that adoption of bee keeping technologies was hampered by several factors mostly lack skills, credit, lack of training and other factors like poor market, expensive bee equipment and labor shortage.

Based on the conclusions, recommendations include targeted training programs to enhance beekeeping knowledge, financial support initiatives for startup capital, awareness campaigns to challenge cultural norms and creating cooperative to create reliable market for honey in the town council. The farmers should adopt improved bee hives and good harvesting technics and attend training on bee keeping to widen their knowledge and experience in bee keeping.

These findings provide a foundation for informed decision-making and the development of policies aimed at overcoming the identified constraints and fostering sustainable beekeeping practices in Manafwa Town Council.

CHPATER ONE

1. INTRODUCTION

1.1 Background

Beekeeping is the scientific process of conservation and rearing of bees for the production of hive products (Rana & Mishra, 2022). The bee products collected from the bee hives are honey, beeswax, pollen, venom and royal jelly (Reilly *et al.*, 2020). Bee wax is used in manufacturing candles, soaps, and cosmetics (Wehbe *et al.*, 2019). It can also be seen in food, medicine, paper and textile. Honey is used as food, antibacterial agent and antiseptic and prevents disorders like cancer, neurological degeneration, cardiovascular diseases and infectious diseases (Zaharia *et al.*, 2020). Honey bees are ecologically more important as they are effective pollinators of flowering plants and trees which lead to enhanced crop productivity besides contributing to the maintenance of plant diversity (Wakgari & Yigezu, 2021).

Internationally, honey production is 1.9 million tones and the country leading in honey-production is China which is ranked as a principal honey producing country in the world with a production volume amounted to 444 metric tons of honey which accounts for 20% of the overall production (Khalil *et al.*, 2010).

According to Peter (2022), the African continent currently produces 10% of honey and 23% of the bee wax is produced worldwide which is used for home consumption and export. There is moderately lower honey production in Sub-Saharan Africa which is due to poor management practices and insufficient impact research activities (Hailu *et al.*, 2020). According to Amulen (2019), Tanzania is the largest producer with 45,300 tons followed by Kenya with 7,300 tons, then Uganda and Rwanda with just 4,000 tons annually.

In Uganda, the promotion of modern beekeeping practices started in the 1980s (Abera *et al.*, 2016). Beekeeping is an old and richest agricultural practice first documented to be common in the northern region of Uganda. Honey and beeswax are the major products exported from

REFERENCES

- Abdullahi, A., Isekenegbe, J., & Mohammed, U. S. (2014). Comparative economic analysis of modern and traditional bee-keeping in Lere and Zaria local government areas of Kaduna State , Nigeria. *International Journal of Development and Sustainability*, 3(5), 989–999.
- Abebe, W., & Puskur, R. (2011). *Beekeeping sub sector challenges and constraints in Atsbi Wemberta District of eastern zone , Tigray Region ,.* 3(1), 8–12.
- 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 Horticulture and Forestry*, 6(11).
- Aguti, G. (2023). *AMERICAN UNIVERSITY OF BEIRUT A COMPARATIVE STUDY OF THE FARMING SYSTEMS IN UGANDA , KENYA , AND TANZANIA TO ENHANCE.* January.
- Ahikiriza, E. . e. al. (2016). Faculty of Bioscience Engineering Beekeeping as an alternative source of livelihood in Uganda. *Journal Article*, 22–38.
- Akidi, I. L., Mshenga, P. M., & Mugonola, B. (2022). *Determinants of Governance Structure Choice among Beekeepers in Northern Uganda.* 86–105.
<https://doi.org/10.4236/as.2022.131008>
- Akullu, P., & Mwesigwa, D. (2021). Embracing bee-keeping technology to enhance smart farming: evidence from Lira city, mid-north Uganda. *International Journal of Interdisciplinary Research and Innovations*, 9(2), 114–123.
<https://ir.lirauni.ac.ug/handle/123456789/278>
- Alarape, A. A., Wahab, M. K. A., & Arira, P. E. (2020). Survey of Apicultural Practices in Ibadan, Oyo State, Nigeria. *International Journal of Environment, Agriculture and Biotechnology*, 5(1), 76–80. <https://doi.org/10.22161/ijeab.51.11>
- Albarrak, A., & Gray, A. (2023). An overview of beekeeping in the Kingdom of Saudi Arabia. *Journal of Apicultural Research*, 62(1), 11–22.
<https://doi.org/10.1080/00218839.2022.2026008>

- Alebachew, G. W., & Eshetie, T. M. (2020). Assessment of Beekeeping Practices of Youth Groups in Eastern Amhara, Ethiopia. *Bee World*, 97(4), 117–122. <https://doi.org/10.1080/0005772x.2019.1637191>
- Altunel, T., & Olmez, B. (2019). Beekeeping as a rural development alternative in Turkish Northwest. *Applied Ecology and Environmental Research*, 17(3), 6017–6029. https://doi.org/10.15666/aeer/1703_60176029
- Amuko, W., Kalule, S. W., & Odongo, W. (2023). The relationship between market information and entrepreneurial orientation : the case of smallholder honey producers in Northern Uganda. *Agricultural and Food Economics*, 8. <https://doi.org/10.1186/s40100-023-00249-8>
- Amulen, D.-R., Okwee, J., Vudriko, P., Tweyongyere, R., Jolly, A., Biryomumaisho, D., & Okodia, R. (2020). *Strategies for Increased Utilisation of New Propolis*. 0–8.
- Amulen, D. R., D’Haese, M., D’Haene, E., Acai, J. O., Agea, J. G., Smaghe, G., & Cross, P. (2019). Estimating the potential of beekeeping to alleviate household poverty in rural Uganda. *PLoS ONE*, 14(3), 1–19. <https://doi.org/10.1371/journal.pone.0214113>
- Andaregie, A., & Astatkie, T. (2021). Determinants of beekeeping adoption by smallholder rural households in Northwest Ethiopia. *Cogent Food and Agriculture*, 7(1). <https://doi.org/10.1080/23311932.2021.1954817>
- Aryal, S., Thapa, R., & Jung, C. (2015). *An overview of Beekeeping Economy and Its Constraints in Nepal*. 135–142.
- Aydin, B., Aktürk, D., & Arsoy, D. (2020). Economic and efficiency analysis of beekeeping activity in Turkey: Case of Çanakkale province. *Ankara Üniversitesi Veteriner Fakültesi Dergisi*, 67(1), 23–32. <https://doi.org/10.33988/auvfd.571371>
- Azeez, K. K. (2022). *Analysis of information needs of beekeepers in Oyo State , Nigeria. 2018*.
- Bava, R., Castagna, F., Piras, C., Musolino, V., Lupia, C., Palma, E., Britti, D., & Musella, V. (2022). Entomopathogenic Fungi for Pests and Predators Control in Beekeeping.

Veterinary Sciences, 9(2). <https://doi.org/10.3390/vetsci9020095>

- Chala Kinati. (2012). Opportunities and challenges of honey production in Gomma district of Jimma zone, South-west Ethiopia. *Journal of Agricultural Extension and Rural Development*, 4(4), 85–91. <https://doi.org/10.5897/jaerd11.047>
- Chazovachii, B., Chuma, M., Mushuku, A., Chirenje, L., Chitongo, L., & Mudyariwa, R. (2012). Livelihood Resilient Strategies through Beekeeping in Chitanga Village, Mwenezi District, Zimbabwe. *Sustainable Agriculture Research*, 2(1), 124. <https://doi.org/10.5539/sar.v2n1p124>
- Dawud, S., Negessa, D., Lemi, K., & Tsegaye, D. (2020). Assessment of Beekeeping System, Constraints and Opportunities in Selected Districts of West Hararghe Zone, Oromia Regional State, Ethiopia. *International Journal of Animal Science and Technology*, 4(2), 17. <https://doi.org/10.11648/j.ijast.20200402.11>
- De Carolis, A., Newmark, A. J., Kim, J., Cazier, J., Hassler, E., Pietropaoli, M., Robinette, C., Formato, G., & Song, J. (2023). Results of an International Survey for Risk Assessment of Honey Bee Health Concerning Varroa Management. *Applied Sciences (Switzerland)*, 13(1). <https://doi.org/10.3390/app13010062>
- Devinder Tiwari, V. bajpai R. K. (2022). Impact of Family Capital and Social Capital on Selected Beekeepers in Up Scaling of Beekeeping Venture (Entrepreneurship) Development in Punjab State, India. *Global Journal of Engineering, Science & Social Science Studies-ISSN- 2394-3084; Vol 8, No 3 (2022): March 2022 ; 2394-3084*, 1–8. <https://www.gjess.edwin.co.in/index.php/gjess/article/view/660>
- Didas, R. (2005). Beekeeping project in S W Uganda. *Bee World*, 86(3), 69–70. <https://doi.org/10.1080/0005772X.2005.11417315>
- Djurabaevich, D. O., & Lecture, S. (2022). *IJSSIR*, Vol. 11, No. 05. May 2022. 11(05), 206–215.
- Eforuoku, F., & Etukudo, M. (2017). Attitudinal Disposition of Trained Beekeepers towards

- Use of Modern Beekeeping Technologies in Oyo State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 21(4), 1–12.
<https://doi.org/10.9734/ajaees/2017/26931>
- Francis, A., Richard, K., Nicholas, K., Paschal, T., & Ismail, L. (2023). *Study on the Contribution of Bee Farming On the Socio- Economic Transformation of Communities in Rural Areas in Arua District Pajulu Sub-County*. 7(2), 44–54.
- Fuad, M. A. F., Nurhasan, M., & Kayess, M. O. (2019). Potentials and Prospects of Beekeeping Entrepreneurship in Dinajpur Region: A Participatory Analysis. *Agricultural Research & Technology: Open Access Journal*, 21(5), 209–213.
<https://doi.org/10.19080/ARTOAJ.2019.21.556178>
- Garima, Dhingra, A., & Ghalawat, S. (2022). Constraints faced by first generation Agripreneurs while selecting Agripreneurship as a profession: A study of Haryana. *The Pharma Innovation Journal*, 11(1).
- Gebeyehu, A., Kebede, T., Zuber, S., Gutu, T., & Umeta, G. (2010). *Participatory rural appraisal investigation on beekeeping in Arsi Negelle and Shashemene districts of West Arsi zone of Oromia , Ethiopia. January 2017*.
- Gratzer, K., Susilo, F., Purnomo, D., Fiedler, S., & Brodschneider, R. (2019). Challenges for Beekeeping in Indonesia with Autochthonous and Introduced Bees. *Bee World*, 96(2), 40–44. <https://doi.org/10.1080/0005772x.2019.1571211>
- Gratzer, K., Wakjira, K., Fiedler, S., & Brodschneider, R. (2021). Challenges and perspectives for beekeeping in Ethiopia. A review. *Agronomy for Sustainable Development*, 41(4).
<https://doi.org/10.1007/s13593-021-00702-2>
- Hailu TG, D ALvise P, Tofilski A, Fuchs S, Greiling J, Rosenkranz P, Hassselmann M (2020) Insights into Ethiopian honey bee diversity based on wing geomorphometric and mitochondrial DNA analyses. *Apidologie* 51:1-17. <https://doi.org/10.1007/s13592-020-00796-9>

Honeycutt, C. (2023). *Profitable, Alternative Income Generation and Improved Quality of Life Among Global Beekeepers*.

Icaat 2022. (2022).

Jahan, M., Rahman, M., Haque, M., & Saikat, M. (2021). Problems and Prospects of Apiculture in Bangladesh: A Review. *Fundamental and Applied Agriculture*, 6(0), 1. <https://doi.org/10.5455/faa.117149>

Kalanzi, F., Nansereko, S., Buyinza, J., Kiwuso, P., Turinayo, Y., Mwanja, C., Niyibizi, G., Ongerep, S., Sekatuba, J., Mujuni, D., & Ajijur Rahman, S. (2015). Socio-economic analysis of beekeeping enterprise in communities adjacent to Kalinzu forest, Western Uganda. *International Journal of Research on Land-Use Sustainability*, 2(1), 81–90. <https://doi.org/10.13140/RG.2.1.2647.4329>

Kasangaki, P., Sarah Otim, A., P'Odyek Abila, P., Angiro, C., Chemurot, M., & Kajobe, R. (2015). Presencia de Varroa en Uganda y su conocimiento por parte de la industria apícola. *Journal of Apicultural Research*, 54(4), 373–377. <https://doi.org/10.1080/00218839.2016.1159858>

Kebede, T., & Lemma, T. (2007). Study of honey production system in Adami Tulu Jido Kombolcha district in mid rift valley of Ethiopia. *Livestock Research for Rural Development*, 19(11).

Khan, W., & Anjum, F. (2016). *BEE KEEPING ' S IMPACT ON SUSTAINABLE LIVELIHOODS DEVELOPMENT IN BAJAUR AGENCY PAKISTASN*. 5(6), 39–48.

Lyubenov, L. D. (n.d.). *Budget for marketing stimulation of regional bee products on the basis of value*. 2.

Lloyd, K. (2021). *APICULTURE ADAPTATIONS IN A SHIFTING WORLD: THE BEE KEEPERS EXPERIENCE ACROSS THE GLOBE*.

Matsuzawa, T., & Kohsaka, R. (2022). A Systematic Review of Urban Beekeeping Regulations of Australia, the United States, and Japan: Towards Evidence-Based Policy Making. *Bee*

World, 99(3), 89–93. <https://doi.org/10.1080/0005772x.2022.2073952>

Mujuni, A., Natukunda, K., & Kugonza, D. R. (2012). Factors affecting the adoption of beekeeping and associated technologies in Bushenyi District, Western Uganda. *Livestock Research for Rural Development*, 24(8).

Mulatu, A., Marisennayya, S., & Bojago, E. (2021). Adoption of Modern Hive Beekeeping Technology: The Case of Kacha-Birra Woreda, Kembata Tembaro Zone, Southern Ethiopia. *Advances in Agriculture*, 2021, 4714020. <https://doi.org/10.1155/2021/4714020>

Nader, R. A., Mackieh, R., Wehbe, R., Obeid, D. El, Sabatier, J. M., & Fajloun, Z. (2021). Beehive products as antibacterial agents: A review. *Antibiotics*, 10(6), 1–26. <https://doi.org/10.3390/antibiotics10060717>

Nainu, F., Masyita, A., Bahar, M. A., Raihan, M., Prova, S. R., Mitra, S., Emran, T. Bin, & Simal-Gandara, J. (2021). Pharmaceutical prospects of bee products: Special focus on anticancer, antibacterial, antiviral, and antiparasitic properties. *Antibiotics*, 10(7). <https://doi.org/10.3390/antibiotics10070822>

Nat Schouten, C., & John Lloyd, D. (2019). Considerations and Factors Influencing the Success of Beekeeping Programs in Developing Countries. *Bee World*, 96(3), 75–80. <https://doi.org/10.1080/0005772x.2019.1607805>

Negash, D., & Mengeste, B. (2019). Assessment of Honey Production System, Constraints and Opportunities in Selected Kebeles of Hawassa City Administration, Ethiopia. *International Journal of Research -GRANTHAALAYAH*, 7(8), 78–87. <https://doi.org/10.29121/granthaalayah.v7.i8.2019.641>

Nepali, P., & Chokhal, K. (2023). *Study on Management Practice and Challenges on Beekeeping in Bagnaskali, Palpa, Nepal*. June. <https://doi.org/10.3126/pp.v11i1.55512>

No Title. (2022).

Okpokiri, C. I., & Nwachukwu, I. N. (2015). *DETERMINANTS AND PROFITABILITY OF*

HONEY PRODUCTION IN IKWUANO LOCAL GOVERNMENT AREA , ABIA STATE , NIGERIA. 15(3), 211–216.

- Onwumere, J., Onwukwe, F., & Alamba, C. (2012). Comparative Analyses of Modern and Traditional Bee Keeping Entrepreneurships in Abia State, Nigeria. *Journal of Economics and ...*, 3(13), 1–9. <http://iiste.org/Journals/index.php/JEDS/article/view/3482>
- Oromokoma, C., Kasangaki, P., Akite, P., Mugume, R., Kajobe, R., Mangusho, G., Matovu, M., & Chemurot, M. (2023). First physicochemical analysis of stingless bee honey from Uganda. *Journal of Apicultural Research*, 0(0), 1–10. <https://doi.org/10.1080/00218839.2023.2167362>
- Ozkirim , A. (2018): Beekeeping in Turkey: Bridging Asia and Europe. - In: Chantawannakul, P et al. (eds.) Asian Beekeeping in the 21 century.ss
- Peter, O., Fulfilment, P., The, O. F., For, R., Award, T. H. E., & The, O. F. (2022). *Assessing the Influence of the Honey Bee Management Practices Used By Model Farmers on Honey Production in Tororo District.*
- Rana, K., & Mishra, I. (2022). *I NTERNATIONAL J OURNAL OF Adoption of Recommended Beekeeping Practices in Kumaon Hills of Uttarakhand. 5(02), 279–283.* <https://doi.org/10.47191/ijmra/v5-i2-05>
- Ratajczak, M., Kaminska, D., Matuszewska, E., Hołderna-Kedzia, E., Rogacki, J., & Matysiak, J. (2021). Promising antimicrobial properties of bioactive compounds from different honeybee products. *Molecules*, 26(13). <https://doi.org/10.3390/molecules26134007>
- Reilly JR, Artz DR, Biddinger D, Bobwash K, Boyle NK, Brittain C et al(2020) Crop production in the USA is frequently limited by alack of pollinators. *Proc R Soc B* 287(1931):e20200922.<http://doi.org/10.1098/rspd.2020.0922>
- Sahle, H., Enbiyale, G., Negash, A., & Neges, T. (2019). *Assessment of honey production system , constraints and opportunities in Ethiopia. February 2018.* <https://doi.org/10.15406/ppij.2018.06.00153>

- Salatino, A., L Pereira, L. R., & Faria Salatino, M. L. (2019). The emerging market of propolis of stingless bees in tropical countries. *MOJ Food Processing & Technology*, 7(2), 27–29. <https://doi.org/10.15406/mojfpt.2019.07.00215>
- Serda, B., Zewudu, T., Dereje, M., & Aman, M. (n.d.). *Journal of Veterinary V eterinary Science & T echnology Beekeeping Practices , Production Potential and Challenges of Bee Keeping among Beekeepers in Haramaya District , Eastern Ethiopia*. 6(5). <https://doi.org/10.4172/2157-7579.1000255>
- Shahbandeh.M. (2021). Leading producer of Honey World wide in 2019.1-2.
- Shaon Kumar Das, Ezekiel K. Bhujel, E. L. Devi1, R. L. andV. K. M. (2022). Scientific Beekeeping Technology for Sustainable Agriculture and Employment Generation. *Http://Www.Biospub.Com/*, 4:4, 244–247. <https://medium.com/@arifwicaksanaa/pengertian-use-case-a7e576e1b6bf>
- Singh, N. K., Kumar, S., & Kumar, B. (2016). Impact assessment of bee keeping in Nalanda Bihar in livelihood security. *Ecology, Environment and Conservation*, 22(4).
- Tarekegn, A. (2022). Traditional Forest Beekeeping and Its Challenge in Benishangul Gumuz Regional State, Ethiopia. *Bee Studies- Apiculture Research Institute*, 14(1), 27–34. <https://doi.org/10.51458/bstd.2022.25>
- Tessema Zewudu, B. S., & Mohammed Aman, M. D. (2015). Beekeeping Practices, Production Potential and Challenges of Bee Keeping among Beekeepers in Haramaya District, Eastern Ethiopia. *Journal of Veterinary Science & Technology*, 06(05). <https://doi.org/10.4172/2157-7579.1000255>
- Thakur, M., Sharma, D., Khajuria, M., & Kapoor, B. (2023). *Prospects and constraints in traditional beekeeping in Jammu and Kashmir*. 12(5), 3691–3694.
- Tiwari, P., Tiwari, J. K., Singh, D., & Singh, D. (2013). Traditional beekeeping with the Indian honey bee (*Apis cerana F .*) in District Chamoli , Uttarakhand , India. *International Journal of Rural Studies (IJRS)*, 20(1), 1–7.

- To, C., Keeping, B. E. E., Processing, H., Of, S. S., District, S., To, S., Faculty, T. H. E., Agriculture, O. F., Requirements, O. F. T. H. E., Ofthe, A., Of, D., Of, B., & Production, A. (2016). *Dale : June*.
- Tutuba, N. B., & Kapinga, C. (2022). Beekeeping Productivity: Why is the Beekeeping Sector less Productive in Tanzania? *International Journal of Economics, Business and Management Research*, 06(09), 199–211. <https://doi.org/10.51505/ijebmr.2022.6914>
- Wakgari, M., & Yigezu, G. (2021). Honeybee keeping constraints and future prospects. *Cogent Food and Agriculture*, 7(1). <https://doi.org/10.1080/23311932.2021.1872192>
- WALI KHAN & FOUZIA ANJUM. (2016). Bee Keeping’S Impact on Sustainable Livelihoods Development in Bajaur Agency Pakistasn. *International Journal of Applied and Natural Sciences (IJANS)*, 5(6).
- Wambua, B. M., Musimba, N. K. R., & Muli, E. (2016). Socioeconomic analysis of beekeeping technologies in Kenya: A case study of Kitui County. *International Journal of Education and Research*, 4(4), 345–354. www.ijern.com
- Zuria, G., Weredas, G., State, G. R., Zuria, G., Weredas, G., & State, G. R. (2016). *Identifying Opportunities and Constraints of Beekeeping : The Case of Entomology , Ornithology & Herpetology : Current Research Identifying Opportunities and Constraints of Beekeeping : The Case of. August*. <https://doi.org/10.4172/2161-0983.1000182>
- Abdi, K., Ben Said, M., Crotti, E., Masmoudi, A. S., & Cherif, A. (2023). The promise of probiotics in honeybee health and disease management. *Archives of Microbiology*, 205(2), 73. <https://doi.org/10.1007/s00203-023-03416-z>
- Affognon, H. D., Diiro, M. G., Kingori, W. S., Makau, S., Muriithi, B. W., Omondi, A. I., & Raina, S. K. (2015). Adoption of modern beekeeping and its impact on honey production in the former Mwingi District of Kenya: assessment using theory-based

- impact evaluation approach. *International Journal of Tropical Insect Science*, 35(2), 96-102. <https://doi.org/10.1017/S1742758415000156>
- Ahikiriza, E. (2016). Beekeeping as an alternative source of livelihood in Uganda. *Faculty of Bioscience Engineering. University of Gent*.
- Ahmad, Z. (2023). Assessment of natural enemies of honeybee (*Apis mellifera jemenitica*) in the Asir region, Southwestern, Saudi Arabia. *Journal of King Saud University - Science*, 35(6), 102781. <https://doi.org/https://doi.org/10.1016/j.jksus.2023.102781>
- Amulen, D. R., D'Haese, M., Ahikiriza, E., Agea, J. G., Jacobs, F. J., De Graaf, D. C., Smagghe, G., & Cross, P. (2017). The buzz about bees and poverty alleviation: Identifying drivers and barriers of beekeeping in sub-Saharan Africa. *PLOS ONE*, 12(2), e0172820. <https://doi.org/10.1371/journal.pone.0172820>
- Biruk, D. D. (2014). *The constraints of honey production in beekeeping cooperatives: A case study of KilliteAwlalo Woreda* [Mekelle University].
- DEMISSIE, W. (2016). *DETERMINANTS OF ADOPTION OF KENYA TOP BAR HIVE BEEKEEPING TECHNOLOGY: THE CASE OF LOKA ABAYA DISTRICT, SNNPR, ETHIOPIA*
- Gikunda, R. M., Ooga, D. M., Okiamba, I. N., & Anyuor, S. (2021). Cultural barriers towards women and youth entry to apiculture production in Maara Sub-County, Kenya. *Advancements in Agricultural Development*, 2(2), 73-85. <https://doi.org/10.37433/aad.v2i2.113>
- Gratzer, K., Wakjira, K., Fiedler, S., & Brodschneider, R. (2021). Challenges and perspectives for beekeeping in Ethiopia. A review. *Agronomy for Sustainable Development*, 41(4). <https://doi.org/10.1007/s13593-021-00702-2>

- Kuma, T., Abebe, G., & Kitila, C. (2023). Assessments on honey bee (*Apis mellifera*) production and its major constraints of Holota Beekeeping Association producers, Ethiopia. *GeoJournal*, 88(3), 2983-2992. <https://doi.org/10.1007/s10708-022-10788-0>
- Mburu, P. D. M., Affognon, H., Irungu, P., Mburu, J., & Raina, S. (2017). Gender Roles and Constraints in Beekeeping: A Case from Kitui County, Kenya. *Bee World*, 94(2), 54-59. <https://doi.org/10.1080/0005772x.2016.1275490>
- Mulatu, A., Marisennayya, S., & Bojago, E. (2021). Adoption of Modern Hive Beekeeping Technology: The Case of Kacha-Birra Woreda, Kembata Tembaro Zone, Southern Ethiopia. *Advances in Agriculture*, 2021, 4714020. <https://doi.org/10.1155/2021/4714020>
- Muya, B. I. (2014). *Determinants of adoption of modern technologies in beekeeping projects: the case of women groups in Kajiado County, Kenya* [University of Nairobi].
- Ostroverkhova, N. V., Konusova, O. L., Kucher, A. N., Kireeva, T. N., & Rosseykina, S. A. (2020). Prevalence of the Microsporidian *Nosema* spp. in Honey Bee Populations (*Apis mellifera*) in Some Ecological Regions of North Asia. *Veterinary Sciences*, 7(3), 111. <https://www.mdpi.com/2306-7381/7/3/111>
- Papini, R., Mancianti, F., Canovai, R., Cosci, F., Rocchigiani, G., Benelli, G., & Canale, A. (2017). Prevalence of the microsporidian *Nosema ceranae* in honeybee (*Apis mellifera*) apiaries in Central Italy. *Saudi J Biol Sci*, 24(5), 979-982. <https://doi.org/10.1016/j.sjbs.2017.01.010>
- Robi, D. T., Temteme, S., Aleme, M., Bogale, A., Bezabeh, A., & Mendesil, E. (2024). Health status of honeybee colonies (*Apis mellifera*) and disease-associated risk factors in different agroecological zones of Southwest Ethiopia. *Veterinary Parasitology: Regional Studies and Reports*, 47, 100943. <https://doi.org/https://doi.org/10.1016/j.vprsr.2023.100943>

- Sharma, S., & Das, D. (2018). Factors affecting adoption of beekeeping and associated technologies in Kamrup (rural) district, Assam state, India. *Biodiversity Int J*, 2(3), 253-258.
- Solomon, S., Degu, T., Fesseha, H., & Mathewos, M. (2021). Study on Major Parasitic Diseases of Adult Honeybees in Three Districts of Kaffa Zone, Southern Ethiopia. *Veterinary Medicine International*, 2021, 6346703. <https://doi.org/10.1155/2021/6346703>
- Teklu Gebretsadik, W. (2016). Survey on honeybee pests and predators in Sidama and Gedeo zones of Southern Ethiopia with emphasis on control practices.
- Tulu, D., Aleme, M., Mengistu, G., Bogale, A., Bezabeh, A., & Mendesil, E. (2020). Improved beekeeping technology in Southwestern Ethiopia: Focus on beekeepers' perception, adoption rate, and adoption determinants. *Cogent Food & Agriculture*, 6(1), 1814070. <https://doi.org/10.1080/23311932.2020.1814070>
- Zocchi, D. M., Volpato, G., Chalo, D., Mutiso, P., & Fontefrancesco, M. F. (2020). Expanding the reach: ethnobotanical knowledge and technological intensification in beekeeping among the Ogiek of the Mau Forest, Kenya. *J Ethnobiol Ethnomed*, 16(1), 57. <https://doi.org/10.1186/s13002-020-00409-w>