

WOAH Collaborative Centre Reports Activities 2025

This report has been submitted: 3 février 2026 07:24

CENTRE INFORMATION

*Title of WOA Collaborating Centre	Bee Health in Africa
*Address of WOA Collaborating Centre	International Centre of Insect Physiology and Ecology (ICIPE)
*Tel:	+254-20 863 20 00
*E-mail address:	ssubramania@icipe.org
Website:	www.icipe.org
*Name Director of Institute (Responsible Official):	Dr. Abdou Tenkouano, CEO and Director General
*Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Dr Subramanian Sevgan, Principal Scientist and Head, Environment Health Theme, icipe
*Name of the writer:	Subramanian Sevgan

TOR 1 AND 2: SERVICES PROVIDED

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by WOA

Category	Title of activity	Scope
Disease control (true)	Activity 1: Characterization of volatile compounds and polyphenols in the leaves and stem bark of <i>Croton sylvaticus</i> Hochst (Euphorbiaceae) from the Democratic Republic of Congo	Activity 1: The aim of this study was to identify the volatile phytochemical compounds and to quantitatively determine the total polyphenol and flavonoid content in the leaves and stem barks of <i>Croton sylvaticus</i> Hochst collected in the Democratic Republic of Congo. Gas chromatography coupled with mass spectrometry (GC-MS) analysis of the extracts led to the identification of 35 volatile compounds in the leaves and 18 in the stem barks. The identified compounds were mainly mono- and sesquiterpenes. Kamalandua, B. M., Balaga, B., Kiatoko, D., Munday, C. N., Mawete, D. T., Mbungu, P., ... & Mavinga, B. M. (2025). Caractérisation des composés volatils et des polyphénols dans les feuilles et écorce des tiges de <i>Croton sylvaticus</i> Hochst (Euphorbiaceae) provenant de la République Démocratique du Congo. <i>Revue Congolaise des Sciences et Technologies</i> , 4(3), 536-545
		Activity 2: This targeted surveillance study provided

Epidemiology, surveillance, risk assessment, (true)

Activity 2: Honey bee colony loss rates, management practices and risk factors for losses in Cameroon, Kenya, and Ethiopia: Insights from the 2023/2024 active beekeeping season (In Press)
 Activity 3: Honey bee colony losses and causes during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries
 Activity 4: Influence of colony and hive attributes, landscape, and seasonality on occurrence of large hive beetles in Kenya
 Activity 5: Climate effects on honey bees can be mitigated by beekeeping management in Kenya
 Activity 6: the current status, magnitude, and drivers of stingless bee colony losses in Kenya
 Activity 7: New Records

real-time, comparative data on colony losses and their drivers in Cameroon, Kenya and Ethiopia. It identified country-specific risk factors (e.g., hive type effectiveness, novel predation by serval cats in Cameroon) and conclusively demonstrated that beekeeper training in best management practices significantly reduces losses. The findings are directly actionable for national extension services and beekeeping associations in these countries. Assefa, F., Belayhun, L., Ayalew, W., ... & Nganso, B. T. (In Press). Honey bee colony loss rates, management practices and risk factors for losses in Cameroon, Kenya, and Ethiopia. *Journal of Apicultural Research*.
 Activity 3: This foundational continental surveillance study quantified colony losses and identified key risk factors, including uncontrollable events (theft, drought, fire), pests, and absconding, across East, West and Central African countries. It revealed actionable management practices that mitigate losses: colonies in movable-frame hives had significantly lower mortality than those in traditional frameless hives, and professional, migratory beekeepers experienced fewer losses than stationary or hobbyist beekeepers. These evidence-based insights provide clear targets, improving local hive types and professional practices among African beekeepers to enhance sector resilience. Nganso, B. T., Ayalew, W., Wubie, A. J., Assefa, F., Belayhun, L., Ndungu, N. N., ... & Subramanian, S. (2025). Honey bee colony losses and causes during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries. *PloS one*, 20(5), e0322489
 Activity 4: This study investigated a new threat to Kenyan apiculture—an outbreak of large hive beetles (*Oplostomus haroldi*)-in Taita Taveta County. It identified key risk factors for higher infestation: stronger colonies (with more brood, pollen, and honey) and hives with larger entrances (notably Langstroth hives) were more susceptible, with higher beetle populations also found in forested landscapes and during rainy seasons. Crucially, the findings provide a direct, low-cost management strategy: reducing hive entrance sizes can effectively limit hive beetle invasion, offering a practical intervention to protect colony health and productivity for local beekeepers in Taita. Wambua, M. B., Fombong, A. T., Nkoba, K., Onyambu, G. K., Kutima, H. L., Subramanian, S., & Nganso, B. T. (2025). Influence of colony and hive attributes, landscape, and seasonality on occurrence of large hive beetles (Coleoptera: Scarabaeidae) in Taita Taveta County, Kenya. *Journal of Insect Science*, 25(3), 22
 Activity 5: This study was conducted through survey to estimate the decrease of honey bee colonies in Kenya for the year 2021–2022 to explore the effects of environmental conditions, such as temperature and precipitation, on decrease. It included checking on dead colonies and absconding. A total of 589 beekeepers from a variety of areas participated in the survey. Kenyan beekeepers had an average of 36.6% colony decrease in 2021–2022, with higher decreases during the dry and hot (31.9%) than during the wet and cold season (20.2%). Interestingly,

	<p>Involving Native and Exotic Jumping Spiders (Araneae, Salticidae) Preying Upon Stingless Bees (Apidae, Meliponini) in the Afrotropical Realm Activity 8: Development and dissemination of IPM strategies for <i>Aethina tumida</i></p>	<p>we found that precipitation mitigated temperature effects on colony decrease for both seasons. we found that beekeepers practicing water supplementation had up to 10% less livestock decrease during the dry and hot season than those that did not, suggesting it to be a relevant adaptive strategy to mitigate livestock decrease. Leyton, M. S., Lattorff, H. M. G., Kiatoko, N., & Requier, F. (2025). Climate effects on honey bees can be mitigated by beekeeping management in Kenya. <i>Journal of Environmental Management</i>, 374, 123879. Activity 6: A survey of 239 meliponiculturists in Kenya (2022–2023) estimated mean annual colony losses of 15.9%, with higher losses during the dry and hot season than the wet season. Colony losses increased significantly with rising temperatures, while forest cover and beekeeping experience showed no significant effects. Climate projections indicate that losses will increase further, especially in northern and eastern Kenya, highlighting the need for targeted management strategies. Malena Sibaja Leyton, H. Michael G. Lattorff, Nkoba Kiatoko, Fabrice Requier (2025). Climate change may increase colony losses of managed stingless bees in Kenya. <i>Journal of Environmental and Sustainability Indicators</i> (under second review) Activity 7: In this study we documented opportunistic predation events of <i>Hypotrigona</i> and <i>Liotrigona</i> species by both native (<i>Menemerus bivittatus</i>) and exotic (<i>Plexippus petersi</i>) jumping spiders (Salticidae). Across Guinea, Kenya, Tanzania and Madagascar, jumping spiders were observed ambushing foragers at nest entrances and successfully capturing prey, with repeated instances recorded over multiple days. This phenomenon, which we term meliponophagy, has received very little attention to date and our observations provide the first evidence of jumping spiders preying upon <i>Liotrigona</i> species in the Afrotropical realm Razakamiamanana, A. N., Ihsane, O., Héger, M., Aganze Mweze, M., Karanja, R. H., Randriamalala, J. R., ... & Vereecken, N. J. (2025). Meliponophagy: New records involving native and exotic jumping spiders (Araneae, Salticidae) preying upon stingless bees (Apidae, Meliponini) in the Afrotropical realm. <i>African Journal of Ecology</i>, 63(7), e70110. Activity 8: Synthesized research on the chemical ecology of the Small Hive Beetle (SHB) was translated into practical management guidelines. This knowledge was disseminated to beekeepers and extension officers to reduce colony losses from this invasive pest. Bobadoye, B., Nganso, B. T., Stuhl, C., Torto, B., & Fombong, A. T. (2025). Chemical Ecology and Management of the Small Hive Beetle, <i>Aethina tumida</i> (Coleoptera: Nitidulidae). <i>Journal of chemical ecology</i>, 51(1), 16.</p>
		<p>Activity 9: Hands-on training in advanced analytical techniques directly supports food security by ensuring food safety, improving quality, strengthening livelihoods, enhancing regulatory capacity, and promoting sustainable and resilient food systems. Activity 10: The training contributes to food security by ensuring the availability, quality, and accessibility</p>

<p>Training, capacity building (true)</p>	<p>Activity 9. Hands-on training on Advanced Analytical Techniques for Honey Quality Testing in Ethiopia Activity 10. Beekeeping input suppliers' business skill training in Ethiopia Activity 11: Hands-on training on data collection tools for colony carrying capacity Activity 11a: Advanced technical skills, colony multiplication and postharvest training</p>	<p>of honey, enhancing livelihoods, supporting sustainable agricultural practices, and strengthening the resilience of the honey value chain. Activity 11: The training and a follow-up assessment helps determine the appropriate number of colonies that an area can sustainably support as well as the area's honey production potential, resulting in optimal resource utilization to improve honey production, and increase income. Furthermore, proper colony placement and stocking rates enhances pollination efficiency for crops such as oil seeds, pulses, fruits, vegetables, and spices, leading to improved yield, better crop quality, and greater production stability. Maintaining ecological balance ensures the long-term availability of pollinators that are essential for production systems. Activity 11a: Advanced technical skills enable apiculture officers to support beekeepers in implementing improved hive management, disease and pest control, seasonal colony management, and climate-smart practices. Healthy and stronger colonies produce more honey and beeswax production while reducing colony losses. Stable and productive honeybee populations improve rural livelihoods by ensuring a reliable supply of nutritious food products, which contributes to dietary diversification and household food security.</p>
<p>Diagnosis, biotechnology and laboratory (true)</p>	<p>Activity 12: Chemosensory function of Varroa gnathosoma: transcriptomic and proteomic analyses Activity 13: Data Augmentation and Machine Learning algorithms for multi-class imbalanced Activity 14: Increased tolerance to high viral loads mediated by active individual immunity in Varroa destructor-resistant Apis mellifera scutellata in Kenya (Under Review)</p>	<p>Activity 12: In this study, we evaluated the role of the gnathosoma (mouthparts) in chemosensing of the most devastating honeybee parasite, Varroa destructor mite through transcriptomic analysis. Nganso, B. T., Eliash, N., Mani, K., Sela, N., Villar-Briones, A., Osabutey, A. F., ... & Soroker, V. (2024). Chemosensory function of Varroa gnathosoma: transcriptomic and proteomic analyses. <i>Experimental and Applied Acarology</i>, 1-19. Activity 13. The study focusses on handling of multiclass imbalanced data on classification of stingless bee samples by employing data balancing techniques, namely Synthetic Minority Oversampling Technique (SMOTE) and Adaptive Synthetic (ADASYN) approach. These techniques are applied in combination with machine learning (ML) algorithms; specifically Random Forest (RF), and Support Vector Machine (SVM), to assess the models' predictive performance to infer stingless bee samples identities Salifu, D., Chepkemioi, L., Ibrahim, E. A., Nkoba, K., & Tonnang, H. E. (2025). Data Augmentation and Machine Learning algorithms for multi-class imbalanced morphometrics data of stingless bees. <i>Heliyon</i>, 11(3). Activity 14. This mechanistic study revealed, for the first time, that an active innate immune response is a key contributor to the resilience of Kenyan honey bees (<i>Apis mellifera scutellata</i>) against Varroa mites and associated viruses. It demonstrated that colonies maintain consistently low mite levels (< 3 mites/100 bees) and tolerate high viral loads without disease symptoms. Crucially, when viral loads exceeded a critical threshold, specific immune genes (<i>Vago</i> and <i>hymenoptaecin</i>) were strongly upregulated, indicating an inducible, individual-level defense system. This work establishes that, in addition to known social behaviors, a robust</p>

		<p>innate immune capacity is a fundamental pillar of the natural resilience observed in these African bee populations. Mary Chege, Angelina F. Osabutey, Mbatha B. Wambua, Joseph Kilonzo, James Ng'ang'a Kimani, Beatrice T. Nganso. Increased tolerance to high viral loads mediated by active individual immunity in <i>Varroa destructor</i>-resistant <i>Apis mellifera</i> <i>scutellata</i> in Kenya. Manuscript under review in <i>Journal of Invertebrate Pathology</i>.</p>
		<p>Activity 15: To identify traditional plant-based bee attractants, an ethnobotanical survey was carried out in Kenya to gain an in-depth understanding of traditional apicultural practices used for hive baiting to attract swarms. Additionally, the volatile composition of traditional plants used as swarm lures was examined using gas chromatography–mass spectrometry (GC–MS), and their effectiveness in catching swarms was evaluated in comparison to beeswax in the field. The survey results revealed that <i>Ocimum kilimandscharicum</i>, <i>Cymbopogon nardus</i> and <i>Elaeodendron buchananii</i> are the three commonly used traditional plants for baiting, chosen based on their aroma, abundance, ease of processing and durability. Notably, the volatiles emitted by <i>O. kilimandscharicum</i> plus beeswax attracted significantly two and half-fold more bee swarms than the control (beeswax alone). Our findings suggest that adding <i>O. kilimandscharicum</i> to beeswax may significantly enhance bee swarm catches in the field. Ochola, J. B., Nganso, B. T., Subramanian, S., & Nkoba, K. (2024). Evaluation of volatiles from ethnobotanical plants as attractants for the honeybee swarms in Kenya. <i>Journal of Applied Entomology</i>, 148(8), 938-947.</p> <p>Activity 16: Using a structured household survey and the Contingent Valuation Method (CVM), we elicited both binary and continuous WTP responses before and after providing information about pollination benefits. We employed Binary Logit and Tobit models to analyze factors influencing WTP and the amount farmers are willing to pay. The results show that 86% of farmers are willing to increase pollinators on their farms after receiving information, and 62% express WTP for managed pollination services, with an average payment of ETB 476. Knowledge and awareness that bees improve crop productivity significantly increases both the likelihood and amount they WTP. WTP tends to be higher for younger farmers, and for those with beekeeping experience, and received training on beekeeping. Farmers with bee colonies already nearby, who know other wild pollinators or in high vegetation cover areas tend to offer lower WTP. Regional variation is also significant, with higher WTP in coffee-producing districts. The study highlights a substantial demand for pollination services and shows that information provision significantly boosts farmers' interest. These findings underline the importance of tailored extension services, targeted training, and region-specific pricing strategies to scale up managed pollination services as part of sustainable agricultural intensification in Ethiopia. Taye, B., Abro, Z., Tefera, T.,</p>

and Kassie, M. (2026). Farmers Willingness to pay for managed pollination services in Ethiopia. Draft manuscript. Integrated Data and Analytics Platform (IDAP)-icipe. Activity 17: We quantify the economywide effects of enhanced pollination resulting from the expansion of beekeeping under Ethiopia's More Young Entrepreneurs in Silk and Honey (MoYESH) Programme. We apply a Dynamic Computable General Equilibrium (CGE) and microsimulation models that explicitly incorporates the beekeeping sector and its forward linkages to crop production. Using spatially referenced apiary location data, we estimate potential productivity improvements for pollinator-dependent crops and trace their economywide impacts through key indicators. Our findings show that scaling pollination services yields substantial socioeconomic gains. Expanded pollination under MoYESH has the potential to increase GDP by USD 254 million per year. National crop production could rise by 279,000 tonnes annually. Improved pollination also creates an estimated 81,000 agricultural jobs and 61,000 non-agricultural jobs each year. Household incomes rise by about 0.12%, translating into a measurable reduction in poverty: about 70,000 people are lifted above the poverty line annually. The results highlight a major untapped policy opportunity: embedding pollination into agricultural planning, extension services, landscape management, and pesticide regulation can generate substantial and long-lasting economic and welfare benefits. Taye, B., Abro, Z., Legesse, E. E., Tefera, T., and Kassie, M. (2026), Bee economy: Assessing the National Economic Value of Pollination Services in Ethiopia. Draft manuscript. Integrated Data and Analytics Platform (IDAP)-icipe Activity 18: This study used DNA metabarcoding to map the forage sources for honey bees in Taita Taveta County, Kenya, identifying 224 plant species across different landscapes and seasons. It revealed that forage availability was significantly limited, particularly in pollen diversity, during the short dry season and in agricultural lowland areas compared to forested highlands. A critical finding was that honey bee nutrition in the region depends heavily on exotic plant species (67%) rather than native flora. This knowledge directly informs actionable strategies: by identifying when and where nutritional gaps occur, it provides a basis for promoting native, nutrient-rich forage plants through targeted habitat restoration and farmer-led planting initiatives in lowland agricultural zones. This approach is essential for building resilient, sustainable forage landscapes to support colony health and secure pollination services. Chege, M., Wambua, M. B., Kilonzo, W. J., Subramanian, S., & Nganso, B. T. (2025). Seasonal and Landscape-Driven Variations in Forage Resources of *Apis mellifera scutellata*: Implications for Pollination Sustainability and Colony Health in Taita Taveta County, Kenya. *Ecology and Evolution*, 15(7), e71613. Activity 19: This foundational study created the first continental geospatial atlas of honey bee forage plants, compiling data on 1,248 species from Africa and beyond. The accompanying

Food security (true)

Activity 15: Evaluation of volatiles from ethnobotanical plants as attractants for the honeybee swarms in Kenya
 Activity 16: Evaluation of willingness to pay for pollination services for improved yields of fruit trees
 Activity 17: Quantify the sustainable economic growth and food production impact of managed bees distributed through icipe's investment via the MOYESH Programme
 Activity 18: Seasonal and landscape-driven variations in forage resources of *Apis mellifera scutellata*: Implications for pollination sustainability and colony Health
 Activity 19: A Geospatial atlas of honey bee forage plants and their distribution patterns in Africa and beyond
 Activity 20: A faculty manual for agricultural trainer
 Activity 21: Synthesis of the key lessons learned and potential next steps of the MOYESH programme including further scale up
 Activity 22: Climate-smart apiary site selection in East Africa
 Activity 23: The Physicochemical Properties, Biochemical Makeup, and Health benefits of honey produced From Stingless Bees (Apidae: Meliponini)
 Activity 24: Ecological and evolutionary drivers of stingless bee honey variation at the global scale
 Activity 25: Influence of Environment and Bee Species on the Physicochemical and Biochemical Properties of Stingless Bee Honey
 Activity 26: Landscape structure influences honey quality parameters of *Plebeina armata* an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso
 Activity 27: Honey plant diversity of the stingless bee *Plebeina armata* (Magretti) in Burkina Faso

interactive dashboard visualizes species distributions and identifies critical data gaps, particularly in Western, Central, and Northern Africa. For regions with better data, such as Eastern and Southern Africa, the atlas serves as a direct tool for promoting pollinator-friendly land management. By mapping forage resources, this open-access resource provides an essential evidence base for targeting habitat conservation, guiding sustainable agricultural practices, and building climate-resilient beekeeping strategies across the continent. Nganso, B. T., Agboka, K. M., Atagong, S. D., Topé, S. F., Massing, T., Landmann, T., ... & Guimapi, R. A. (2025). A Geospatial atlas of honey bee forage plants and their distribution patterns in Africa and beyond. *Scientific Reports*, 15(1), 34384.

Activity 20: Apiculture and Meliponiculture is a specialized chapter in *Fundamentals of Entomology: A Faculty Manual* (2026). The manual is designed for faculty-level instruction, bridging biological theory with actionable field management for agricultural trainers. Moses Chemurot, Nelly N. Ndungu, Felix Meutchieye, Fiona Nelima Mumoki, Patrice Kasangaki¹, Donald Rugira Kugonza (2024). Apiculture and Meliponiculture Development in Africa. In *Fundamentals of Entomology: A Faculty Manual*. Book chapter title: Apiculture and Meliponiculture. (In press)

Activity 21: In-depth analysis of Ethiopia's honey sector, including mapping key production areas and evaluating the feasibility of unique honey types. Roadmap for Scaling MOYESH Outcomes: a strategic roadmap for expanding MOYESH outcomes to new regions within Ethiopia and beyond A report on significance of establishing the Youth Summit as an annual event. Roadmap for unique Ethiopian honey registration and commercialization: a structured technical framework for registering unique Ethiopian honey types, ensuring alignment with international standards, including a road map for at least one mono-floral Ethiopian honey type.

Activity 22: This was a study to evaluate beekeeping as a sustainable strategy to enhance resilience in East African agriculture by improving food security, livelihoods and pollination services. Using GIS-based analysis, it identifies climate-smart apiary sites, assesses current suitability and forecasts future conditions to support sustainable practices. Mengistu, Binyam Tesfaw Hailu, Temesgen Alemayehu Abera, Janne Heiskanen, Tadesse Terefe Zeleke, Tino Johansson, Kiatoko Nkoba, Juuso Tuure and Petri Pellikka (2025). Climate-smart apiary site selection in East Africa: GIS-based analysis of current and future climate projections. *International Journal of Climate Change Strategies and Management*, Vol. 17 No. 1, 2025 pp. 1243-1270. <https://doi.org/10.1108/IJCCSM-10-2024-0191>

Activity 23: In this review we provided a comprehensive overview of stingless bee honey (SBH), focusing on its physicochemical properties, biochemical composition, and health benefits. SBH exhibits unique characteristics, including color, flavor, texture, and lower thermal stability, influenced by various botanical sources, stingless bee species, and diverse

geographic and climatic conditions. This review also emphasizes findings from in vitro and in vivo studies, highlighting SBH's antioxidant, antimicrobial, anti-inflammatory, and wound-healing properties. While preliminary evidence suggests potential benefits for managing diabetes, cardiovascular diseases, and gastrointestinal disorders, further research is needed to validate these claims. Gebreyes, B. G., Teka, T. A., Tola, Y. B., Tamiru, M., & Kiatoko, N. (2025). The Physicochemical Properties, Biochemical Makeup, and health benefits of Honey produced from Stingless bees (Apidae: Meliponini). *Journal of Food Quality*, 2025(1), 7570525. Activity 24: In this study, we aimed to disentangle the roles of evolutionary and environmental drivers of SBH compositional variation using a sampling design that combines honey profiling by H1-NMR spectroscopy with the collection of honeys from honey bees and stingless bees at the global scale. The results show a clear differentiation between the chemical composition and functional diversity of honey bee and stingless bee honeys, mainly due to the production of a range of bioproducts during sugar fermentation Pierre Noiset, Madeleine Henger, Chloe Salmon, Peter Kwapong, Rofela Combey, Kumara Thevan, Natapot Warrit, Marcelo Rojas-Oropeza, Nathalie Cabirol, Carlos Zaragoza-Trello, Claus Rasmussen, Kiatoko Nkoba, Nicolas J. Vereecken (2025). Ecological and evolutionary drivers of stingless bee honey variation at the global scale. *Science of the Total Environment* 969:178945.

<https://doi.org/10.1016/j.scitotenv.2025.178945>.

Activity 25: This study assessed how district and species influence the physicochemical and biochemical properties of stingless bee honey from *Meliponula beccarii* and *Plebeina armata* in Ethiopia. Significant species- and location-based variations were observed, with *M. beccarii* honey showing higher moisture and stronger antioxidant, phenolic, and flavonoid contents. In contrast, *P. armata* honey exhibited higher electrical conductivity, proline content, invertase activity, and free acidity, indicating greater mineral content and honey maturity. Both honeys were dominated by fructose and glucose, with minor differences in sugar profiles and HMF levels influenced by species and storage conditions. Overall, the findings confirm that stingless bee honey differs markedly from *Apis mellifera* honey, highlighting the need for species-specific quality standards. Belay Gezahegn Gebreyes, Yetenayet Bekele Tola, Kegode Timothy, Indiazi Solomon Chogo, Nkoba Kiatoko (2025). Influence of Environment and Bee Species on the Physicochemical and Biochemical Properties of Stingless Bee Honey from Ethiopia. Under review.

Activity 26: In Burkina Faso, stingless bee honey is widely used for medicinal and cultural purposes and is gaining popularity due to its unique flavor and texture. *Plebeina armata*, a soil-nesting species with strong potential for meliponiculture, was studied due to limited data on its honey properties. Honey samples were collected from fields, fallow land, and forests in southern Burkina Faso and analyzed using

		<p>standard international methods. Results showed ecosystem-based variation in color, moisture, pH, conductivity, sugars, ash, and polyphenol content.</p> <p>Overall, <i>P. armata</i> honey exhibited valuable physicochemical and phytochemical qualities, supporting its food, medicinal, and meliponiculture potential. Souleymane KOUSSOUBE; Josefa Somé; Fidèle W. Tapsoba; Timothy Kegode; Farûk Koira; Issouf Ouédraogo; Gérald Nana; Frédéric Soubandé; Kiatoko Nkoba; Mamoudou Traoré; Mamounata Bélem; Souleymane Nacro (2025). Landscape structure influences honey quality parameters of <i>Plebeina armata</i> an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso. <i>Apidologie</i> (under review). Activity 27: In Burkina Faso, <i>Plebeina armata</i> honey is valued for food, rituals, and traditional medicine, but current harvesting methods destroy colonies. To promote sustainable use, meliponiculture is proposed as an alternative to destructive honey harvesting. This study aimed to identify melliferous plants of <i>P. armata</i> across fields, forests, and fallow lands. Woody plant species were inventoried around selected nests and classified using botanical references. Results identified high plant diversity in all ecosystems, dominated by Fabaceae, providing key knowledge to support sustainable meliponiculture of <i>P. armata</i>. Souleymane Koussoubé, Josefa Somé, Adama Kaboré, Apolline Sanou, Karim Ouédraogo, Farûk Koira, Issouf Ouédraogo, Gérald Nana, Frédéric Soubandé, Kiatoko Nkoba, 5 Mamoudou Traoré, Mamounata Bélem, Souleymane Nacro (2025). Honey plant diversity of the stingless bee <i>Plebeina armata</i> (Magrett) (Hymenoptera: 2 Apidae) in south soudanienne zone of Burkina Faso. <i>African Journal of Ecology</i> (second review)</p>
		<p>Activity 28: This perspective paper examines the multifaceted cultural ecosystem services (CESs) provided by wild bees with particular attention to the spiritual, medicinal, and traditional knowledge-based dimensions associated with Afrotropical stingless bees. We integrate these insights within a biocultural framework, highlighting their relational values and arguing that the systematic omission of these cultural roles in pollinator research, policy and conservation constitutes a form of epistemic injustice Vereecken, N. J., Héger, M., Aganze Mweze, M., Razakamiamanana, A., Karanja, R. H., Nkoba, K., & Noiset, P. (2025). Afrotropical Stingless Bees Illustrate a Persistent Cultural Blind Spot in Research, Policy and Conservation. <i>Diversity</i>, 17(12), 826. Activity 29: This study documents indigenous knowledge and practices related to stingless bee honey production among 253 communities in southwestern and southern Ethiopia, where SBH has strong medicinal, nutritional, and cultural value. Honey harvesting is male-dominated, largely based on traditional knowledge passed down from elders, and relies mainly on wild colonies with minimal domestication. Harvesting methods and seasons vary by region, with most honey collected once annually using squeezing techniques, primarily for medicinal use. Production</p>

<p>Traditional and Ecological Knowledge (true)</p>	<p>Activity 28: Afrotropical Stingless bees illustrate a persistent cultural blind spot in research, policy and conservation Activity 29: Indigenous knowledge-based production practices and utilization of stingless bee honey in communities in humid Afromontane Forest zones of the Southwest and semi-arid forest zone of Ethiopia Activity 30: Beyond Nutrition: a novel hierarchical framework for the study of Traditional Ecological Knowledge associated with Stingless Bee Honeys</p>	<p>volumes differ across zones, and honey is commonly used to treat respiratory and other ailments. The study identifies major threats to stingless bees and highlights the urgent need for training, conservation, and sustainable meliponiculture interventions that integrate indigenous and modern practices. Belay Gezahegn Gebreyes, Zewudu Ayalew Abro, Menale Kaasie, Yetenayet Bekele Tola, Nkoba Kiatoko (2025). Indigenous knowledge-based production practices and utilization of stingless bee honey in communities in humid Afromontane Forest zones of the Southwest and semi-arid forest zone of Ethiopia. <i>Journal of Ethnobiology and Ethnomedicine</i> (under review) Activity 30: Stingless bee honey is a highly valued product in tropical regions, widely used for food and therapeutic purposes, yet traditional ecological knowledge (TEK) remains poorly documented in Africa. This review presents the first global synthesis of TEK related to stingless bee honey, with a focus on its non-food uses. Non-food uses were systematically classified into seven themes, nearly 30 categories, and 90 sub-categories, offering a new analytical framework. The study applied interdisciplinary methods, including diversity indices, to examine the distribution of these uses across regions and cultures. Overall, the review highlights the broad medicinal, cultural, and sustainability roles of stingless bee honey and sets a foundation for future socio-ecological research. Madeleine Héger, Pierre Noiset, Kiatoko Nkoba & Nicolas J. Vereecken (2025). Beyond Nutrition: a novel hierarchical framework for the study of Traditional Ecological Knowledge associated with Stingless Bee Honeys. <i>Journal of Ethnobiology</i> (Under review).</p>
		<p>Mulat Goshu, a male Ethiopian PhD student in Economics, is working on the research topic "The Economics of Integrated Pest and Pollinators Management in Horticulture Production" (ongoing). Imelda Meyo Ma'a, a female Cameroonian MSc student in Animal Production, completed an MSc thesis titled "Caractérisation in vitro du pollen collecté par <i>Apis mellifera</i> (Hymenoptera: Apoidea) en activité dans la zone forestière à pluviométrie bimodale du Cameroun". Walelign W. Wanore, a male Ethiopian PhD student in Entomology, is conducting research on "Investigating the mechanisms of tolerance and resistance in Ethiopian honey bees in Amhara region against the invasive pest <i>Varroa destructor</i> and its associated viruses" (ongoing). Mbatha B. Wambua, a male Kenyan MSc student in Zoology, is studying "Investigating the impact of large hive beetles <i>Oplostomus</i> spp. on managed honey bee <i>Apis mellifera</i> L. colonies in Taita Taveta County, Kenya" (ongoing). Maryanne Waithera, a female Kenyan intern with a BSc in Biotechnology (University of Nairobi), received training in microbiology and molecular biology laboratories. Agnes Mogaka, a female Kenyan intern with a BSc in Biological Sciences (University of Nairobi), received training in microbiology and molecular biology laboratories.</p>

<p>PhD, MSc and Internships training (true)</p>	<p>PhD, MSC and interns</p>	<p>Alemu Tsegaye, a male Ethiopian PhD student in Bee Health, is researching "Host-Parasite-Pathogen interaction in naturally adapted Varroa-surviving Ethiopian honey bees." Pierre Noiset, a male Belgian PhD student in Agroecology at ULB Bruxelles, completed his PhD on "Ecology and evolution of stingless bees: a multiscale approach with an emphasis on the Afrotropics." Belay Gezahegn G, a male Ethiopian PhD student in Food Chemistry at Jimma University, is working on "Stingless Bee Honey (Meliponinae) from the Humid Afromontane Forest of the Southwest and the Semi-Arid Forest of South Ethiopia" (ongoing). Waiganjo Regina, a female Kenyan PhD student in Pollination (Jomo Kenyatta University), is studying "Assessment of diversity of pollinators in strawberry in open field and pollination efficiency of Afrotropical stingless bees" (ongoing). Sileshi Yesera, a male Ethiopian PhD student in Bee Ecology (Bahir Dar University), is researching "Identification and characterization of stingless bees (Hymenoptera, Apidae: Meliponini) in Kaffa Zone, Southwestern Ethiopia" (ongoing). Chloe Salmon, a female Belgian PhD student in Socio-economics at ULB Bruxelles (thesis title not provided). Marcelin Aganze, a male researcher from DR Congo pursuing a PhD in Ecology (University of Nairobi), is studying "Diversity, ecology, and ecosystem services of wild bees in the Kakamega forests of western Kenya" (ongoing). Madelaine Heger, a female Belgian PhD student in Socioeconomics at ULB Bruxelles, is working on "Exploring the dialogue between Western sciences and Indigenous knowledge in the Afrotropics: Honey and its non-food uses" (ongoing). Timothy Kegode, a male Kenyan MSc graduate in Chemistry (JKUAT), completed research on "Phytochemical profile, antibacterial and antioxidant activities of Apis mellifera propolis from selected regions in Kenya." Brenda Atieno, a female Kenyan MSc student in Bioecology (Masinde Muliro University of Science and Technology), is studying "Assessment of pollinator community structure and plant-pollinator interaction networks across habitat types in the Kakamega forest ecosystem" (ongoing). Edith Stacy, a female Kenyan MSc student in Pollination Ecology (Masinde Muliro University of Science and Technology), is researching "Estimating pollination-related yield and deficits across local crops in Kakamega, Kenya" (ongoing). Wendie Kasiera, a female Kenyan MSc student in Biotechnology (JKUAT), is conducting "Comparative analysis of genetic variation in insect species (social and solitary bee pollinators) across different habitats in the Kakamega forest ecosystem" (ongoing). Kivivya Boniface, a female Kenyan MSc student in Zoology (Kenyatta University), is studying "Diversity and composition of insect pollinator communities visiting local crops across agricultural, urban, and forest ecosystems around Kakamega" (ongoing).</p>
---	-----------------------------	---

TOR 3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main focus area for which you were designated

Proposal title	Scope/Content	Applicable Area
Geographic indication for Ogiek honey in Kenya	HonOgiek Project: Launched in April 2023 in collaboration with CIRAD (French Agricultural Research Centre for International Development), this project aims to create a formal GI for Ogiek honey. It involves over 500 bee farmers, including those from the Ogiek and Maasai communities, across Nakuru, Narok, and Kericho counties.	Training and Education

3. In exercising your activities, have you identified any regulatory research needs* relevant for WOA?H?

Yes

Research need 1

Please type the Research need: Stingless bee honey standards and stingless bee hives and hive tools standards.

Relevance for WOA?H Standard Setting,

Relevance for the Code or Manual Code, Manual,

Field Therapeutics,

Animal Category Terrestrial,

Disease:

Kind of disease (Zoonosis, Transboundary diseases)

If any, please specify relevance for Codes or Manual, chapter and title

(e.g. Terrestrial Manual Chapter 2.3.5 - Minimum requirements for aseptic production in vaccine manufacture)

Answer:

Notes:

Answer:

4. Did your Collaborating Centre maintain a network with other WOA?H Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of WOA?H CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Sub-Regional Representation for Eastern Africa,	Nairobi	África	Building capacity on antimicrobial management in Apiculture.
Central Bicol State University of Agriculture (CBSUA), Philippines	Phillipines	Asia y el Pacífico	Participation in The 2025 International Symposium on Stingless Bees (2025 ISSB)

TOR 4 AND 5: NETWORKING AND COLLABORATION

5. Did your Collaborating Centre maintain a network with other WOAHA Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of WOAHA CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOAHA Wildlife Health Collaborating Centre Network Meeting, Spain, 25-27 June 2025	Spain	Europe	Participation in a Network meeting.

TOR 6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOAHA?

Yes

Name of expert	Kind of consultancy	Subject
Dr Beatrice Nganso	Training of Partners	Training on AMR in Bee Keeping
Dr Nelly Ndungu	Training of Partners	Training on AMR in Bee Keeping

TOR 7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

No

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOAHA, to personnel from WOAHA Members?

Yes

a) Technical visit : 2

b) Seminars : 600

c) Hands-on training courses: 5244

d) Internships (>1 month) : 19

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
C	- Training on benefits of integrating beehives into mango production systems - Training on improved pollinator management in the context of horticultural production	Ethiopia	2000
	Geographical Indication of Honey from the Mau Forest: The intervention contributes to co-design and enhances capacity among Ogiek Honey value chain stakeholders at different scales on Geographic indication		

C	(GI). It also contributes to designing and implementing GI workflows for the range of Ogiek honey and promoting conservation of supporting ecosystems. Moreover, the intervention is establishing market linkages and pilot GI implementation for domestic and export markets.	Kenya	30
C	Pollination and ecosystem-based development in Ethiopia; Community-Managed Pesticide Use (CMPU) in Ethiopia; Integration of apiculture into protected public lands endorsed and Private sector strengthened via EADA	Ethiopia	2000
B	The 2025 Youth Learning Summit: On 24 March 2025, ICIPE and the Mastercard Foundation hosted the 2025 Youth Learning Summit in Addis Ababa, Ethiopia. This high-level gathering contemplated the culmination of the MOYESH programme, an indisputable model that has emerged in Ethiopia, resonating with one of Africa's most pressing quests: how to create jobs for the continent's youth while simultaneously tackling a myriad of interconnected complexities.	Ethiopia	300
B	05 February, Addis Ababa, consultation on newly introduced approach 03- 04 March regional stakeholders meeting in Jimma 18 May stakeholders' consultation workshop 20 – 27 November Learning summits in Bahirdar, Assosa and Asayita	Ethiopia	300
C	BRAINS: follow-up and training ToT on the three insect value chains (Fruit, Insect for food and feed, and Honey bees), 12th-20th September 2025	Uganda	85
C	BRAINS: A report for GAC, ICIPE, CIAT visit to potential BRAINS farmers in Kigali Rwanda, 28th April – 1st May 2025	Rwanda	110
C	BRAINS farmers training on the three insect value chains (Fruit, Insect for food and feed, and Honey bees), Muranga county, 2nd to 5th April 2025	Kenya	84
C	BRAINS Project Farmers Training on Nature-Based Insect Technologies, Bomet county. 5th–7th Feb 2025	Kenya	285
C	BRAINS World Bee Day Awareness for meliponiculture and apiculture, Turkana County, 16th to 21st May 2025	Kenya	300
C	Zanbee phase 1 training on value addition of beehive and moringa products 5th - 8th	Tanzania	30

--

	May 2025		
C	FEF Kakamega project training of students and forest rangers on Pollinator Monitoring and Crop Pollination Assessment	Kenya	50
C	Giz project-Training on meliponiculture - Ethiopia - 6th-8th April 2025	Ethiopia	22
C	GIZ training on Meliponiculture - Kenya, 4th -10th November 2025	Kenya	37
C	Topic- Training of youth partners, aggregators, and program team on digital literacy and e-commerce platforms. November 18-December 10, 2025 Bahir Dar, Kombolcha, Arbaminch and Bale Robe Objective: Enhancing the capacity of youth entrepreneurs to effectively use digital technologies for business development and market engagement.	Ethiopia	250
A	Topic- Hands-on training on Advanced Analytical Techniques for Honey Quality Testing 19th – 28th August 2025, Nairobi, Kenya Objective- Enhance knowledge of global honey safety standards and regulations and build technical capacity in sample preparation and instrumental analysis. Provide hands-on training in GC-MS/MS, LC-MS/MS, and ICP-MS for honey contaminant analysis to strengthen participants' understanding of QA/QC protocols, method validation, and accreditation under ISO/IEC 17025, and to improve skills in data interpretation and reporting of analytical results.	Kenya	30
A	Topic- Beekeeping input suppliers business skill training November 4-8, 2025, Objective- The objective of the training was to equip local enterprises with crucial business acumen and technical know-how necessary for sustainable growth and enhanced service delivery within the beekeeping sector.	Ethiopia	7
C	Topic- Hands-on training on methodology and data collection tools to assess colony carrying capacity. July 31st to August 1st 2025 Objective-Equip data collectors with the objectives, approach and data collection tools required to conduct colony carrying capacity assessment.	Ethiopia	25
	Topic- Advanced technical skills, colony		

C	multiplication and postharvest training. Objective-Skilling MaYEA program apiculture officers with advanced technical skills, colony multiplication and postharvest process.	Ethiopia	25
C	Topic- Field testing and user acceptance testing of the National Apiculture Management Information System (APMIS). Objectives- The UAT Training Workshop was designed to verify that APMIS meets specified user needs and performs reliably in field conditions, thereby enabling pilot deployment and acceptance sign-off	Ethiopia	73
C	Topic- Data Analysis and Best Practices Training for MaYEA Program Implementing Partners (April 24-26, 2025) Objectives-The training aimed to equip participants with a comprehensive understanding of quantitative data analysis and coding while enhancing their practical skills in data quality validation, indicator disaggregation, and the use of specialized tools like Kobo Toolbox and Power BI for effective monitoring and visualization.	Ethiopia	32

TOR 8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOA?H?

No

TOR 9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOA?H that may be useful to Members of WOA?H

a) Articles published in peer-reviewed journals:

26

Publications

1. Assefa, F., Belayhun, L., Ayalew, W., ... & Nganso, B. T. (In Press). Honey bee colony loss rates, management practices and risk factors for losses in Cameroon, Kenya, and Ethiopia. *Journal of Apicultural Research*.
2. Belay Gezahegn Gebreyes, Yetenayet Bekele Tola, Kegode Timothy, Indiazi Solomon Chogo, Nkoba Kiatoko (2025). Influence of Environment and Bee Species on the Physicochemical and Biochemical Properties of Stingless Bee Honey from Ethiopia. Under review.
3. Belay Gezahegn Gebreyes, Zewudu Ayalew Abro, Menale Kaasie, Yetenayet Bekele Tola, Nkoba Kiatoko (2025). Indigenous knowledge-based production practices and utilization of stingless bee honey in communities in humid Afromontane Forest zones of the Southwest and semi-arid forest zone of Ethiopia. *Journal of Ethnobiology and Ethnomedicine* (under review)
4. Bobadoye, B., Nganso, B. T., Stuhl, C., Torto, B., & Fombong, A. T. (2025). Chemical Ecology and Management of the Small Hive Beetle, *Aethina tumida* (Coleoptera: Nitidulidae). *Journal of chemical ecology*, 51(1), 16.
5. Chege, M., Wambua, M. B., Kilonzo, W. J., Subramanian, S., & Nganso, B. T. (2025). Seasonal and Landscape-Driven Variations in Forage Resources of *Apis mellifera* scutellata: Implications for Pollination Sustainability and Colony Health in Taita Taveta County, Kenya. *Ecology and Evolution*, 15(7), e71613.
6. Gebreyes, B. G., Teka, T. A., Tola, Y. B., Tamiru, M., & Kiatoko, N. (2025). The Physicochemical Properties, Biochemical Makeup, and health benefits of Honey produced from Stingless bees (Apidae: Meliponini). *Journal of Food Quality*, 2025(1), 7570525.
7. Kamalandua, B. M., Balaga, B., Kiatoko, D., Munday, C. N., Mawete, D. T., Mbungu, P., ... & Mavinga, B. M. (2025). Caractérisation des composés volatils et des polyphénols dans les feuilles et écorce des tiges de *Croton sylvaticus* Hochst (Euphorbiaceae) provenant de la République Démocratique du Congo. *Revue Congolaise des Sciences et Technologies*, 4(3), 536-545.
8. Leyton, M. S., Lattorff, H. M. G., Kiatoko, N., & Requier, F. (2025). Climate effects on honey bees can be mitigated by beekeeping management in Kenya. *Journal of Environmental Management*, 374, 123879.
9. Madeleine Héger, Pierre Noiset, Kiatoko Nkoba & Nicolas J. Vereecken (2025). Beyond Nutrition: a novel hierarchical framework for the study of Traditional Ecological Knowledge associated with Stingless Bee Honeys. *Journal of Ethnobiology* (Under review).
10. Malena Sibaja Leyton, H. Michael G. Lattorff, Nkoba Kiatoko, Fabrice Requier (2025). Climate change may increase colony losses of managed stingless bees in Kenya.

Journal of Environmental and Sustainability Indicators (under second review).

11. Mary Chege, Angelina F. Osabutey, Mbatha B. Wambua, Joseph Kilonzo, James Ng'ang'a Kimani, Beatrice T. Nganso. Increased tolerance to high viral loads mediated by active individual immunity in *Varroa destructor*-resistant *Apis mellifera scutellata* in Kenya. Manuscript under review in *Journal of Invertebrate Pathology*.
12. Mengistu, Binyam Tesfaw Hailu, Temesgen Alemayehu Abera, Janne Heiskanen, Tadesse Terefe Zeleke, Tino Johansson, Kiatoko Nkoba, Juuso Tuure and Petri Pellikka (2025). Climate-smart apiary site selection in East Africa: GIS-based analysis of current and future climate projections. *International Journal of Climate Change Strategies and Management*, Vol. 17 No. 1, 2025 pp. 1243-1270. <https://doi.org/10.1108/IJCCSM-10-2024-0191>
13. Moses Chemurot, Nelly N. Ndungu, Felix Meutchieye, Fiona Nelima Mumoki, Patrice Kasangaki¹, Donald Rugira Kugonza (2024). Apiculture and Meliponiculture Development in Africa. In *Fundamentals of Entomology: A Faculty Manual*. Book chapter title: Apiculture and Meliponiculture. (In press)
14. Nganso, B. T., Agboka, K. M., Atagong, S. D., Topé, S. F., Massing, T., Landmann, T., ... & Guimapi, R. A. (2025). A Geospatial atlas of honey bee forage plants and their distribution patterns in Africa and beyond. *Scientific Reports*, 15(1), 34384.
15. Nganso, B. T., Ayalew, W., Wubie, A. J., Assefa, F., Belayhun, L., Ndungu, N. N., ... & Subramanian, S. (2025). Honey bee colony losses and causes during the active beekeeping season 2022/2023 in nine Sub-Saharan African countries. *PLoS one*, 20(5), e0322489.
16. Nganso, B. T., Eliash, N., Mani, K., Sela, N., Villar-Briones, A., Osabutey, A. F., ... & Soroker, V. (2024). Chemosensory function of *Varroa gnathosoma*: transcriptomic and proteomic analyses. *Experimental and Applied Acarology*, 1-19.
17. Ochola, J. B., Nganso, B. T., Subramanian, S., & Nkoba, K. (2024). Evaluation of volatiles from ethnobotanical plants as attractants for the honeybee swarms in Kenya. *Journal of Applied Entomology*, 148(8), 938-947.
18. Pierre Noiset, Madeleine Henger, Chloe Salmon, Peter Kwapong, Rofela Combey, Kumara Thevan, Natapot Warrit, Marcelo Rojas-Oropeza, Nathalie Cabirol, Carlos Zaragoza-Trello, Claus Rasmussen, Kiatoko Nkoba, Nicolas J. Vereecken (2025). Ecological and evolutionary drivers of stingless bee honey variation at the global scale. *Science of the Total Environment* 969:178945. <https://doi.org/10.1016/j.scitotenv.2025.178945>.
19. Razakamiamanana, A. N., Ihsane, O., Héger, M., Aganze Mweze, M., Karanja, R. H., Randriamalala, J. R., ... & Vereecken, N. J. (2025). Meliponophagy: New records involving native and exotic jumping spiders (Araneae, Salticidae) preying upon stingless bees (Apidae, Meliponini) in the Afrotropical realm. *African Journal of Ecology*, 63(7), e70110.
20. Salifu, D., Chepkemai, L., Ibrahim, E. A., Nkoba, K., & Tonnang, H. E. (2025). Data Augmentation and Machine Learning algorithms for multi-class imbalanced morphometrics data of stingless bees. *Heliyon*, 11(3).
21. Souleymane Koussoubé, Josefa Somé, Adama Kaboré, Apolline Sanou, Karim Ouédraogo, Farûk Koira, Issouf Ouédraogo, Gérald Nana, Frédéric Soubandé, Kiatoko Nkoba, Mamoudou Traoré, Mamounata Bélem, Souleymane Nacro (2025). Honey plant diversity of the stingless bee *Plebeina armata* (Magretti) (Hymenoptera: 2 Apidae) in south soudanienne zone of Burkina Faso. *African Journal of Ecology (second review)*
22. Souleymane KOUSSOUBE; Josefa Somé; Fidèle W. Tapsoba; Timothy Kegode; Farûk Koira; Issouf Ouédraogo; Gérald Nana; Frédéric Soubandé; Kiatoko Nkoba; Mamoudou Traoré; Mamounata Bélem; Souleymane Nacro (2025). Landscape structure influences honey quality parameters of *Plebeina armata* an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso. *Apidologie (under review)*.
23. Taye, B., Abro, Z., Legesse, E. E., Tefera, T., and Kassie, M. (2026). Bee economy: Assessing the National Economic Value of Pollination Services in Ethiopia. Draft manuscript. *Integrated Data and Analytics Platform (IDAP)-icipe*
24. Taye, B., Abro, Z., Tefera, T., and Kassie, M. (2026). Farmers Willingness to pay for managed pollination services in Ethiopia. Draft manuscript. *Integrated Data and Analytics Platform (IDAP)-icipe*.
25. Vereecken, N. J., Héger, M., Aganze Mweze, M., Razakamiamanana, A., Karanja, R. H., Nkoba, K., & Noiset, P. (2025). Afrotropical Stingless Bees Illustrate a Persistent Cultural Blind Spot in Research, Policy and Conservation. *Diversity*, 17(12), 826.
26. Wambua, M. B., Fombong, A. T., Nkoba, K., Onyambu, G. K., Kutima, H. L., Subramanian, S., & Nganso, B. T. (2025). Influence of colony and hive attributes, landscape, and seasonality on occurrence of large hive beetles (Coleoptera: Scarabaeidae) in Taita Taveta County, Kenya. *Journal of Insect Science*, 25(3), 22.

b) International conferences:

1

2025 International Symposium on Stingless Bees, CBSUA, Bicol, Philippines

1) Characterization of honeys produced by sympatric species of Afrotropical stingless bees (Hymenoptera, Meliponini)

Hosea O. Mokaya^{1*}, Kiatoko Nkoba¹, Robert M. Ndunda¹, Nicolas J. Vereecken^{2*}

¹ International Centre of Insect Physiology and Ecology (icipe), Nairobi, Kenya

² Agroecology lab, Université libre de Bruxelles (ULB), Brussels, Belgium

2) Landscape structure influences honey quality parameters of *Plebeina armata* (Magretti) (Apidae: Meliponini) an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso

Souleymane Koussoubé^{1*}, Josefa Somé², Fidèle W. Tapsoba³, Timothy Kegode⁴, Farûk Koira², Issouf Ouédraogo², Gérald Nana², Frédéric Soubandé², Kiatoko Nkoba^{4*}, Mamoudou Traoré¹,

Mamounata Belem¹, Souleymane Nacro¹

¹ Institut de l'Environnement et de Recherches Agricoles (INERA), 04 BP 8645 Ouagadougou 04, Burkina Faso.

² Université Libre de Bruxelles (ULB-Coopération)

³ Institut de Recherche en Sciences Appliquées et Technologies, Ouagadougou, Burkina Faso

⁴ International Centre of Insect Physiology and Ecology (icipe), Po Box 30772-00100, Nairobi, Kenya.

Email: koussolo@yahoo.fr; nkiatoko@icipe.org

3) *Landscape structure influences honey quality parameters of Plebeina armata (Magretti) (Apidae: Meliponini) an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso*

Souleymane Koussoubé^{1*}, Josefa Somé², Fidèle W. Tapsoba³, Timothy Kegode⁴, Farûk Koira², Issouf Ouédraogo², Gérald Nana², Frédéric Soubandé², Kiatoko Nkoba^{4*}, Mamoudou Traore¹, Mamounata Belem¹, Souleymane Nacro¹

¹ Institut de l'Environnement et de Recherches Agricoles (INERA), 04 BP 8645 Ouagadougou 04, Burkina Faso.

² Université Libre de Bruxelles (ULB-Coopération)

³ Institut de Recherche en Sciences Appliquées et Technologies, Ouagadougou, Burkina Faso

⁴ International Centre of Insect Physiology and Ecology (icipe), Po Box 30772-00100, Nairobi, Kenya.

Email: koussolo@yahoo.fr ; nkiatoko@icipe.org

4) *Landscape structure influences honey quality parameters of Plebeina armata (Magretti) (Apidae: Meliponini) an underground nesting stingless bee species in the South-Sudanian zone of Burkina Faso*

Souleymane Koussoubé^{1*}, Josefa Somé², Fidèle W. Tapsoba³, Timothy Kegode⁴, Farûk Koira², Issouf Ouédraogo², Gérald Nana², Frédéric Soubandé², Kiatoko Nkoba^{4*}, Mamoudou Traore¹, Mamounata Belem¹, Souleymane Nacro¹

¹ Institut de l'Environnement et de Recherches Agricoles (INERA), 04 BP 8645 Ouagadougou 04, Burkina Faso.

² Université Libre de Bruxelles (ULB-Coopération)

³ Institut de Recherche en Sciences Appliquées et Technologies, Ouagadougou, Burkina Faso

⁴ International Centre of Insect Physiology and Ecology (icipe), Po Box 30772-00100, Nairobi, Kenya.

Email: koussolo@yahoo.fr ; nkiatoko@icipe.org

5) *Beyond nutrition: a novel hierarchical framework and diversity analysis of Non-Food Uses and Traditional Ecological Knowledge associated with Stingless Bee Honey*

Madeleine Héger^{1*}, Pierre Noiset¹, Kiatoko Nkoba² & Nicolas J. Vereecken¹

¹ Agroecology Lab, Université libre de Bruxelles (ULB), Avenue F.D. Roosevelt 50, B-1050 Brussels, Belgium.

² International Centre of Insect Physiology and Ecology (icipe), P.O. Box 30772-00100, Nairobi, Kenya.

Email: madeleine.heger@ulb.be

6) *Indigenous knowledge-based production practices and utilization of stingless bee honey in humid Afromontane Forest zones of the Southwest and semi-arid forest zone of Ethiopia*

Belay Gezahegn Gebreyes^{1,2, 3,*}, Zewudu Ayalew ABro², Menale Kaasie², Yetenayet B.Tola¹, Nkoba Kiatoko²

¹Department of Postharvest Management, Jimma University College of Agriculture and Veterinary Medicine, P.O Box 307, Jimma, Ethiopia

² International Centre of Insect Physiology and Ecology (ICIPE) Nairobi, Kenya

³ Ethiopian Institute of Agricultural Research, Teppi Agricultural research center, P.O Box 34, Teppi, Ethiopia

Email: bgebreys@icipe.org

c) National conferences:

0

d) Other (Provide website address or link to appropriate information):

0

11. What have you done in the past year to advance your area of focus, e.g. updated technology?

* *Factors for colony loss in Africa assessed at continental level*

* *Stingless bee and Honeybee honey characterized from Africa*

* *New tools and innovations for Bee pest management developed*

* *Significant efforts towards capacity building of stakeholders in Bee keeping and Meliponiculture undertaken.*

* *Significant efforts towards capacity building of research in Africa for Beekeeping undertaken.*

12. Additional comments regarding your report: