



Ministry of Green Economy and Environment

Zambia Integrated Forest Landscape Project

Improving lives through sustainable management of natural resources

BEEKEEPING MENTOR MANUAL



HONEY BEE



Executive Summary

The Beekeeping Mentor and Hive Management Manual, a cornerstone of the Zambia Integrated Forest Landscape Project (ZIFLP), is aimed at fostering sustainable honey production, preserving bee populations, and supporting small-scale farmers in Zambia. The initiative seeks to promote forest conservation, boost economic opportunities for local communities, and access premium export markets. Central to this effort are beekeeping mentors, community members rigorously trained to manage various aspects of hive management, including assembly, harvest organization, quality control, and honey sales to the private sector. Equipped with tools, protective gear, and communication devices, mentors play a pivotal role in ensuring successful apiary management.

Guidelines provided in the manual stress the importance of selecting optimal apiary locations, numbering hives for traceability, securing hives, and monitoring for signs of distress or threats. Quality harvesting methods are outlined, emphasizing grading, packaging, and payment procedures to maintain honey integrity. Incentives, including commissions based on honey yields, motivate mentors and harvesting teams, while comprehensive training empowers the community in sustainable beekeeping practices, maximizing honey production.

Strategic considerations are made to enhance honey production while conserving forest ecosystems. Apiary siting minimizes environmental impact, considering factors like proximity to water sources, avoiding pesticide-treated agricultural areas, and safeguarding wildlife habitats. Emphasis is placed on organic honey production, adhering strictly to guidelines that prohibit fire usage, maintain equipment cleanliness, and establish buffer zones to prevent agricultural chemical contamination. Sustainable harvesting practices, such as leaving sufficient honey reserves for bee colonies, ensure long-term viability.

In sum, the Beekeeping Mentor Training and Hive Management Manual offer a comprehensive framework for sustainable honey production, community empowerment, and environmental stewardship in Zambia's forest landscapes. Leveraging local expertise, fostering stakeholder collaboration, and promoting responsible beekeeping practices, the initiative strives for lasting benefits for both people and the planet.

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1.0 Introduction

The Beekeeping Mentor and Hive Management Manual represents a pivotal initiative within the Zambia Integrated Forest Landscape Project (ZIFLP), aimed at fostering sustainable honey production while preserving vital forest ecosystems. With a dual focus on economic empowerment and environmental conservation, this manual outlines a comprehensive framework for engaging local communities in beekeeping activities, enhancing livelihoods, and safeguarding biodiversity.

By leveraging the expertise of beekeeping mentors selected from within the community, this program seeks to promote modern beekeeping practices, facilitate access to premium markets for high-quality honey, and mitigate threats to bee populations and forest habitats. Through rigorous training, mentorship, and the provision of essential equipment, the manual equips individuals with the skills and resources necessary to effectively manage apiaries, maintain hive health, and ensure the integrity of honey production.

Central to this endeavor is the recognition of the interconnectedness between sustainable beekeeping, forest conservation, and community development. Through strategic apiary siting, adherence to organic production standards, and the implementation of responsible harvesting techniques, the manual underscores the importance of balancing economic objectives with environmental stewardship.

As such, this manual serves as a guiding document for stakeholders involved in beekeeping initiatives within Zambia, offering practical guidance, best practices, and incentive structures to promote the sustainable management of bee populations and forest landscapes. Through collective action, collaborative partnerships, and a commitment to holistic approaches, this initiative aims to foster resilience, prosperity, and ecological integrity within Zambia's forest communities.

2.0 Mentors: Key Roles, Equipment, and Support Structures

Zambia Integrated Forest Landscape Project (ZIFLP) approach is to promote sustainable honey production through the use of modern beehives and support the following objectives:

- Preserve bee populations by using sustainable management practices that prevent deforestation,
- Help small-scale farmers living around the forests earn income from the sale of high quality honey.
- Increase the supply of honey to access better-paying premium export markets in collaboration with the private sector.

The operations are designed to support the conservation of the forests and will be organized around the various roles of beekeeping mentors in the community based led groups (cooperatives) who will maintain a standard of apiary management and quality of honey collected for purchase by the private sector.

A mentor is an individual residing in the area with a demonstrated interest and expertise in beekeeping. Selected by community-led groups following training, examination, and assessment of competence, the mentor assumes various responsibilities within their area, including:

- Assembly of beehives and assistance in suspending them within forest reserves.
- Data collection and compilation regarding hive occupancy, damages, and harvesting outcomes.
- Organization of bucket distribution and provisioning of harvesting inputs.
- Coordination of harvesting activities in teams and supervision of honey extraction.
- Ensuring timely delivery of honey to a central bulking center for storage.
- Supervision of harvesting teams to maintain the quality of honey.
- Adherence to organic standards, ensuring proper labeling of buckets with farmer names, weights, and origins.
- Facilitation of meetings and communication among stakeholders.

2.2 Equipment for the mentors

To enable mentors to effectively carry out their duties, community leaders will supply the following equipment in each designated area:

- JIG: This apparatus facilitates the assembly of hive components.



Fig. 2.1: JIG

- Tools and materials necessary for hive assembly.
- Equipment for suspending and lowering hives.
- Protective clothing and essential beekeeping tools, including smokers.
- Harvesting equipment and stationary.

Community leaders will oversee the delivery of beehives and other necessary equipment to the designated areas. Mentors will then be responsible for distributing this equipment to farmers for use and ensuring its recovery afterward.

1.3. Support Resources and Facilities

Considering the expansive distances within the forest areas where beehives will be positioned, community leaders will supply bicycles to mentors and their assistants during the harvesting period. This provision aims to streamline their movement for effective work execution. However, these bicycles must be returned after the harvest to prevent misuse. Additionally, mentors will be equipped with phones to facilitate the collection of beekeeping-related information. During the harvesting period, mentors will

also receive essential tools such as scales, refractometers, protective clothing, and buckets.

1.4. Mentor Training

Both mentors and their assistants will undergo comprehensive beekeeping training. Mentors will receive instruction in various aspects of beekeeping, encompassing topics such as apiary site selection, methods for attracting bees into hives, hive maintenance, harvesting techniques, grading of comb honey, and proper hygiene practices to prevent honey contamination.

1.5. Mentor Incentives

To incentivize mentorship activities, community-led groups will provide fixed-rate payments for specific tasks performed by mentors, including hive assembly, assisting farmers with hive suspension, and data collection on hive occupancy. These payments will be disbursed upon task completion or at scheduled intervals. Additionally, mentors and their assistants will receive commissions for harvested comb honey, as detailed in Section 4 and 4.1.

3.0 Beekeeping Management Strategy

3.1 Location Selection

An apiary refers to a designated forest area where one or more beehives are maintained, aimed at enhancing the quality of the forest habitat to maximize honey production. Community efforts will ensure that each hive is marked with a unique identification number and designated apiary number. Apiaries may be managed by individual hive owners or in collaboration.

The ideal apiary location is characterized by proximity to trees or flowers abundant in nectar and pollen, typically within a 3-kilometer radius and at least 500 meters away from water sources such as streams or rivers. Avoiding water-logged areas is essential, as excessive moisture can prolong honey ripening time and accelerate hive deterioration. Furthermore, it's imperative to steer clear of agricultural zones where pesticides or chemicals are utilized, as these substances pose a threat to bee health and compromise the organic integrity of honey. A buffer zone of at least 3 kilometers from the apiary should be maintained free from pesticide, fertilizer, or chemical usage.

Positioning hive entrances towards the East or West can potentially enhance honey yields, as bees are believed to commence work early with Eastern exposure and prolong activity with Western orientation. Shading the beehives helps regulate hive temperature, ensuring optimal working conditions for bees.

3.2 Hive and Apiary Numbering

Each hive will be assigned a unique identification number, prominently displayed on the hive itself, facilitating traceability of honey sources by community leaders. Additionally, apiary tags may be affixed to nearby trees for easy identification. GPS coordinates for each beehive will be recorded using smartphones to accurately map their locations.



Fig. 3.1: Numbering of hives! *Numbering is very important for administrative and honey traceability purposes.*

3.3 Suspension of the beehives

Newly installed beehives will be positioned 3 to 5 meters above ground level, utilizing pulleys and ropes for suspension. Mentors will provide assistance to farmers in hanging the hives within forested areas.



The accompanying image depicts a hive suspended at a height exceeding 3 meters.

Suspending hives at considerable heights offers several advantages. It enhances hive occupancy while mitigating potential threats from predators such as honey badgers. Moreover, elevated placement reduces exposure to risks such as fire damage and honey theft.

During the harvesting season, hives are lowered using a pulley and rope system.

Harvesting activities involve a team comprising the mentor, a community member or leader, and the hive owner (farmer). Protective gear, including veils, overalls, gloves, gumboots, and smokers, will be provided to ensure safety during the harvesting process.

3.4 Apiary Monitoring Protocol

Regular inspection of apiary locations is essential, with assessments conducted every fourteen (14) days to ensure the well-being of bee colonies and identify any environmental issues necessitating apiary relocation.

A common issue encountered in apiaries is low hive occupancy or unoccupied hives. To address this, hives should be re-baited every two (2) weeks during March to May and August to October, and monthly during other months.

Other potential problems include honey theft, inadequate hive maintenance, vandalism, honey badger activity, intrusion by ants (both ordinary and red), beekeeper negligence, pest infestations (such as rodents), among others. Mentors are responsible for promptly **identifying these issues and implementing necessary corrective measures.**

4.0 High-Quality Harvesting Procedure

To ensure the integrity of the harvest and preserve bee colonies, the community leaders will oversee the allocation of buckets to a designated bulking center before each harvesting season. Harvesting activities will be conducted solely by community mentors, with farmers prohibited from harvesting from their own hives independently. The

following steps outline the method by which community groups will conduct comb honey harvesting:

- **Formation of Harvesting Teams:** Mentors will assemble teams comprising two or three individuals, including a mentor, a community leader or helper, and the farmer (though the farmer does not receive commission). Each team will be equipped with three sets of protective clothing (overalls, gloves, veils, and gumboots), smokers, buckets, and necessary pulleys and ropes for hive retrieval.
- **Harvesting Process:** The Harvesting Team will extract combs from the hives, grade them, and transfer them into plastic containers with secure lids to prevent moisture absorption and contamination from external sources.
- **Maintenance of Hives:** After harvesting, the team will ensure that hive lids are securely replaced, leaving the hive in good condition.
- **Weighing and Documentation:** The comb honey in plastic containers will be immediately weighed, and the details recorded on a Payment Voucher. The farmer will receive the Payment Voucher indicating the amount due, with full details provided and the farmer's signature required.
- **Labeling and Transport:** The mentor will label each honey bucket with the farmer's name, weight, ID number, hive number, and the name of the grader or mentor. This information will be recorded on masking tape affixed with a marker. Farmers will then transport the comb honey to the bulking center for storage.
- **Payment Process:** Upon completion of harvesting and honey delivery to the bulking center, the mentor will inform the honey buyer. A suitable date will be scheduled for payment and collection of the honey.
- **Payment Criteria:** The private sector will pay premium or market prices per kilogram for high-quality honey, provided that farmers demonstrate effective apiary management and contribute to forest conservation efforts as directed by the community.
- **Purchasing Arrangements:** Purchases will occur in each respective area once all beehives have been harvested, and the honey has been delivered to the bulking center.

5.0 Commission Structure for Mentors

Community leaders will allocate a 10% commission to mentors based on honey yields, with an additional 10% commission allocated to Harvesting Teams. Consequently, a total of 20% commission will be disbursed for every kilogram of honey harvested. Mentors are responsible for organizing the harvest, ensuring sufficient assistance to complete the process within 4-6 weeks.

4.1 Distribution of Commission

For instance, if a mentor harvests 500kg of honey at a price of K14.40 per kilogram, the amount payable to the farmer would be K12 per kilogram. The mentor's commission, calculated at 20% of K14.4 (K2.4), results in K2.2 per kilogram. This amount will be directly paid to the mentor, with each member of the harvesting team also receiving K2.2 per kilogram.

6.0 Honey Collection Procedure in Forest Reserves

The honey collection process will entail the consolidation of comb honey at designated points as identified by community leaders. Mentors and community leaders will serve as focal individuals at these collection points, overseeing the safekeeping of buckets and the grading of comb honey.

Once honey accumulation reaches a recommended critical mass, typically at least 700 kilograms or more, the mentor or community group leader will notify the buyer (e.g., COMACO). The buyer will then arrange for the necessary payment, which will be disbursed on a scheduled date during honey collection at the designated points. All farmers whose beehives have contributed to the harvest must be present to receive their payments.

Buckets should be securely sealed with lids to prevent moisture absorption and contamination by dirt or dust. Community leaders will ensure that mentors accurately label each bucket with the farmer's name, weight, village, hive ID, and grader. Only buckets with correct and legible labeling will be permitted for transportation out of the collection center.

7.0 Strategies for Enhancing Honey Production and Conservation

- **TRAINING:** All farmers receiving beehives will undergo comprehensive beekeeping training (refer to Appendix I for the training curriculum).
- **APIARY SITING:** Utilizing satellite maps and GIS systems, community leaders will identify suitable locations for hives within pristine forest reserve areas with dense tree cover. Hives will be positioned near streams or within 500 meters of water sources.
- **HIVE PLACEMENT:** To prevent overcrowding, a ratio of 7 hives per hectare will be employed in some forest reserve communities to determine the maximum number of hives per site. Apiary sites will adhere to a 6-kilometer exclusion zone between neighboring apiaries in Nyimba-Chakombola and Mwasanika. Alternatively, hives will be spaced 10 to 20 meters apart, depending on forest reserve characteristics.
- No vegetation or land will be cleared at apiary sites except for firebreaks, ensuring the preservation of trees within the forests.
- Apiaries will not be situated in areas of high ecological significance, such as watersheds or animal migratory routes, to minimize disturbance to the environment and wildlife.
- Apiaries will be positioned at least 50 meters away from roads and tracks to mitigate the risk of bee stings to the community and road users.
- Where apiaries are adjacent to roads or tracks, they will be shielded by vegetation to minimize exposure. Apiaries will not be placed near heavily trafficked routes.
- Apiaries will maintain a minimum distance of 100 meters from the nearest buildings, bridges, dams, villages, structures, or community facilities.

8.0 Harvesting Practices for Organic Honey Production

- Only the smoker may be used for lighting fires; any fire residue from the smoker must be fully extinguished before disposal on the land.
- Prior to use in the apiary, protective clothing and equipment must undergo thorough inspection to ensure they are free from debris, dirt, and unwanted organisms.

- Beehives will not be placed within 3 kilometers of high-risk areas of cotton cultivation. Additionally, a buffer zone of 1.5 kilometers near forest reserve boundaries, particularly in areas like Nyimba, will be maintained to ensure the production of pure organic honey. This buffer zone commences 1.5 kilometers inward from the forest reserve boundary, safeguarding bees from chemical exposure associated with agricultural activities conducted around the forest reserve.
- During harvesting, a minimum of 5 to 7 combs will be left in each beehive as a food reserve for the bees. This sustainable harvesting approach prevents starvation of the bees and allows for the buildup of a robust bee population.

APPENDIX: Beekeeping Course Content

No	Major Topics	Sub-topics
1	Bee Biology	<ul style="list-style-type: none"> ✓ The colony ✓ Workers, drones and queens ✓ Duties of the queen, workers and drones ✓ Impregnating of queen swarming ✓ Queenless colony ✓ The unfertilized queen ✓ Bees calendar
2	Beekeeping Technology and Equipment	<ul style="list-style-type: none"> ✓ Types of beehives ✓ Construction ✓ Advantages and disadvantages ✓ Smokers, veils, etc. ✓ Advantages of bee equipments
3	Beekeeping Rural Enterprise Development	<ul style="list-style-type: none"> ✓ Factors considered in starting beekeeping ✓ Apiary site selection ✓ Tree species that favour honey production ✓ Looking after bees ✓ Feeding bees.
4	Hiving of colonies	<ul style="list-style-type: none"> ✓ Use of baiting method ✓ Use of catch box ✓ Use of clustered swarm ✓ Transfer of wild colonies ✓ Hiving by dividing an established colony (colony multiplication). ✓ Uniting a swarm to a colony
5	Factors militating beekeeping Enterprise	<ul style="list-style-type: none"> ✓ Bee predator/ natural enemies/ pests ✓ Natural climatic conditions ✓ Human activities ✓ Poor management of colonies ✓ absconding

6	Common practices in apiary management	<ul style="list-style-type: none"> ✓ controlling swarming to your advantages ✓ hive inspections ✓ Brooding ✓ Formation of a nucleus ✓ Prevention of robbing ✓ Feeding of bees ✓ Watering of bees ✓ Keeping of records ✓ Colony records ✓ Operational records
7	Beekeeping Economy	<ul style="list-style-type: none"> ✓ Community Enterprise i.e. COMACO ✓ Structure of Beekeeping Industry ✓ Market potential ✓ Product from the industry
8	Pollination and bee flora	<ul style="list-style-type: none"> ✓ Foraging flowers for field bees ✓ Shelter establishment ✓ Trees that favour honey production e.g. Acacia species, euc. Spp. ✓ Environmental issues put into considerations ✓ Low frequency use of pesticides
9	Beekeeping pathology	<ul style="list-style-type: none"> ✓ American foul brood (AFB) ✓ European Foul brood (EFB) ✓ Chalkbrood ✓ Nosema ✓ Wax moths ✓ Tracheal mites ✓ Varroa mites