**BEEKEEPING MANAGEMENT SYSTEM**

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**A project proposal submitted to the faculty of Physical Sciences, Engineering and Technology in partial fulfillment of the requirements for the award of Diploma in Information and Technology of Tharaka University.**

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# DECLARATION

I hereby declare that this project is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for a degree or any other award in any other education institution.

Student Name:

………………

Signature:

………………

Date:

……………….

**APPROVAL**

This project was conducted under our supervision and is submitted with our approval as university supervisor.

Supervisor Name: ………….

Signature: …………….

Date: ………….

# DEDICTION

I dedicate this project to the almighty God for giving me strength to do this project. I also dedicate to my beloved parents and I wish to give them a special feeling of gratitude.

I also dedicate this project to my teacher sir Francis who has supported me throughout the process. I will always appreciate all they have done especially for helping develop my technology skills.

# ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my project teacher sir Francis who gave me this golden opportunity to do this wonderful project NEKTA MANAGEMENT SYSTEM as well as helping me in doing a lot of research and came with so many things.

# ABSTRACT

Bee keeping, vital for pollination and honey production, demands meticulous management to ensure colony health, productivity, and sustainability this abstract presents a bee keeping management system, a comprehensive digital tool designed to streamline the management process within apiaries.bms integrates modern technology with traditional beekeeping practices to enhance efficiency, promote data-driven decision-making, and facilitate sustainable beekeeping practices.

The BMS encompasses several key features tailored to address the multifaceted aspects of beekeeping management. It includes modules for hive monitoring, enabling real-time tracking of hive conditions such as temperature, humidity, and weight. Through sensors and IoT devices, BMS provides beekeepers with timely insights into colony health, allowing for prompt intervention in case of anomalies.

Furthermore, BMS incorporates inventory management functionality, simplifying the tracking and replenishment of beekeeping supplies such as frame, feeders, and protective gear. This feature ensures optimal resource utilization and prevents shortages, thereby contributing to operational efficiency.

Another integral component of BMS is its data analytics module, which harnesses the power of big data to analyze hive performance trends, identify patterns, and predict future outcomes.

Moreover, bee farming management system promotes collaboration and knowledge-sharing among beekeepers through its communication platform. Beekeepers can connect with peers, exchange best practices, and seek advice, fostering a supportive community dedicated to advancing beekeeping practices.

In summary beekeeping management represents a paradigm shift in beekeeping management, offering holistic solution to address the challenges faced by modern apiarists. By harnessing technology and data driven insights, bee farming empowers beekeepers to enhance productivity, ensure colony health and promote the long-term sustainability of beekeeping practices.

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# CHAPTER ONE

# INTRODUCTION

# 1.1 Background Information

Beekeeping management systems involve a comprehensive approach to maintaining and caring for bee colonies to ensure their health and productivity. This includes selecting appropriate hive types, such as Langstroth, Top-Bar, or Warre hives, and placing them in optimal locations with good sunlight, minimal wind, and access to water. Regular hive inspections are essential to monitor colony health, detect diseases, manage pests, and ensure the queen's productivity. Effective management also involves understanding bee biology and behavior, maintaining proper nutrition, and employing sustainable practices to support both the bees and their environment. By implementing these strategies, beekeepers can promote robust and productive bee colonies, contributing to pollination and honey production.

Bee keeping management system aim to streamline the management of bee keeping operations by providing tools for tracking hive health, production, and other critical factors.Beekeeping management system offer significant advantages for modern beekeeping, from improved hive health and productivity to efficient management practices.

Beekeeping, also known as apiculture, has been practiced for thousands of years, with evidence dating back to ancient Egypt, Greece, and China. Originally, humans collected wild honey, but over time, they developed methods to domesticate bees and manage colonies more effectively. Modern beekeeping began to take shape in the 19th century with the invention of the movable-frame hive by Lorenzo Langstroth, which revolutionized the industry by making it easier to inspect hives and harvest honey without destroying the colony.

A beekeeping management system encompasses various practices and tools aimed at maintaining healthy bee colonies. Key components include hive management, disease and pest control, and seasonal management. Hive management involves selecting suitable hive types, ensuring proper placement, and conducting regular inspections. Disease and pest control require vigilance and intervention to protect bees from threats like Varroa mites, American foulbrood, and Nosema. Seasonal management entails adjusting practices according to the time of year, such as preparing hives for winter or managing swarming in spring.

Advancements in technology have also influenced beekeeping, with modern beekeepers using tools like hive monitoring sensors, GPS tracking for migratory beekeeping, and data analytics to optimize their practices. Additionally, sustainable and organic beekeeping practices are gaining popularity as beekeepers become more aware of the environmental impacts of conventional methods.

Beekeeping management system in the United States began in the 17th century when European settlers brought honey bees with them. The industry evolved significantly in the 19th century with the invention of the Langstroth hive in 1852 by Reverend Lorenzo Langstroth, which allowed for movable frames and improved hive management. The 20th century saw advancements in queen breeding and disease control, along with the development of migratory beekeeping practices to support large-scale agricultural pollination. Today, the US is a major producer of honey and beeswax, and beekeepers play a critical role in pollinating crops.

Beekeeping management system in the UK has ancient roots, with evidence of honey hunting dating back to prehistoric times. By the medieval period, beekeeping had become an established practice. The invention of the movable-frame hive by Langstroth in the 19th century also impacted British beekeeping, leading to modern management practices. The British Beekeepers Association (BBKA), founded in 1874, has played a significant role in promoting beekeeping education and research. In recent years, there has been a resurgence of interest in beekeeping in the UK, driven by concerns about bee health and the environment.

Beekeeping management system in Japan dates back to ancient times, with traditional practices involving the Japanese honey bee, Apis cerana japonica. Modern beekeeping began in the late 19th century with the introduction of the European honey bee and movable-frame hives. Japanese beekeepers have adapted Western methods to local conditions and have developed unique practices, such as the use of vertical hives. The Japanese Beekeeping Association, established in 1912, has been instrumental in advancing beekeeping through research and education. Japan is known for its production of high-quality honey and royal jelly.

Beekeeping management system in Mexico has pre-Columbian roots, with the indigenous Maya practicing beekeeping using the stingless bee, Melipona beecheii. This traditional practice, known as meliponiculture, is still alive in some regions. European honey bees were introduced by Spanish colonists, and modern beekeeping methods were adopted over time. Mexico is one of the world's leading honey producers and exporters, with a significant portion of honey coming from small-scale beekeepers. The government and various organizations support beekeeping through programs aimed at improving productivity and sustainability.

* 1. **Problem statement**

Beekeeping is a complex and delicate process that involves managing multiple aspects of hive health, honey production, queen health and environmental conditions.Traditional methods of beekeeping rely heavily on manual tracking and observation which can be time consuming and prone to error.A beekeeping Management System can streamline these processes by providing beekeepers with centralized platform to monitor, manage and optimize their beekeeping operations.

The proposed system aims to is to develop an integrated Beekeeping Management System that helps beekeepers efficiently manage their hives, monitor hive health< track honey production, manage queen bees and automated alerts. It will also modernize and streamline beekeeping operations by providing a comprehensive, data-driven platform for hive management. By leveraging technology, beekeepers can enhance their productivity, improve hive health, and ultimately achieve more sustainable and profitable beekeeping practices.

## Objectives

### General Objective

The general objectives of a beekeeping management system are to ensure the health and survival of bee colonies, maximize the productivity of honey and other bee products, and enhance pollination services for agricultural and ecological benefit.

### Specific Objective

1. To provide bees a diversity of natural pollen
2. To provide supplemental feed, especially protein.
3. To sustain beekeeping practices
4. To track cost, revenues and profitability of bee keeping operations
5. To monitor and manage the health and productivity of bee colonies.

## Research Questions

1. What are the most effective methods for controlling Varroa mites and other common bee pests?
2. How do different diseases, such as American foulbrood and Nosema, impact bee colony health and productivity?
3. How can you maximize the production of honey by bees so as to optimally exploit them economically?

## Significance of study

1. Improved Hive Health and Productivity

Continuous monitoring of hive conditions allows for early detection of potential issues, such as pest infections or diseases leading to timely interventions.

1. Efficient resource Management

Automated scheduling and reminders for inspections, feedings, treatments, and other task reduce the risk of oversight and ensure timely maintenance of hives.

1. Enhanced Data Management and Decision Making

Access to accurate and detailed data enables beekeepers to make informed decisions, enhancing overall apiary management and productivity.

## Scope

The scope of a beekeeping management system is comprehensive, covering all aspects of hive and colony management, production tracking, task scheduling, data analytics, and integration with various technologies. By implementing such systems, beekeepers can enhance the efficiency, productivity, and sustainability of their operations.

# CHAPTER TWO

# LITRATURE REVIEW

## 2.0 Introduction

Beekeeping, has been extensively studied due to its critical role in agriculture and ecosystem sustainability. The literature on beekeeping management systems encompasses various aspects such as colony health, productivity, environmental impact, and economic viability.

**2.1** Review of Related Works

**Colony Health and Disease Management**

A significant portion of the literature focuses on understanding and mitigating diseases and pests that threaten bee colonies. Varroa destructor mites are a primary concern, with studies exploring various control methods, including chemical treatments, biological controls, and integrated pest management strategies (Rosenkranz et al., 2010). Research has also delved into the impacts of bacterial and fungal diseases, such as American foulbrood (Paenibacillus larvae) and Nosema, on colony health and productivity (Genersch, 2010; Higes et al., 2008).

**Bee Nutrition and Foraging Behavior**

Nutrition plays a critical role in bee health, with studies highlighting the importance of diverse forage sources and supplemental feeding practices (Brodschneider and Crailsheim, 2010). The availability of pollen and nectar throughout the year has been shown to influence colony strength and honey production. Additionally, research into foraging behavior has provided insights into how bees interact with their environment and the factors affecting their foraging efficiency (Couvillon et al., 2015).

**Queen Management and Breeding**

Effective queen management is essential for colony productivity. Literature on queen rearing techniques and breeding practices emphasizes the importance of genetic diversity and selecting for traits such as disease resistance and high productivity (Rinderer et al., 2010). Studies have also examined the impacts of different mating strategies and artificial insemination on queen quality and colony performance (Tarpy and Page, 2000).

**Environmental and Climatic Impact**

The environmental impact on bee health is a well-researched area, particularly concerning pesticide exposure and habitat loss. Numerous studies have documented the adverse effects of neonicotinoids and other pesticides on bee behavior and survival (Goulson et al., 2015). Climate change is another critical factor, with research indicating shifts in foraging patterns and colony dynamics due to changing weather conditions (Le Conte and Navajas, 2008).

**Pollination Services and Agricultural Impact**

Bees' role in pollination is well-documented, with research highlighting their contribution to crop yields and quality (Klein et al., 2007). Studies have explored the economic value of pollination services and the best practices for managing bees to maximize their effectiveness in various agricultural systems (Garibaldi et al., 2013). The interactions between different agricultural practices and bee health are also a focal point of research (Brittain et al., 2013).

**Sustainable Beekeeping Practices**

Sustainability in beekeeping is an emerging area of interest, with literature exploring organic and natural beekeeping methods (Breeze et al., 2014). These practices aim to minimize environmental impact and promote long-term colony health. Studies have examined the benefits and challenges of sustainable practices, such as the use of natural pest control methods and habitat conservation (Vanbergen and the Insect Pollinators Initiative, 2013).

**2.2**Conclusion

The literature on beekeeping management systems is extensive and multifaceted, covering a wide range of topics essential for the health, productivity, and sustainability of bee colonies. Ongoing research and innovation are crucial to address emerging challenges and to develop more effective and sustainable beekeeping practices. This body of knowledge provides a foundation for beekeepers, researchers, and policymakers to work together in supporting the vital role of bees in agriculture and ecosystems.

**2.3** Conceptual framework

By harnessing the synergies between bees, biodiversity, and community development, beekeeping has the potential to transform rural landscapes and livelihoods. However, realizing this potential requires concerted efforts to address the challenges and barriers that hinder the widespread adoption of beekeeping practices.

# CHAPTER THREE

# METHODOLOGY

1. Introduction

In the methodology section of a beekeeping management system study, approaches and techniques used to gather data, analyze information, and develop or assess the system are discussed. The methodology chapter focusses on explaining how the research was conducted and ensures that the findings are reproducible and valid.

**Overview of Methodology**

* **Purpose**: Explain the objective of the methodology section, which is to describe the procedures and techniques used to investigate and develop the beekeeping management system.
* **Scope**: It outlines the scope of the study or project, including the key areas of focus such as data collection, system design, and evaluation.
  1. **Research Design**
* **Approach**: It describes the overall research approach (e.g., qualitative, quantitative, mixed-methods) and justify why this approach was chosen.
* **Framework**: It explains the theoretical or conceptual framework guiding the research. This might include models or theories related to beekeeping management and technology.
  1. **Target population**

The “targeted population" typically refers to the specific group or groups of individuals or entities that a beekeeping management system or study aims to address or benefit. Identifying and understanding the targeted population helps ensure that the system or research meets their needs and addresses relevant issues. The targeted population in beekeeping can be featured as follows:

* + 1. **Beekeepers**
* **Commercial Beekeepers**: Large-scale beekeepers who manage multiple hives and are involved in honey production, pollination services, and other bee-related enterprises.
* **Small-Scale or Hobbyist Beekeepers**: Individuals who keep bees on a smaller scale for personal interest, honey production, or local pollination.
  + 1. **Beekeeping Organizations**
* **Professional Associations**: Organizations that represent the interests of beekeepers, provide training, and advocate for beekeeping practices (e.g., American Beekeeping Federation).
* **Local Beekeeping Clubs**: Community-based groups that offer support, resources, and networking opportunities for beekeepers.
  + 1. **Agricultural Stakeholders**
* **Farmers**: Individuals and businesses involved in crop production who rely on pollination services provided by beekeepers to enhance crop yields.
* **Landowners**: Those who manage land where beekeeping occurs and may be involved in decisions affecting bee habitats.
  + 1. **Researchers and Academics**
* **Entomologists**: Scientists specializing in the study of insects, including bees, who are interested in beekeeping practices and bee health.
* **Agricultural Researchers**: Researchers focusing on the intersection of agriculture and beekeeping, including studies on pollination and crop management.
  1. **System Design and Development**
* **Development Process**: Describe the process used to design and develop the beekeeping management system. This might include requirements analysis, system architecture, and development phases.
* **Technology and Tools**: Detail the technologies and tools used in the development of the system (e.g., programming languages, software platforms, hardware).

## Data collection methods and tools.

**Field Observations**

* Direct Observations, regular inspections of beehives to monitor bee activity, hive conditions, and signs of disease or pests.
* Checklists, use of standardized checklists to record observations systematically.

**Surveys and Questionnaires**

* Beekeeper Surveys: Gathering information from beekeepers about their practices, challenges, and needs through structured surveys.
* Pest and Disease Reports: Collecting data on pest outbreaks and disease prevalence from multiple beekeepers or regions

**Digital Tracking**

* Mobile Apps: Using smartphone applications to record hive data, track bee activity, and manage beekeeping tasks.
* Wearable Sensors: Employing devices worn by beekeepers to monitor environmental conditions and hive metrics in real time.

**Sensor Technology**

* Hive Sensors: Installing sensors inside hives to collect data on temperature, humidity, and hive weight.
* Environmental Sensors: Placing sensors around hives to measure external conditions like temperature, humidity, and air quality.

**Software and Applications**

* Beekeeping ManagementSoftware: Tools like HiveTracks, Bee Plus, or Apiary Book that allow beekeepers to manage hive data, track inspections, and analyze trends.
* DataAnalysisSoftware: Programs such as Excel, R, or SPSS for analyzing collected data and generating reports.

**Sensors and Devices**

Temperature and Humidity Sensors: Devices that monitor and record internal and external environmental conditions.

Weighing Scales: Scales designed for hives to track changes in hive weight, which can indicate honey production and colony health.

Microphones: Acoustic sensors to monitor bee activity and detect sounds related to hive health.

**Data Storage and Management**

Cloud Storage: Using cloud-based solutions for storing and backing up data collected from beekeeping management systems.

Database Systems: Implementing databases to organize and manage large volumes of data efficiently.

**Communication Tools**

IoT Devices: Internet of Things (IoT) devices for real-time data transmission and remote monitoring.

Networking Solutions: Tools for connecting various sensors and data sources within the beekeeping management system.

## Data Analysis

Data analysis in a beekeeping management system involves systematically examining collected data to optimize hive management and enhance productivity. By employing techniques such as descriptive statistics to summarize key metrics, comparative analysis to benchmark performance, and predictive modeling to forecast future trends, beekeepers can gain actionable insights into hive health, productivity, and bee activity. Tools like Hive Tracks and Bee Plus facilitate data tracking and visualization, while advanced software such as R and Python enables deeper statistical analysis. Effective data analysis not only helps in identifying trends and correlations but also supports decision-making by providing clear, actionable insights that can improve hive management practices and address emerging issues.

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**Questionnaire**

In order to get more information, we decided to prepare some questionnaire that would help uncover some classified information

1. How long does take to process ordered honey?

1 hour several hours

2 hours

Several days

1. How do you find it managing several orders?

Easy Hard

1. How often do errors occur during data processing?

Very often often

Not often not at all

|  |  |  |  |
| --- | --- | --- | --- |
| MAINTANANCE AND RUNNING COST | | | |
| EXPENDITURE ON | | EXPENDITURE ON | |
| MANUAL SYSTEM PER MONTH | | COMPUTERISED SYSTEM PER MONTH | |
| Maintenance | 15000 | It specialist | 10000 |
| Farm implement | 12000 | computers | 11000 |
| Cash books | 7000 | Database administrators | 5000 |
| Files | 19000 | computers | 10000 |
| TOTAL EXPENDITURE | KSH =53,000 | TOTAL EXPENDITURE | KSH= 36000 |

|  |  |
| --- | --- |
| ACTIVITY | DURATION |
| System Analysis | 4 weeks |
| System Designing | 8 weeks |
| System Coding | 8 weeks |
| System Testing | 4 weeks |
| System implementation | 4 weeks |
| TOTAL | 28 weeks (4 months) |