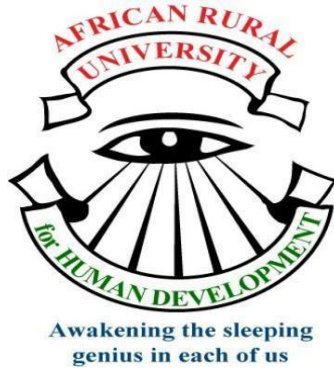


AFRICAN RURAL UNIVERSITY



FACULTY OF TECHNOLOGY FOR RURAL TRANSFORMATION

**END OF YEAR THREE FIELD ATTACHMENT TWO REPORT CONDUCTED AT
RWEBITABA ZONAL AGRICULTURAL RESEARCH AND DEVELOPMENT
INSTITUTE IN KYEMBOGO VILLAGE, BUSORO SUB-COUNTY KABAROLE
DISTRICT**

BY

BUKIRWA DIMINTIRIA

REG NO. 21/ARU/BSSA/004

**A FIELD ATTACHMENT REPORT SUBMITTED TO THE FACULTY OF
TECHNOLOGY FOR RURAL TRANSFORMATION IN PARTIAL FULFILMENT FOR
THE AWARD OF A DEGREE OF BACHELOR OF SCIENCE IN SUSTAINABLE
AGRICULTURE OF AFRICAN RURAL UNIVERSITY.**

SEPTEMBER 2024

Declaration.

I BUKIRWA DIMINTIRIA, declare that this report is an original copy of my activities done during my field attachement conducted at Rwebitaba Zonal Agricultural Research and Development Institute (RWEBITABAZARDI) NARO. I declare that it has never been submitted to any university or institution for the award of a Bachelors Degree, Diploma or any other qualification.

Signature

.....

BUKIRWA DIMINTIRIA

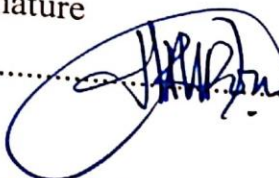
Date... 02/10/2024

Approval

This is to certify that BUKRWA DIMINTIRIA had a month of field attachment training at Rwebitaba Zonal Agricultural Research and Development Institute and this is a true record of what she was able to be involved in and do under our supervision.

Agency Supervisor

Signature



Mugume Ronald



Date.....14. 10. 2024

University Supervisor

Signature.....



Dr. Moses Kanyambindwa

Date.....



Dedication.

With special feeling of gratitude, I dedicate my dissertation work to my loving parents Mr. Mukalazi Francis and Nasande Mary and also my siblings for the love and care you gave me. My field and academic supervisors Mr. Mugume Ronald and Dr. Moses Kanyambindwa respectively and also Mr. Jackson Kusiima and Mr. Tibeingana Denis for your words of encouragement and push for tenacity ring in my ears.

Acknowledgement.

With so much pleasure am very grateful to people who contributed to my academic excellence by supporting me in everything during my field attachment for a period of one month.

First and foremost, my academic supervisor Dr. Moses Kanyambindwa who guided me academically and also gave me guidance and counselling that helped me to stay focused so that i can fulfill my obligations as a student.

Secondly, the staff and management of RWEBZARDI especially Mr. Mugume Ronald who was my field supervisor, Mr. Innocent Gumaoshabe, Peter Ssenyonga, and other staff members who guided me so that I accomplish my field attachment.

I dedicate this field report to my beloved family members especially my father Mr. Mukalazi Francis, my mother Mrs. Nasande Mary who gave me parental love and also supported me financially, my dear brothers and sisters, friends more especially Kevin and Loyce for their moral and financial support towards the completion of this field attachment.

List of Acronyms.

Rweb ZARDI: Rwebitaba Zonal Agricultural Research Development Institute.

NARO: National Agricultural Research Organisation

ARU: African Rural University

URDT: Uganda Rural Development and Training Programme

TRIEA: Tea Research Institute of East Africa

NARS National Agriculture Research System

NaCRRI: National Crops Resources Institute

WHAZ: Western Highlands Agro-Ecological Zone

NGO: Non-Governmental Organization

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Abstract.

The field attachment at Rwebitaba Zonal Agricultural Research and Development Institute ZARDI commenced on 06/08/2024. The one-month practical experience, fulfilling 40% of the course's practical component, provided insight into various enterprises within the institute. The attachment involved extensive engagement with activities across different programs, including crop and natural resource research, animal resource research, technology promotion and outreach research programs.

Throughout the attachment period, diverse activities were undertaken, encompassing pasture identification and pasture management, agroforestry, tea production, potato harvesting and seed trials, banana management, apiculture, aquaculture, and livestock production. The experience did not only deepen my theoretical knowledge but also provided practical exposure, contributing to a well-rounded understanding of agricultural practices and research methodologies. The field attachment concluded on 06/09/2024, marking the successful completion of this hands-on learning opportunity.

CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

This chapter stretches the back ground of field attachment, back ground of African Rural University (ARU) and Rwebitaba Zonal Agricultural Research Development Institute (RwebitabaZARDI), purpose of field attachment, objectives and the scope of field attachment.

1.1 Back ground of ARU

African Rural University (ARU) is a value-based, all-women university that creates a discipline of professional rural transformation specialists: change-makers and agents that work within the African development context. African Rural University's graduates call for a re-orientation of the mindset and generate energy around visions and possibilities, rather than problem-solving. The graduates enable the rural people to move from dependency to independency to sustainability and interdependency, Ubuntu: I am because you are, hence we care for self, others and our mother earth.

The University has a strong foundation: 25 years of successful rural development work by the Uganda Rural Development Training Programme (URDT). An indigenous non-governmental organization (NGO) that founded ARU. The 1987 Articles of Association mandated URDT to establish a rural university “comprising disciplines which develop the full potential of the people, especially the young, to strengthen the social and economic structures at the rural and national levels”. URDT is a close partner to ARU in participatory action research, placements of students in rural communities and advocating for the African Renaissance. The preparations for ARU started in 2002 and the co-creating process involved multiple teams and diverse stakeholders.

1.1.2 Back ground of the course.

The Bachelor of Science degree in Sustainable Agriculture is a comprehensive program that integrates technical, natural, economic, and social sciences. This interdisciplinary approach equips students with a holistic understanding of the management and conservation of the natural resource base. The program is designed to orient technological and institutional changes, ensuring the fulfillment of human needs for both current and future generations.

A central focus of the program is to instill environmentally friendly agricultural practices, addressing the escalating global demand for food while concurrently prioritizing the conservation of ecosystems. Graduates from the Bachelor of Science in Sustainable Agriculture program are expected to possess in-depth knowledge, practical skills, and valuable experiences in sustainable soil, land, and water management. This expertise is aimed at enhancing agricultural production and productivity in a manner that is both environmentally conscious and socially responsible. The program thus prepares individuals to contribute to the sustainable development of agriculture, meeting the needs of the present without compromising the ability of future generations to meet their own needs.

1.1.3 Background of Field Attachment.

At the end of second and third years of study, students who successfully complete four/six semesters are sent to the field; during which they are introduced to various firms/farms and organizations to learn practical skills in the modern agriculture technologies, extension work, program development and firm management at different levels. Outreach will acquaint learners with interpersonal relationship with the farming communities and rural sociological principles and approaches. The one month of field attachment was carried out to fulfil the ARU requirement of 40% practical and 60% theory. The 40% practical is fulfilled through project work, student participation in area of placement which was at Rwebitaba Zonal Agricultural Research Development Institute supervised by the field supervisor who was Mr. Mugume Ronald and the university supervisor who was Dr. Moses Kanyambindwa with the help of the epicenter manager.

1.1.4 The objectives of the field attachment

- Develop skills in the application of theory to practical work situations.
- Acquaint the learner with skills and knowledge to devise a sustainable farming technology that will be disseminated for adoption by the local farmers to address their needs.
- Test the students' aptitude for a particular career before permanent commitments are made.
- Develop skills and techniques directly applicable to their careers.
- Enable students acquire good work habits.
- Enable the student a systematic needs assessment of a farm and identify real life problems in the local farming communities.
- Equip the student with a hands-on practical farming to appreciate and transform theory into practice.

1.2 Back ground of Rwebitaba ZARDI

RwebitabaZARDI, originally established in 1960 as a Tea Research Centre, emerged as the main tea breeding station for the Tea Research Institute of East Africa (TRIEA). However, the collapse of the East African Community in 1977 led to the cessation of research activities in Uganda, with TRIEA discontinuing operations in 1978. Subsequently, Rwebitaba came under the administration of the Ugandan Government.

With the enactment of the National Agriculture Research System (NARS) Act in 2005, the National Crops Resources Institute (NaCRRI) assumed control of Rwebitaba in 2007, aiming to revive tea research in Uganda. In July 2011, NARO declared Rwebitaba a full-fledged institute for the Western Highlands Agro-Ecological Zone (WHAZ), encompassing several districts in the region.

RwebitabaZARDI is one of nine zonal agricultural research and development institutions established under the 2005 parliamentary act, guided by NARO's policy framework. RwebitabaZARDI addresses agricultural challenges specific to the western highlands of the agro-ecological zone. The other eight ZARDIs are located in in different agricultural zones and include; MbaZARDI in Mbarara, BugiZARDI in Bulambuli, BuZARDI in Hoima,

KachwekanoZARDI in Kabale, AbiZARDI in Arua, MuZARDI in Mukono, NgeZARDI Lira, and NabwinZARDI in Moroto.

Operating in two stations, namely the Rwebitaba tea research center in Kyenjojo and Kyembogo station in Kabarole district, the institute officially began operations in October 2011. Its primary role is to serve as a zonal entity, focusing on applied and adaptive agricultural technology development and dissemination to various stakeholders in the Western Highlands Agro-Ecology Zone.

1.2.1 Vision

To improve the livelihoods and income of resourceful poor farmers through generation the dissemination profitable and sustainable technologies for improved productivity of the farming systems in the WHZ.

1.2.2 Mission

To improve agricultural productivity of farming communities of WHZ by conducting and disseminating appropriate demand driven and market responsive strategic and adoptive and applied research while enabling sustainable natural resource management.

1.2.3 Goal

To enable NARO to respond and contribute to sustainable agricultural productivity by conducting relevant research that will enhance economic growth, food security and poverty eradication in the WHZ.

1.2.4 Mandate of Rwebitaba ZARDI

To conduct demand driven and market responsive applied and adaptive research in crops, livestock, aquaculture, meliponiculture and apiculture to develop appropriate technologies for dissemination to update pathways.

1.3 Location of organization in which internship was conducted.

The RwebZARDI is located in Kyembogo village, Busoro sub-county, Kabarole district, Kijura road, 12km from Fort portal city. The study area is characterized by bimodal rains with two seasons; first season: March to June, second season: August to December with average rainfall of

1,623mm. The average temperature is 20.2 C° with humidity of 77% (Rwebitaba Metrological Weather Station, 2021).

1.3.1 Fig 1. Map showing the location of Rwebitaba ZARDI in Kabarole District

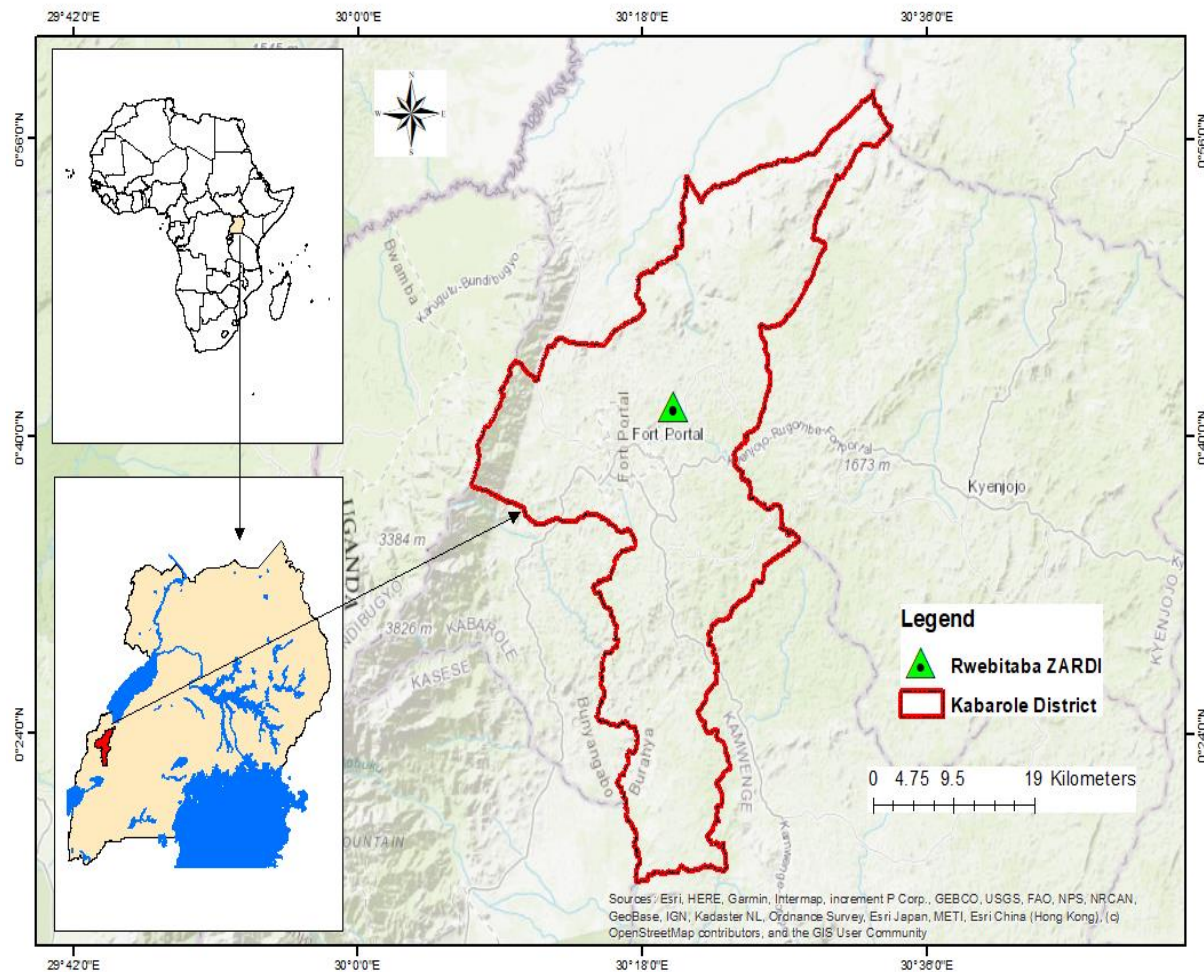


Figure 1.

1.4 Core functions of RwebitabaZARDI

To comprehend constraints, opportunities and component interactions in the farming system of Western Highlands Agro-ecological Zone.

- To conduct basic, applied and participatory adaptive research and generate appropriate technologies for dissemination to uptake path-ways.
- To provide and process feedback between farmers, researchers, extension staff and other partners in order to identify and respond to zonal specific and emerging production and marketing constraints.
- To contribute to multiplication of foundation seed for distribution to farmers and other research partners.
- To generate and disseminate tea technologies country-wide.
- To establish and strengthen collaboration and linkages in order to exploit synergy in research and uptake of technologies.

1.5 Target population

The target population of RwebitabaZARDI is the Western highland agro-ecological zone that comprise of the nine districts namely, Bundibugyo, Kyegegwa, Kabarole, Bunyangabo, Kamwenge, Kasese, Kyegegwa, Kyenjojo, and Ntoroko including the national mandate of Tea reach.

1.6 Products/ services offered by the organization

The products offered by the organization are got from different enterprises and they include honey, propolis from bee keeping, well improved and planting materials and breeds plus technical back stopping and that under takes applied and adaptive agricultural technology development and dissemination to different stakeholders in the western highlands agro-ecological zone.

1.7 Source of Funding

RwebitabaZARDI is funded by the government of Uganda, competitive proposal writing, grants and from the non-tax revenue collected and then ploughed back in research including other activities.

1.8 Organizational and Management structure of Rwebitaba ZARDI

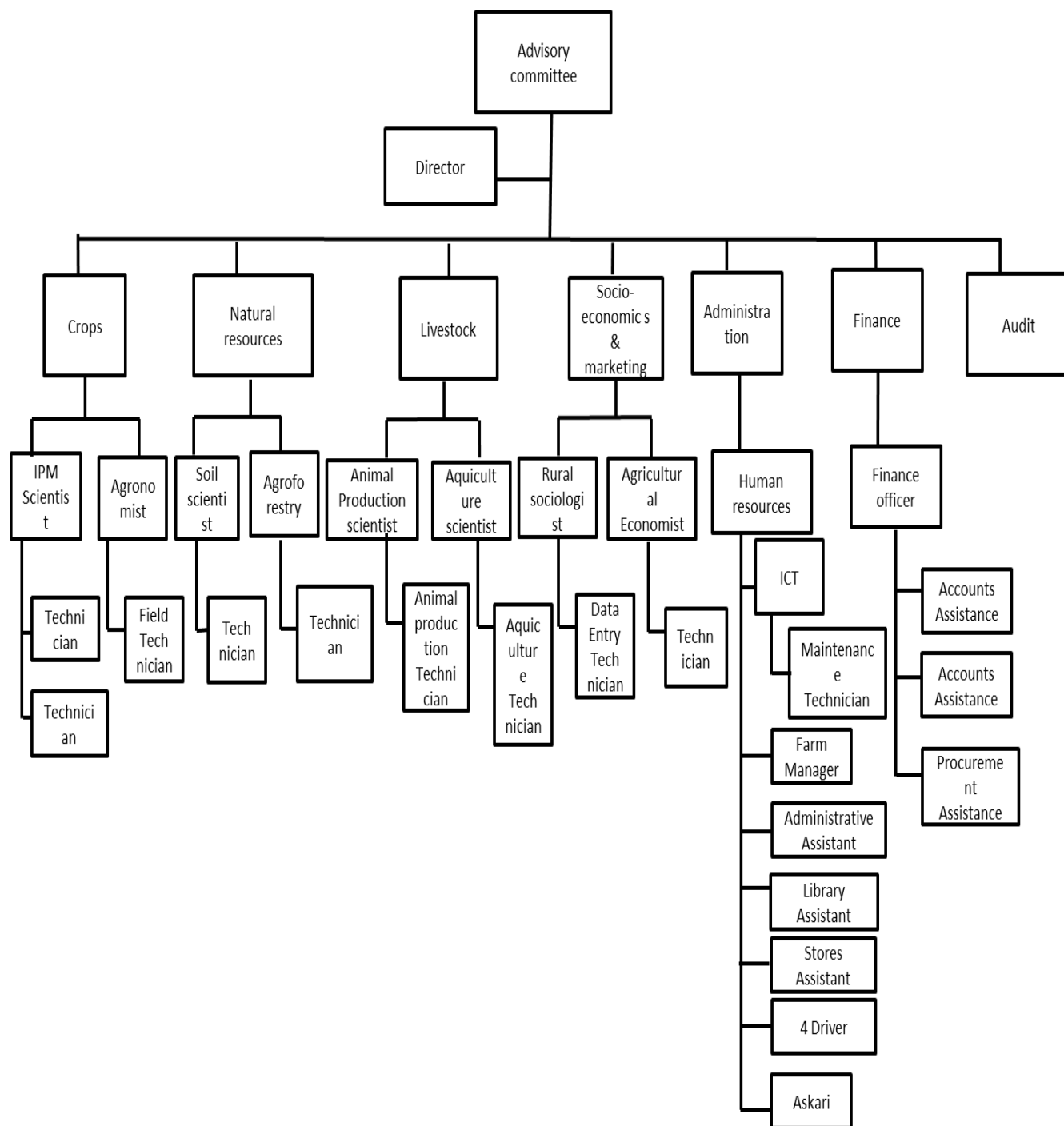
The management structure comprises 35 staff members. Among them include 12 research scientists, 9 research technicians, and 14 support staff

1.8.1 Human Resources

The Human Resource and Administration section serves as the coordinating hub for planning human resource and administrative activities within the organization. This encompasses crucial functions such as staff recruitment, worker training, welfare management, corporate responsibility, and ensuring ethical practices aligned with job descriptions and specifications. At the helm of this section is the Human Resource and Administrative Officer.

The team responsible for human resource and administration consists of key roles, including the Finance Officer, Accounts Assistants, Cashier, Procurement Officer, Internal Auditor, Inventory Officer, and locally recruited staff. Together, they work collaboratively to streamline and oversee various aspects of organizational management, ensuring a well-functioning and ethical work environment.

1.8.2 Organisation structure RwebitabaZARDI



1.9 Research programs at RwebitabaZARDI

RwebitabaZARDI has three programs offered which include,

- Crop and natural resource research program
- Animal resource research program
- Technology promotion and outreach research Program

Crop and natural resource program.

This section covers research and improvement on different crop varieties and seed multiplication. Research and multiplication is done on crops like cassava, potatoes, seed maize, beans and soya bean, banana sucker multiplication, different vegetable crops such as cabbages and tomatoes. The research is headed by an agronomist (agronomy scientist) supported by a technician and a volunteer.

Tea research project

As earlier on said that RWEBZARDI was originally into tea research, the organization therefore still holds a national mandate to conduct research in tea and this is in a special way conducted from Rwebitaba Kyenjojo Tea Research Station (TRC). The organization conducts research about different pests, pathogens and diseases that infest and infect tea forests and how susceptible or resilient the tea plants are. The research also goes to identifying the different tea clones and how they suit geographically, breeding tea clones, to mention but a few.

Agroforestry project

This section entirely looks at conserving the environment the different tree species and varieties. Tree fruits such as avocado and in here are HASS Avocado variety, mangoes, apples, oranges are bred and managed. The indigenous tree species such as Mvule, musisi, mahogany also

conserved. Coffee plants are also bred and managed. Grafting is always done to improve the traits of the different tree species for instance to improve the fruit sizes, to attain shorter fruit trees for easy harvesting among others.

Animal resources research program.

Under this Programme there are projects such as, the livestock project, aquaculture specifically fish farming in ponds and harpers and apiculture projects are implemented at the institute.

The livestock project.

Research on livestock animals particularly cattle and goats is done and the breeds are the cross breed of cattle and Boer goat is done. Improved pasture varieties are also grown both leguminous and grass pastures for instance alfalfa, *calliandra calothyrsus*, *sesbania sesban*, lablab, green leaf desmodium, silver leaf desmodium, centrosema for the legume pastures and chloris gayana, Napier grass, NARO napier, sugar napier, Branchiaria, kikuyu grass, for the grass pastures. This is entirely to improve nutrition of the livestock to increase their yields in form of milk production for the dairy cattle and meat for goat. . The section is headed by a research officer who is also an animal health scientist/ head of program animal resources.

Apiculture project

Research in apiculture is to investigate the appropriate technologies for increased apiculture production in the zone. Efficiency of different bee hives (KTB, Langstroth bee hives, Log bee hives, Weaved bee hives) on colonization and honey yield looking at quality and quantity, both on-station and on-farm. This investigation is being undertaken in different districts of the WHAZ. Different types of bee forage (*calliandra calothyrsus*, *ocimum species*, and *citrinus carlistermons*) being evaluated on suitability, nectar and pollen production. The project has more activities in stingless bees. Apiculture project is actively involved in research project titled “Domestication of stingless bees in Uganda”, this project intends to identify, multiply, domesticate, characterize stingless bees, developed high value stingless bee products, design appropriate hive technologies, design protocols of harvesting stingless bee products, evaluate which stingless bee species is good for which product and commercialize stingless in Uganda.

The section is headed by the apiculture scientist who is also the director of research, and with the support of the apiculture technician and a volunteer is also attached on this project where i spent most of my time engaged.

Fisheries and aquaculture project

Basic, applied and adaptive research is being carried out to generate appropriate technologies to improve fish production in the WHAZ. On-going data collection on feeding strategies, fish breeding and establishment of base population of pure lines of Nile tilapia in earthen ponds to improve fish production in the zone. On-station fish breeding in earthen ponds is carried out under seed multiplication to avail quality seed to fish farmers who lack access to quality stock in the zone. The section is headed by the Aquaculture Scientist assisted by the Aquaculture technician, all under the head of program Livestock research resources program.

Technology Promotion and outreach Programme

This Programme is responsible of taking out the generated technologies to final beneficiaries for adoption; it looks at socio-economics, social cultural aspects of the communities on the technologies and trends in the WHAZ. It links up different stakeholders in agricultural socio-economic related activities. These include; policy formulation, gender issues, social issues, marketing of agricultural produce and the trend of commodities in the market, value chain analysis and conducting farming systems and livelihood surveys for all the units. This is headed by the socio-economist scientist assisted by a rural sociologist.

CHAPTER TWO

INTERNSHIP EXPERIENCE.

2.0 Introduction.

This chapter reviews the management of the internship exercise, the field attachment plan, the organization and its role, duties performed in area of placement and the status and roles of the field and the university supervisor.

2.1 Organization of the field work.

The field internship attachment at RwebitabaZARDI started 06/08/2024 which was the day of the arrival and the following day I engaged in different activities on the farm. In partial fulfillment of the course I got involved in a variety of activities within one month period and increase perfection by doing what I studied theoretically to practical which helped me to acquire more knowledge and skills from different enterprises and the activities engaged in include pasture management, agroforestry, potato harvesting, banana management, apiculture, aquaculture and livestock production

2.2 Organization and its role.

Rwebitaba ZARDI has three programs offered which are crop and natural resource research program, animal resource research program and technology promotion and outreach research Programme.

Crop and Natural Resource Research Program

This section is responsible for carrying out research on the genesis and classification on crop soil and other natural resources. Understand crop production the enterprises at Rwebitaba ZARDI include banana production, coffee production, Irish and sweet potato production, bean and soya bean production, cassava production, tea, maize production and agroforestry.

Animal Resource Research Program

This program is responsible for providing high quality animal care services and facilitates to improve animal research and ensure the health and the welfare of animals. At RwebitabaZARDI, the enterprises under animal production include cattle production, goat rearing, pasture production, aquaculture and apiculture.

Technology Promotion and Outreach Research Program

This program aims at supporting the mult stake holders' innovation platform around seed production through training in different aspects like agronomy, quality control, post-harvest handling, marketing and group management. Under this program, the services provided by RwebitabaZARDI include provision of seeds to farmers, field study by students, refugee project and partnership with other organizations.

Rwebitaba ZARDI's score function is to comprehend constraints, opportunities and component interactions in the farming system of Western Highlands Agro-ecological Zone. And its objectives are;

- To conduct basic, applied and participatory adaptive research and generate appropriate technologies for dissemination to uptake path-ways.
- To provide and process feedback between farmers, researchers, extension staff and other partners in order to identify and respond to zonal specific and emerging production and marketing constraints.
- To contribute to multiplication of foundation seed for distribution to farmers and other research partners.
- To generate and disseminate tea technologies country-wide.

- To establish and strengthen collaboration and linkages in order to exploit synergy in research and uptake of technologies.

2.3 Status of the field supervisor

Mr. Mugume Ronald was my field supervisor and he is an apiculture scientist

The following are the roles the field supervisor.

- Develop learning objectives and goals with the students
- Monitor the intern students to ensure students accomplish the assigned duties.
- Evaluate student's progress and provide feed back

2.4 Status and role of the field supervisor

Dr. Kanyambindwa Moses is a lecturer in the agriculture department and the following are his roles

- Evaluate and examine students' academic progress
- Give instructions and encouragement in the research activities.
- Serve as mentor to students by guiding them

2.5 Roles as a student

- Engage in the activities assigned to
- Net working with professionals in different enterprises
- Gaining professional experience in the field
- Learning different services in the field

CHAPTER THREE

FINDING AND OBSERVATIONS

3.0 Introduction

This chapter comprises of, the enterprises engaged in during field attachment and their description, experience and knowledge gained, personal contributions and the problems encountered. The methods used during field attachment at Rwebitaba ZARDI were hands on, observation, lectures, outreach and extension, and participatory action research. These methods were employed in activities like banana production, potato production, aquaculture, apiculture animal production among others.

3.1 ACTIVITIES CARRIED OUT

3.1.1 Animal management.

Livestock refers to the domesticated animals raised in agricultural setting in order to provide labor, milk, meat, fur, wool among others. At Rwebitaba ZARDI, the enterprises under animal production include cattle production, goat rearing, pasture production, aquaculture and apiculture. Livestock management refers to series of activities carried out on an animal farm to increase their level of production in areas of nutrition, housing and infrastructures, breeding and health. Nutrition constitutes 65% productivity, housing and infrastructures 15%, breeding 15%, health 5% and production 5%. Nutrition is the main principle in animal production and the nutritional requirements are proteins which are body building feeds, carbohydrates energy source and vitamins boost the body immunity.

The following animal management practices were carried out at RwebZARDI.

3.1.1.1 Ear tagging

Ear tagging is a method used to identify livestock animals by attaching a tag to their ear. This tag typically contains a unique identification number, which helps farmers, researchers, or wildlife managers keep track of individual animals for management, breeding, or research purposes. The ear tags used were Rweb 28,29,30,31 and 32.

The process followed when carrying out ear tagging Ear Tagging at Rweb zardi

1. Preparation: this included Selection of the appropriate ear tag size and the animal to be tagged. The tagging equipment were cleaned to prevent infections and five animals were selected from the heard.
2. Restrain the Animal: Safely the animals were restrained to minimize stress and movement during the tagging process and it was particularly done to larger animals using a crush and halter.
3. Choose the Tagging Spot: Selection of the correct position on the ear was done where by the tag was placed in the middle of the ear between the cartilage ribs to minimize discomfort and avoid interfering with ear growth.
4. Apply the Tag: Loading the ear tag into the tagging applicator and then positioning the applicator over the chosen spot on the ear and pressing firmly to attach the tag.
5. Setting the animal free and taking it back to the kraal.



Figure 1 Ear tagging

Tools and equipment used while Ear Tagging

- Ear Tags: These are plastic or metal tags, often color-coded, that bear a unique identification number
- Tag Applicator: this is specialized tool designed to attach the ear tag securely to the animal's ear.
- Restraint Devices: these included halter, and a crush restraining the animal during the process.

Importance of Ear Tagging

- Identification: Allows for easy identification of individual animals, which is crucial for managing large herds or tracking animals in the wild.
- Record Keeping: Helps in maintaining accurate records related to breeding, health management, and production data.
- Disease Control: Facilitates the tracking of animals in case of disease outbreaks, enabling targeted treatment and control measures.
- Ownership: Proves ownership in case of theft or loss, as the tag often contains details of the owner or the farm.

3.1.1.2 Milking

This is the act of removing milk from the mammary glands of the female animal. It may be done by hands or machine and it requires the animal to be currently or recently pregnant.

The following were procedures followed when milking the cow at RwebZARDI with the help and guidance from Ms. Marcy.

The animal was brought to the milking parlor which also contained feeds for the animal. Restraining the animal was done using the halter on the hind legs to avoid disturbance by the animal.

- Cleaning of the udder by washing the teats with water to avoid infestation and also to produce clean milk
- Drying the teats using a clean towel to produce good quality milk.
- Applying of milking salve to smoothen the teat in order to avoid physical damage of the teats
- Milking was done by stripping the milk from the teats into a clean milking bucket
- Measuring was done after milking and we collected 6 litres of milk.



Figure 2 milking

3.1.1.3 Identification of Animal Pastures.

Pastures are green plants feed to animals. Miss Mercy helped me to identify different pastures in the pasture field and the identified and they were legume pastures and grass pasture. The legume pastures are more palatable to animals than grass pastures. Examples of grass pastures are Chloris Giana, branchiara muratha and molato, Naro Napier, sugar Napier, and kikuyu grass. The legume pastures were alfalfa, sesbania seseban lablab green and silvery desmodium, cantrosema and cariantra. The methods used in pasture feeding are cut and carry, hay making and silage making. Different pastures provide different nutrients where by legumes provide proteins, grass pastures provide carbohydrates and vitamin is provided by all green plants.



Figure 3 pasture identification

3.1.1.4 Lablab defoliation

Lablab (*Lablab purpureus*) is a legume often used in pastures for grazing, forage, or as a cover crop due to its high nutritional value and nitrogen-fixing properties. Defoliation in lablab pastures refers to the removal of leaves from the plant and it's done for various purposes. It's

done by removing the mature leaves and leaving at least four young leaves leaving for continued growth. The leaves that were collected after defoliation were fed to animals

Process followed when defoliating lablab at Rweb ZARDI

Removal of weeding to provide enough space and also efficiency

Removing of the mature plant leaves by pricking them out using hands

Collecting of the pricked leaves into a sack

Reasons for lablab defoliation

- Improved forage quality by stimulating new, tender growth, which is more palatable and nutritious for livestock compared to older, mature leaves.
- Grazing management since controlled defoliation helps in managing the growth of lablab to ensure consistent feed availability for livestock.
- Pest and disease control by reducing the habitat for pests and lower the risk of disease spread in a lablab crop.
- Increased regrowth and yield since controlled defoliation can stimulate new shoots and lead to increased overall biomass production. When managed well, defoliation encourages more vigorous regrowth, leading to a higher yield over the growing season.
- Preventing shading of other crops because defoliation helps regulate the amount of light reaching those plants, promoting a better growth balance in mixed-crop systems.
- Soil health improvement through regular defoliation which helps return organic matter to the soil, contributing to improved soil structure and nutrient cycling.

Effects of defoliation:

- Reduced ability of the plant to photosynthesize, leading to lower growth and productivity.
- If excessive, defoliation can weaken the plant, affect regrowth, and reduce the forage value in pastures



Figure 4 Lablab defoliation

3.1.1.2 Apiculture project

This is the keeping and rearing of bees for differing purposes such as tourism, research, food, pollination among others. Apis refers to species of stinging bees. At Rweb ZARDI the species of stinging bees reared are

- *Apis mellifera adansonai* which are dark in color, small in size and aggressive
- *Apis mellifera scutellata* are big in size, brown and docile

3.1.1.2.1 Bee species

With the cooperation of Mr. Mugume Ronald, I identified different castes of bees and the bee colony consists of three castes which are the queen, drone and worker bee

The Queen Bee

The queen bee is brown and large in size and also has well developed reproductive tract and a spermatheca which is the sperm bag that aids in fertilization. It uses mating signs like dancing, pheromones and a smell to attract the drone bees when it's ready for mating.

- The queen bee lays both fertilized and unfertilized eggs hence the mother of the colony.
- The queen bee has a sting and therefore commander of the colony
- It mates with the drone in a drone congregation area.

The Drone Bee

Drone bees are male bees with a medium size.

- They mate with the queen in a drone congregation area which is an area where bees meet for fertilizations
- It is the father of the colony.

The Worker Bees

These female bees with undeveloped reproductive systems and they constitute the large number in the colony. They are small in size and have a sting which is used for protection. They carry out different activities in the hive which include

- Collecting nectar to make honey and pollen to feed the brood
- Carry out construction of the hive using their wax and repair in case of any damage in the hive
- Worker bees collect water used in softening food for the brood also cooling the hive.

3.1.1.2.2 Bee hives

Different bee hives are used at Rwebitaba ZARDI such as local bee hives, semi modern bee hives and modern hives.

Local bee hives. These are hives made from locally available materials like clay, fibers, wood among others and examples include box hive, pot hive, and leg hive and weaved hive.

Advantages

- They are cheap and can easily be established.
- They are portable since they can be put in different places like trees
- They can locally be made

Disadvantages

- They are not durable since they can easily be destroyed
- They accommodate little number of bees as compared to modern hives.

- They can easily be affected by adverse weather conditions like heavy rains.

Semi modern hives. These are movable hives made from improved materials and they are more durable than the local hives they include Kenya top bar hive and Tanzania top bar hive. They have a long durability than the local hives and also they can accommodate a large number of bees.

Modern hives.

These are fixed hives made from modern movable frames and examples include the langstroth hive.

Advantages

- Easy to inspect and harvest.
- Easy to control swarming
- Bee breeding and queen rearing is possible
- They are very durable

Disadvantages

- Weakens the bee's immunity
- They are very expensive to buy

The following are factors considered when siting an apiary.

- The site should be 200m from the public on an open area and 100m in the forested area to avoid disturbance of bees by the public.
- The site should have forage plants where bees will be collecting nectar and pollen and the plants should be diurnal plants since they are attracted by bees.
- The site should be near a water source so that bees are able to collect water to be used in the hive to regulate temperature, softening food for young bees and making honey.

- The site should be free from pesticides, pests, predators and vermin since they may attack and kill bees.
- The site should be free from noise since this may cause bee swarming.
- The site should be on a gentle slope to encourage the establishment of bee hives.

3.1.1.2.3 Honey harvesting

Honey harvesting is the process of collecting honey from beehives after bees have produced and stored it. Honey harvesting was carried out with the help of Mr. Ronald Mugume and Miss Moreen who guided me when harvesting honey especially when removing honey combs from the bee hives

Processes followed when harvesting honey

Preparation for harvest

- Timing: honey harvesting was carried out during the late hours of the day. Honey is typically harvested during late summer or early fall when bees have had enough time to produce and store honey
- Equipment: Before starting, the following equipment were gathered to aid in harvesting
 - Bee suit for protection.
 - Smoker to calm the bees.
 - Hive tool for prying open the hive.
 - Bee brush to gently remove bees from frames.
 - Honey extractor uncapping knife, honey filter, and clean jars or containers for storage.



Figure 5 Arranging bee equipment

2. Calming the Bees

- **Using a Smoker:** Smoke was puffed into the hive entrance and over the frames to calm the bees. Smoke masks their alarm pheromones, reducing aggression and making the bees less likely to sting. This makes it safer for the beekeeper to access the hive.

3. Removing the Honey Frames

- **Opening the Hive:** The hive tool was carefully used to lift the hive lid and inner cover. Inspecting the frames for capped honey, as these are the frames ready for harvesting.
- **Removing the Bees:** Gently bees were removed from the frames using a bee brush and a gentle shake to clear bees from the frames.
- **Collecting the Frames:** Once the bees were off the frames, the honey-filled frames were placed into a bee-free, covered container to promote honey quality.



Figure 6 Removing honey combs

3.1.1.2.4 Honey processing

Honey processing is the series of steps used to extract, clean, and prepare honey for consumption after it has been harvested from honeycomb frames in a beehive. The goal of honey processing is to ensure that the honey is pure, free of impurities, and safe for consumption while retaining its natural properties.

3.1.1.2.4.1 Detailed guide to honey processing while at RWEB ZARDI

1. Extracting the Honey

Crush and Strain Method was used as follows

- **Crushing the Comb:** The honey combs were placed in a large, clean bucket using hands to crush the comb completely. This releases the honey from the wax cells.

- **Straining the Honey:** The crushed honeycomb was poured into a fine mesh strainer over a clean container to let the honey drip through.
- **Pressing for More Honey:** After most of the honey has dripped, gentle pressing of the comb in the strainer to extract more honey was done.



Figure 7 Honey extraction

2. Filtering the Honey

- **First Filtration:** After the honey was extracted, filtering was done to let out any bits of wax, propolis, and bee parts. Honey was poured through a coarse filter to remove large particles.
- **Second Filtration:** To ensure clean honey, straining again was through a finer mesh. To remove any remaining debris.

3. Bottling the Honey

- **Prepare Sterilized Jars:** The jars were cleaned to avoid any contamination.
- **Fill the Jars:** The honey was poured into jars while measuring 500gm.

- Seal the Jars: Once filled, sealing the jars with lids was carried out to keep out moisture and air, which can spoil the honey.
- Label the Jars: This was done using labeled stickers with the type of honey, harvest date, and location.



Figure 8 Honey bottling

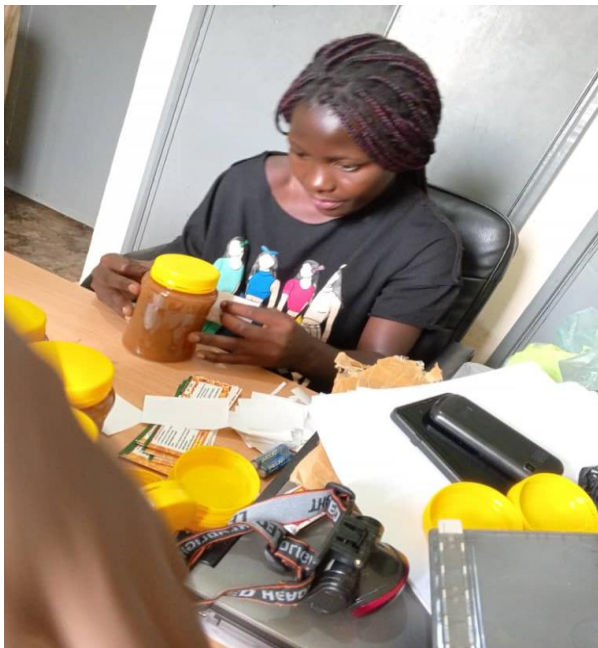


Figure 9 Honey labeling

4. Storing the Honey

- **Store in a Cool, Dry Place:** Honey was stored in a cool, dry area, away from direct sunlight. Properly sealed honey can last indefinitely without spoiling, as long as moisture is kept out.

5. Cleaning Up

- **Cleaning Equipment:** Thoroughly cleaning of the equipment used in the harvesting process was done to maintain hygiene and prevents contamination in future harvests

3.1.1.3 Aquaculture management

Aquaculture refers to the practice of rearing aquatic animals including fish, molluscs, crustaceans, and crocodiles among others. With the help of Mr. Mununuzi David I learnt about different species of fish reared at RwebZARDI which feeds on different types of feeds and they include the following

3.1.1.3.1 Fish species

Different fish species are reared at RwebZARDI which include the following

Cat fish: This resembles a cat's whisker and range in size and behavior. They possess leading spines on their dorsal and pectoral fin

Tilapia fish: these are shaped like a sunfish and are easily identified by the lateral line characteristics. They are composed of deep bodies and have long dorsal fins.

Fish undergo several stages of growth which are eggs, embryo, hatching, fry, fingerling, juvenile and adult fish. There are several conditions necessary for aquatic life which include water pH, temperature, oxygen and conductivity.

3.1.1.3.2 Fish feeds

- Zoo planktons and phytoplankton which are small aquatic organisms that are unable to swim effectively against currents and are provided naturally.
- Pellets which are artificially made from a mixture of fish meal, plant protein, vitamin and minerals and they are normally fed to young fish.

3.1.1.3.3 Features of a Fish Pond.

- Pond wall; which holds water in the pond
- Water pipes; includes the inlet and outlet pipe which allows water in and out respectively.
- Water controls; control the level of water and its flow through the pond.
- Tracks and road ways; for access of the pond.

The following are factors that should be considered when siting a fish pond.

- Topography of the area. The fish pond should be constructed in an area that is on gentle slopes to avoid unnecessary drainage.
- The fish pond should be constructed on fertile and well drained soils which ensures regulates the amount of water in the pond and also the fertility of the pond.
- Accessibility of the pond should also be considered while siting the fish pond to encourage the production and effectiveness of the fish pond.

Activities carried out in aquaculture at RwebZARDI

3.1.1.3.4 Fishing

Fishing is the activity of catching fish, either for food, sport, or recreation. It typically involves using various tools such as rods, reels, nets, or traps. The practice can take place in fresh or saltwater and includes different techniques, such as angling, fly fishing, or netting. While at RwebZARDI, I carried out fishing fingerlings from a haper and they were to be taken to another fish pond for further growth. The number of fingerlings fished were 100 fingerlings of different

species which included tilapia and cat fish. The tools used were bucket where fingerings were put after fishing, a fishing net among others



Figure 10 Fishing fingerings



Figure 11 Fished fingerings

3.1.2 Crop management

Under crop production the enterprises at Rwebitaba ZARDI include banana production, coffee production, potato production, tea, maize production and agroforestry. Different activities were carried out at RwebZARDI which include the following.

3.1.2.2 Banana management.

Bananas belong to Musaceae family and the variety planted was Mpologoma which has a maturity period of 6 months to first harvesting and a spacing of 3m from one plant to another. There are two types of banana management practices which are establishment and rehabilitation practices. I carried out the following banana establishment practices with the help of the farm manager.

3.1.2.2.1 De-Suckering

This is the practice of reducing the number of banana suckers on a plant and it was done using a small hoe and a panga and I uprooted sword suckers using a small hoe after disinfecting the tools using jik because they get enough nutrients from the mother plants instead of a water sucker which is an independent sucker since they are less productive because they lack nutrients and they are prone to pests and diseases. The suckers on the banana plant were removed and only the mother, daughter and granddaughter plants were left to avoid competition. After removing the sucker, the hole left is covered with soil to avoid infection



Figure 12 De suckering

3.1.2.2.2 Suck paring

Suck paring. This is the process of cleaning of the uprooted sucker by removing all the roots and pruning it using a disinfected panga and this helps to avoid disease spread from the mother plant and also to avoid pests since the excess roots acts as breeding grounds for pests like weevils the

sucker should be left for about 3 to 4 days so that the pests that might have remained on a plant starve and die and their life cycle is broken. A slant cut is used for easy growth



Figure 13 Sucker pairing

3.1.2.2.3 Digging of the holes and planting.

Digging of the planting holes was done using a hoe in the marked areas and after planting was done following these procedures below

- Laying of the field was done by clearing the field where the suckers are to be planted
- Measuring the spacing to be considered while planting and a spacing of 8by8 was used to avoid competition.
- Planting holes were dug using a hoe and the top soil was separated from the sub soil since the top soil was to be used in covering because of its fertility. The size of the hole was 3 Fits wide and 2 fits deep.
- Planting of the banana sucker was done and the top soil was used to cover the sucker



Figure 14 digging a planting hole



Figure 15 Planting a banana suckers

3.1.2.3 Agroforestry and nursery bed management

3.1.2.3.1 Agroforestry

Agroforestry is an integrated land-use management system that combines agriculture and forestry practices to create more sustainable and productive ecosystems. It involves the cultivation of trees alongside crops and/or livestock, enhancing biodiversity and providing multiple benefits, such as improved soil health, microclimate regulation, increased biodiversity, economic benefits among others.

Agroforestry systems

Agrisilvicultural systems: Trees combined with crops

Silvopastoral systems: Trees combined with pastures or animals

Agrosilvopastoral systems: Animals, trees and crops

While at RwebZARDI several activities carried out under agroforestry included tea management

Tea at RwebZARDI is grown in Rwebitaba tea research Centre located in Kyenjojo district. Rwebitaba started as a Tea Research Centre, established in 1960 as a branch of Tea Research Institute of East Africa (TRIEA).

Rwebitaba station was the main tea breeding station for TRIEA before the collapse of the East African Community in 1977 that led to the closure of research activities in Uganda. Different products obtained from tea at RwebZARDI include soap, tea powder among others

Tea is a perennial crop, belonging in feaceae family with a spacing of 4by4 meters originated from china and it takes four years to have the first harvest. The common tea grown at Rwebitaba Tea Research Centre is clonal tea with varieties such as 303/577 *tea* clone, 6/8 *tea* clone, 31/8 *tea* clone, 108/82 *tea* and the activities carried out in tea production include tea planting, tea pruning, tea plucking, tea teaping, tea shading and tea transportation. The tea research center also consists of a tea gene bank with 152 gene type obtained through vegetative and sexual reproduction.

The activities carried out at Rwebitaba Tea Research Center were

3.1.2.3.1.1 Tea tipping

This refers to the practice done when the shoots (primaries) grow in a tea bush after pruning and they are tipped or decapitated at a predetermined height parallel to the ground surface. By tipping a flat plucking surface is established for convenient plucking. It also helps to stimulate the axillary buds below the level to grow and form the plucking table. This height in a normal bush is 20 cm which corresponds to 5 leaves on an average. And therefore tipping was done to obtain a flat tea bush of 20cm from the ground.



Figure 16 Tea tipping



Figure 17 Identifying tea varieties in a screen house

3.1.2.3.2 Nursery Bed Management

Nursery Bed Management refers to the practices involved in cultivating young plants in a controlled environment, typically before they are transplanted to their final growing locations. Effective nursery bed management includes site selection soil preparation, planting techniques, water management, pest and disease control, fertilization, pruning and thinning.

Activities carried out under nursery bed management.

3.1.2.3.2.1 Potting and Pasture planting in a nursery bed

This is the practice of putting soil in the potting bags where the seedlings from the nursery bed will be put. Seed potting is done after seedlings have been already established in a nursery bed and when they are over two months. I carried out soil measuring to determine the potting media with the help of Mr. Onesmus and I measured 4 wheelbarrows of soil 1 of sand and 1 for

manure. The soil was sieved first before mixing it with sand and manure. Brancharia pasture specie was planted in the potting bags after potting.

Procedures that followed when potting.

- Digging out the soil that is to be potted
- Sieving the soil to remove big particles which may cause compaction and also poor aeration.
- Determining the potting medium by measuring 4 wheelbarrows of soil, 1 for manure and 1 for sand to increase the nutrient content and avoid soil compaction respectively
- Putting of the soil in the bags and arranged in order.
- Softening the soil by watering to enable easy planting of pastures
- Planting of Brancharia pasture in the potting bags, arranging them in a nursery be and finally watering to maintain the moisture content



Figure 18 Potting



Figure 19 Planting pastures in the potting bags

3.2 Experience and knowledge gained

Since I personally engaged in several activities and the following were lessons learnt

I learnt that worm water can be also used while sterilizing tools to be used carrying banana management.

I learnt that pastures can also be raised in a nursery bed instead of planting them directly like *Brancharia Morata*.

I also learnt that different pasture species have different biomass.

3.3 Relevancy

Since field attachment equip the student with a hands-on practical farming to appreciate and transform theory into practice, I was engaged in different enterprises and I carried out different

activities practically that I learnt theoretically such as milking, disease control, potting de-suckering among others and there are different methods used especially between conversional agriculture and organic agriculture such as use of worm water in disinfecting tools instead of jik and other chemicals.

3.4 Personal contributions.

I actively participated in every activity that I was supposed to do like honey harvesting, processing, fish feeding and also cleaned the dining among others

3.5 Evaluation of Rwebitaba ZARDI

3.5.1 Strength

Power: adequate supply of hydroelectricity power that is used in running electric machines such as computers, printers, milling machines among others and it is supplemented by a stand by generator and this promotes affectivity and simplicity work being produced at the institute.

Water supply: Adequate water provided by the nearby swamp and taps which is used to carry out different domestic work at the institute for both human and animals. Swamp water is also used for irrigation especially sprinkler irrigation to improves crop yields

Land: The availability adequate land that facilitates the establishment of a large number of enterprises such as crop production, apiculture, aquaculture, animal production among others and this increases the production level, better farming methods like shifting, cultivation and also encourages future expansion.

Partnership: There is different partnership which is a significant aspect in research for example the institute has partnership with different farming groups all over the western highlands and also the weather station that helps in daily programming of the institute activities since it consists of different weather equipment such as the Stevenson screen, wind vane, wind sock, anemometer and many others.

Staff. Rwebitaba ZARDI works with a wide range of department with experienced staff such as the director, advisory committee, human resource manager and the support staff who help in the proper running of the institute.

3.5.2 Weaknesses

There is over dependency on pesticides which have a long residual effect and this is a threat to the natural environment.

The institute lacks laboratories in most departments where laboratory analysis and experiments are made and this limits research.

3.6 Challenges encountered.

The following are challenges faced during my field attachment at Rwebitaba ZARDI.

Some specialists were on leave making it unable to attend on the activities assigned too hence affecting the field attachment,

Unfavorable climatic conditions like heavy rainfall which would not encourage the running of some activities.

The time for field attachment was not enough to be engaged in all activities on the farm and this made some enterprises not being attended to.

Excess use of chemicals at the institute to carry out different operations also affected the field attachment since it was not in line with the course of sustainable agriculture.

CHAPTER FOUR

RECOMMENDATIONS AND CONTRIBUTIONS

4.0 Introduction

This is last but not least; this chapter of field attachment presents the conclusion and recommendations as seen below.

4.1 Recommendations

4.1.1 Recommendations to Rwebitaba ZARDI.

The institute should adopt sustainable organic farming where organic farming methods are used such as mulching to control weeds instead of using herbicides, use of organic pesticides like garlic and Neem other than pesticides and this will promote biodiversity since it is environmentally friendly.

The institute should carry out lobby funds from different sources such as nongovernmental organization to finance some activities on the institute and also in the construction of different structures such as laboratories and the library.

More research should be done on integrated pest management to combat the use of chemicals which are harmful to the environment.

4.1.2 Recommendations to the university.

The university should carry out pilot study before taking students for field attachment so that the institute prepares in advance to receive the intern students.

The one provided to students by the university is not enough for students to engage well in different enterprises on the institute.

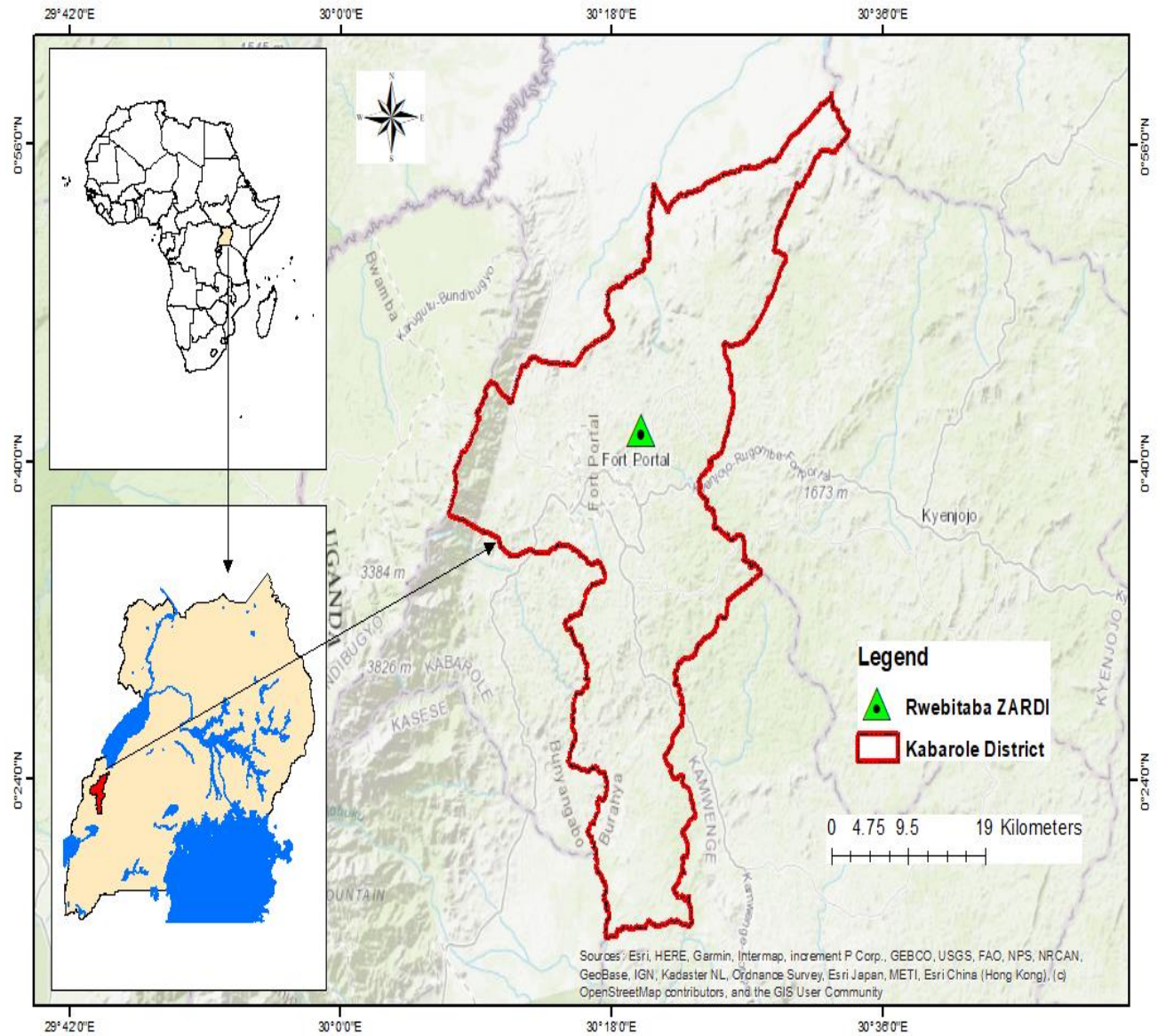
4.2 Conclusion

The one-month period of field attachment has effectively been helpful due to the experience obtained that has increased my perfection since the theoretical work was put in practice by engaging in different enterprises to do different kind of activities in aspects of animal production, crop production, apiculture, aquaculture, agroforestry among others.

Therefore, Rwebitaba ZARDI is favorable for students to carry their internship and it should be continuously being included in the most useful places for internship training due to the good experience, environment and different enterprises on the institute.

4.3 APPENDIX

Location of RwebitabaZARDI.



Introduction letter

AFRICAN RURAL UNIVERSITY (ARU)

Contact Office

Plot 617, Rubaga

Kibuga Block 4, Right-off
Southern gate

Main Office:

Kagadi Campus

P. O. Box 24



25/9/2023

Dear Sir/Madam

RE: REQUEST TO HOST OUR STUDENT FOR FIELD ATTACHMENT FOR THE PERIOD OF ONE MONTH ON YOUR FARM/ORGANIZATION

I hereby request your farm/ organization to host our student by names of BUKIRWA DIMINTIRIA registration number 21/ARU/BSSA/004 who is currently in year two of study. She is offering Bachelor of Science in sustainable agriculture (BSSA) of African Rural University.

The field attachment will enable our students to learn practical skills in the modern agricultural technologies, extension work, program development and farm management at different levels thus enabling ARU to graduate rural transformation specialists with the necessary knowledge and skills to meet the demands of both rural and urban farmers.

Thank you're in advance for accepting my request. Together we can transform our communities from subsistence agriculture to sustainable market oriented agriculture.

Yours faithfully,

.....

Sengozi Bagenda Jerome (D.Eng.)

Faculty Dean

Photos of some activities during the attachment

