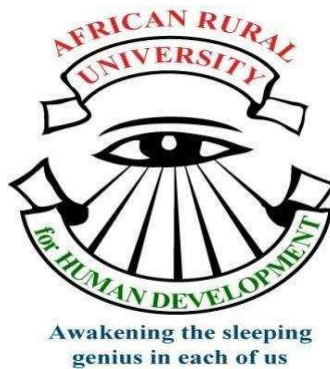


AFRICAN RURAL UNIVERSITY



FACULTY OF TECHNOLOGY FOR RURAL DEVELOPMENT

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 WESTERN
REGION

BY

ARINITWE LOYCE

21/ARU/BSSA/002.

A ONE-MONTH FIELD ATTACHMENT TWO REPORT SUBMITTED TO THE FACULTY
OF TECHNOLOGY FOR RURAL TRANSFORMATION IN PARTIAL FULFILMENT FOR
THE AWARD OF A BACHELOR OF SCIENCE IN SUSTAINABLE AGRICULTURE OF
AFRICAN RURAL UNIVERSITY

SEPTEMBER, 2024

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Declaration

I ARINITWE LOYCE declare that this report is an original copy of activities done during a field attachement conducted at Rwebitaba Zonal Agricultural Research and Development Institute (RWEBITABAZARDI). It has never been submitted to any University or Institution for the award of a Bachelors Degree, Diploma or any other qualification.

Signature..........Date15/10/2024.....

Approval.

This is to certify that ARINITWE LOYCE had a one 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 under my supervision.

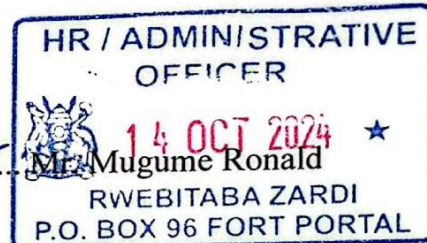
Field supervisor

Signature



Date.....

14.10.2024



Academic supervisor

Signature



Date.....

15/10/2024

Mr. Moses Kanyambindwa

Acknowledgment

First and foremost, I thank the Almighty for the gift of love, mercy, favor and life still portraying to me.

Secondly, I convey my sincere appreciations to my beloved mother Ms. Tumusiime Scovia who has always supported in all ways especially financially, material and guidance and counselling. My brothers and sisters Mr. Asiimwe Apollo, Mr. Matsiko Boaz, Ms. Kyalisiima Novia, Tumushelure Fortunate, Niwasiima Joyce and Tayebwa Joshua for the support in all ways.

University Supervisor Dr. Kanyambindwa Moses for the educational guidance, corrections where I would go wrong and educative criticism in the course of my one-month field attachment.

I also thank the staff and management of African Rural University for the financial support and the mode of education always provided to me that has enabled me complete this field attachment.

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The staff and management of Rwebitaba ZARDI especially Mr. Dominic and Mr. Agaba Hannington the HRM for the warm welcome to the institution, Mr. Jjemba Douglas, Mr. Mununuzi David, Mr. Gumoshabe Innocent, Mr. Mugenyi Lawrence to mention but a few for the love and hospitality that was portrayed to me as well as guidance, corrections where necessary, and their time, may the almighty God continue blessing you abundantly.

Last but not least, I acknowledge the government of Uganda for setting up such research institutes which have helped in the smooth running of different people at different levels especially the students and farmers.

List of acronyms and abbreviations

RWEZARDI:	Rwebitaba Zonal Agriculture research and development institute.
MAAIF:	Ministry of Agriculture, animal husbandry and Fisheries.
FAO:	Food and Agriculture Organization
EAC:	East African Community
WHZ:	Western highlands Agro-ecological Zone
HRM:	Human Resource Manager.
ARU:	African Rural University.
URDT;	Uganda Rural Development and Training Institute.
DAP:	Di-ammonium Phosphate.
NPK:	Nitrogen phosphorus potassium

Abstract

The aim of this supervised field attachment was to put the theoretical work into practice so as to acquire technical and professional agricultural experience and skills in the operation and management of different agricultural enterprises thus the preparation for a career in Agricultural extension worker. The areas covered at while at Rwebitaba ZARDI were crop production which comprised of bananas, maize, rice, cassava, tomatoes and Agroforestry, with animal production areas covered included livestock management, aquaculture, and Apiculture. In the above areas covered, I gained knowledge and skills in identification of animal diseases like mastitis, the effect of weather to bees, how to prepare a banana planting material. However, while at Rwebitaba ZARDI I encountered few challenges which include; excessive use of chemicals which did not fit well with my programme and I was able to them adopt integrated pest management practices and organic farming, limited time with my supervisor this was mitigated by involving me in some activities available with the casual workers and also used to delicate someone to take me through. In addition, I recommended that the Rwebitaba ZARDI should adopt organic farming as this ensures conserves the environment, the supervisor should always fix enough time for the interns.

CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

This chapter explains the background of African Rural University, course, field attachment, purpose of field attachment, objectives of field attachment and the background of the organization where internship was organized Rwebitaba ZARDI as shown below.

1.1 Background of African Rural University

African Rural University is an all-Women's University fully accredited by National Council of Higher Education (U1/PL/017). It was founded by Uganda Rural Development and Training Programme. The University is located 1.5km along Kagadi-Hoima Road, Kagadi Town Council, and Kagadi District in Mid-western Uganda. It runs two programmes which include Bachelor of Science in Sustainable Agriculture and Bachelor of Rural Development.

The University offers an integrated curriculum that creates a pool of female professionals capable of promoting socio-economic empowerment of the marginalized and less advantaged through the provision of rigorous scientific input into the design and practice of rural development. There is buttressed in ARU's Education Model which is a conduit for societal wide, systemic and structural change. It's based on the University philosophy, vision, mission, values and working premises. The model's philosophical foundation calls for a fundamental shift in life orientation from the problem solving to the creative orientation. People in the creative orientation understand and develop commitment on what they truly want to achieve in life. Not only through visioning, but also in action. It permits genuine democratic participation and improves ownership and leadership qualities. This is the basis of sustainable human and rural development.

1.2 Vision

To be a leading Centre in providing transformational education that creates effective change agents and makers within an African development context.

1.3 Mission

African Rural University applies theoretical learning, innovative instruction and field practice, so that ARU graduates can create conditions for people to improve their lives, transform their

communities, awaken inherent leadership and increase their capacity for self-generating and sustainable change.

1.4 Background of the course

The Bachelors of Science in Sustainable Agriculture is a program combining technical, natural, economic, and social disciplines of science. The program introduces students to the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. It focuses on producing graduates with thorough knowledge on use of environmentally friendly agricultural practices. It intends to address the increasing global demand for food while conserving the ecosystems. Bachelor of Science in Sustainable Agriculture program graduates will have knowledge, skills, and experiences in sustainable soil, land and water management to enhance agricultural production and productivity. The degree program will familiarize students with the science and practice of sustainable farming based on fundamentals of the creative process.

After completing the Bachelor's degree in sustainable agriculture, students will have a thorough practical knowledge of agro-biodiversity management, integrated pest and disease management and the interconnectedness among agro-systems. Each student will then fulfill course requirements by doing fieldwork during recess terms and research and completing an internship.

1.5 Background of field attachment.

At the end of year two and year three study, students who successfully complete four/six semesters are sent to the field during which they are introduced to various farms and organization to learn practical skills in the modern technologies, extension work, program development and farm management at different levels. The learners are expected to apply the acquired knowledge in project related activities as they take part in all activities of the organization/farm where they are attached. Outreach will acquaint learners with interpersonal relationship with the farming communities and rural sociological principles and approaches. This is done in the fulfillment ARU's method of teaching where 60% is theory and 40% practical. The 40% was done at Rwebitaba ZARDI Kyembogo station, Kabarole district fort portal tourism city for one month (150 hours) supervised by Mr. Mugume Ronald the field supervisor and Mr. Kanyambindwa Moses the university supervisor.

1.5.1 Purpose of field attachment

To transfer theory work into hands-on practical skills.

1.5.2 Objectives of field attachment

To develop skills in the application of theory to practical work situations

To develop skills and techniques directly applicable to my career

To enable acquire good work habits

To enable the learner a systematic needs assessment of a farm and identify real life problems in the local farming communities

To acquire skills and knowledge to devise a sustainable farming technology that will be disseminated for adoption by the local farmers to address their needs

To be equipped with a hands-on practical farming to appreciate and transform theory into practice

1.6 Background of Rwebitaba ZARDI

NARO Rwebitaba ZARDI is one of the nine zonal agricultural research and development institutes established under the act parliament of 2005 and the policy guidance of NARO as a way of addressing agricultural challenges in western highlands of agro-ecological zone. RwebitabaZARDI operates in nine districts of Kabarole, Kasese, Kamwenge, Ntoroko, Bundibugyo, Kitagwenda, Bunyangabo, Kyegegwa, and Kyenjojo. Rwebitaba as a ZARDI started its operations in October 2011 to serve as a zonal entity that undertakes applied and adaptive agricultural technology development and dissemination to different stakeholders in the Western Highlands Agro-ecological Zone. 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 Meteorological Weather Station, 2021). The other eight ZARDIS in different agro ecological zones and these include; MbaZARDI in Mbarara, KachwekanoZARDI in Kabale, BuZARDI in Hoima, MuZARDI in Mukono, NgeZARDI in Lira, NabwinZARDI in Moroto, BugiZARDI in Bulambuli.

1.6.1 Location

Rwebitaba ZARDI is located in Kyembogo village, Busoro sub-county, Kabarole district, Kijura road 8km from Fort portal tourism city.

1.6.2 Map showing the area of study

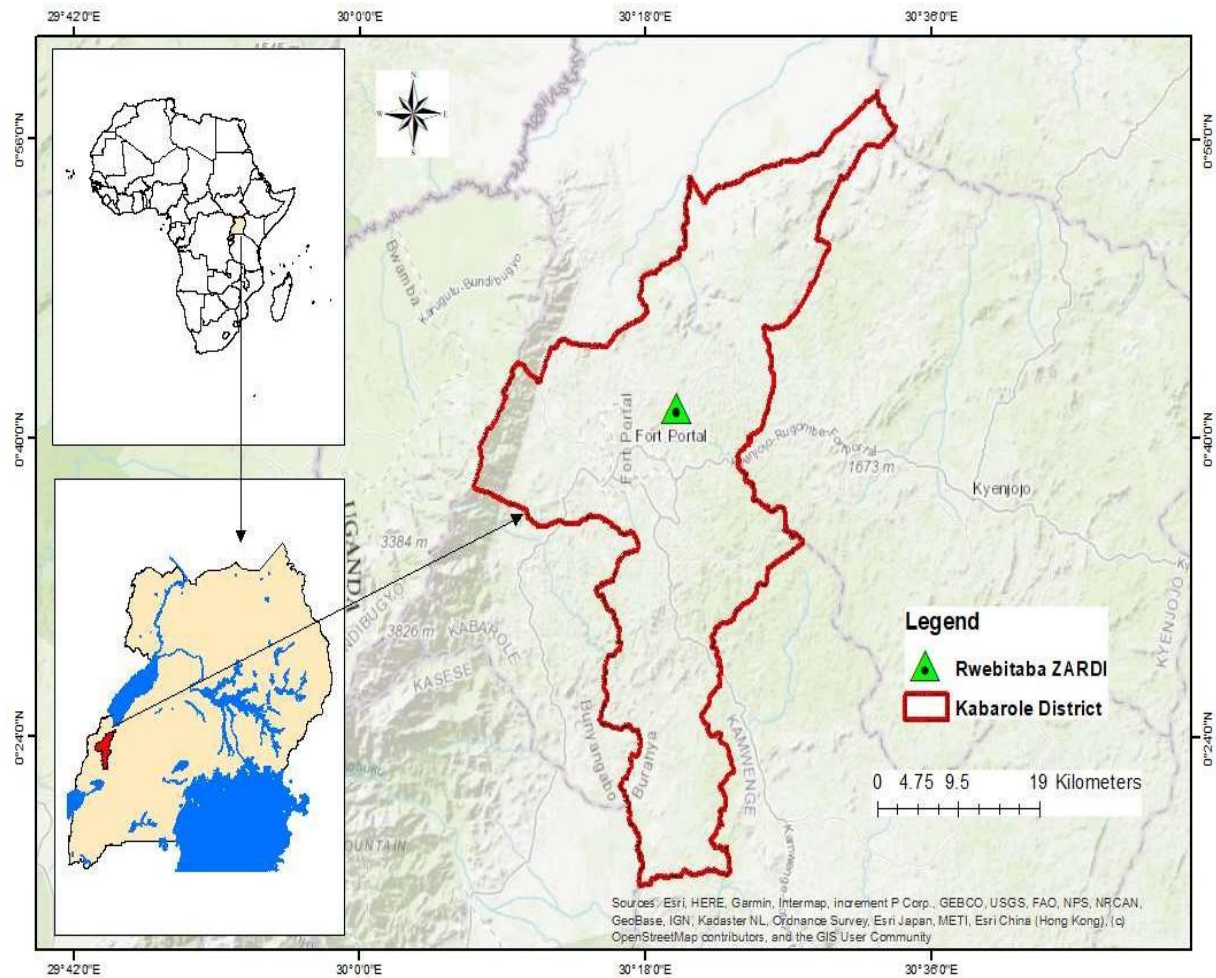


Figure 1. Map of Kabarole District showing the location of RwebitabaZARDI.

1.6.3 Mandate

To conduct driven and market responsive applied and participatory adaptive research in crops. Aquaculture, livestock, apiculture to develop appropriate knowledge of dissemination to uptake ways by the farmers.

1.6.4 Goal.

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.

1.6.5 Vision

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

1.6.6 Mission

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

1.6.7 Objectives

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 immerging 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.

1.6.8 Target population

Rwebitaba ZARDI is operating in nine districts of Kabarole, Kasese, Kyenjojo, Kamwenge, Ntoroko, Bundibugyo, and Kyegegwa, Kitagwenda and Bunyangabo and one city that is fort portal.

1.6.9 Products offered by Rwebitaba ZARDI include;

Quality seeds

NARO Honey

Coffee yoghurt

Propolis

NHL feeds

NACOFE

T16, T32, T32S

NARO face and body scrub

1.6.10 Products and Services offered by RwebitabaZARDI

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.

1.6.11 Source of funding

RwebitabaZARDI is funded by the government of Uganda, and competitive proposal writing and grants and from the nontax revenue collected and then ploughed back.

1.6.12 Research programs at RwebitabaZARDI

Crop and Natural Resources Research Programme

Livestock Resources Research Programme

Technology Promotion and outreach Programme

Description of Research programs.

1.6.12.1 Crops and Natural Resources Programme.

Crops project.

Under this section, research on crop varieties is done together with seed multiplication. Research in crop section covers; cassava evaluation/multiplication, evaluation of different rice varieties for adaptability, multiplication of beans, maize, potatoes, different vegetables different banana cultivars and different techniques of banana farming among others. The section is headed by an Agronomy scientist supported by Agronomy technician and volunteer is attached on to this project.

Agro-forestry project.

Under this unit, research is basically in natural resource conservation and interactions, the tree crop, animal and insect interactions, natural species conservation/utilization of plant materials, fruits like; mangoes, oranges, apples, grapes, pawpaw, quavers. Activities such as grafting of fruit trees, tree nursery activities and data collection on apple fruit performance are carried out among others in this section. The section is headed by the Agro-forestry scientist and supported by an Agro-forestry technician.

Tea program.

This unit has national mandate of conducting research on tea at national level. The team investigates the susceptibility of tea clones on certain diseases like *Xylaria* and *armyleria*, leaf blight diseases and pests like nematodes, thrips, adaptability of different tea clones in different parts of the country, evaluating cup quality of different tea clones, breeding different clones, blending different clones, extracting and evaluating different tea clones among other research activities. The unit is headed by a scientist, this unit has more five scientists and two technicians.

1.6.12.2 Animal research resources Programme

Apiculture project.

Research in apiculture carried out at RWEBITABA ZARDI aims to explore suitable technologies to enhance the production of both honeybees and stingless bees in the designated zone. The study assesses the efficiency of various bee hive types, including KTB, Langstroth, Log, and Weaved hives, with a focus on colonization success and honey yield in terms of quality and quantity. This evaluation takes place both on experimental stations and on-farm locations across different districts within the WHAZ.

Additionally, the research delves into the suitability of different bee forage options such as calliandra calothyrsus, ocimum species, and citrinus carlistermons. The assessment considers factors like nectar and pollen production, as well as the survival of these forage types in the local environment. Notably, the project places a particular emphasis on stingless bees, with an ongoing research project titled "Domestication of Stingless Bees in Uganda." This initiative seeks to identify, propagate, domesticate, and characterize stingless bee species. Furthermore, it aims to develop high-value products derived from stingless bees, design suitable hive technologies, establish harvesting protocols, and ultimately commercialize both stingless bees and their products in Uganda. The apiculture section, led by the apiculture technician, actively involves a volunteer who dedicates a significant amount of time to the project.

Fisheries and aquaculture project.

Research activities in the WHAZ focus on basic, applied, and adaptive approaches to develop technologies aimed at enhancing fish production. Ongoing efforts include data collection on feeding strategies, fish breeding, and the establishment of a foundational population of pure lines of Nile tilapia and catfish in earthen ponds to boost overall fish production in the region.

On-station fish breeding in earthen ponds is a key component of seed multiplication, ensuring the availability of high-quality seeds for fish farmers who lack access to superior stock in the zone. Simultaneously, there is a commercial pond dedicated to fish production for sale, generating income for the institute through non-tax revenue. Additionally, a hatchery is in the process of being established to further support fish breeding initiatives.

The Aquaculture Scientist leads this section, with support from the Aquaculture Technician, both operating under the Livestock Research Resources Program.

Livestock project.

Research is underway to enhance pasture quality, focusing on legumes such as mucuna, lablab, *stylothenis*, crotalaria ternate, and calliandra carthorses, alongside grasses like Rhodes grass, *brachiaria* spp, and kakamega. The goal is to improve milk production in the WHZ through high-yield forage. The research also includes the development of feeding regimes and supplements for animals.

Additionally, the section is actively involved in studying cattle, pigs, chickens, and goats, examining their breeds and characteristics. The research encompasses the identification and enhancement of desirable traits in these animals.

The research officer, who also serves as an animal health scientist and head of the Programme for Animal Resources Research, leads the section. Support is provided by an animal health technician and a dedicated volunteer. The overarching aim is to develop technologies and management practices, particularly in the control of ticks, to benefit farmers in the WHZ.

1.6.12.3 Technology Promotion and outreach Programme

This program plays a crucial role in disseminating developed technologies to the end-users for adoption. It conducts comprehensive assessments of socio-economic and socio-cultural aspects within communities in the WHAZ. This involves analyzing the impact of technologies and staying informed about trends in the region.

The program serves as a connector, facilitating collaboration among various stakeholders engaged in agricultural socio-economic activities. This encompasses areas such as policy formulation, gender considerations, social dynamics, and marketing of agricultural produce, market trends, value chain analysis, and the conduct of farming systems and livelihood surveys across all units.

The leadership of this program is held by a socio-economist scientist, with support from a rural sociologist. Together, they work to bridge the gap between research and practical implementation, ensuring that the developed technologies align with the social and economic realities of the communities in the WHAZ.

1.6.13 Core function of Rwebitaba ZARDI

To comprehend constraints, opportunities and component interactions in the farming

Systems 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 contribute to multiplication of foundation seed for distribution to farmers and other research partners.

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

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.

1.6.14 Organizational and Management structure of Rwebitaba ZARDI

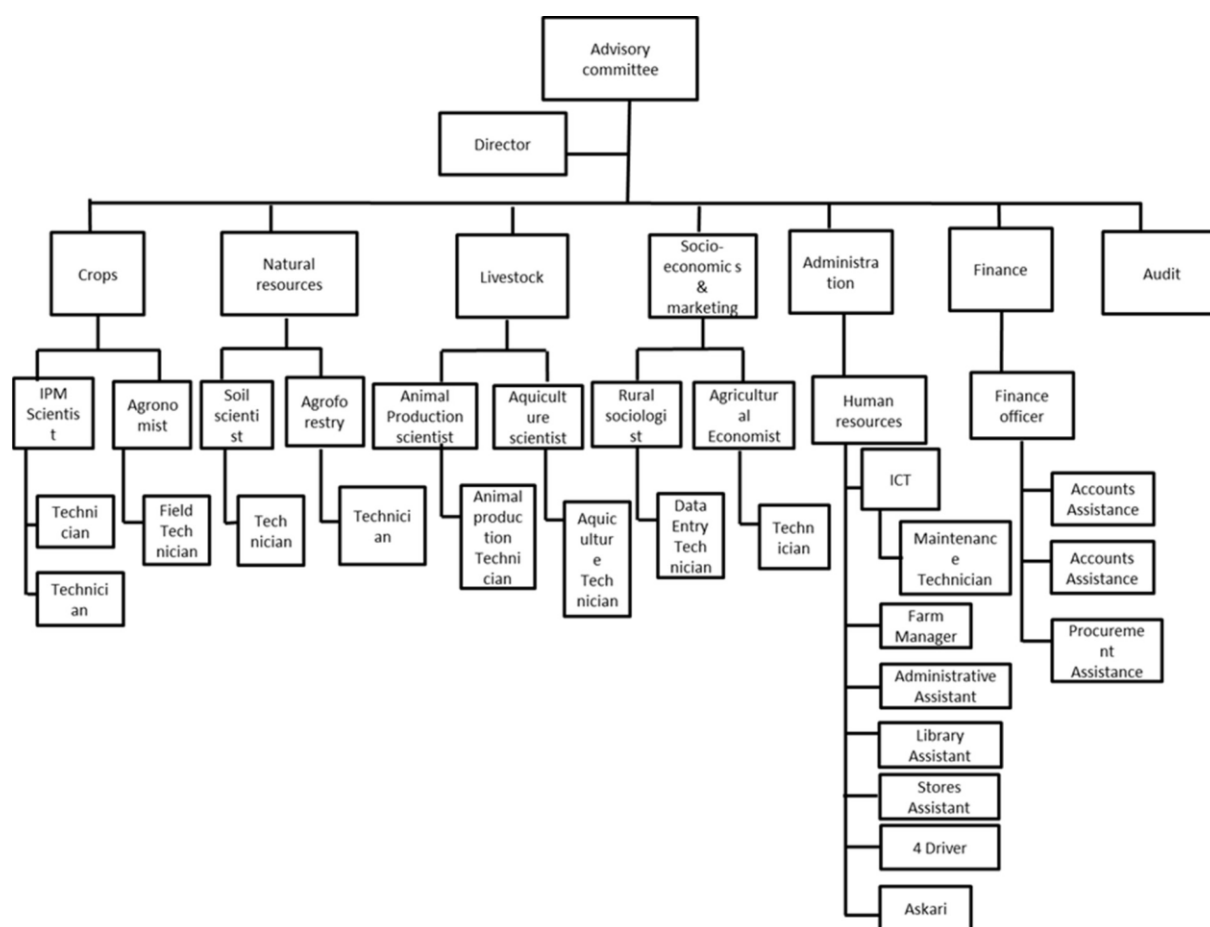
The management structure comprises 35 staff members. Among them include 12 research scientists, 9 research technicians, and 14 support staff (Plate: 1).

Human Resource and Administration section

Human resources.

This section coordinates planning of human resource and administrative activities like; staff recruitment, training of workers, welfare, corporate responsibility, and ethics required as per job description and specification, among others issues. It is headed by the human resource and administrative officer. Human resource and administration include the finance officer, accounts assistants, cashier, procurement, internal auditor, inventory officer and locally recruited staff as illustrated below;

1.14.1 Figure 2. Organization structure of RwebitabaZARDI



CHAPTER TWO

MANAGEMENT OF THE FIELD ATTACHMENT EXERCISE.

2.0 Introduction

This chapter comprises of the organization and its roles, the roles of the supervisors and students as explained below;

2.1 Roles played by the organization (RwebitabaZARDI)

Carry out applied and adaptive research on different projects.

Set demonstrations for farmers and students to learn different improved farming technologies.

They do on-farm and off-farm trainings on agricultural technologies.

In addition, the farm also ensured that the student in a number of activities under different enterprises to gain hands-on practical skills. The enterprises had the following lead persons as the facilitators for instance Mr. Mugume Ronald who took me through apiculture, Mr. Mununu David took me through Aquaculture, Ms. Faith took me through potato production, and Mr. Gumaoshabe took me through livestock, Mr. Ssenyonga Peter who also took me through rice production among others. This enabled me learn and acquire knowledge and skills especially in milking, identification of animal diseases, preparation of banana planting materials to mention but a few.

2.3 Roles of the field supervisor (the head of research in apiculture)

Briefing the student about the field work expectations.

The supervisor formulated and harmonized the time table.

Follow up reminders on a timetable during the internship period.

Correction and guidance on how to relate with the farmers and organization staff.

He linked me to other field staff (facilitators).

Supervision on field report writing.

2.4 Roles of the University supervisor.

Briefing the learner and guidance on good conduct during field attachment one.

Linking student with agency supervisor.

Making supervisory visits during field attachment one

The University Supervisor ensured that the student was attached to a good farm and did continuous mentorship and monitoring of the student which guided me achieve my objectives throughout the field attachment one.

2.5 Roles of a student

Attending to the activities as per the time table including attending to emerging activities

Timely daily reporting to the station.

Consulting the supervisor and field staff.

Documenting daily activities in a final field report.

CHAPTER THREE

ACTIVITIES CARRIED OUT

3.0. Introduction

This chapter comprises of a number of farm enterprises that were engaged in, their description and the activities carried out during field attachment. While at Rwebitaba ZARDI, different methods were used to acquire knowledge and skills and these methods include observation, hands-on and lectures in enterprises of potato production, banana production, livestock production, aquaculture, apiculture, Tea production and agroforestry. The activities carried out include the following;

3.1 Banana production

A banana is an elongated, edible fruit botanically a berry produced by several kinds of large herbaceous flowering plants in genus *Musa*. Banana is one of the major crops that promote food security and household incomes. Most of the banana and its bi-products are consumed domestically. There are different types of bananas which include; beer bananas, food bananas and dessert bananas.

At RwebitabaZARDI, different banana types are grown for different purposes and the varieties include Mpologoma, Kibuzi, Mbwarzirume, Musakala, Kitika, Bishop and kisansa bananas for food and other varieties, however other varieties for deserts are also grown

The management practices in banana production are;

Pruning; this is where the dry and old leaves are removed to avoid competition for growth factor.

Weeding; this is also done to remove unwanted weeds in the garden as it reduces competition for growth factors and regulate the spread of diseases.

Thinning; this is the removal of less effective plants to allow the productive plants to grow well without competition.

Mulching; This the covering the soil with dry grasses to control weeds by suppressing them and regulate water runoff.

3.2 Disease control

This refers to the systematic measures taken to reduce the incidence, prevalence, and spread of diseases within a population, particularly infectious diseases. There are several measures of controlling pests and diseases in banana plantation which include clean suckers may be obtained from non-infested fields by paring the corm to remove eggs and larvae or by use of tissue cultured plants. It involves clean weeding, de-suckering, and pruning, manuring, disinfection of the tools using disinfectants like a mixture of jik and water to the ratio of 1:5, destruction of the infected plants and mulching which produce vigorous plants that are more tolerant to weevil damage.

I identified a disease in the plantation known as rust thrips which attacks the banana fingers which causes the black spots on the fingers leading to premature ripening and finger fall off. (africasoilhealth.cabi.org/wp-content/uploads/2019/09/Banana-agronomy-extension-guide-final.pdf, 2019)



Cutting the infected plant



Eliminating the infected plant

3.3 Livestock production

This refers to the raising and maintaining livestock, primarily for the purposes of producing meat, milk and eggs. RwebitabaZARDI is engaged in dairy production and the breeds are the Friesian crosses.

3.4 Ear tagging

This refers to the application of a metal or plastic object used for identification of domestic livestock and other animals. It is commonly used in cattle, sheep, goats, pigs, and other domesticated animals, aiding in record-keeping and ensuring traceability for disease control and livestock management. I was engaged in ear tagging at Rwebitaba ZARDI dairy farm where five (5) were ear tagged marked as RWEB28, RWEB29, RWEB30, RWEB31 AND RWEB32 using an ear tag applicator.

3.4.1 Procedure of ear tagging

Choose the right tag; tags come in various shapes, sizes, and colors. The appropriate tag is selected based on the animal species and the information to be recorded. Tags may be pre-numbered or customized with specific data like the animal's id, farm name, or breed.

Tagging equipment; an ear tag applicator (or tagging pliers) is used to insert the tag. Make sure the equipment is clean and functioning properly to prevent infections.

Disinfect the tag and equipment; sterilize the tag and the applicator to reduce the risk of infection. This can be done by wiping the equipment with disinfectant or using an alcohol solution.

Restrain the animal to minimize stress and injury, the animal should be gently but firmly restrained. This may require handling the animal in a calm manner or using a squeeze chute or holding pen for larger animals like cattle.

The ear is held securely to ensure the correct placement of the tag.

The tag should be placed in the middle third of the ear between the two cartilage ribs, avoiding blood vessels to reduce pain and bleeding. For most species, this spot ensures the tag stays in place and does not interfere with ear function.

Insert the male and female parts of the tag into the applicator. The male part (the pin) is placed on one side, and the female part (the button or plate) is placed on the other.

Insert the tag by squeezing the ear tag applicator firmly to insert the tag through the ear. The male part of the tag pierces the ear and locks into the female part, securing the tag in place.

After tagging, it's a good practice to apply disinfectant to the ear to prevent infection.

Monitor the animal for a few minutes after tagging to ensure there's no excessive bleeding or distress. Keep an eye on the tagged area in the following days to check for signs of infection or irritation.

Record the tag information especially the tag number and any other relevant details (such as the animal's birth date, breed) in a farm management system for future reference.

([britannica.com/topic/livestock-farming](https://www.britannica.com/topic/livestock-farming), 2024)



Placing the ear tag into an ear tag applicator



Ear tagging

3.5 Pasture management

This is a practice for profitable livestock production providing the animals with forage grasses and legumes and keeping the soil healthy. It defines strategies to improve grass health and forage production, maintain a healthy ecosystem, and reduce production costs.

3.5.1 Data collection

This was done on grass pastures (brongharia) where different pasture samples were selected randomly. It involved counting the tillers, measuring the height of the tallest tiller on the stool, height and width of the tallest leaf on the tallest tiller and the number of leaves. One stool was selected randomly to measure the fresh weight and dried in the screen house where they will be taken to the lab after drying to measure the biomass and nutrient content of the pasture. This was done using a sickle, weighing scale, counter, a timber-made square, book and pen.



*Counting tillers on the stalk measuring the cut tillers
screen house*

drying the cut tillers in a

3.5.2 Defoliation

This refers to the removal or destruction of leaves and other foliage from plants, typically grasses and legumes.

I defoliated lablab pasture manually using hands and a sickle to stimulate new growth and promote healthy plant development, encourage diversity and density of pasture species, it also allows for the redistribution of nutrients through manure and urine.



Defoliating lablab

3.5.3 Potting

This is the process of preparing a planting medium for tree seeds. This is where soil is mixed with sand and decomposed organic manure in the ratio of 4:1:1 respectively.

Four wheelbarrows of soil were sieved to eliminate the foreign materials and trash such as plant debris, large soil rocks until fine soil particles were obtained.

Sandy soil was also collected and sieved.

Organic manure was obtained and sieved.

Soil, sand and organic manure were mixed in a ratio of 4:1:1 respectively.

Sand was added to improve to improve the soil texture and structure so as to improve factors such as aeration, water filtration and percolation to the deeper layers after being incorporated into the pot bags.

The organic manure was to improve soil fertility and boost nutrient availability in the pot soil.

The mixture of soil, Sand and manure was incorporated into the potting bags.

3.6.0 Apiculture

This is the keeping and rearing of bees for different purposes like tourism, research and development. There are two types of bees which include honey bees and stingless bees though

they all produce honey and some other products. Under honey bees there two bee species in Uganda which include; *Apis melifera Andasoni* which are small, dark and aggressive and they live in dry areas and *Apis melifera Scutelata* are big, brown and docile, they live in areas with low temperatures, the rest with see with variations are crosses.

3.6.1 Meliponiculture

This refers to the rearing and domestication of stingless bees that make honey in pots and they are stingless. They are characterized by small size with a brown color and they lack stingers. The stingless bees have several bee species over 550 described as meliponines species in the world, in Uganda so far what's domesticated and especially at RwebitabaZARDI are *Melipona bucaindei*, *hypotrigona gribodoi* and *Melipona feruginea*.

3.6.2 Importance of apiculture

Source of income to the farmers

Research and education

Source of medicine like ape-therapy

Apiculture balances the ecosystem

Increases crop production through pollination

3.6.3 Factors to consider when siting an apiary

The distance between the site and public places should be 200m and 100m from the forested area to avoid inconveniences.

Availability of bee forage plants for nectar.

The site be free from noise like vibrations

The site should be away from intruders.

The availability of water to regulate temperatures in the hive, keeping the brood moist and larvae out of desiccation.

The site should be free from pests, predators and vermin's since they may attack and kill bees.

Topography, the site should be on the gentle slope

Should have shade or shade should be established

3.6.4 Bee castes and their roles in the bee hive

A bee hive consists of three castes which include queen, drone and workers where there is 1:1: many respectively.

Queen bee

This is the only one female bee in the hive with well-developed reproductive system, spermathecal for carrying sperms and a medium thoracic area. It mates with the drone in the drone congregation area after taking a mating flight.

Roles of the queen bee

Lays eggs that are both fertile and infertile

Mother of the colony

Mates with the drone.

Drone bee

These are few in a bee colony, males and big in size.

Roles of the drone bees

Father of the colony.

Mate with the queen

Worker bees

These are the thousands seen in most bee colonies, females with poorly developed reproductive systems.

Roles of the worker bees to the colony

They collect nectar and pollen

Collect Propolis

They ventilate the hive

They clean and repair the hive

Brood nursing,

They attend to the queen

They build the comb

Foraging for food and water

They create and store honey

They guard the hive from intruders

Communications in bees

Use of pheromone; bees use different pheromones for different type of communication for instance, Alarm pheromone is used to recruit bees to defend the colony, while Nasanov pheromone is used for aggregation (during swarming or if bees are displaced from the colony)

Use of dances; bees use the famous waggle dance to send messages throughout the colony locate nearby food source and communicate other information.

3.6.5 Types of bee hives

Traditional bee hive.

These are hives that are made in locally available materials such as box hive, log hive, pot hive, weaved hive.

Advantages of traditional bee hive

They are cheap to acquire or make because they are made of locally available raw materials

They house large number of bees.

They provide large quantities of bee's wax

When occupied, they are difficult to be stolen.

They are movable

Disadvantages

They are difficult to work with.

Removal of the comb for inspect is difficult.

They are hard to circulate smoke through.

They produce low quality honey.

Semi-modern type of bee hives

Kenyan top bar

Tanzanian top bar

Advantages of semi-modern bee hives

They are movable

They produce good quality honey

They are durable

Harvesting is easy and possible to select the sealed combed (ripe).

Easy to inspect to know the conditions of the colony.

Control of swarming is easy.

Disadvantages

They are expensive for ordinary farmers to afford.

They require technical knowledge.

Production is limited as it cannot be expanded.

Combs can easily break while in the transit

Modern bee hives

Longstroth hive

Advantages of modern bee hives

They are durable

They produce good quality honey

Produce more honey

Allow many colony management practices

Use of modern equipment's and technologies

Disadvantages of modern bee hives

Production is limited as it cannot be expanded.

They are expensive

They require technical knowledge

3.6.6 Qualities of honey

Honey should be thick with water content of 17-19% that is measured by refractometer.

Honey should be gold colored

Honey should have good aroma

Honey should be sweet and clean

Quality during harvesting

Harvest capped/sealed honey

Use clean equipment for harvesting

Avoid over smoking which may cause smell into honey.

Avoid foreign materials like ashes, bees, pollen and grasses.

After harvesting at processing

Avoid dusty places

Use clean containers

Avoid contact with chemicals

Use air tight containers

Avoid bee pest infestation

Sort sealed and unsealed honey combs.

3.6.7 Bee forage plants

These are plants where bees get their nectar and pollen and other products of botanic origin. These plants include the diurnal plants which flower during day and have flowers and smell that attract bees, nocturnal plants which flower at night and smell bad, repellants and carnivorous plants. Bees normally visit diurnal plants like calliandra calothyrsus, leucina leucocephala, phaseolus vulgaris (beans), ocimum, musa spp, cordia africana and others since they are active during the day and secrete products liked by bees. Different plants secrete pollen and nectar at different time during day or night hours depending also on the prevailing weather to achieve the optimum performance as well.

Table1. Showing examples of bee forage plants, their common and scientific names and what they produce for the bees

S.no	Common name	Scientific name	pollen	nectar	resin
/botanic					
1	Bottle brush	<i>Citrus carlistermon</i>			x
2	Beans	<i>Phaseolus vulgaris</i>			x
3	Eucalyptus	<i>Eucalyptus cadagie</i>			x
4	Cariandra	<i>calliandra calorthyrus</i>			x

5	Ocimum	<i>Ocimum gratissimum</i>			x
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3.6.8 Honey harvesting

Honey harvesting refers to the process of collecting honey from beehives. It involves extraction of honey from the wax honeycombs in which bees store honey, without damaging the combs or harming the bees.

3.6.8.1 Procedure of harvesting honey

Assembling of the honey harvesting equipment which includes bee suit, gumboots, smoker, hive tool, bee brush, fuel water and air tight bucket.

Smoke the hive to calm the bees to ease harvesting.

Open the hive using the hive tool and remove the top bar where a honey comb is constructed.

The honey combs are cut using a bee knife and placed in the air tight bucket and covered to avoid the absorption of water from the atmosphere which may reduce quality.



Fuelling the smoker



opening the bee hive

3.6.9 Honey processing

This refers to the extraction of honey from honey combs. It involves sorting of honey from pollen, removal of foreign materials like grass, bees and honeycomb cells.

Junking of the honey combs where the combs are broken down into small particles and placed into a setting tank.

Honey is left to settle and scum that is formed is scooped out.

Filtering is done using a white cloth and a bucket to remove other small foreign materials.

Honey is packed in the recommended bottle sizes and weight, labelled and sealed ready for distribution to the market.

Honey harvesting is typically done during peak nectar flows, when the honey is ripe and the bees have stored excess honey. Beekeepers aim to leave enough honey for the bees to sustain themselves during winter months.



Sorting honey



Junking honey



Filtering honey

3.6.10 Honey packing

This is the process of packaging honey into containers to be sold either commercially or for retail. Honey may be directly bottled into small retail containers or into large drums for storage or export, depending on the intended market. Packaging is a necessity for maintaining the quality, safety and integrity of raw as well as processed products from the farm or plant to consumption. (includeplatform.net/blog/flight-paths-of-the-beekeeping-sector-in-uganda/, 2022)



Putting honey into the packaging bottle



packed honey

3.7.0 Aquaculture

This refers to the controlled keeping and rearing of aquatic organisms like fish, crocodiles and crustaceans.

3.7.1 Factors considered while selecting a suitable site for pond construction

Topography; the flood prone areas especially low land areas which may cause flooring of water ponds.

Source of water; the water source should be nearly available to provide water to the pond in case of need.

Soil types; the soil should be well drained, deep and fertile to encourage the growth of planktons that act as food for fish.

Accessibility; the site should be accessible interns of safety, market and the operation practices like feeding.

3.7.2 Hinderances of fish farming

Technological know-how; farmers have inadequate knowledge and skills on how to manage farming.

Seed quality and quantity; the quantity and quality of seeds is low which leads to low production thus hindering fish farming.

Feed quality and quantity; inadequate feeds which are of low quality have also hindered fish farming.

3.7.3 Fish feeds

Pellets; these are feeds typically made from a mixture of fish meal, plant proteins, vitamins, and minerals, and they can be floating or sinking pellets. Floating pellets are ideal for surface-dwelling fish while sinking pellets are better for bottom-feeders.

Zoo planktons and phytoplankton's; these are cultured to feed bivalve mollusks (all life stages), the early larval stages of crustaceans, and the zooplankton (e.g., rotifers, cope- pods) that are used as live food in fish hatcheries. Flagellates and diatoms are two important types of phytoplankton at the base of the food chain.

Forage; these are small species such as herring, menhaden, and sardines that swim in big schools and feed on plankton.

3.7.4 Life cycle of fish

Eggs ► embryo ► hatchery ► fingerling ► juvenile ► adult

Fish species at RwebitabaZARDI

3.7.5 Nile Tilapia;

This species is bronze to brownish-gray dorsally and laterally, and white ventrally. They have a small head with a short snout and a slightly protractile mouth that is located at the front of the head.

Characteristics Nile tilapia fish

It has a deep-bodied, compressed shape.

It is bronze to brownish-gray dorsally and laterally, and white ventrally.

It has a truncated caudal fin that has many thin black bands and a pinkish-red posterior margin.

Adult fish can reach up to 60 cm body length and up to 4.3 kg body weight.

But in commercial production, they are generally grown up to 400-500 grams.

Behavior

Nile Tilapia Fish are known to be very social animals and regularly form schools. They are active swimmers and can be found near the water surface during the day but tend to move deeper during the night.

They can tolerate a wide range of water temperatures, salinity, and oxygen levels, making them highly adaptable to different environments.

3.7.6 Cat fish

Catfish are so-named because of their whisker-like barbels, which are located on the nose, each side of the mouth, and on the chin.

Characteristics of catfish

Catfish are scale less

Most catfish possess leading spines in their dorsal and pectoral fins

They have highly developed sensory organs

They are capable of laying up to 50000 eggs

They can thrive in both hot and warm water

Most of them are nocturnal

3.7.7 Transferring fingerlings

This involves the removal of fingerlings from the hacker where they have been confined and taken to another pond for stocking. With the help of a pond attendant, I collected fingerlings from the hacker to be transferred to another pond. Two varieties of fish fingerlings named as catfish and Nile Tilapia.

I also identified the sex of fingerlings, this was done by observing the reproductive parts of the fish and the structure of the fish as well. Males are usually smaller and more colorful than females. They also possess an external sexual organ, the gonopodium, which makes it easy to differentiate males from females.



Removing fingerlings from the happer



Identifying the sex of the fish

3.8.0 Potato production

Potato fruits are a succulent but inedible spherical, yellow-green berry, up to 4cm across. Underground, the edible root forms a tuber that can be a range of colors, sizes and shapes, depending on the cultivated variety. Potato belongs to the Solanaceae family and it takes four months to grow.

3.8.1 Steps in potato growing at Rwebitaba ZARDI include;

Seed selection; this refers to the process of identifying healthy, viable and disease-free seeds for growing crops to produce higher yields.

Characteristics of good potato seeds.

They should have many eyes (buds) so as to bring many shoots.

A good seed should be of an egg size

They should be disease free and resistant

Site selection; this is the identification the area where to grow potatoes, with required elements and the factors considered include;

Soil type; the soil of the area should be fertile.

Topography; the area should be a gentle slope to allow easy flow of water.

History of the area; the areas should have spent 2-3 years without the growth of any Solanaceae family crop.

Land preparation; this is done by slashing, primary tillage and secondary tillage until the land is ready for receiving the seeds. Primary tillage ensures soil conservation by reducing erosion and maintaining soil fertility and secondary cultivation turns the rotten organic matter and brought near the surface for plant use.

Field marking and pegging; this is done using a measuring tape and pegs to ensure accuracy in spacing, easily estimate the seeds needed for a certain field and estimate the expected output.

Pitting and Planting; potatoes are planted in ridges with the spacing of 75cm by 30cm and a tuber is placed at 15cm deep. On planting, a bottle soda top of NPK 17 17 17 fertilizer is applied to each tuber (seeds) which boosts leaf and tuber formation.

Weeding and Earthing-up; weeding is the removal weeds in order to reduce competition between weeds and plants for growth requirements like sunlight, nutrients, water air and sometimes space. Earthing up also involves the piling soil up around the base of the plant. It is done two weeks after full emergency and when properly done, ensures that the stolons found above the ground are covered well to provide necessary conditions for formation of new tubers thus leading to increased yields.

Spraying; this done with recommended contact fungicides especially M45 using a spray pump to prevent diseases like bacterial wilt, late and early blight that affect potatoes that may reduce their productivity.

Dehaulming; this involves detaching of the vegetative parts of the potato plant found above the ground from the root tubers. It is one of the pre-harvesting handling practices that is done nearly 10-15 days before harvesting aimed hardening the skin of the potatoes to reduce injuries during the postharvest handling.

3.8.2 Harvesting

This refers to the removal of the potatoes from the garden using hand hoes to uproot the tubers. We harvested Naropot4 known as Rwangume in its local name.



Harvesting Naropot4



Harvesting 2019NA1.1

3.8.3 Data collection

This was done on different potato varieties like Naropot4 (Rwangume), master, 2016219, 2019NA1.1, Rutuku, master and Victoria. The aim of collecting data was to identify the qualitative traits for chipping and crisping among candidate varieties. The parameters included the oval and oblong shape for machine processing shall eyes to ease peeling, cream and yellow color when fresh is the best appearance and the overall yield.

The selected varieties are submitted to the variety release committee of MAAIF and be released as varieties for commercial production.

Basing on the data collected with the help of Mr. Aijuka Sammy we found out that Naropot4 (Rwangume), Rutuku and Victoria were thriving well than other varieties and therefore used as local checks.



Potato variety cut to observe the color



measuring the weight of 2019NA1.1

3.9.0 Tea production

Tea is one of the most consumed beverages in the whole world and Uganda is one of the high producing tea countries in the world. Tea can be consumed in two different ways: hot tea or iced tea. Tea growing involves a step by step process which includes planting, pruning, fertilizing and harvesting. If you rightly follow the procedure, it will ensure that you have a profitable tea farm. There are numerous tea varieties types in Uganda and there are the green, black and Oolong tea. The only thing that differentiates the three is the way in which they ferment.

Tea cultivation is the agricultural practice of growing tea plants, primarily *Camellia sinensis*, for the production of tea. This process involves selecting appropriate varieties, managing soil health, and employing techniques for harvesting and processing the leaves.

At Rwebitaba tea research center there are two types of tea grown which include; clonal and seedling tea.

3.9.1 The varieties of tea at Rwebitaba ZARDI

6/8

100/5

32/8

U10

U8

3.9.2 Agronomic practices in tea

The following are the agronomic activities in tea production

Pruning; this involves the removal of vegetative tea bush at 450cm above the ground using a pruning knife, measuring stick at an angle of 45 and is done during dry spell to prevent rotting of the cut part. This is done for convenience during operations, for rejuvenation.

Sanitary pruning; this involves the elimination of decayed branches from tea bush.

Height reduction pruning; this is done at 15cm above the ground to

Tea plucking; this involves the removal of a desired tea shoots from the tea bush for market.

Tea tipping

This is done when the shoots in the tea bush after pruning at a predetermined height parallel to the ground surface.



Tea tipping

3.10.0 Field work evaluation

3.10.1 Self-assessment

During my field attachment one at RwebitabaZARDI, which commenced on 7/08/2024 where Mr. Mugume Ronald welcomed me at the institute and Mr. Agaba Hannington took me through orientation and told about the enterprises at the farm. I got involved in different enterprises like bananas, potato, and livestock among others. This enabled me acquire both knowledge and hands-on practical skills in different enterprises. I also interacted with different people in their dignities which created more connections.

3.10.2 Assessment of the Organization

Strength

Adequate land to facilitate the existence of many enterprises especially cattle, apiculture, aquaculture, banana, cassava among others thus ensuring expansion of the farm for increased production.

Efficient supply of hydroelectricity power from national power grid which ensures the supply of electricity to the institute for running electric offices like computers and printers that make office work simplified.

Presence of external funds from non-government organizations to enhance research activities done in different departments especially research on stingless bees in the apiculture which also results into the increased agricultural production.

The presence of good and experienced administration with a director, responsible human resource manager, internal auditor heads of department, and the support staff who run the institutional programs hence its development.

The availability of water supply that is sufficient pumped from a nearby swamp and river Mpanga for domestic and industrial use especially for animals to drink and mixing of feeds, irrigation during the dry planting and for human consumption.

The institute have abundant of internet to ease research.

Weaknesses

There is over dependency on synthetic agro-chemicals which are a threat to the environment.

Lack of well-equipped library which hinders research by the intern students and staff in the long run.

The institute lack laboratories in different departments for carrying out research experiments and analysis thus making research very expensive.

3.10.3 Experiences, knowledge and skills gained from the field activities

I learnt how to identify diseases like rust thrips in bananas

I learnt the effect of weather on bees, most of the bees are active in the afternoon and evening than in the morning hours.

I learnt how to identify sex in fish

3.10.4 Relevancy of the theories learnt during lectures to the field work activities

The theory that I had in lecture was put into practice by engaging into practical activities like disease control and identification in banana production, identification of sex in fish, data collection in potatoes and pastures. This has enabled me acquire knowledge and skills especially in milking, preparing a banana planting material to mention but a few.

3.10.5 Special contribution of persons to the organization

I planted bananas of Mpologoma as this contributes to the expansion of the banana enterprise.

I cleaned the bee hives as this contributed to the health maintenance of the apiary.

Challenges encountered during field attachment

Limited engagement in outreach programs hence less opportunity to interact with the farmers who are the key stake holders in agriculture.

The farm that I was attached to was over depending on the use of agro-chemicals which did not suit my programme. However, I encouraged them adopt the use of organic farming and they promised to do so.

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

4.0 Introduction

This chapter comprises of the conclusion of what I learnt during my field attachment one and recommendations as discussed below

4.1 CONCLUSION

This field attachment one has been a success and has helped me to relate and apply most of my theoretical work to practical's through engaging in activities like rice planting, de-suckering, milking, bee hive inspection, transplanting tomatoes, fish pond cleaning, determining the fertility of the fish pond among others and these have enabled me learn and acquire knowledge and hands-on practical skills in disease identification, milking, bee hive inspection, determining the fertility among others which fulfilled my objectives.

4.2 RECOMMENDATIONS

4.2.1 Recommendations to the University

The time provided for field attachment is not enough, therefore the university should revise the programme and increase the time length for field attachment as this will enable a student to cover all that is required and attain adequate skills.

The University should engage students in practical's by including them in the time table to equip students with some knowledge on practical's before being attached to farm as this will enable them leave some knowledge and projects at the farm attached to.

The University should prove the importance of sustainable agriculture in its programs through training students in environmentally friendly farming practices by setting up demonstrations and experiments that promote long-term sustainability with high production.

4.2.2 Recommendations to Fellow Students

Rwebitaba ZARDI is one of the farms where students can acquire hands-on practical knowledge and skills in all aspects of agriculture, therefore, as a student should utilize the time effectively whenever attached to this farm.

Students should always get time and visit this farm for purposes of learning.

4.2.3 Recommendation to the organization

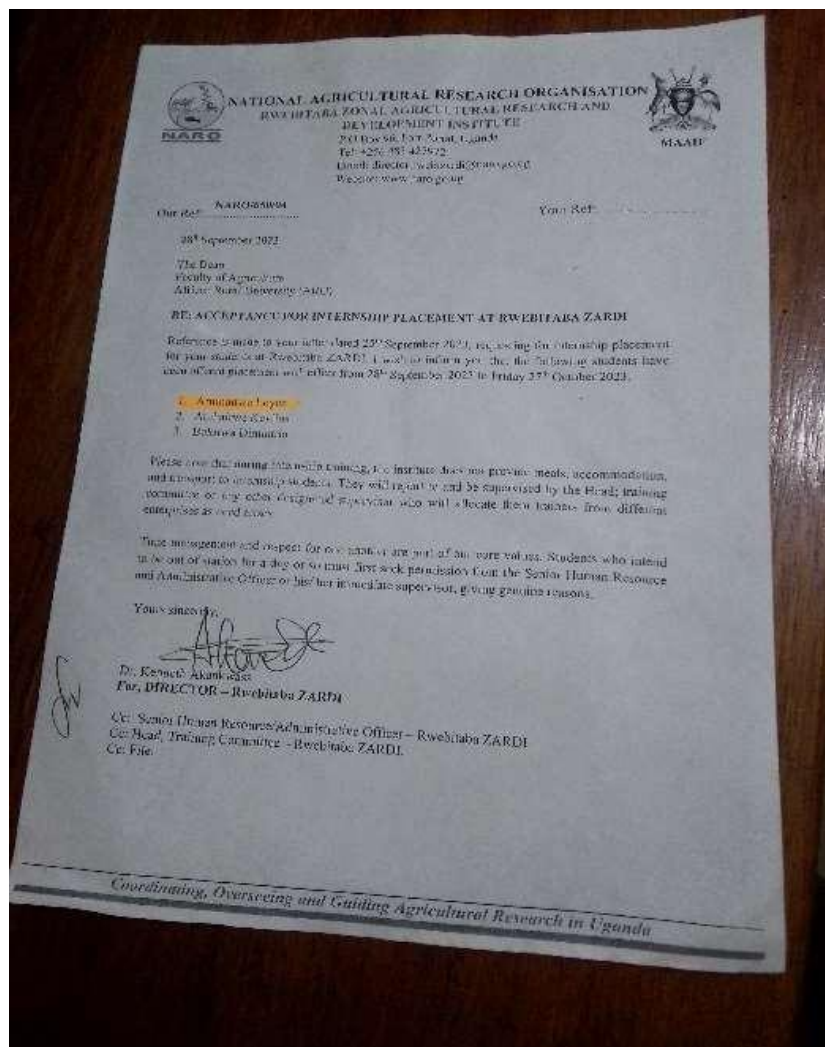
The organization should adapt the use of organic farming practices such as the mulching, use of organic manure to improve soil fertility to regulate the over dependency of inorganic fertilizers as this is harm to the environment.

The organization should also implement the use of integrated pest, vector, disease, virus, fungal, management system to avoid the excessive use of agrochemicals as they affect the biological activities in the by killing the living organisms in the soil and also affects the people's health through food chain and in the process of applications.

The organization should also have an organized timetable for the students to avoid inconveniences in the course of training as this led to leave some areas untackled.

The arrangements for extension services should be included in the program such that the students can be able to interact with the farmers since they are the key stakeholders in agriculture.

4.3 APPENDICES



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.....

27/7/2024

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
.....registration numberwho 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 in advance for accepting my request. Together we can transform our communities
from subsistence agriculture to sustainable market oriented agriculture.

Yours faithfully,

.....

Ssengonzi Bagenda Jerome (D.Eng.)

Faculty Dean

NATIONAL AGRICULTURAL RESEARCH ORGANISATION

RWEBITABA ZONAL AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE

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Time Table for training Interns – September 2024

Date	Topics/courses	Resource persons
07/08/2024	Orientation	Mr. Agaba Hannington/Mr. Twesige Dominic
08/08/2024	Field lay out for pasture establishment	Mr. Gumaoshabe innocent
09/08/2024	Soya bean trial establishment	Mr. Turyahebwa Veleriano
12/08/2024	Vegetable production	Mr. Asimwe Hillary
13/08/2024	Cassava production	Ms. Asio Elizabeth
14/08/2024	Irish potato production	Ms. Aharinta Faith
15/08/2024	Vegetable production	Mr. Mutebi Douglas Jjemba
16/08/2024	Vegetable production	Mr. Mutebi Douglas Jjemba
19/08/2024	Maize production/Banana production	Mr. Mutebi Douglas Jjemba / Mr. Kazigye Francis
20/08/2024	Rice production	Mr. Ssenyonga Peter / Ms. Alituha Maureen
21/10/2024	Agroforestry	Mr. Mwesigwa Boaz
22/10/2024	Soil and water conservation	Ms. Namutebi Vivian / Mr. Mugenyi Lawrence
23/10/2024	Apiculture	Mr. Mugume Ronald
26/10/2024	Aquaculture	Mr. Mununuzi David
27/10/2024	Livestock production	Mr. Gumaoshabe innocent

Date	Topics/courses	Resource persons
28/08/2024	Report writing	Dr. Suubi Godfrey/Ms Namwase Agnes
29/08/2024	Creative life orientation	Mr. Twesige Dominic
30/08/2024	Tea production	Mr. Kawooya Ronald / Mr. Mugisa Charles/ Mr. Veleriano
02/08/2024	Agric machinery	Mr. Mutebi Douglas Jjemba / Mr. Wasswa Kasib
03/09/2024	Submission of the draft reports	Dr. Suubi Godfrey
04/09/2024	Review of the draft reports	Dr. Suubi Godfrey
05/09/2024	Final report submission	Mr. Mutebi Douglas Jjemba



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URDT website

NARO website