



MAKERERE UNIVERSITY  
COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES  
(CAES)

# ANNUAL REPORT

2019/ 2020

Copyright @ 2020  
Principal's Office, CAES.

**Concept: Prof. Bernard Bashaasha, Principal**

*This work may be transmitted for non-commercial use and educational use with acknowledgement of the Principal's office CAES and the author (s).*

**For additional rights, write to:**

[principal.caes@mak.ac.ug](mailto:principal.caes@mak.ac.ug) or P.O Box 7062, Kampala Uganda

**Editors:**

*Prof. Bernard Bashaasha, Principal, CAES  
Jane Anyango, Principal Communication Officer, CAES  
Tonny Obua, Assistant Lecturer, School of Agricultural Sciences*

**Writers:**

*Jane Anyango, Principal Communication Officer, CAES.*

**Layout and Design:**

*Jane Anyango, Principal Communication Officer, CAES.*

**Printed by:**

*Logik Media Publications  
Kampala Uganda*

## VISION

To be a thought leader of knowledge generation for societal transformation and development.

## MISSION

To produce graduates, research products and knowledge services in the fields of agricultural, food technology and environmental management.

# TABLE OF CONTENTS

Vision .....	iii
Mission .....	iii
Acronyms .....	viii
Executive Summary.....	ix
<b>1.0 INTRODUCTION.....</b>	<b>2</b>
1.1: The College of Agricultural & Environmental Sciences (CAES).....	2
1.2: Purpose of the College .....	2
1.3: Vision.....	2
1.4: Mission.....	2
1.5: Schools and Departments.....	2
1.6: Research Institutes.....	3
1.7: Research Centers.....	3
<b>2.0: TEACHING AND INFRASTRUCTURE.....</b>	<b>8</b>
2.1 Teaching Infrastructure and Human Resources .....	8
2.2 Programs Offered .....	8
2.3 Fees Structure .....	11
2.4 Curriculum Review .....	13
2.5 Undergraduate Admissions 2020/2021.....	14
2.6 Internship Placement, Supervision and Recess Term .....	15
2.7 Graduate programs supervision, thesis examination and defense .....	21
2.8 Advertisement of PhD Agricultural and Applied Economics .....	21
2.9 Graduation output 2019/2020 .....	22
2.10 Semester I 2019-2020 Results .....	24
2.11 Semester II 2019-2020 Teaching.....	24
2.12 Commencement of Semester II 2019-2020 teaching of Undergraduate and Graduate finalists under the New Normal of COVID 19 .....	24
2.13 External Examiners/Under and Graduate.....	25
2.14 Testimonials, Transcripts and Certificates.....	25
2.15 Internship/Industrial Training, Recess Term .....	25
2.16 Graduate programs admission, teaching, student supervision, thesis examination, internal examiners.....	25
2.17 Teaching space .....	25
2.18 Laboratories, Libraries, Furniture and Equipment .....	26
2.19 Transport for students' field work and off campus stations .....	26
2.20 PhD Agricultural and Applied Economics approved.....	26
2.21 CAES Library Achievements .....	26
2.22 MSc. Food Safety and Quality Management gets first lot of students.....	26

<b>3.0 RESEARCH FUNCTION.....</b>	<b>29</b>
3.1 Resource Mobilisation & Collaborations.....	29
3.2 CAES Grantees for the Mak-RIF funds .....	29
3.3 Running Projects in CAES (2019-2020).....	32
3.4 Collaborative Initiatives .....	42
3.5 Memorandum of Understanding (MoUs) Signed .....	46
<b>4.0 RESEARCH, TECHNOLOGIES AND INNOVATIONS .....</b>	<b>50</b>
4.1 Research Ethics Committee (CAES REC).....	50
4.2 Automation of Communal Hand Water Pumps to Eliminate COVID-19 Transmission-MAK-RIF-Project.....	52
4.3 Addition of Thermal Imaging, 3D Printing to Fight Against COVID-19 .....	53
4.4 A Touchless Handwashing (TW-20) Kit as a responsive technology to the COVID-19 Pandemic Launched.....	54
4.5 Piloting Nitrogen Bio-fortified and pelletised commercial-grade organic fertilizer in Uganda.....	55
4.6 ProWEAI Tool that Measures Women Empowerment in Agricultural Projects.....	56
4.7 Teaching Model for University-Industry Linkage .....	56
4.8 Adding Value to Potatoes to Enhance Productivity and Incomes in Uganda.....	58
4.9 Adaptation and Promotion of the New Fruit Drying Technonogy-R efractance Window Drying Technology (RWDT) for Production of High Quality Bioproducts .....	60
<b>5.0 INFRASTRUCTURE DEVELOPMENT AND EQUIPMENT ACQUIRED .....</b>	<b>63</b>
5.1 A Shs.146m Machine (Sperm Vasion) Installed for Testing Quality and Quantity .....	63
of Semen and Herbs .....	63
5.2 Modification of the SAS Conference Room to a Video Conferencing Facility .....	64
5.3 The Construction of the shs.2.8bn WB Funded Office Block and Lecture theatres nears completion .....	66
5.4 MaRCCI injects UGX 50 Million in the Rehabilitation of the University Gene Bank .....	67
<b>6.0 RESEARCH DISSEMINATION, KNOWLEDGE TRANSFER AND PARTNERSHIPS .....</b>	<b>70</b>
6.1 Book on Agriculture and Ecosystem Resilience in Sub-Saharan Africa Launched .....	70
6.2 MAK-RIF 2nd Policy Seminar Series for Researcher's, Policy Makers and Advisors held .....	71
6.3 Inauguration of Policy Seminar Series on Agriculture and Rural Development Vice Chancellor Prof. Barnabas Nawangwe (4th), Prof. Ezra Suruma (5th) and Participants pose for a Group Photo after the Launch.....	72
6.4 Research dissemination workshop on Enhancing Value addition on Potato-Sorghum enterprises for Improved Livelihoods in Uganda (EvaPoSIL) project, call for setting up a plant in Western Uganda.....	73
6.5 Wakiso pig farmers trained on how best to conduct Artificial Insemination in pigs.....	75
6.6 CAPSNAC Dissemination Workshop held in Mbale.....	77
6.7 GREAT Project hold symposium on Gender Responsive Breeding .....	78

6.8	The 1st International GORILLA Conference Opens at Makerere University .....	79
6.9	Policy dialogue on Lake Victoria Water Rising Levels and pollution in Masaka .....	80
6.10	A Poultry Training Manual to address key capacity and knowledge gaps within the poultry sector designed .....	81
6.11	Mak RIF COVID 19 Special project Unmasks the Gendered Impact of COVID 19 guidelines on Market Vendors of Perishable Goods in Urban and Peri-urban Areas of Uganda .....	82
6.12	Mak-RIF project unveils Uganda’s Potential to Process Powdered and Liquid Eggs for Domestic and International Market .....	85
6.13	Donation of the touchless handwashing kits to health facilities .....	86
6.14	Policy tour to Bugiri district over Lake Victoria’s rising water levels and pollution .....	87
6.15	Policy Dialogue on Lake Victoria’s Hydrology, Water Quality and Livelihoods in Jinja District .....	88
6.16	GREAT Project held virtual Annual meeting to take Stock of its Achievements in Phase I .....	88
6.17	CAPSNAC Project Writeshop .....	89
6.18	Government officials trained on Environmental Valuation.....	90
6.19	Mak RIF AI project well received in Wakiso district.....	91
6.20	Researchers Trained in Experimental Economics.....	92
6.21	GREAT Gender Awareness Training for Students and Scientist working on Ground Nut Projects in Sub-Saharan Africa .....	92
6.22	Webinar on Harnessing the COVID-19 Recovery Programs to Combat Climate Change in Uganda .....	93
6.23	Engagement of alumni for student study opportunities at Yale School of Forestry .....	94
6.24	District Agricultural Officers retooled.....	96
6.25	Mak RIF Pig AI team in consultative meeting with Kamuli piggery farmers .....	97
6.26	Policy dialogue in Mukono district on governance of natural resources .....	98
6.27	Launch of the Mak RIF project on empowerment of Agro processing industries (EAPI).....	98
6.28	CAPnex Policy Dialogue on Water Quality and Food Security .....	100
6.29	GREAT 4 Course on Gender-Responsive Plant Breeding .....	101
6.30	Policy dialogue on governance of Natural Resources in Wakiso .....	102
6.31	RUFORUM Vice Chancellors, Principals, and Deans meeting at Cape Coast Ghana on Continental Agenda 2063 .....	103
6.32	Post Doctoral Students retooled on Project Management at the RUFORUM AGM Cape Coast .....	104
6.33	Graduate Students in Training during RUFORUM AGM in Cape Coast.....	105
6.34	GREAT Gender Responsive Rice Breeding Training .....	106

6.35 GREAT holds first TOT in the world on Women specific Empowerment in Agriculture Index .....	107
6.36 Mak Agricultural Day and Exhibition .....	108
6.37 College publications and branding materials secured .....	111
<b>7.0 HUMAN RESOURCE FUNCTION .....</b>	<b>113</b>
7.1 Academic Staff Career Development/Promotion .....	113
7.2 Staff / Student Awards .....	113
7.3 Contract Staff .....	117
7.6 COVID 19 Screening .....	117
7.7 Staff Offices in the new Graduate Teaching Laboratory at MUARIK .....	117
7.8 Academic Staff Establishment as of October 2020 .....	118
<b>8.0 FINANCE FUNCTION .....</b>	<b>130</b>
8.1 Budget performance .....	130
<b>9.0 REPORT ON MAKERERE UNIVERSITY AGRICULTURAL RESEARCH INSTITUTE KABANYOLO (MUARIK) .....</b>	<b>133</b>
9.1 Introduction .....	133
9.2 General Structure of MUARIK .....	134
9.3 Enterprises at MUARIK, their status and challenges .....	135
9.4 Achievements in 2019/2020 .....	136
9.5 Staff at MUARIK .....	137
9.6 Financial Report .....	140
9.7 Challenges faced at MUARIK .....	140
9.8 Opportunities for Improvement .....	141
<b>10.0 REPORT ON MAKERERE UNIVERSITY BIOLOGICAL FIELD STATION (MUBFS) .....</b>	<b>143</b>
10.1 About Makerere University Biological Field Station (MUBFS) .....	143
10.2 Facilities and Accessibility .....	144
10.3 Research and Training Opportunities .....	145
10.4 Achievements 2019-2020 .....	146
10.5 MUBFS Publications .....	147
10.6 Other MUBFS Achievements .....	148
<b>11.0 THE NATIONAL BIODIVERSITY DATABANK (NDBD) .....</b>	<b>149</b>
<b>12.0 MAKERERE UNIVERSITY CENTRE FOR CLIMATE CHANGE RESEARCH AND INNOVATIONS (MUCCRI) .....</b>	<b>151</b>
<b>13.0 PUBLICATIONS 2019/2020 .....</b>	<b>154</b>

## ACRONYMS

AfDB	African Development Bank
ARUA	African Universities Alliance
CAES	College of Agricultural and Environmental Sciences
DABE	Department of Agricultural and Bio-Systems Engineering
DANRE	Department of Natural Resource Economics
DAP	Department of Agricultural Production
DEIS	Department of Extension and Innovation Studies
DEM	Department of Environmental Management
DEM	Department of Environmental Management
DFTHN	Department of Food Technology and Human Nutrition
DGGCS	Department of Geography, Geo-informatics and Climatic Sciences
DRGT	Directorate of Research and Graduate Training
FBT	Department of Forestry, Biodiversity and Tourism
FTBIC	Food Technology and Business Incubation Centre
MAK	Makerere University
MaRCCI	Makerere University Regional Centre for Crop Improvement
MUARIK	Makerere University Research Institute Kabanyolo
MUBFS	Makerere University Biological Field Station
NBDB	National Biodiversity Data Bank
NEF	Next Einstein Fellowship
NFC	Nyabyeya Forestry College
SAS	School of Agricultural Sciences
SFECS	School of Forestry, Environmental and Geographical Sciences
SFTNB	School of Food Technology, Nutrition and Bioengineering
USAID	United States Agency for International Development
WSU	Western Sydney University



## EXECUTIVE SUMMARY



The academic year 2019-2020 was rocked with many challenges following the declaration of the Corona Virus Disease (COVID-19) a global pandemic on 11th March 2020. Countries world over are experiencing and trying to cope with its unprecedented rapid spread that has claimed many lives and devastated the social economic activities. Given the absence of a vaccine, partial and total lockdowns, social distancing, wearing of face masks, hand washing and sanitizing were recommended by the World Health Organization (WHO) as the global remedy to contain the spread of COVID-19.

All institutions of learning were since closed with online delivery as the only option despite the challenges that come with it. However, despite the challenges, the CAES registered some milestones. Eight (8) staff members were awarded projects under the Mak-RIF Special COVID-19 Call to contribute to measures to curb the spread of the pandemic. Over five technologies and innovations under this initiative were unveiled including an Automated Communal Hand Water Pump (MakNAI), Thermal Imaging for detection of COVID-19, Three-Dimensional (3D) printing of biodegradable face shields and components for the Bulamu ventilator and the Touchless Handwashing (TW-20) Kit .

Teaching and learning was disrupted. Academic staff were trained via zoom on uploading content on MUELE and also delivering lectures online. Student's placement for internship was disrupted by the Pandemic. The college developed different guidelines on how to conduct internship for all programs. E-learning focal coordinators were appointed.

Graduate program supervision, examination and defence resumed after the partial lifting of the lock down. A total of 1,017 undergraduate students were admitted. Of these, of 480 were admitted under the government scholarship while 537 students were admitted under the Private scheme.

The college actively participated in the restructuring of her programs following minimum standards developed by the National Council for Higher Education (NCHE) and the Quality Assurance and Gender Committee (UQAG) of the University Council was tasked to identify programs with duplications to be merged or removed from the curriculum. Pronouncements have been made by the different units as we wait for management decisions.

In our outreach and knowledge transfer efforts, over 250 staff publication in revered journals were recorded for the academic year 2019/2020. College branding materials including banners, tear drops, flyers and brochures were procured and a Book on Agriculture and Ecosystem Resilience in Sub Saharan Africa launched. Monthly policy seminar series to re-ignite the debate and bridge the existing knowledge gap between research and policy making on issues of agricultural and rural

development were inaugurated. The College Strategic Plan (2020-2030) was developed and shared with college stakeholders and the university planning committee. The Climate Change Manual for Eastern Uganda was formulated and a Poultry Training Manual to address key capacity and knowledge gaps within the poultry sector designed. Over 20 research dissemination workshops for Mak-RIF and other projects were held.

On the human resources front, a number of our staff ascended in their academic ranks, a few resigned and some retired after reaching the mandatory retirement age. Six of our staff were nationally and internationally recognized for their outstanding performance.

The college continues to write grant winning proposals to mobilise resources to supplement the university resource envelope. As of now the CAES has over 150 running projects and 8 MoU s signed in the period under review.

On behalf of CAES Management, allow me express our heartfelt gratitude for the support rendered by university management, our development partners and the Government of Uganda towards our research function. I also thank our staff for the commitment and dedication to serve the university despite the challenges. We also thank students and parents/ guardians as our primary key stakeholders. As CAES, we are committed to delivering on our mandate to build for the future.

I thank you.



Prof. Bernard Bashaasha  
**PRINCIPAL**



# INTRODUCTION

# 1.0 INTRODUCTION

## 1.1: The College of Agricultural & Environmental Sciences (CAES)

CAES is one of the ten colleges of Makerere University located within the Western part of Makerere University. Its main administrative center is in the Agriculture building located just opposite the University Main Library entrance. CAES has three Schools: School of Agricultural Sciences (SAS), School of Forestry, Environmental and Geographical Sciences (SFECS) and School of Food Technology, Nutrition and Bioengineering (SFTNB).

The college has two institutes that handle research namely Makerere University Agricultural Research Institute Kabanyolo (MUARIK) and Makerere University Biology Field Station (MUBFS).

## 1.2: Purpose of the College

The purpose of the CAES and Makerere University at large is derived from the mandate of Universities and Other Tertiaries Institutions Act (UOTIA) as amended:-

- a) the provision of higher education, promotion of research and advancement of learning;
- b) dissemination of knowledge and giving opportunity of acquiring higher education to all persons including persons with disabilities regardless of the race, political affiliation, colour, creed or sex and;
- c) the provision of accessible physical facilities to the users of public university.

## 1.3: Vision

To be a thought leader of knowledge generation for societal transformation and development.

## 1.4: Mission

To produce graduates, research products and knowledge services in the fields of agricultural, food technology and environmental management.

## 1.5: Schools and Departments

The college has three schools and eight departments.

The School of Agricultural Sciences (SAS) is comprised of three Departments:

- i) Agricultural Production (DAP);
- ii) Agribusiness and Natural Resource Economics (DANRE);
- iii) Extension & Innovation Studies (DEIS)

The School of Forestry, Environmental and Geographical Sciences (SFECS) is composed of three departments:

- i) Forestry, Biodiversity and Tourism (FBT);
- ii) Environmental Management (DEM);

- iii) Geography, Geo Informatics and Climatic Sciences (GGCS)

The School of Food Technology, Nutrition and Bioengineering (SFTBN) comprises two departments:

- i) Agricultural and Biosystems Engineering (DABE);
- ii) Food Technology and Human Nutrition (DFTHN);

The SFTNB also hosts the Food Technology and Business incubation Centre (FTBIC)

## 1.6: Research Institutes

### 1.6.1: *Makerere University Agricultural Research Institute Kabanyolo (MUARIK)*

MUARIK is a public institution and an arm of Makerere University that interfaces with the National Agricultural research system (NARS). Seated on 650 hectares of land it is being managed as a multi-disciplinary facility for training, research, outreach and production under the CAES. It is located 19 kilometers North-West of Kampala off Gayaza Township on the Kampala-Zirobwe Road. The institute houses the center for Continuing Agricultural Education Centre (CAEC), the postgraduate students' hostel and facilities for over 30 graduate students under the regional programs. The Tissue Culture, Animal Science laboratory, MaRCCI, and the Biotechnology laboratories are also located at MUARIK. Other facilities at MUARIK include CURAD, staff residences, poultry, dairy, and piggery units among others.

### 1.6.2: *The Makerere University Biological Field Station (MUBFS)*

MUBFS is located in Kibale National Park in Kibale district. It is mainly involved in research but it is increasingly hosting short international courses in Tropical Biology. Originally, most of the research at MUBFS was primatology but over the years, the research agenda has broadened to include ecological and behavioral research on taxonomy, and socio economic studies. There is adequate dormitory and guest house space for groups ranging between 10 and 60 and catering services. In collaboration with national institutions, the institute provides consultancy services to the government and other organizations in Uganda. Consultancy services include tailor made training in different fields of environment and natural resources, assessment and monitoring of environment and natural resources therein environmental impact assessments and audits, project monitoring and evaluation and facilitation.

## 1.7: Research Centers

The college has over 14 centers serving as a base for knowledge transfer and partnerships. These are complemented by facilities located at Nyabyeya Forest College and Budongo Conservation Field Station that cater for Forestry students.

Centre Name	Focus Area (s) / Objectives	Target Group	Partners
The Food Technology and Business Incubation Centre (FTBIC)	<ul style="list-style-type: none"> <li>• Conduct research in agro-processing and value addition,</li> <li>• Train students, staff and the general community in entrepreneurship,</li> <li>• Nurture research ideas into Business enterprises and commercial products,</li> <li>• Carry out skills training (short courses) using the installed equipment for potential entrepreneurs in food value addition.</li> </ul>	Staff, students, entrepreneurs and general community	Makerere University, GoU, Private companies and entrepreneurs
Makerere University Regional Centre for Crop Improvement (MaRCCI)	<p>Expand, strengthen and transform the PhD Plant Breeding program following the pattern of the highly successful MSc in Plant Breeding and Seed Systems.</p> <p>Provide the nations of Eastern and Southern Africa (ESA) with industry-ready plant breeders who are equipped to use cutting edge science to develop and deliver new varieties of food crops.</p>	Universities and nations of Eastern and Southern Africa (ESA)	The world Bank Iowa State University (USA), North Caroline State University (USA), Regional Universities (Universities of Zambia and Juba); Rwanda Agricultural Board (RAB) National Agricultural Research Institute in DR-Congo (INERA), National Agricultural Research Organization in Uganda (NaCRRRI & NaSARRI, and others) The World Vegetable Center –Arusha Tanzania (AVRDC) NASECO (Uganda) and Seed Co. in (Zimbabwe)
Makerere University Centre of Excellence in Waste Management	To become a centre of innovative research and technology development utilizing bio waste (agricultural/ organic wastes) in enhancing sustainable agricultural production and a healthy environment, Optimize and promote compositing of biodegradable waste for improved agricultural production, Develop livestock feed protocols based on market crop waste, Develop bio gas technologies for use by small scale households, Offer training, knowledge sharing and advisory services in waste management and create linkages with the private sector in technology development, Promote the adoption and diffusion of viable waste utilization technologies and products, Promote regional and international research collaborations and linkages and create community awareness and training through linkages.	Farmers, universities, Researchers and research institutions	Sida, the African Union (AU) European Union (EU), Government of Uganda through Bank of Uganda and Makerere University
Makerere University Center for Climate Change Research and Innovations (MUCCRI)	<p>Promote awareness on climate change,</p> <p>Conduct research on climate change science, climate change mitigation and adaptation in all sectors and disseminate the generated information.</p> <p>Generate and disseminate innovations for climate for climate change mitigation and adaptation in agricultural sciences and natural resources sectors,</p> <p>Advocate and influence climate change and development policy to enable Uganda address climate change challenges.</p>	Universities and nations of Eastern and Southern Africa (ESA)	Rockefeller Foundation, regional universities and governments

<p>Makerere University Center for Soybean Improvement and Development (MAKCSID)</p>	<p>To serve as a focal node for training in Plant Breeding, Seed systems and Biotechnology for the region,</p> <p>Develop and release superior Soybean varieties for Uganda and the East and Central Africa region</p> <p>Provides all breeder's and foundation seed for soybean developed and released by the Center.</p> <p>Conduct outreach activities like training of farmer groups, seed multipliers and seed companies in soybean agronomy and seed production techniques</p>	<p>University students (undergraduate and post graduate, researchers, government agencies, non-governmental organizations, seed companies, farmers</p>	<p>NARO, VODP, Soybean Africa Limited, World Vision, Sasakawa Global 2000, VEDCO, Masindi Seed.</p>
<p>The National Biodiversity Data Bank (NBDB) – Uganda</p>	<p>Avail data and information regarding the country's biodiversity to aid in research, conservation and informing the decision making process,</p> <p>Act as a central repository for biodiversity information within Uganda,</p> <p>Monitor the national biological resources,</p> <p>Provide consultancy services to the government and other organizations in Uganda in different fields of environment and natural resources, assessment and monitoring of environment and natural resources.</p>	<p>Conservationists, researchers and policy makers scientists, government agencies, land managers and others interested in the conservation and sustainable utilization of these resources</p>	<p>USAID Makerere University, GoU conservationists, researchers</p>
<p>Uganda Forestry Resources and Institutions Center (UFRIC), Makerere University</p>	<p>Promote sustainable management of global commons including forests.</p> <p>Address global challenging questions such as the impact of institutions on forest sustainability,</p> <p>Collect forest inventory and socio-economic data from several parts of the globe through its Collaborating Research Centers (CRCs)</p> <p>Monitor forest resources and institutions.</p>	<p>Farmers, policy makers, students, Universities</p>	<p>International Forestry Resources and Institutions (IFRI) Research Program.</p> <p>Indiana University Bloomington. Makerere University, GoU</p>
<p>Continuing Agricultural Education Centre (CAEC)</p>	<p>Operate outreach programs for various stakeholders,</p> <p>Host refresher and specialized short courses to meet the demands as they arise in agricultural and environment.</p>	<p>Farmers, policy makers, students etc).</p>	<p>Mak, GoU, Researchers and research institutions</p>

<p>A consortium for Enhancing University Responsiveness to Agribusiness Development (CURAD)</p>	<p>Promote entrepreneurship by students and graduates of Makerere University in business incubation especially those working with agribusiness or farming.</p>	<p>Students and graduates of Makerere University</p>	<p>Mak -CAES, NARO and NUCAFFE</p>
<p>The Remote Sensing and GIS Laboratory: The Remote Sensing and GIS Laboratory was initiated in 1992 by several departments of Makerere University after realizing that the training facility in remote sensing and GIS techniques for applications in fields of natural resource surveys and management was becoming essential. The laboratory has over 30 personal computers connected to a local area network.</p>			
<p>The Molecular Biology Laboratory is a teaching and research facility that was established under the auspices of DANIDA ENRECA (Enhancement of Research Capacity) with the aim of training African scientists and generating scientific information necessary for conservation of Africa's Wildlife resources. It utilizes genetic information in biological macromolecules (proteins, DNA, RNA) to address numerous questions and has a potential for application in a wide range of biological fields such as molecular medicine, agricultural and livestock improvement and wild life genetics. It is capable of handling most molecular biology problems ranging from DNA and RNA extraction through to sequencing, genotyping selected genes and gene cloning. Initially, research in the laboratory was focused on documenting amount distribution of genetic diversity in Africa's large mammals but has now expanded to include genetics major wildlife and livestock, pathogens, microbial and plant genetics.</p>			
<p>The Water and wetlands research Laboratory carries out assessment and monitoring of water and wetlands resources with emphasis on wise use of these resources and pollution control. It is equipped for water quality and plant analysis. It involves national and regional projects like L. Victoria Environmental project (LVEMP) and the East African Regional program and Research Network for Biotechnology, Bio safety and Biotechnology Policy Development (BIO-EARN). In addition, the laboratory is connected to a Local Area Network.</p>			
<p>Other centers in the college include:</p> <ol style="list-style-type: none"> <li>13. Centre for Mountain Resources and Disaster Management</li> <li>14. Rangeland Resources Centre</li> <li>15. Agricultural Policy Analysis Centre</li> </ol>			





# TEACHING AND LEARNING

# 2.0 TEACHING AND LEARNING

## 2.1 Teaching Infrastructure and Human Resources

The CAES has 900.08 sq metres of teaching space on campus complemented by off campus space, 8 libraries, 19 research laboratories, 6 computer laboratories and two GIS laboratories. In terms of human resources, CAES has a total staffing of 410. Of these, 202 are academic staff at various ranks: 24 Professors, 30 Associate Professors, 31 Senior lecturers, 52 Lecturers, 35 Assistant Lecturers and 30 Part-time Lecturers.

On average, the CAES has a total of 2,922 students enrolled. Of these 2758 (94.4%) are undergraduate and 164 (5.6%) are Graduate Students.

## 2.2 Programs Offered

The college offers 16 undergraduate programs and 30 post graduate programs. Of the post graduate programs, 17 are Masters, 10 PhDs and 3 Post Graduate Diploma (PGD) programs.

### 2.2.1 Programs offered at the School of Agricultural Sciences (SAS)

#### 2.2.1.1 Undergraduate programs offered at the School of Agricultural Sciences (SAS)

Program, No. of years	Essential Subjects	Relevant Subjects	Desirable Subjects	CUT OFF POINTS 2019/2020		CUT OFF POINTS 2020/2021	
				Govt	Private	Govt	Private
BSc. Agriculture (AGR), 4 years	Two best done of Chemistry, Biology, Agriculture	One better done of Biology, Agriculture, Physics, Chemistry, Maths, Geography	General Paper, Sub Maths or Computer Studies	38.4	29.2 (day)	43.5	31.7
BSc. Agricultural. Land Use & Management (BAM), 3 years	Two best done of Chemistry, Biology, Agriculture	One best done of Biology, Physics, Geography, Maths, Agriculture, Chemistry	General Paper, Sub Maths or Computer Studies	35.6	24.7 (day)	37.9	23.2
Bachelor of Agribusiness Management (AGM), 3 years	Two best done of Mathematics, Economics, Biology, Agriculture, Chemistry, Physics, Geography	One best done of Mathematics, Economics, Biology, Agriculture, Chemistry, Physics, Geography, Entrepreneurship	General Paper, Sub Maths or Computer Studies	45.2	28.9 (day)	44.1	29.1
BSc. Horticulture (HOT), 3 years	Two best done of Chemistry, Biology, Agriculture	One better done of Physics, Maths, Biology, Chemistry, Agriculture, Geography	General Paper, Sub Maths or Computer Studies	35.3	27.2 (day)	39.3	24.0
Bachelor of Agricultural & Rural Innovation (BAR), 3 years	Two best done of Chemistry, Biology, Geography, Agriculture	One best done of Maths, Chemistry, Economics, Geography, Economics, Physics, Biology, Foods & Nutrition, Entrepreneurship, Agriculture.	General Paper, Sub Maths, Computer Studies	40.3	21.1 (day)		26.4
Bachelor of Agricultural & Rural Innovation (External), 4 years	Two best done of Chemistry, Biology, Geography, Agriculture	One best done of Maths, Economics, Physics, Chemistry, Foods & Nutrition, Entrepreneurship, Biology, Geography, Agriculture	General Paper, Sub Maths or Computer Studies		14.6 (day)		17.6

### 2.2.1.2 Graduate Programs offered at the School of Agricultural Sciences

1. Master of Science in Agricultural Extension (2years)
2. Master of Science in Crop Science (2years)
3. Master of Science in Animal Science (2years)
4. Master of Science in Soil Science (2years)
5. Master of Agribusiness Management (2years)
6. Master of Science in Plant Breeding and Seed Systems (2years)
7. Master of Science in Agricultural and Applied Economics(2years)
8. Master of Science in Integrated Watershed Management (2years)
9. PhD Plant Breeding and Biotechnology (3 years)
10. PhD Agricultural and Rural Innovation (3 years)
11. PhD Agriculture (3 years)

### 2.2.2 Programs offered at the School of Forestry, Environmental and Geographical Sciences (SFECS)

#### 2.2.2.1 Undergraduate programmes offered at the School of Forestry, Environmental and Geographical Sciences (SFECS)

				CUTOFF POINTS 2019/2020		CUTOFF POINTS 2019/2020	
Program, No. of years	Essential Subjects	Relevant Subjects	Desirable Subjects	Govt Sponsorship	Private Admission	Govt	Private
BSc. Meteorology (BMT), 3 years	Two best done of Maths, Physics, Geography, Economics, Chemistry, Biology Agriculture.	One best done of Biology, Physics, Geography, Economics, Chemistry, Maths, Agriculture.	General Paper, Sub Maths, Computer studies	45.8	31.5 (day)	46.6	22.5
Bachelor of Environmental Science (BVS), 3 years	Two best done of Biology, Chemistry, Physics, Maths, Agriculture, Geography, Economics	One best done of Biology, Chemistry, Physics, Agriculture, Economics & Geography	General Paper, Sub Maths or Computer studies	40.1	22.5 (day)	39.2	19.1
BSc. Forestry (BOF), 4 years	Two best done of Biology, Chemistry, Physics, Maths, Agriculture, Geography	Third best done of Biology, Agriculture, Chemistry, Physics, Geography Mathematics, , Economics, Entrepreneurship, Technical Drawing, Wood Work, Metal Work	General Paper, Sub Maths or Computer studies	42.0	27.9 (day)	43.7	24.3
BSc Tourism &Hospitality Management (BTH), 3 years	Two best done of Economics, Geography, Biology, Entrepreneurship, Foods and Nutrition	One best done of Maths, Agriculture, Chemistry, History, Literature in English, Any language subject, Economics, Geography, Biology, Entrepreneurship, Foods and Nutrition	General Paper, Sub Maths or Computer studies		29.5 (day)	44.0	
Bachelor of Geographical Sciences (BGS), 3 years	Two best done of Economics, Geography, Biology, Physics, Chemistry, Agriculture & Mathematics	One best done of A 'Level subjects	General Paper, Sub Maths or Computer Studies		25.6 (day)		20.0

#### 2.2.2.2 Graduate Programs offered at the School of Forestry, Environmental and Geographical Sciences

1. Master of Science in Forestry and Biodiversity Management (2 years)
2. Master of Science in Disaster and Risk Management (2 years)
3. Master of Land Use and Regional Development Planning (2 years)

4. Master of Science in Agroforestry and Community Development (2 years)
5. Master of Geographical Sciences (2 years)
6. Master of Science in Environment and Natural Resources (2 years)
7. PhD Forestry (3 years)
8. PhD Geography (3 years)
9. PhD Agroforestry (3 years)
10. PhD Environment (3 years)
11. Post Graduate Diploma Environmental Impact Assessment (1 year)
12. Post Graduate Diploma Meteorology (1 year)
13. Post Graduate Diploma Environmental Information Management (1 year)

### 2.2.3 Programs offered at the School of Food Technology, Nutrition and Bio Engineering (SFTNB)

#### 2.2.3.1 Undergraduate programs offered at the School of Food Technology, Nutrition and Bio Engineering (SFTNB)

				CUT OFF POINTS 2019/2020		CUT OFF POINTS 2020/2021	
Program, No. of years	Essential Subjects	Relevant Subjects	Desirable Subjects	Gov't Sponsorship	Private Admission	Govt	Private
BSc. Agricultural Engineering (AGE), 4 years	Maths and Physics	One best done of Chemistry, Agriculture, Economics, Geom. & Mech. Drawing, Geom. & Bld. Drawing	General Paper, Computer Studies	45.6	36.3 (day)	49.2	33.3
BSc. Food Science & Technology (FST), 4 years	Biology and Chemistry	One best done of Physics, Agriculture, Foods & Nutrition, Maths	General Paper, Sub Maths or Computer Studies	40.2	33.8 (day)	46.8	35.3
BSc. Human Nutrition (HUN), 3 years	Biology and Chemistry	One best done of Physics, Maths, Agriculture, Economics, Foods & Nutrition	General Paper, Sub Maths or Computer Studies	40.3	32.5 (day)	43.4	36.2
BSc. Water & Irrigation Engineering (BWE), 4 years	Maths and Physics	Chemistry	General Paper, Computer studies		25.8	48.2	36.2
BSc. Bioprocessing Engineering (BBP), 4 years	Maths and Physics	One better done of Chemistry, Biology, Agriculture, Foods & Nutrition, Computer Science	General Paper, Computer studies			45.8	24.4

#### 2.2.3.2 Graduate programs offered at the School of Food Technology, Nutrition and Bio Engineering

1. Master of Science in Agricultural Engineering
2. Master of Science in Food Science and Technology
3. Master of Science in Applied Human Nutrition
4. PhD Food Science and Technology

5. PhD Applied Human Nutrition
6. PhD Agricultural Engineering

## 2.3 Fees Structure

### 2.3.1 Fees Structure for Undergraduate Programs offered at the CAES

				2019/2020 ACADEMIC YEAR	
DAY PROGRAMMES					
CODE	PROGRAM	YEAR OF STUDY	TUITION FEES PER SEMESTER IN UGX. FOR UGANDANS, EAST AFRICANS, SOUTH SUDAN	SEMESTER TUITION FEES FOR INTERNATIONAL STUDENTS	
AGR	Bachelor of Science in Agriculture	4 Years	1,777,440	2,962,400	
FST	Bachelor of Science in Food Science and Technology	4 Years	1,777,440	2,962,400	
AGE	Bachelor of Science in Agricultural Engineering	4 Years	1,777,440	2,962,400	
BAM	Bachelor of Science in Agricultural Land Use and Management	3 Years	1,110,900	1,666,350	
AGM	Bachelor of Agribusiness Management	3 Years	1,018,325	1,527,488	
HOT	Bachelor of Science in Horticulture	3 Years	1,296,050	1,944,075	
BAR	Bachelor of Agricultural and Rural Innovation	3 Years	1,851,500	3,740,030	
HUN	Bachelor of Science in Human Nutrition	3 Years	1,587,000	2,938,595	
BOF	Bachelor of Science in Forestry	4 Years	1,265,000	3,450,000	
BGS	Bachelor of Geographical Sciences	3 Years	1,265,000	3,450,000	
BVS	Bachelor of Environmental Science	3 Years	1,110,900	1,388,625	
BTH	Bachelor of Science in Tourism and Hospitality Management	3 Years	1,265,000	3,450,000	
			Recess (770,500)		Recess (2,254,000)
BMT	Bachelor of Science in Meteorology	3 Years	1,190,250	1,587,000	
BBP	Bachelor of Science in Bioprocessing Engineering	4 Years	2,000,000	3,250,000	
BWE	Bachelor of Science in Water And Irrigation Engineering	4 Years	1,744,000	2,640,000	
EXTERNAL PROGRAMME(S)					
BAX	Bachelor of Agricultural and Rural Innovation (External)	4 Years	859,625	2,235,025	

### 2.3.2 Fees Structure for Graduate Programs offered at the CAES

The Academic Registrar, Makerere University normally invites applications for admission to Graduate Programs (Postgraduate Diplomas, Masters and Doctoral Degree Programs) for the respective Academic Year. Applicants to graduate programs should have obtained at least a first or second class degree (or its equivalent) from a recognized and chartered university/institution at the time of completion. Applicants should also possess a Ugandan Certificate of principal passes and one subsidiary pass obtained at the same sitting (or its equivalent).

## Sponsorship

All Graduate Programs are PRIVATELY-SPONSORED. Therefore, applicants seeking sponsorship should have their applications endorsed by their respective sponsors where applicable. Applicants should note that the various fees payable to the University indicated for the various programs EXCLUDE functional fees, accommodation, books, research and other expenses.

ACADEMIC PROGRAMMES Ugandan & East African Students		TUITION FEES PER ANNUM (SHILLINGS/USD) AS OF 2020/2021 Advertisement	
		International Students	
1	PGD Environmental Impact Assessment	Shs.5,000,000/=	Shs.8,000,000/=
2	MSc. in Agricultural Extension Education	Shs.5,000,000/=	Shs.8,000,000/=
3	MSc. in Crop Science	Shs.5,000,000/=	Shs.8,000,000/=
4	MSc. in Animal Science	Shs.5,000,000/=	Shs.8,000,000/=
5	MSc. in Agricultural Engineering	Shs.5,000,000/=	Shs.8,000,000/=
6	MSc. in Soil Science	Shs.5,000,000/=	Shs.8,000,000/=
7	Master of Agribusiness Management	Shs.5,000,000/=	Shs.8,000,000/=
8	MSc. in Integrated Watershed Management	Shs.5,000,000/=	Shs.8,000,000/=
9	MSc. in Food Science & Technology	Shs.5,000,000/=	Shs.8,000,000/=
10	MSc. in Plant Breeding and Seed Systems	Shs.5,000,000/=	Shs.10,338,360/=
11	MSc. in Applied Human Nutrition	Shs.5,000,000/=	Shs.9,090,000/=
12	MSc.in Forestry and Biodiversity Management	Shs.5,660,000/=	Shs.8,985,600/=
13	MSc.in Disaster Risk Management	Shs.5,000,000/=	Shs.7,200,000/=
14	Master of Land Use and Regional Development Planning	Shs.5,000,000/=	Shs.7,200,000/=
15	MSc.in Agroforestry and Community Development	Shs.5,660,000/=	Shs.8,985,600/=
16	Master of Geographical Sciences	Shs.5,000,000/=	Shs.7,200,000/=
17	Master of Science in Environment and Natural Resources Management	Shs.5,060,000/=	Shs.9,345,600/=
18	MSc. Agricultural and Applied Economics	Shs.5,500,000/=	Shs.7,200,000/=

### DOCTORAL DEGREES BY COURSEWORKS AND DISSERTATIONS

1	PhD in Agricultural and Rural Innovation	Shs.7,000,000/=	Shs.13,000,000/=
2	PhD in Plant Breeding and Biotechnology	Shs.7,000,000/=	Shs.10,338,360/=

### DOCTORAL DEGREES BY RESEARCH ONLY

3	PhD degrees tenable in the School of Forestry, Environmental and Geographical Sciences	Shs.7,000,000	Shs.9,000,000
4	PhD degrees tenable in the School of Food Technology, Nutrition & Bio-Engineering	Shs.7,000,000	Shs.9,000,000
5	PhD degrees tenable in the School of Agricultural Sciences	Shs.7,000,000	Shs.9,000,000

## PHD DEGREES BY RESEARCH ONLY

Makerere University offers PhD degrees by Research. Applicants for PhD by research should have a Master's degree in a field relevant to their area of further studies. Applicants are required to submit their applications any time in Room 410, Level 4 with a synopsis. For further information, please visit our website <http://rgt.mak.ac.ug> check on applying.

### Duration of Programmes

Postgraduate Diplomas	-	One Academic Year
Masters degrees (Full time)	-	Two Academic Years
Masters degrees (Part time)	-	Three – Four Academic Years
PhD (Provisional Admission)	-	One Academic Year (Maximum)
PhD (Full Admission)	-	Three Academic Years
PhD (Part time)	-	Five Academic Years.

### 2.4 Curriculum Review

The National Council for Higher Education developed minimum standards for undergraduate programs. The University Quality Assurance and Gender Committee (UQAG) was tasked by the University Council to identify programs with duplications to be merged or removed from the curriculum. University Council approved the general principles presented by UQAG and tasked the curriculum subcommittee to carry out consultations on the implications of the set principles. The subcommittee invited colleges for interactions to respond to issues raised. The college reviewed the proposed minimum standards as summarised below.

S/N	Program	STATUS	ISSUES	RECOMMENDATIONS
a)	Proposed merging in BSc Agriculture program	Majors created to subsume 7 programs: 1.BSc. Agriculture 2.BSc. Agribusiness Management 3. BSc. Agricultural Land Use and Management, 4.Bachelor of Agribusiness Management 5.BSc. Horticulture, 6.BSc Human Nutrition 7. BSc.Food Science and Technology	The school of Agricultural Sciences has petitioned against the proposed mergers.  Merging will increase the number of CUs in the receiving programs calling for an increase in the duration of the program.  The programs being restructured were arrived at after thorough market research and this calls for the respective units to go back to consult their stake holders.	Each department remains with at least one undergraduate program e.g. Department of Extension and Innovation studies – Bachelor of Agribusiness Management  Department of Agribusiness and Natural Resource Economics- BSc. Agribusiness Management.  In the Department of Agricultural Production –the school agreed to merging BSc. Agricultural Land Use and Management and BSc. Horticulture mainstreamed into BSc. Agriculture but also create a Masters program in Horticulture.
b	Environmental Science program	Proposed merging of 3 programs to 1 program (Bachelor of Environmental Science, Bachelor of Geographical Sciences & Bachelor of Science in Meteorology)	The School of Forestry, Environmental and Geographical Sciences has petitioned management against the proposed mergers  The programs are still new and each is addressing specific needs of society.	No merging, the school request that the school is allowed to run all the existing programs.
C d	Mechanical engineering  BSc. Human Nutrition and Food Science	Proposed merging of 2 programs to 1) BSc. in Mechanical engineering and BSc. in Agricultural engineering)  Proposal to merge. BSc Human Nutrition and BSc. Food Science and Technology	The School of Food Technology, Nutrition and Bioengineering disagreed with the proposed mergers.	The school is left to run all the four programs.  While teaching Agricultural engineering, the current state students should take the core courses in CEDAT, together with students of Mechanical engineering to give them a strong foundation.

**Issues raised from CAES**

1. Merging will increase the number of CUs in the receiving programs calling for an increase in the duration of the program.
2. The programs being restructured were arrived at after thorough market research and this calls for the respective units to go back to consult their stakeholders.
3. The need to carry out a thorough review of the programs based on the set principles and source of funding to carry out the exercise.
4. A contradiction observed; that the critical areas for specialized training highly needed in the country whereas the private sector may not be willing to pay tuition on those programs

**Stakeholder concerns in CAES**

1. Do not agree with Principle 1, “Undergraduate programs should be broad with options”, noting that options produce weaker professionals.
2. Some of the programs were created out of demand which is the trend everywhere.
3. While teaching Agricultural engineering the current students should take the core courses in CEDAT, together with students of Mechanical engineering to give them a strong foundation.

**2.5 Undergraduate Admissions 2020/2021**

A total of 1,017 undergraduate students were admitted. Of these of 480 were admitted under the government scholarship while 537 students were admitted under the Private scheme.

Government Undergraduate students admitted is summarized below, 282 were Male and 198 are Female.

S/No	Program	Male	Female
1	BSc. Agriculture	28	22
2	BSc. Agricultural Land Use and Management	09	04
3	Bachelor of Agricultural and Rural Innovation	24	26
4	Bachelor of Agricultural and Rural Innovation- External	22	06
5	BSc.in Bio-processing Engineering	24	06
6	Bachelor of Geographical Sciences	20	15
7	BSc. in Meteorology	26	16
8	BSc. Forestry	30	20
9	BSc. in Tourism and Hospitality Management	25	25
10	Bachelor of Environmental Science	33	17
11	BSc. in Water and Irrigation Engineering	15	12
12	BSc. in Food Science and Technology	14	13
13	BSc. in Horticulture	02	02
14	BSc. in Human Nutrition	10	14
	<b>TOTAL</b>	<b>282</b>	<b>198</b>



## 2.6 Internship Placement, Supervision and Recess Term

Student's placement was disrupted by the CORONA Pandemic for the following programs:

1. BAGR (YR I & YR III)
2. BHOT (YR I & YR II)
3. BLUM (YR I & YR II)
4. BARI (YR I & YR II)
5. BAGM (YR I & YR II)
6. BGS (YR II & YR III)
7. BMET (YR II)
8. BVS (YR II)
9. BFOR (YR I & YR III)
10. BTOU
11. BFST
12. BAGE
13. BHNU

As a result, different guidelines on how to conduct internship and Recess term were developed for all programs in the College.

### 2.6.1 Guidelines for Activities undertaken by BARI I (SELPs I) and BAX II student (SELPs II).

SELPs I (Situation analysis and project identification)	SELPs II (Project or innovation implementation using action research)
Understand the context/situation on the ground Project identification Come up with a priority problem of concern (preference is for the most pressing) Diagnose the identified problem (causes and root causes) Generate alternative solutions to the root causes Do a needs assessment Identify the innovation: Prioritize the most appropriate solution(s) to work with. This will be the project/ innovation Articulate the nature of the innovation and its uniqueness Generate objectives (what you intend to do about the project) – in this case, one objective will suffice Come up with a proposed work plan on how the objective will be realized Participatory and gender-sensitive approaches are recommended during SELPs I activities.	This basically is for the student to implement his/her project/ innovation that was identified during SELPs I. In this case, the students are expected to work with the same organization/ community that was engaged in SELPs I for continuity. Recast the problem and innovation identified during SELPs I to the farmers In case priorities or communities have changed (especially during this time), the student will do a quick rapid appraisal to establish a project. Establish an extension and research objectives that will guide the implementation Extension objectives (one) – what you are going to do with the community to solve the problem. What appropriate extension methods are you going to use (utmost two), the how Research objectives (one) – what you want to find out as you apply the solution/innovation. Apply the solution and collect data guided by your research objective variables through frequent follow-ups up to when the internship will end. The research could be on farmers' perception, acceptance, use, creativity e.t.c related to the innovation

### 2.6.2 Guidelines on Activities for Horticulture (HRT 2301) Students during Internship

The horticulture students were placed at organizations with firms or farms that deal with horticulture crops (in this case flowers, vegetables especially those for export – pepper) or carry out landscaping and design. The students were placed in and around Kampala and Wakiso districts. The students, depending on where they were placed, conducted an (economic) analysis of the horticulture firm/farm and suggested appropriate context-based ways of improving the firm/farm (this is for either flower/fruits or landscaping). The students were also tasked to describe the

existing management style of the chemicals, tools and equipment used in the firm/farm, give the implications and detailed suggestions of what needs to be done. This also included analyzing the crop management practices used, their implications for the market and suggest improvements that will boost production and sales. The students were also expected to understand the existing landscape and suggest the appropriate design.

### **2.6.3 Guidelines on activities for agribusiness (ABM 2301) during the internship**

Students in agribusiness were placed in farms and firms that are agribusiness based dealing with fresh, processed or value addition targeting the different markets. Such firms conducted business in crop, animal or animal products or even mixed enterprises. Banks with agriculture products/services were also appropriate as placement sites for students in this program. The firms/farms of attachment could be for an individual or organization/company. During the internship period, the agribusiness student were expected to:

Understand how the farm/firm is operating in general, identify weak areas and suggest what the farmer/company ought to do to enhance viability in business (which enterprise could be the most appropriate and a proposed investment plan).

Analyse record keeping culture with implications to business viability; identify the records kept and how they are used, advantages and disadvantages of the current system/culture of record keeping/use. Suggest a more feasible strategy that the farmer should adopt to ensure clean and appropriate record management. They were also to identify the production costs incurred and profit margins to identify possible business leakages and suggest the best alternatives that can help the farmer to minimize costs yet improve on the profits. This includes how price per unit item is determined. Analyse the value chain of the enterprise to help the farmer identify areas to take advantage of for more business. Describe the current market and marketing strategies being used to identify gaps and suggest appropriate ways of improving the business given the context and; Find what measures are in place to mitigate risks and uncertainties in the business so as to suggest the most appropriate measures.

### **2.6.4 Guidelines on activities for Agriculture (EEE 2301) during this internship**

The students offering B.Sc. Agriculture have an advantage. Their integrated nature allows them to work with any agricultural organization or community that deals with crop or animal (in general) or mixed. The student were expected to:

1. Ascertain the appropriateness of the agronomic management practices (with focus on pest, disease and weed management that the farmer is applying in the extensively cultivated crop enterprise and how the practices are impacting on the quantity and quality of yields realized. Suggest the most appropriate methods for improved quality and yield of the crop.
2. Analyse the implications of how the farmer(s) are currently handling the crop cycle from seed to post harvest handling. Make comprehensive suggestions on the most appropriate context based ways the farmers should handle the crop across the cycle for better yields.
3. Identify strong and weak areas of soil fertility enhancement or management practices conducted in the field (of the extensively cultivated crop) – giving examples of existing local indicators of the soil status; analyse long term and short effects of the practices to the soil

and crop health with most suitable recommendations on ways of improving the soil based on the context.

4. For the animal component (the animals kept for income e.g. poultry, dairy cows, bees) – irrespective of the animal, the student was expected to understand the suitability of the animal enterprise, general management practices that the farmers do (type and source of breed, feed and feed management, and health management). Identify the loopholes and suggest suitable ways of improving.
5. Identify weaknesses in the market and marketing of the animal enterprise and suggest what needs to be improved.

**2.6.5 Guidelines for students of Land Use (I and II) during their internship**

LUM I	LUM II
Natural resources management for Agricultural production: Situation analysis of land use, natural resources and their management	Land management and land use plan: planning strategies to improve Agricultural Land Use and Management
<p>Identify the land use and resources in the community/village. Draw the land use and resource map of the community/village</p> <p>Identify the renewable resources, describe how each of them is being used and managed by the community, and analyse the weaknesses or gaps. Give implications of the effects of the use and management situation of the resources on the development of the village/community</p> <p>Identify the non-renewable resources and discuss how the community/village is using and managing them. Give implications of effects of the use and management status of the existing non-renewable resources to the development of the village/community</p> <p>Make a synthesis of the land and natural resource management approaches and practices in the community/village. Select one best example of the most sustainable approach/practice, and one best example of the worst one likely to cause land degradation. Critically discuss their management.</p>	<p>Describe the land use and management issues existing in the community/village and their status. Discuss with the community and identify the most common or most pressing issue/problem. Analyse the selected issue to identify the causes and root causes</p> <p>Develop alternative ways/technologies of handling the issue on the ground to help the situation</p> <p>Make a case study of technology (ies) (utmost 2) to solve a specified land use and/or management problem. Share the technology with the community (train them or show them how to use it)</p> <p>In the case study, evaluate farmer success and/or failure in using the technology. What made the farmers like or use it with success; what made them dislike or use it with failure? What made them fail/succeed in using the technologies?</p> <p>Based on the failure (if it happened) suggest the most appropriate technology that would work better in the existing context.</p> <p>Identify the community/village land use plan and suggest an improvement, with reasons. Share the suggested improvements with the community/village</p>

**Recommendations for our internship students across the cohorts following the COVID-19 pandemic**

Despite the current COVID-19 pandemic, the students must undertake the internship to have their expected full load before graduation. Schools suggested measures that were taken for each of the students to remain safe and have a meaningful internship engagement for increased marketability and responsiveness. These were the suggestions (not in order or priority), following the presidential directive to curb the spread:

All the students are to be placed in organizations (agrarian communities) whose operations are within the 98 districts. Those that had gotten placement in any of the 40 border districts will be given chance to relocate to any of the 98. Given the time limitation, they will be encouraged to work with district farmer organizations and groups. NGOs may not be appropriate especially when they have no funds to operate

All the students will be provided with formal letters of introduction that they will present to the district, organization and community leadership

We maintain the students staying near and/or within the area of operation (the sub-county) to minimize movements and mixing with so many different people as well as take care of restricted late evening and early morning movements (the curfew)

To take care of the participatory approaches, (all are supposed to work with communities save Horticulture) each of the student will work with a maximum of 20 farmers of mixed gender and age in a village/community.

The students will hold meetings with the farmers in a spacious place. More open space under big trees (most common meeting sites in villages) is more recommended. The participants will seat at least one meter apart with the help of parish chief or village leader.

At the meeting sites, open space or spacious room like the halls at the sub-county headquarters, there will be need for adequate water and soap that every participate will use to effectively wash their hands.

A water tank (with a tap) with clean water and soap are a must.

For activities that require repeated handling/use of some equipment, the students will have sanitizer that will be used to disinfect the hands and equipment every after a different user in preparation for the next one. This will happen during sessions of demonstrations

All the time the student is working with or talking to the participants, s/he will have a face mask on. It is important that the participants in the meeting, too, get/use masks. That means each student might need to avail masks to the participants.

Shaking of hands with the participants for any reason is prohibited/discouraged when conducting internship.

The students will not participate in any other community social gathering unless it is related to his/her internship.

The students will be briefed on what will be expected of them prior to the field attachment in batches. School and program coordinators participate in the briefing. We will need two tents raised in the school compound to provide an open space that can allow up to 80 students addressed at a time (there are groups with more than 80 students especially Agribusiness and BARI). The briefing will be done in two sessions per day targeting the different groups/cohorts. During this period, we will need all to wear masks, water, soap (hand washing), and hand sanitizer.

For smooth progress of the students and efficient use of the limited time, academic staff will visit the students at their work sites/districts during week 2 and week 4. During the supervision, social distance and use of masks remain a norm. Hand sanitizers will be needed every time the supervisor or student handles their logbooks.

Each of the student is often assigned a field supervisor that guides them on a daily basis while in the field. During this guidance, the field supervisor and student shall wear masks and keep the recommended physical distance.

The students will spend five days in a week on their internship so as to cover more. When back on campus, they will be given ample time (4 weeks) within which to submit their logbooks and

reports for marking which will be done by the supervisors that visited each of them for follow up.

For the marking, 60% will be done in the field by the field supervisor in collaboration with the academic supervisor at the time of visiting and the 40% will be awarded from written exam (Non BARI students) while the BARI students will produce a report. During the interactions for assessing practical engagement of the interns in the field, face masks, sanitizers will be used while maintaining the social distance.

### **2.6.6 Bachelor of Geographical Sciences (BGS)**

The Bachelor of Geographical Sciences programme was designed with a strong field component through mandatory in-semester excursions and a recess term during the second and third year. The Course GEO 3225: Internship and Research Project is a 3rd year field based course involving in semester field excursions and field attachments conducted during the recess term. The in-semester field excursions are MANDATORY to all BGS students as well as subject students from CEES, CHUSS and CoNAS majoring in the Geography Subject. The field attachment is CORE to all BGS students as well as subject students doing a research paper. In-Semester Field excursions.

A 4-day in-semester field excursion to South Western Uganda had been organized and accommodation and meals reserved. However, the exercise could not take place owing to the lockdown, which was instituted a week prior to the excursion.

#### **Recommendations:**

1. The study site will now be restricted to Mbarara District, instead of Kigezi Highlands to take care of the travel guidelines to Border Districts.
2. Given the large number of students (averaging 130) involved in the field excursions, we propose to conduct the exercise over two or three shifts so that smaller numbers are handled at a time.
3. We propose to use two 60-seater Buses, each carrying up to 30 passengers to conform to the physical distancing guidelines.
4. The Buses will be equipped with certified sanitizers that shall be regularly and constantly used.
5. A Health Worker will be hired to carry out the necessary screening of students and staff before boarding the Bus. The Health worker will also accompany the Team to the field for purposes of monitoring the health status of the field participants.
6. Masks will be given to all students and will be worn at all times when in public space.
7. Full Board accommodation and meals will be reserved at dedicated Hotels (not open to the general public during the excursion period) to reduce on the risk of social interactions.
8. An advance Team of Supervisors/Lecturers were sent out to the sites for reconnaissance prior to the exercise to ensure that the necessary sanitization and related preparation is in place. They will stay there until the exercise is completed.

#### **Field Attachment**

Field attachment is compulsory to the BGS students as well as subject students that opt to do a research project. The theme for this year's field attachment is 'Participatory Integrated Planning as

a novel tool to ecosystem stewardship and resilience building among natural resource-dependent local communities'. We had planned to attach students to one or two households within the communities with whom they were to identify and work out solutions to address the prevailing natural resource predicaments. The students were to come up with a 'household visit' that could be used by the beneficiary households to plan for their future, while, the students would use the data to write a compulsory academic report for assessment purposes. However, attachment to households will not be possible given the social distancing guidelines.

### Recommendations

1. As per the original plan, field attachment will be conducted in the already identified hotspot area of Mt Elgon ecosystem, taking care of the guidelines regarding movement to and from border districts.
2. For transport, accommodation and meals, similar arrangements as those for the field excursions will be done to ensure adequate distancing, sanitation and adherence to standards.
3. Field facilitators from our partner Organization in Mbale (the MWARES Project) will be invited to expose students to Participatory Integrated Planning techniques to environmental conservation as a novel tool to ecosystem stewardship and resilience building among natural resource-dependent local communities.
4. Field trials/practicals will be conducted at the Organization's demonstration fields instead of going to households to reduce exposure risks.
5. The students will spend up to two weeks (instead of four weeks that had been planned) in the field.
6. The respective reports will be jointly assessed by the field facilitators and the University Staff.

#### 2.6.7 BSc Meteorology

Internship is a full course unit (MET 2207) with 5 CUs, with a written curriculum conducted during the second year recess period. This course unit normally takes up to 8 weeks, with students attached to Meteorological establishments, particularly the Uganda National Meteorological Authority, CAA, Aviation School- Soroti and the Meteorology Training School in Entebbe. Should the University be opened to continuing students, and in light of the current COVID 19 situation, the Department will endeavor to reduce the exposure risks of both students and Staff involved in the program through the following measures.

#### Recommendations:

1. In order to avoid a potential pressure arising out of missing this course unit, an intensive training program supported by both staff from Makerere and UNMA for 4 weeks should be arranged. This implies that staff from Makerere will be fully stationed in the field to supplement the field supervisors. Also the field supervisors will have to be facilitated for these 4 weeks of intensive training.
2. Social distancing: We propose to contact the Meteorology Training School in Entebbe for training space instead of being full time at the Control Tower (NMC). However, this will only work if the training school is in holidays.

3. For transport, accommodation and meals, similar arrangements as those for the BGS program will be done to ensure adequate distancing, sanitation and adherence to standards.

### **2.6.8 Graduate Programs**

The MSc Disaster Risk Management, the Master of Land Use and Regional Development and Master of Geographical Sciences Programmes have compulsory field practicum courses DRM 7203 (Field Exposure and Project Reporting) and LUD 7208 (Regional Ecological Planning Studio), respectively. The Courses involve up to three weeks of field activities, entailing, problem contextualization and formulation, tooling and mobilization of equipment for field data collection, travel to field and reconnaissance survey, stakeholder involvement/analysis, surveys and inventory of resources, demographics, development issues and field based analysis and reporting. The thrust of these courses unit is to give students field skills and make them more practical. We had planned to have field sessions where students interact with communities and collect both biophysical and socio-economic data that would be analysed culminating into a written report. However, owing to the COVID-19 pandemic, we will restrict these interactions through the following measures;

1. As per the original plan, field practicum will be conducted in Eastern Uganda to ensure continuity from last year's exercise. However, instead of three weeks, this time round fieldwork will last only one week.
2. Pre-field and Field Training approach: A hands on and students-based training will be planned at Campus. The students will actively participate in concept development in their areas of interest before the field. These concepts based on recommended themes per each programme, will be vigorously discussed. Guidelines will be designed by the field instructors and issued to students to further improve on their write up.
3. To reduce on the risk of exposure, preparations will be done on Campus and students will only leave for the field to collect data. Previously, concept development was incrementally done during the first week of fieldwork.
4. There will be minimal contact with the community members as more biophysical data will be collected through field instrumentation, supplemented with key informant interviews with identified officers.
5. For transport, accommodation and meals, similar arrangements as those for the undergraduate programs will be done to ensure adequate distancing, sanitation and adherence to standards.

### **2.7 Graduate programs supervision, thesis examination and defense**

Graduate program supervision, examination and defense resumed after the partial lifting of the lockdown. However, lack of teaching support for graduate programs was observed. Students experienced delays in supervision and thesis examination due to lack of incentives. The college requests the center to avail teaching materials and space for postgraduate programs and pay examiners and supervisors allowances.

### **2.8 Advertisement of PhD Agricultural and Applied Economics**

PhD Agricultural and Applied Economics was advertised and is expected to commence in 2020/2021 Academic year. This is so because the program was finally approved by University Council at its 150<sup>th</sup> meeting.

## 2.9 Graduation output 2019/2020

Makerere University 70<sup>th</sup> Graduation Ceremony kicked off on Tuesday 14<sup>th</sup> January 2020 with the CAES presenting the highest number of PhD students and the overall best science student.

A Total of 677 students graduated from the CAES during the Makerere 70<sup>th</sup> Graduation ceremony. Of these, 580 were undergraduates, 81 Masters and 16 PhDs.

Some students however, missed out due to delayed submission of marks for the research projects as there was no addendum to accommodate late clearances. The graduation ceremony was also marked by partial and late delivery of graduation gowns. The center should streamline the procurement process for early delivery of the graduation gowns to avoid inconveniences caused.

The CAES Principal Prof. Bernard Bashaasha, the Deputy Principal Assoc. Prof. Gorettie Nabanoga and School deans presented 16 PhD students, 81 Masters and 580 Undergraduates for the conferment of degrees and award of Diplomas in different disciplines.

Ms. Namayengo Sarah, 22 undertaking a Bachelor of Conservation Forestry and Products Technology was recognized by Convocation Chairman Dr. Tanga Odoi with a plaque and a prize of One Million shillings for emerging overall best science student with CGPA of 4.83.

The graduation ceremony was presided over by Makerere University Chancellor, Prof. Ezra Suruma at the Freedom Square. The ceremony was also graced by the President of the Republic of Uganda represented by the Prime Minister, Hon. Ruhakana Rugunda and the First Lady and Minister of Education and Sports Hon. Janet Kataha Museveni.



*A Section of Masters Students during the Graduation Ceremony*





*A Section of PhD Students during the 70th Graduation Ceremony*

“The College of Agricultural and Environmental Sciences has produced 16 PhDs representing 26% of all PhD’s at this 70<sup>th</sup> Graduation ceremony. I congratulate the College for this exemplary performance, the Vice Chancellor remarked.



*Ms. Sarah Namayengo (kneeling) receiving her Plaque from Dr. Ruhakana Rugunda*



*Hon. Janet Kataha Museveni shakes hands with Ms. Sarah Namayengo's parents*

## 2.10 Semester I 2019-2020 Results

Lecturers were trained and granted authority to enter/capture student's results onto AIMS with a specified expiry period. School Boards and College Boards met and discussed examination results for Semester I 2019/2020 and released to the students.

It was noted that some lecturers still have challenges with uploading marks on AIMS system. More training on AIMS should be conducted from time to time to all staff that use AIMS. There is also delayed marking and submission of marks. Implementation of the Centralised Marking Policy is recommended.

## 2.11 Semester II 2019-2020 Teaching

The timetable was released earlier thereby allowing lecturers to start teaching on time. Some students reported late and others early enough so it affected teaching at the beginning. Draft Examination Time table for Semester II 2019/2020 had already been displayed. Preparations including processing examination funds and materials were on track beginning April 27<sup>th</sup> 2020. Despite all these preparations all processes came to a halt following the outbreak of CORONA Pandemic and the subsequent closure of the University on 18<sup>th</sup> March 2020. In semester practicals which are an important component of teaching had also been timetabled but equally affected.

## 2.12 Commencement of Semester II 2019-2020 teaching of Undergraduate and Graduate finalists under the New Normal of COVID 19

Academic staff were trained via zoom on uploading content on MUELE and also delivering lectures online. E-learning focal person's coordinators were appointed. However there were concerns over poor internet connectivity and students' affordability of the required hardware and internet to access MUELE and data for staff to conduct online teaching. It was recommended that more staff training was required, the issue of internet access and MUELE server be upgraded to accommodate more volumes of data.

Following the staff training on delivery of teaching online, a time table was drawn for the SFECS another for SAS combined with SFTNB.

In order to promote smooth operationalization and monitoring of teaching using the emergency ODeL mode, the DVCAA proposed the tool/template for further guidance.

### 2.13 External Examiners/Under and Graduate

External examination for undergraduates was suspended due inadequate funding for external examiners; they are always invited late, at times they are not paid their honorarium and besides it is too little. Refusal of some service providers to offer their services due to non-payment (*Like Travel Agents and Hotels*) was part of the reason for suspension. The University should ensure that the external examiners are remunerated well and on time and also ensure timely payment of service providers.

### 2.14 Testimonials, Transcripts and Certificates

Testimonials were issued by the College Registrar while Transcripts were received from Senate to the Principals Office for distribution to students. Some students could not receive their transcripts on time due to delayed release from Senate. The College should be permitted to handle the processing of transcripts, leaving the Certificates for the centre.

### 2.15 Internship/Industrial Training, Recess Term

Student's placement was delayed because of the pandemic (COVID-19) and a few practicals had been conducted. Students were dispatched to internship centers without funds. There is need to increase the subvention released to the colleges and fast track the release of funds for student's placement. The entire activity was further halted due to the outbreak of the CORONA Pandemic.

Few of the students have actually gone for internship placement because of the pandemic. Some organisations have not allowed to host our students. There has been a challenge of students being asked to do internship at the same time handle online classes.

### 2.16 Graduate Programs Admission, Teaching, Student Supervision, Thesis Examination, Internal Examiners.

PhD by Research Program applications are received throughout the year. However, in the academic year 2020/2021 the process delayed because of the pandemic. Graduate programs face a number of challenges including; lack of teaching space and graduate study rooms. The students also experience delays in supervision and thesis examination due to lack of incentives. It is proposed that the DRGT should expedite the process of admission, avail teaching materials for postgraduate programs. The centre should avail space for graduate students and pay examiners and supervisors allowances.

### 2.17 Teaching Space

The college has 900.08 sq meters complemented by off campus stations. However, this is not adequate for teaching undergraduate and graduate students. The would be space for the Department of Geography, Geo-informatics and Climatic Sciences is still being held on by CHUSS. The centre should allocate CAES space in the new Centralised Teaching Facilities on campus and implement its' decision to free up Geography space in CHUSS building.

## 2.18 Laboratories, Libraries, Furniture and Equipment

The CAES has 19 Research Laboratories, 6 Libraries, 6 Computer Rooms and two GIS Computer Laboratories. Some of the laboratories however lack equipment, furniture and consumables, and are in need of rehabilitation. Most computers and printers are old and unserviced. The centre should allocate a budget line for office and laboratory facilities for repairs and maintenance.

## 2.19 Transport for Students' Field Work and Off Campus Stations

The college has six buses, three tractors and over 30 pickups mainly project vehicles. Given the number of students and field activities required, these are inadequate. Most of these vehicles are old with high maintenance costs. The centre should budget for vehicles and their maintenance for the field based colleges.

## 2.20 PhD Agricultural and Applied Economics Approved

A Regional PhD in Agricultural and Applied Economics underwent approvals at all University levels, now awaiting approval by Uganda National Council of Higher Education as the first joint DANRE-SOE PhD program. Three Ugandan PhD students completed studies in Agricultural and Applied Economics at Kansas State University under the DANRE-KSU project.

## 2.21 CAES Library Achievements

The library acquired additional books for Geography, Environment, and Food Science Libraries and a new UV barcode reader. We also got online support services for students and staff during the COVID-19 lockdown. The college also acquired a new furnished library space for MUARIK Library, increased digital collection for undergraduate and graduate institutional repositories and enhanced library staff support, with acquisition of additional staff at Forestry Library.

## 2.22 MSc. Food Safety and Quality Management gets first lot of Students

Our new MSc Food Safety and Quality Management program received its first lot of students from the Food Industry, UNBS, Directorate of Government Analytical Laboratories, and others. We currently have fifteen students who are progressing successfully.

In a bid to motivate students to excel, the Head, Department of Food Technology and Nutrition initiated the recognition of academic excellence for all B.Sc Food Science and Technology and B.Sc Human Nutrition students. All students who qualify for the Dean's List (CGPA 4.4) at the end of every academic year shall be awarded a certificate of excellent performance. Students in the graduating class who score a CGPA 4.66 will be awarded the HoD's Plaque of Excellent Performance. The first ceremony was held on Friday 29<sup>th</sup> November 2020. This ceremony also served as an opportunity to provide a platform for career guidance and sharing personal experiences. A total of 23 students were recognized. Only two students: Ms. Patricia Namutebi (B.Sc FST, CGPA = 4.67) and Ms. Claire Atukunda (B.Sc HUN, CGPA = 4.71) received the HoD's Plaque of Academic Excellence. (*see photos of the plaque and one of the recipients below*).



Claire Atukunda Academic Excellence award 2019



# RESEARCH FUNCTION

## 3.0 RESEARCH FUNCTION

### 3.1 Resource Mobilisation & Collaborations

Currently, the CAES has over 150 running projects and a number of MoUs signed in the period under review. A total of 30 staff proposals were considered for Mak-RIF Round 1, 23 for the Mak-RIF Round 2 and eight (8) for the Mak-RIF COVID Special research. The main objective of Mak-RIF is to support research and innovation initiatives that contribute to better delivery of national development initiatives in all sectors critical to Uganda's economy.

The college Grants office was established in May 2015 with support from the Directorate of Graduate Research and Training (DGRT) & Quality Assurance. However, in 2020, the office Coordinator Prof. Moses M. Tenywa resigned. Currently, the CAES grants office is not fully supported. The University should fully support the grants office with staff and facilities.

The tables below show grantees under the different Mak-RIF projects.

### 3.2 CAES Grantees for the Mak-RIF Funds

#### 3.2.1 Grantees for the Mak-RIF COVID-19 Special Call

Out of 110 projects, 8 staff members of the CAES were awarded projects under the Mak-RIF COVID-19 Special Call.

No.	Title	PI
1	Automation of communal hand water pumps to eliminate COVID-19 transmission	Kiggundu Nicholas
2	Impact of COVID19 lock down and, effectiveness of supplementary feeding on the nutrition status of mothers and their malnourished breastfeeding children, attending nutrition Units of health facilities	Dorothy Nakimbugwe
3	The Gendered Impact of COVID-19 Guidelines on Market Vendors of Perishable goods in Urban and Peri-Urban areas of Uganda	Losira Nasirumbi Sanya
4	Development of a Green Low Cost Touchless Handwash Technology (TW-20 Kit) For Public Shared Spaces	Wanyama Joshua
5	Design and development of an atomized spray drier for egg powder production for use in bakery industries of Uganda	Kivumbi Hussein Balimusi
6	Strengthening the resilience and visibility of peri-urban poultry farmers in Wakiso for better marketing and profitability through feeding, post-harvest handling, value addition and resources recovery	Ahamada Zziwa
7	Exploring Egg Processing As A Sustainable Market Solution For Ugandan Poultry Farmers During And Post Covid-19 Pandemic	Rosemary Emegu Isoto
8	Optimized software for planning and simulation of food aid response during the COVID-19 pandemic and other similar disasters in Uganda	Fildah Ayaa

#### 3.2.2 List of Projects Awarded under Mak-RIF2

In the new Financial Year 2020/2021, the Government of the Republic of Uganda allocated an additional UGX 30 billion to Makerere University Research and Innovations Fund Mak-RIF Round

2. Track 1 awarded 160 researchers and innovators out of 386 competitive applications.

These awardees were expected to implement their projects and share actionable research products and approaches in reference to the earlier developed National Research and Innovation Agenda. 24 CAES staff won the grants under the Mak-RIF 2 call as listed below:

No.	Project Title	PI
1	Development of a Simulation Model to Aid Formulation of Sustainable Agricultural Mechanization Strategies in Uganda	Robert Kambugu Kyeyune
2	Developing Climate-Smart Watersheds: An improved nexus for sustainable water resources and societal resilience to climate change in Uganda, Ås fragile landscapes	Yazidhi Bamutaze
3	Developing a prototype for biogas purification and packaging systems	Prof Elly Sabiiti Nyambobo
4	Optimizing irrigation water use: integrative developing of capacity for small scale farmers and relevant local government personnel to improve knowledge and practice of irrigation water use	Isa Kabenge
5	Tree species trials for commercial forestry development and climate change mitigation in Uganda	Fred Babweteera
6	Developing and diversifying tourism products at Sipi Falls and Bamasaba Cultural Site in Eastern Uganda	Jim Ayorekire
7	Environmental, social and human health impacts of Artisanal and small-scale gold mining in Uganda; Status, concerns and mitigation	Nelson Turyahabwe
8	Development of a biogas-powered cold storage for perishable horticultural products to reduce post-harvest losses in off-grid areas of Uganda	Kizito Simon
9	Developing a smart solar powered irrigation control system kit for enhancing water use efficiency in irrigated agriculture	Wanyama Joshua
10	Improving the quality of commercially produced Obushera through capacity building for processors and production of suitable pasteurizers (IQuO)	Ivan Muzira Mukisa
11	Innovating on-farm agronomic practices and postharvest technologies to increase finger millet [Eleusine corocana (L.) Gaertn.] production and productivity for a climate resilient food production in Uganda	Herbert L Talwana
12	Analysing the suitability of Bamboo and Napier grass in riverbank stabilization and buffer zone restoration for erosion and flood control in the upper River Rwizi catchment, South western Uganda.	Nseka Denis
13	Towards a food secure Uganda under a changing climate	Isaac Mugume
14	Development of Nutrient-Dense Recipes and Products from Underutilized Crops to Alleviate Malnutrition among HIV/AIDS Infected Persons in Western Uganda	Agnes Nabubuya
15	Towards smallholder flower production for export	Okello Robert Cyrus Ongom
16	Multidisciplinary research for improving economic performance and livestock sustainability in the Northeast cattle corridor of Uganda	Kiggundu Nicholas
17	Building business management skills and sustainable practices among urban and peri-urban roadside plant nursery owners, operators and workers for resilient ÅgreenÅ businesses in Greater Kampala, Uganda	Edward Nector Mwavu
18	Proximal and remote sensing of soil quality for supporting farmers, crop agriculture	John Allan Komakech
19	Potential of Tetrapleura tetraptera Fruit in the Formulation and Production of High Value Nutraceutical Product	Enock Ssekuubwa
20	Valorising organic waste into high quality animal feed and organic fertilizer using the Black Soldier Fly	Alice Amoding Katusabe
21	Application of Mobile-Phone Technology to Advance Access to Sustainable Point-Of-Use Water Purification Technologies for Household Drinking Water & Wastewater Reuse for Backyard Food Production	Prossie Nakawuka



22	Enhancing Makerere University, College of Agricultural and Environmental Sciences Relevance to Policy Processes in Uganda	Rosemary Emegu Isoto
23	Perinatal Paternal Mental Illness, Infant Growth and Development in Rural Masaka and Kyotera Districts, Uganda: A Longitudinal Cohort study	Simon Kizito
24	Extraction and Purification Bromelain from Pineapples and its Formulation for Clinical Treatment of COVID-19	William Kyamuhangire

### 3.2.3 List of Projects awarded during the Mak RIF Round 1

Out of the 704 proposals submitted, 223 were awarded across the university colleges for award categories. 30 CAES staff were awarded as listed below.

No.	Title	PI First Name	PI Last Name
1	Unlocking the commercial potential of Canarium schweinfurthii indigenous fruits for improved livelihood in Central Uganda	Jacob Godfrey	Agea
2	Tailoring Climate Services for Improved Agricultural Production (LOCATE)	Julianne	Sansa Otim
3	Strengthening the capacity of teachers to integrate nutrition education in primary school curricula to improve children's dietary practices and physical activity so as to combat malnutrition	Margaret	Kabahenda
4	Smokeless Tobacco Products in Uganda: Characteristics, Use, Enforcement of and Compliance with the Tobacco Control Act, 2015	Denis	Male
5	Revamping and commercialization of Agricultural Engineering Workshop at MUARIK	Balimunsi	Husein Kivumbi
6	Paradigm shift to intelligent agriculture for Ugandan farmers using Internet of Things (IoT) sensors	Noble	Banadda
7	Optimized and intelligent classroom environments for new generation learners	Fildah	Ayaa
8	On-farm comparative evaluation of hermetic and conventional storage technologies on post-harvest quality of stored common beans	Francis	Okori
9	Mountain Gorilla Tourism Re-examined: Implications of increased visitor numbers to the welfare and behaviour of mountain gorillas in Bwindi Impenetrable National Park, Uganda	David	Mwesigye Tumusiime
10	Integrating assisted reproductive technologies and elite pig genetics to transform the pig value chain in Uganda (IntARTs Genetics)	Donald Rugira	Kugonza
11	Innovations to mitigate the impacts of oil exploration on soil and water resources for sustainable livelihoods of communities in the Albertine Graben	Rutabatiina	Abraham Mwesigye
12	Improving the prediction of Storms and flood forecasting over Kampala City	Alex	Nimusiima
13	Improving access to biodiversity data for conservation decision making: A case of the National Biodiversity Data Bank, Makerere University, Uganda	Daniel	Waiswa
14	Farm Forestry intervention for increased Crop Productivity and livelihood resilience to climate variability in Eastern Uganda	Goretie	Nsubuga Nabanoga
15	Evaluating critical rainfall and soil moisture conditions for early warning of landslides in Eastern Uganda	Jamiat	Nanteza
16	Enhancing Value addition on Potato-Sorghum enterprises for Improved Livelihoods in Uganda (EvaPoSIL)	Johnny	Mugisha

17	Enhancing utilisation and conservation of east african sandalwood ( <i>osyris lanceolata</i> ) in uganda	John Bosco Lamoris	Okullo
18	Enhancing mango production and productivity for sustainable livelihoods in Uganda	Grace	Nakabonge
19	Empowerment of the Agro-Processing Industry to meet the Quantity and Quality Standards for the Local and Export Market; a Programme Enhancing the Practical Skills of Students in Makerere University	Julia	Kigozi
20	Digitalizing the Makerere University Soil Test Kit for rapid soil assessment, improved soil management, crop yields and incomes among farmers in Uganda	Emmanuel	Opolot
21	Development of a Safe and Efficacious Anti-malarial drug from Traditional medicine	John	Tabuti
22	Developing dry season feeding technologies for different cattle production systems in Uganda	Justine	Nambi-Kasozi
23	Developing Biofertiliser Formulations to Unlock Crop Productivity for Improved Food Security and Household Livelihood in Uganda	John Baptist	Tumuhairwe
24	Developing an automatically controlled commercial solar-dryer and efficient resource recovery innovations for sustained market responsive fruit production in Uganda	Ahamada	Zziwa
25	Design and development of mobile irrigation technology systems for small to medium commercial farmers and pastoralists in the rain constrained areas of Uganda	Kivumbi	Balimunsi Hussein
26	Deployment of the new Maksoy soybean varieties for on-farm income enhancement, Food and Nutrition security, Enterprise Development and Job creation in Eastern Uganda	Phinehas	Tukamuhabwa
27	Characterization, value addition and evaluation of natural tree extractable compounds (resins and essential oils) as potential pesticides against common insect pests in stored grains.	Christine	Nagawa
28	Carbon accumulation and storage in agricultural and other non-forested land use and cover types in Uganda	Michael	Mbogga
29	Building Stewardship and Resilient Ecosystems through Participatory Integrated Planning Approaches. The Case of Manafwa Watershed, Eastern Uganda	Frank	Mugagga
30	A Pedal-Operated Seed Cleaner (PoS-Cleaner) To Boost Post Harvest Grain & Legume Quality, Increase School-Study time & Create Financial Freedom in Rural-Uganda	Peter	Tumutegereize

### 3.3 Running Projects in CAES (2019-2020)

CAES has over 150 running projects.

Project title	PI/ Co-PI	Amount	Funder	Start and end date
Developing a Controlled Solar Drying System for Improved Drying Efficiency and Nutritional Quality of Dried Fruit Products	Isa Kabenge,	USD5,000	FTBIC Presidential Initiative Fund	September 2018 to April 2019
Makerere University and Cukurova University Research Collaboration	Isa Kabenge,	USD2,000,000 per year for three years	Governments of Uganda and Turkey	July, 2019 to July, 2022; Co-PI
ARUA Water Center of Excellence	Isa Kabenge,	USD250,000;	Rhodes University and ARUA-UKRI GCRF Partnership Programme	May, 2019 to May 2024

Fruits and Vegetables for all seasons: Improved resource-efficient processing techniques and new markets for surplus fruits and vegetables for rural development in Sub-Saharan Africa	Noble Banadda Ephraim	EUR 976,200	BLE Germany Government	
Capacity Building for Quality Graduate Training in Engineering in African Universities	Noble Banadda Ephraim	EUR 2,548,800	INTRA ACP-EU MOBILITY	
Modeling of non-point source pollution in the Lake Victoria basin	Noble Banadda Ephraim	USD 150; 000	SIDA	
Capacity building on the water-energy-food security Nexus through research and training in Kenya and Uganda (CapNex)	John Kawongolo Co-PI	150,000 Euros	Austrian Partnership Programme in Higher Education & Research for Development (APPEAR)	2017 - 2019
Development of Products from Finger millet, pearl millet, white sorghum and pigeon pea	Julia Kigozi Bulya PI	\$16,850;	ICRISAT	December 2016- March 2019
Design and Fabrication of a continuous pasteurizer	Julia Kigozi Bulya PI	\$16,000,	FTBIC and MAPRONANO	September 2018-todate
Nitrogen bio-fortified and pelletized commercial-grade organic fertilizer made from urban bio-waste to improve soil productivity and livelihoods of small holder farmers Granting Agency	Lwasa Stephen Lukyamuzi Co-PI	36,575 USD	ICIPE/BIO - INNOVATE	2018-2020
STOVERPACK- Creating a new value proposition for waste maize stover in Uganda	Lwasa Stephen Lukyamuzi Co-PI	100,400 USD.	INNOVATE-UK.	July, 2019-December, 2020*
Makerere-Sweden Bilateral Research programme	Mukadasi Buyinza PI	USD \$45 million	Sida, Sweden	2015 - 2020
Nurturing Emerging Research Leaders through Post-doctoral Training in the East African Region (NERLPEA)	Mukadasi Buyinza PI	USD\$ 2,000,000;		2017 - 2021
Intra-Africa Academic Mobility Scheme, Africa Regional International Staff/Student Exchange: Food Security and Sustainable Human Wellbeing II	Mukadasi Buyinza PI	USD\$500,000	European Commission.	2016 - 2020
Making Potato Value Chain Enhance Productivity and Incomes in Uganda;	Johnny Mugisha PI	USD350,000	MasterCard Foundation through RUFORUM	2018-2022
Education and Training for Sustainable Agriculture and Nutrition in East Africa (EaTSANE)	Johnny Mugisha Co-PI	USD120,000;	EU (LEAP-Agr) and Government of Uganda	2017-2021
Women's Response to Market-oriented Production Policy: Impact on Income and Nutrition Outcomes in Uganda	Dick Sserunkuuma PI	USD 15,000	African Economic Research Consortium	2018-2019
Develop Index insurance for drought-prone maize and bean-based farming systems in East Africa to enhance farmer adoption of climate-adapted germplasm	Fredrick Bagamba CO-PI	Euros 23000	GCP grant	2018 - 2020

Policy and regulatory reform options for seed market development: Expanding the empirical evidence base in Uganda	Fredrick Bagamba CO-PI	Euros 28325	NWO-WOTRO	2019 - 2022
Strengthening the Capacity of the Department of Agribusiness and Natural Resource Economics (DANRE)	Gabriel Elepu PI	USD3 million	USAID/KSU	2016-2020
Combating Arthropod Pests for better Health, Food and Climate Resilience	Rosemary Isoto Emegu CO-PI	USD 22,211	ICIPE	2019-2023
Implementation of Annual Agriculture and Market Support Household Surveys In Uganda In The Framework of WFP CSP UG 01	Bernard Bashaasha PI	USD 100,000	WFP	2020-2024
Improving Food Security and Reducing Poverty Through Intra-Regional Fish Trade in Sub-Saharan Africa	Theodora Hyuha Shuwu PI	USD 39,590	Fish Trade	15th July 2015-July 2020
Assessment of Market Opportunities for Small-Scale Fisheries and Farmers in Central Uganda	Theodora Hyuha Shuwu PI	USD 140, 918		2013-2019
Pluralistic agricultural advisory service delivery as a tool in enhancement of sustainable land management and agricultural development in highland areas of Uganda	Alice Turinawe PI	9000USD	IFS - International Foundation for Science	
Leveraging the Makerere University Agricultural Research Institute Kabanyolo Dairy Value Chain for Dairy Business Incubation and Skill Development-DAIRY LEVER among Students and Smallholder Farmers in Uganda	Alice Turinawe CO- PI	50,000USD	RUFORUM	
Small Grants on Harnessing the Potential and Competitiveness of Maize: Opportunity in Uganda under Vision 2040.	Alex Tatwangire		Maize Competitiveness Research Platform, Department of (DANRE Mak) Department of Agricultural Economics of Kansas State University (KSU)	
Agricultural Investors as Development Actors (AIDA)	Bernard Bashaasha PI	\$315,340.30;	DANIDA	March 30, 2016-2020
Impact of Creative Capacity Building of Local Innovators and Communities on Income, Welfare and Attitudes in Uganda; International Initiative for Impact Evaluation	Bernard Bashaasha PI	\$746,055.00	3ie	April 2013- July 2018
Feed the Future Innovation Laboratory for Nutrition	Bernard Bashaasha PI	\$2,242,763.40	USAID	2012-2020
Knowledge Heterogeneity: Experimental Evidence on Information Barriers to Oil Seed Adoption in Uganda	William Ekere CO-PI	150,000 US\$	3ie	
Mobilization and Training of Women Groups on Savings mobilization for Maize Seed purchases in Uganda	William Ekere PI	38000 \$	CIMMYT Mexico	

Upgrading the Institutional Capacity Of DANRE	Jackline Bonabana Wabbi CO-PI	\$3.1m	USAID	
Large Scale Land Investments And Effects On Agricultural Productivity In Uganda	Jackline Bonabana Wabbi PI	\$150,000	AERC	
Marker-assisted Breeding of Selected Native Chickens in Mozambique and Uganda (MAB-Chicken project)	Donald Kugonza Rugira PI	USD\$ 1,248,326	African Union AURG-II/2/2018	2019-2022
Genetic Characterization of Cattle Populations for Optimized Performance in African Ecosystems (OPTIBOV)	Donald KUGONZA Rugira PI	Euro € 1,231,574	European Union & UNCST - (LEAP-AGRI-326	2018-2021
Establishing Boar Semen Centres & Database for Commercializing Liquid Boar Semen in Uganda	Donald Kugonza Rugira PI	USD 50,000 PI	(NARO - Competitive Grant Scheme (CGS)	2017-2019
Building Research and Training capacities to develop innovations in ecological intensification of cereal – based cropping systems for improving productivity, food security and resilience to climate change in Uganda	Herbert Talwana Libbo PI	SEK8,000,000	Sida Swedish Research Training Partnership Program for new research collaboration agreement with Uganda	2015 – 2020
Healthy seedling systems for safer, more productive vegetables in East Africa	Herbert Libbo CO-PI	Euro 200,000	Austrian Development Agency (ADA).	2016 – 2019
Improved Resilience Through Sustainable Production Of Grafted Tomatoes in Uganda	Herbert Talwana Libbo CO-PI	Euro 294,347	NWO WOTRO	2017 – 2019
Application of digital soil maps to guide soil and land management planning in Uganda: The case of Eastern Uganda	Emmanuel Opolot	11350 USD	International Foundation for Science (IFS)	
Participatory Pathways to Sustainable Intensification (PASUSI)	John Baptist Tumuhairwe PI	\$228,000	EU/Government of Uganda under LEAP-agri consortium	2019 - 2023
Capacity building on the water-energy-food security Nexus through research and training in Kenya and Uganda (CapNex	Jeninah Karungi Coordinator	Euro 389.999.24	Austrian Partnership Programme in Higher Education & Research for Development (APPEAR)	2017-2020.
Productivity and biological diversity in the coffee-banana system in the Mt. Elgon Region of Uganda: Establishing Trends, Linkages and Opportunities	Jeninah Karungi PI	Euro 145,000 +60,000	The Volkswagen Foundation, Germany	2015-2020
Partnership for Training Scientist in Crop Improvement for Food Security in Africa (SCIFSA)	Thomas Odong Lapaka, PI/overall coordinator	1,398,975 euros	European Commission Grant	2017 - 2022
Prediction and Exploitation of Genebank Accessions - a study in Uganda Sorghum (PEGAUS)	Thomas Odong Lapaka, PI	USD 24,000	DGF Germany	2018 -2020

Regional Capacity Building for sustainable Natural Resources management and Agricultural Productivity under climate Change	Samuel Kyamanywa PI	USD 3,000,000. (NOKS 18,000,000).	NORAD through NORHED	2014 to December 2019
Integrating ICT in Commercial Production of Quality Sweetpotato Planting Material in East Africa (ICOPSEA).	Samuel Kyamanywa PI	USD 741,015	SIDA through Bioinnovate Africa Program	2018 - 2020
N2Africa- Making Nitrogen fixation to work in Africa	Peter Ebanyat, in Lab equipment and Green house Collaborator- Graduate student supervision	\$235,000	IITA	2014 - 2019
PEARL Project: Sustaining sweetpotato productivity through exploiting reversion from sweetpotato virus infections	Peter Wasswa PI	\$500,000	BMGF	Sept, 2014 – Sept, 2018 but extended to July 2019.
RUFORUM CARP+ PROJECT, "Making Potato Value Chain Vibrant and Enhance Productivity and Incomes in Uganda	Peter Wasswa Collaborator	\$350,000	RUFORUM	Feb 2018 – Jan 2021
RUFORUM CARP+ PROJECT, "Capacity building for micro propagation and certification of cassava planting materials to enhance productivity, incomes and food security and nutrition for small holder farmers in coastal Kenya	Peter Wasswa Collaborator	\$350,000	RUFORUM	Feb 2018 – Jan 2021
PEER Cycle 5 Grant: Delivering Crop Yield nowcasts and Forecasts by integrating satellite data and crop modelling in Sub-saharan Africa	Twaha Basamba Ali Ateenyi Co-PI	\$300,000	USAID	2016 - 2019
Institutionalisation of Farmer Field Schools	Basamba Ali Ateenyi Co-PI	\$100,000	FAO	2019 - 2020
Establishment of the Makerere Regional Centre for Crop Improvement (MaRCCI)	Richard Edema PI	\$ 6 Million	World Bank/GOU	2016 - 2021
Enhancing Institutional Breeding Capacity in Ghana, Senegal and Uganda to Develop Climate Resilient Crops for African Smallholder Farmers	Richard Edema Co-PI	\$76,000	International Fund for Agricultural Development	2018 - 2021
Capacity building in MSc Plant breeding and Seed Systems at Makerere University for improved response to farmers' needs and market demands in the East African Region	Richard Edema PI	USD 2,686,876		2016-2019
Nutritional Strategies to Improve Productivity of Dairy Cattle Grazing Heterogeneous Pastures in South-Western Uganda	Idibu Joachine CO-PI	48,500 Euros	IAEA	2016-2020
Building Capacity for Quality Graduate Training in Agriculture in African Universities (SHARE)	Orum Boniface Emuria PI	Eur. 1,979,475.00	Intra-ACP Academic Mobility Scheme of European Union	2012-2019
Unravelling Agro Ecological and Climatic Approaches to Understanding Restoration of Watersheds	Sarah Akello PI	\$60,000	CARNERGIE Cooperation of Newyork (RUFORUM)	April 2018- Feb 2020

Socio-cultural and Institutional arrangements influencing Uptake of Seed System Technologies: The case of Tissue Culture for control of Banana Xanthomonas Wilt in Central Uganda	Lucy Mulugo Were PI	11,000 USD	Bioversity International	2016-2019
Unearthing the Potential of Participatory, and Information and Communication Technologies' (ICTs) Led Extension and Learning Approaches in Agricultural and Environmental Education in Uganda	Gabriel Karubanga PI	USD60000	RUFORUM	2018-2020
Video for Farmers' Project	Gabriel Karubanga PI	Eur 3000	Access Agriculture with funding from the Swiss Agency for Development and Cooperation	2019
Developing Value Chain Innovation Platforms to improve food Security in East and southern Africa, ACIAR	Prossy Isubikalu Nakato, collaborator and coordinator Uganda	3m AUD	Government of Australia through ICRAF	June 2015 - November 2019
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa - Trees for Food Security	Prossy Isubikalu Nakato, collaborator and Co PI under curriculum)	5m AUD	ACIAR (Government of Australia through ICRAF	Jan 2017 - December 2020
University-based Community Action Research for Increasing viability of cereal-legume value chains towards improved nutrition and livelihoods in sub-Saharan Africa	BERNARD OBAA BONTON	Euro 595,387 but for Makerere the budget is Euro 197,400	Long-term EU-Africa research and innovation Partnership on food and nutrition security and sustainable Agriculture (LEAP-Agri) Call; Consortium of 4 universities	
Capacity Building to Promote Sustainable Governance of Petroleum Resources, Biodiversity and Livelihoods in East African Communities	Gorette Nabanoga Nsubuga	NOK 8,450,000	PELIBIGO	2015- 2019
Regional Capacity Building for Sustainable Natural Resource Management and Agricultural Productivity under Changing Climate (CAPSNAC)	Gorette Nabanoga Nsubuga	NOK 18,000,000	NORHED	2013- 2019
Gender Responsive Researchers Equipped for Agricultural Transformation	Margaret Mangheni Najjingo PI	\$2,304,891	Bill and Melinda Gates Foundation	2016-20-21
Tsetse Invasion Effect on Socio-Ecological Resilience of Pastoral Communities in Karamoja Sub-region, Uganda (SORES)	Anthony Egeru PI	US\$30,000	DGRT-Carnegie	2017-2019
Ecohydrological Connectivities and Complexities: Deciphering Transformative Landscape Change in the Drylands of Northern Uganda (ECOLAN)	Anthony Egeru PI	US\$60,000	RUFORUM	
The Potential of Camel Production in Resilience Building to Climate Change in Karamoja, Uganda (CAPREC)	Anthony Egeru CO-PI	US\$60,000	RUFORUM	

BREAD	Bob Nakileza Roga Co-PI	\$ 331,000	SIDA,	2015-2020
Building capacity for REDD+ in East Africa for improved ecosystem health and for sustainable livelihoods in Eastern Africa	John Tabuti Robert Stephen PI	USD 3 million	NORAD	
Water Supply and Sanitation in Small Towns (SMALL)	Frank Kansiime PI	Euros 86,300		October 2016, August 2020
Piloting and Commercialization of Economically Viable Leather Processing Technology for Environmental Protection and Zero Waste Discharge	Frank Kansiime PI	66,054		January 2018 - December 2020
Regional academic exchange for enhanced skills in fragile ecosystems management in Africa (REFORM)	Frank Kansiime CO-PI	Euros 1,399,875		November 2017 - October 2022
The Political ecology of Shea butter tree ( <i>Vitellaria paradoxa</i> C.F. Gaertn) conservation in Uganda)	David Mwesigye Tumusiime CO-PI	29,182 USD	The Carnegie Corporation of New York through the Nurturing Emerging Research Leaders Through Post-Doctoral Training grant at Makerere University (NERLP	2017 – 2019
Agricultural Investors as Development Actors (AIDA)	David Mwesigye Tumusiime CO-PI	320,825 USD	The Ministry of Foreign Affairs of Denmark	2016 – 2021
Climate change and increasing human-wildlife conflict: How to conserve wildlife in the face of increasing conflicts	David Mwesigye Tumusiime CO-PI	356,730 USD	The International Development Research Centre (IDRC) Canada	2017 – 2021
Developing Innovative and sustainable approaches to prevent the spread of African swine fever in Africa	Vincent B. Muwanika. Co-PI.		ASF RESIST African Union	2018-2021
Building Capacity for REDD+ in East Africa for improved Ecosystem Health and Sustainable livelihoods in Eastern Africa	Vincent B. Muwanika. Co-PI.	20.000.000 NoKs	NORAD.	
Delivery of pro-WEAL case study under the GREAT project in Uganda and the qualitative component of the FAO-IFAD JP-RWEE project in Ethiopia for the "Gender, Agriculture, and Assets Project – Phase 2(GAAP2)	Brenda Boonabaana PI	59800 (USD)	International Food Policy Research Institute	2017-2019
Biology and Ecology of <i>Ruspolia sifferens</i>	Philip Nyeko CO-PI	USD522,000	Finnish Academy of Sciences	2015 - 2019
Enhancing Capacity of Uganda to Measure Tourism Impacts	Christin Nagawa Betty,Coordinator	USD 50,000	United Nations Economic Commission for Africa	2017-2019
Uganda Equator Tourism Project	Wilber Ahebwa Manyisa PI	USD 30,000	Uganda Tourism Board	2019
Ranger Welfare Project	Wilber Ahebwa Manyisa PI	20,000 USD	WWF and UWA	2019



Changing tree phenology and its implications for primate foraging	Fred Babweteera PI	£200,000	EARTHWATCH INSTITUTE	2015-2019
Chimpanzee health monitoring in the Albertine Rift	Fred Babweteera PI	\$644,000	ARCUS FOUNDATION	2011-2019
Community adaptability to loss occasioned by wildlife in Uganda	Fred Babweteera CO-PI	£284,940	DARWIN INITIATIVE	2018-2021
Speciation Clock	Gerald Eilu Collaborator	2400 USD	Research Council of Norway	2018-2022
ANTENNA: Norwegian – African network for training a new generation of entomologists in DNA-based molecular methods	Gerald Eilu Partner	700,000 USD	SIU/DIKU (Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education)	2019-2023
Photovoice for Youth Empowerment in Peanut Value Chain in Uganda	Archileo Kaaya Natigo Co-PI	USD 300,000	USAID Peanut Innovation Lab	2019-2021
Enhancing nutritional benefits and safety of maize to improve the health of Africans	Archileo Kaaya Natigo PI	USD 12000	Nestle Foundation	2018-2019
Fruits and vegetables for all seasons: Improved resource-efficient processing techniques and new market solutions for sur-plus fruits and vegetables for rural development in Sub-Saharan Africa	John Muyonga PI	143,000 Euro	Federal Government of Germany	2018-2021
Adaptation and promotion of refractance window drying technology for production of high quality bioproducts	John Muyonga PI	750,000 USD	Bioinnovate Africa II Program	2018-2020
Promoting Community and Home Based Appropriate Postharvest Handling and Processing of Legumes and Starchy Staples to Improve Food Security in Uganda	John Muyonga PI	300,000 USD	McKnight Foundation	2016-2019
Commercialization of New Sorghum and Millet Products for Improved Nutrition and Socio-Economic Gains in Eastern Africa	Yusuf Byaruhanga Byenkya PI	USD 250,000	(Bioinnovate Africa Programme	
Innovate approaches to value addition and commercialization of climate smart crops for enriched food security and nutrition in Africa and beyond - LEAP Agri	Yusuf Byaruhanga Byenkya PI	EURO 1,020,001	NUTRIFOODS	
Assessment of aflatoxin exposure among peri-urban low income populations in Kampala Capital City	Abel Atukwase PI	\$ 41482	Carnegie Corporation of New York	2017 - 2019
Making potato value chain enhance productivity and incomes in Uganda	Abel Atukwase CO-PI	\$350,000	MasterCard Foundation	2018 - 2022
Processing of small sized unmarketable potatoes	Abel Atukwase PI	\$5,700	Government of Uganda/FTBIC	2018 - 2019
Development of a locally sustainable complementary food enriched with Moringa oleifera leaves suitable for children 6-59 months	Gaston Tumuhimbise Ampek PI	USD 41,482	Carnegie NERLP	2017 - 2019
Commercialization of new sorghum and millet products for improved nutrition and socio-economic gains in Eastern Africa	Gaston Tumuhimbise Ampek PI	USD 75,000	BIOINNOVATE AFRICA PROGRAMME PHASE II	2018 - 2020

A new technique for locust mass culture for food and feeds industry in East Africa	Dorothy Nakimbugwe Ndaula CO-PI	\$17,178	East African Science and Technology Commission (EASTEKO)	2018 - 2019
INSBIZ: INSeCT-based agriBIZiness for sustainable grasshopper and cricket production and processing for food in Kenya and Uganda	Dorothy Nakimbugwe Ndaula PI	\$375,000	SIDA/BioInnovate Africa, Phase II	2017 - 2020
Development of high-quality food protein from multi-purpose crops through optimized, sustainable production and processing methods - PROTEIN2FOOD	Dorothy Nakimbugwe Ndaula CO-PI	\$150,000	European Commission, Horizon 2020 - research and innovation framework programme	2014 - 2020
The Implications of the 1.5-2.0 degree C. to Uganda's Climate, Agriculture and Water Nexus	Isaac Mugume PI	US\$100,000	The African Academy of Sciences under the Climate Research for Development program	
Novel Computational Methods for Improved Detection of Changes in Weather	Isaac Mugume PI	US\$16,000	BRIGHT project	
Forecasting Uganda's Future Water Resources. Case study of Western Uganda	Isaac Mugume PI	US\$6,500	BREAD-SIDA project	
Urban Resilience and transition to sustainability	Shuaib Lwasa	USD270,000	AXA Research Fund	
3 Years Urban KNOW Inequality in cities	Shuaib Lwasa	USD280,000	Caren Levy (UCL), GCRF	
3 Years Resilience to Pluvial Flood Extremes in Cities	Shuaib Lwasa	USD 87,000	Claire Walsh (University of New Castle NERC; David Richardson (UN)	
Land Use and Resource Assessment The implications of land use/cover change for household food security and climate variability in eastern Uganda and the Eastern Cape Province of South Africa	Frank Mugagga Partner PI	USD 25,000	The South Africa Joint Science and Technology Research Collaboration Programme	2017 - 2018
Development and Adoption of Multifunctional Perennial Farming Systems. Towards Increased Sustainability and Resilience	Frank Mugagga Collaborator	USD35,000	VR-SIDA, Sweden	2016 - 2019
Understanding the Assessment and Reduction of Vulnerability to Climate Change Hazards in Highland Areas. The Case of Kigezi Highlands, South Western Uganda	Frank Mugagga PI	USD30,000	SIDA Research Capacity Building	2016 - 2018
PostDoctoral Research BREAD Project	Frank Mugagga		Makerere – Programme	2015 - 2020
GMES and AFRICA	Daniel Waiswa Co-PI	USD 140,000	African Union Commission -European Union	2018 - 2020

HyCRISTAL (Integrating Hydro-Climate Science into Policy Decisions for Climate-Resilient Infrastructure and Livelihoods in East Africa) Future Climate for Africa (FCFA) programme	Geoffrey Sabiiti CO-PI	US\$30 million	The UK Department for International Development (DFID) and Natural Environment Research Council (NERC)	2016 - 2019
Displaced Communities, Environmental Degradation and Sustainable Livelihoods in East Africa	Yazidhi Bamutaze PI	£199,322	Donor: Global Challenges Research Fund (GCRF), University of Dundee, UK	2018 - 2021
National Framework Development for Water and Sanitation Sector of Uganda	Yazidhi Bamutaze PI	\$39,000	UNESCO	2019
Delivery of Eleventh International Conference on Community Based Adaptation to Climate Change (CBA11)	Revocatus Twinomuhangi	USD 43,432.08	FAO/FHI360	2017-2018
REFORM Project	Majaliwa Mwanjalolo Jackson Gilbert CO-PI	1.3 million Euro	EU-ACP secretariat	
A multisensor hydrologic modelling framework to assess the impacts of small scale water storage practices to water resources over Uganda	Jamiat Nanteza PI	230,000 USD	PEER-USAID	2017 - 2019
An integrated assessment of groundwater resources and their sustainable use in the Lake Kyoga basin	Jamiat Nanteza PI	100,000 Euros	Volkswagen- Stiftung	2017 - 2019
Developing dry season feeding technologies for different cattle production systems in Uganda funded by Makrif	Nambi J Kasozi (PI) Elly Sabiiti CO-PI, C Katongole, F Bareeba	100,000,000/=		Nov 2019 June 2020
Securing Water Supplies-Participatory Ground Water Monitoring and Management in Botswana and Uganda. This is International collaboration	Basant Maheshwari(PI)Maria Varua,Dharma Hagare, Piet Kenabatho, D.Moalafhi, Sabiiti,Elly( CO-IP)and Ali Basamaba Twaha,CO-PI) A.Goonetilleke	AU\$10,000		Jan-Dec 2021
Developing a prototype for biogas purification and packaging systems funded by Makrif	Elly N Sabiiti,(PI) C Katongole,J Tumutegerize,A.Komakech, Mambo,Wilson et al.	95,000,000/=		Oct 2020 to June 2021
Unlocking the potential of thiocyanate in cassava root for management of vaso-occlusion crisis in sickle cell disease patients in Uganda. [Makerere Research and Innovations Fund: UGX 105million, Co-Investigator] - Partnering with the College of Health Sciences, Mak, and Dr.Mildred Ochwo.				
Identification of vectors transmitting viruses in tomato in Uganda [CONNECTED Virus Network: GBP 30,000; Biotechnology and Biological Sciences Research Council (BBSRC), Co-Principal Investigator] - Partnering with the University of Cambridge (UK). Research student, Mr. Girisom Bwire sent on four month fellowship to the John Carr Lab.				
Dr. Losira Nasirumbi: Makerere University Research and Innovation Fund (RIF) grant for project titled The Gendered Impact of COVID-19 Guidelines on Market Vendors of Perishable goods in Urban and Peri-Urban areas of Uganda.				
Dr. Losira Nasirumbi: Directorate of Research and Graduate Training, Supporting Early-Career Academics at Makerere University (SECA) with support from the Carnegie Corporation of New York, Post-Doctoral Research Fellowship grant for project titled, "Intra-household Gender Dynamics in Uptake of Agricultural Technologies for Sustainable Livelihoods in Uganda".				

Dr. Emmanuel Opolot: Project title: "Digitalizing the Makerere University Soil Test Kit for rapid assessment, enhanced crop yields and incomes among farmers in Uganda (RIF 1 / CAES / 024)". This research is funded by the Government of Uganda, in the framework of Makerere University Research and Innovation Grant (RIF). The value of the award is 102 million Uganda shillings (~30,000 USD). The overall objective of the proposed project is to upgrade and advance the use of rapid soil testing technologies for quick access and use of soil information for more accurate, affordable, and prompt soil, water and nutrient farm management decisions. The deliverables include digital soil database, updated, calibrated and validated Makerere University Soil Test Kit (MAK-STK) and a web-based platform and android app for easy access to soil management recommendations. Opolot aims to develop digital soil maps to guide farmers on soil, water and nutrient management.
Dr. Frank Mugagga -2020 - 2023: Project Overseer: 'Clean Environment Initiatives Project 2 (CEIP 2). Implemented in 20 Secondary Schools within Soroti City and Soroti District; jointly implemented by Seniors without Borders (SwB) – Denmark and Youth Leading Environmental Change - Uganda (YLEC). Funded by the Climate and Environment Fund, Denmark. DKK 5M.
Dr. Frank Mugagga -2019-2020: Principal Investigator: Building Stewardship and Resilient Ecosystems through Participatory Integrated Planning Approaches. The Case of Manafwa Watershed, Eastern Uganda. Funded by the Research and Innovations Fund (RIF), Makerere University and Government of Uganda. UGX 100M.
Dr. Donald Kugonza: MAK/RIF2/CHUSS/070 - Chicken and Under Five Nutrition: Multi-disciplinary innovations building capacity, increasing supply and improving access. 99,935,000=
Dr. Donald Kugonza: MAK/RIF1/CAES/009 - Integrating assisted reproductive technologies and elite genotypes to transform the pig value chain in Uganda worth (Pig Genetics) 180,490,000=
Dr. Donald Kugonza: ILRI-CRP-001113 - Improving Pig Productivity and Incomes through an Environmentally Sustainable and Gender Inclusive Integrated Intervention Package \$84,535
Dr. Ivan Muzira Mukisa: Awarded £79,099 (Co-PI) by BBSRC-GCRF-IBBE for the project, 'Improving essential oil feedstocks and high-value products from Mentha spp to benefit local Uganda economies for the period 2019-2022.
Dr. Ivan Muzira Mukisa: Awarded UGX 73,535,000 (PI) by the Makerere Research and Innovation Fund (MAkRif 2) for the project, 'Improving the quality of commercially produced Obushera through capacity building for processors and production of suitable pasteurizers (IQuO)' for the period 2020-2021.
Dr. Ivan Muzira Mukisa: Awarded UGX 223 million (Co-PI) by the Makerere Research and Innovation Fund (MAkRif 1) for the project, 'Empowerment of the Agro-processing Industry to meet the Quantity and Quality for local and Export Market (EAPI)' for the period 2019-2020.

### 3.4 Collaborative Initiatives

#### 3.4.1 FoodLAND-Food and Local, Agricultural and Nutritional Diversity

With funding of 7 million euros, Makerere University, the CAES, the National Agricultural Research Organisation (NARO), Volunteer Efforts for Development Concerns (VEDCO) and Nutreal Ltd. along with other African and European partners will be undertaking research to boost the nutrition performance of local food systems in Africa. The FoodLAND project kick-off online from 30 September to 2 October, 2020

The FoodLAND project, funded to the tune of 7 million Euros by the European Commission within the Horizon 2020 programme and led by Alma Mater Studiorum – University of Bologna (Italy), is committed to developing a range of innovations for local agriculture and aquaculture development, as well as to nudging consumers towards healthier eating behaviour in six African countries: Morocco, Tunisia, Ethiopia, Kenya, Uganda and Tanzania.

The aim of the project is to strengthen agro-biodiversity and food diversity, along with diversity of healthy diets to combat the major forms of malnutrition in Africa.

The project will create a network of 14 local Food Hubs-paired with 14 separate cities in these countries-that will mobilise relevant actors in rural, urban and peri-urban communities and serve as injection points for testing and introducing the innovations. Indeed, the 28 partners that comprise the FoodLAND consortium (18 of them are African institutions while the other 10 are European) will work together to develop, implement and validate 12 technological innovations; which include organizational and technological innovations for both vegetable and fish farming

and food processing systems, together with 17 novel local food products, ranging from fresh, dried and processed vegetables and fish to composite flours and therapeutic foods.

Uganda's Project Team includes Prof. John Muyonga, Prof. Noble Banadda and Prof. Johnny Mugisha from CAES; Dr. Cassius Aruho, Dr. Puline Nakyewa, Dr. Margaret Masette, Dr. Getrude Atukunda and Dr. Justus Rutaisire from NARO; Mr. Henry Nsereko from VEDCO; and Dr. Dorothy Nakimbugwe from Nutrael.

### **3.4.2 Summer School on Landscape Ecology funded by VW Foundations**

The Department of Geography, Geo Informatics and Climatic Sciences (DGGCS) will be collaboratively implementing a series of summer schools over a period of three years focussing on "Landscape Ecology" funded by the Volkswagen Foundation. Issues of social-ecological sustainability, systems resilience and social equity benefiting from nature's contributions to people continue to occupy a prominent position in the global development dis-course of tropical regions particularly in Sub Saharan Africa (SSA). The dominant narrative paints a dismal picture in SSA and avers that ecological systems are increasingly undergoing enormous degradation linked to natural and human induced processes with adverse implications on local and regional populations whose livelihoods are strongly dependent on environment and natural resources.

A strong desire exists in addressing these issues as seen in the tenets of the Global Development Agenda 2030 and the Africa Union Agenda 2063. Landscape ecology principles provide a framework for sustainable land use planning and natural resource management. Landscape Ecology as an interdisciplinary marriage between geography, biology, ecology and social sciences provides a valid scientific foundation to harness the role of biodiversity for a sustainable livelihood and suggest adequate governance instruments to achieve the SDGs. The VW-summer school series intends to train participants on the knowledge and skills of how landscape ecology can contribute to improve the status of achieving the SDGs and the AU Agenda 2063 objectives. The summer school will entail joint engagement of scientists and practitioners from urban, regional and national planning as well as from governmental institutions who are engaged in socio-ecological system development from multiple perspectives.

### **3.4.3 CAES and BHEARD Program with the support of the MSU's Global Center for Food Systems Innovation (GCFSI)**



*Administration and Design Team meeting on 24<sup>th</sup> September, 2019*

The CAES and Michigan State University's Borlaug Higher Education for Agriculture Research and Development (BHEARD) Program with the support of the MSU's Global Center for Food Systems

Innovation (GCFSI) are working together to advance CAES toward its strategic Vision “To be a thought leader of knowledge generation for societal transformation and development.”

The CAES Innovation Scholars Program (CAESISP) offers an eighteen-month opportunity during which CAES academic personnel can work as interdisciplinary teams to solve food system problems that are relevant to the food systems in Africa, while at the same time offering support to the entire CAES academic team in the areas of design thinking, teaching and learning, community outreach and communicating science. The CAESISP will serve as a catalyst to support food system innovations that improve food security and develop the current and next generation of entrepreneurial scientists at Makerere University and in the region.

The program is modelled after a successful field-tested faculty development program implemented at the Lilongwe University of Agriculture and Natural Resources (LUANAR) and the Malawi University of Science and Technology (MUST)-yet tailored for innovation and contextual challenges at Makerere University. The core values of the CAESISP include: participatory, asset-based, learner-centered, contextualized, and evaluative.

The first CAESISP administration and design team meeting was held on 24<sup>th</sup> September 2019 at the School of Agricultural Sciences (SAS) Conference Room. The key objectives for the meeting were; to give clarity and understanding of the CAESISP concept, to explain the design process and to explain the administrative and logistical issues for the CAESISP.

#### **3.4.4 EAPI Project**

Micro, Small, and Medium Scale Enterprises (MSMEs) contribute substantially to the provision of basic goods and services and generation of tax revenue for National socio-economic development. It is therefore important to enhance their capacity to compete in domestic, regional, and international markets. This will eventually enhance Uganda’s agenda for industrialization. The EAPI Project, through its Tripple Helix Partnership Model (Academia-Industry-Government), is training practitioners in agro-processing with skills that;

- (i) Enable the production of quality products,
- (ii) Enable the processors to grow their market capacity,
- (iii) Facilitate and accelerate the certification process,
- (iv) Facilitate local and export market.

The project uses university students in the implementation of different project activities. Students, therefore, gain hands-on training as well as acquire transferable soft skills relevant to the workplace.

#### **Achievement so far registered:**

1. The project was successfully launched on 6<sup>th</sup> February 2020 by the Dr. J. Mutamba, the Commissioner for Processing and Marketing at the Ministry of Trade, Industry, and Cooperative (MTIC). Details can be accessed on the link: <http://agroprocessingpro.com/activity-details.php#34>
2. Induction workshop for Research assistants and Agro- processors. This training was based on the book by Steven R. Covey – The 7 Habits of Highly Effective People. Details on the link: <http://agroprocessingpro.com/activity-details.php#35>

3. Two-day training workshop for processors and student research assistants to enable them improve their knowledge in various aspects of food processing. Details on the link: <http://agroprocessingpro.com/activity-details.php#36>
4. A baseline study was conducted to establish the status quo at different facilities. Findings from the baseline prompted the project management to change strategy and effective walk with all the processors rather than the planned 20 processors. Details on the link: <http://agroprocessingpro.com/activity-details.php#38>
5. Students with guidance from project team in their groups developed interventions for the different facilities. These were shared with processors in a comprehensive technical report for implementation. Whereas COVID19 delayed the implementation, several processors significantly improved their processes after the lockdown was lifted. Details on the link: <http://agroprocessingpro.com/activity-details.php#39>
6. The students continue to engage in different online trainings to keep them in the loop of the project activities even when the university is closed. Students were trained on process documentation (Details: <http://agroprocessingpro.com/activity-details.php#45>), as well as marketing strategies especially for the small-scale processors (Details: <http://agroprocessingpro.com/activity-details.php#46> )
7. The project developed templates for documentation of processes at the different facilities. Students were sent to the field to help the processors familiarize with the information in the technical reports and the use of templates. Details on the link: <http://agroprocessingpro.com/activity-details.php#43>
8. A few students that are accessible within Kampala were tasked to transfer this knowledge on marketing strategies to the processors. Each student assisted the processor draft a business model canvas. Details on the link: <http://agroprocessingpro.com/activity-details.php#49>
9. As a project, we continue to assist the processors appreciate their indigenous effort in product development by conduction laboratory analysis at the chemistry and microbiology laboratories at Makerere University School of Food, Technology, Nutrition and Bioengineering. We share results with them to assist them improve and optimize their products. Details on the link: <http://agroprocessingpro.com/activity-details.php#44>
10. Since certification top of our agenda, we are encouraging processors to register their companies with URSB, then acquire TIN numbers from URA to be able to fully have access to the services such as standards, certification, product testing offered by UNBS. So far, two companies under the project have successfully obtained permits for use of the Q mark on their products while one is in its final stages. From the ongoing field visits, many others are ready, but constrained by funds. The project is procuring a complete set of standards for all companies that meet the registration requirements.
11. The project is also working around to leverage equipment design and construction for the small-scale industry. Details on the link: <http://agroprocessingpro.com/activity-details.php#50>
12. Third year agricultural engineering students were given a training on simulation to enable them appreciate mechanisms within the prototype prior to actual construction of the machine. Details on the link: <http://agroprocessingpro.com/activity-details.php#40>
13. The project is working together with different processors to improve product labels so as to effectively compete on the local and region market.

14. The project is in the process of procuring simple equipment relevant for production of different products. These will be given to the different processors to allow them improve their processes.
15. Three manuscripts are already under review. These will be used as a part of the project dissemination strategy.
16. The project also runs a website on which it shares the different activities under implementation. A YouTube channel was created to showcase the videos from the project.
  - Website: <http://agroprocessingpro.com/>
  - Youtube: <https://www.youtube.com/channel/UCxc3fi3VDOWNUI4LsXMFRXg>

In press:

- RIF-Funded Empowerment of the Agro Processing Industry Project Launched: <https://news.mak.ac.ug/2020/02/rif-funded-empowerment-of-the-agro-processing-industry-project-launched/>
- Companies advised to give more hands-on training to interns: <https://www.newvision.co.ug/news/1514832/companies-advised-hands-training-interns>
- Makerere launches RIF funded project on empowerment of agro processing industry: <https://www.pmldaily.com/business/agriculture/2020/02/makerere-launches-rif-funded-project-on-empowerment-of-agro-processing-industry.html>
- Mak RIF funded project on the Empowerment of the Agro processing Industry (EAPI) Launched: <http://caes.mak.ac.ug/uncategorized/mak-rif-funded-project-on-the-empowerment-of-the-agro-processing-industry-eapi-launched/>

### 3.5: Memorandum of Understanding (MoUs) Signed

No.	Collaborating Institution(s)	Area of Cooperation	Date signed
1	FAO	Strengthening Small Stock Value Chains for Climate change Adaptation and Improved Livelihoods among Vulnerable Demographics in West Nile and Karamoja regions.	22 <sup>nd</sup> October 2020
2	Heifer Project International	Train and mentor 10 youth in piggery Artificial insemination technical skills under the East Africa Youth inclusion Program (EAYIP)	2 <sup>nd</sup> October 2020
3	International Organisation for Migration(IOM)-UN System Mission in Uganda	Implementation of a research project on Migration, Environment and Climate Change (MECC)	2 <sup>nd</sup> October 2020
4	Sokoine University	Facilitate interviews for REFOREST scholarship applicants in Uganda	12 <sup>th</sup> June, 2020
5	Uganda Martyrs University Nkozi-African Centre of Excellence in Ecology and Livelihood Systems-ACALISE & Government of the Federal Republic of Germany	Implementing the International Training Course in Organic Agriculture (ITCOA) 2020-2021	30 <sup>th</sup> September, 2020
6	Tecnische Universitat Dresden-Faculty of Environmental Sciences -Germany	Development of wood biomass for energy production on national and farm level.	7 <sup>th</sup> August 2020



7	UN Sustainable Development Solutions Network(SDSN) Uganda National Network	Operationalisation of the National Network Secretariat at Makerere university	3 <sup>rd</sup> August 2020
8	University of Illinois USA	Adaptation of Soybeans to high Altitude areas of Uganda	30 <sup>th</sup> July, 2020
9	Makerere University Centre of Excellence in Waste anagement (MUCEWA) and EfD-Mak Center	Cooperative programs promoting scholarly activities ie mutually promote research, training and outreach activities.	29 <sup>th</sup> April, 2020
10	Vetline Services Ltd, Mukono Uganda	Development of the institutions' stratec development goals pspecially those in livestock (research, outreach, staff and student capacity enhancement)	17 <sup>th</sup> June 2020
11	The Nowegian University of Life Sciences	Provision of Research support on Climate Smart innovations in Agriculture in Uganda; Improved food security, livelihoods and soil carbon	29 <sup>th</sup> August 2020
12	Bioinnovate Africa Program	Piloting the Nitrogen bio-fortified and pelletised commercial grade organic fertilizer to improve soil productivity and livelihoods of small holder farmers	16 <sup>th</sup> March, 2020
13	Justus Liebig University Giessen Centre for international Development and Environmental Reserach	Promote international exchange and closer cooperation in research, teaching and joint projects	14 <sup>th</sup> February 2020.
14	Jinja Municipal Council and ACT –an NGO	Strengthening capacity for urban migration management and migrants livelihood improvement in Jina City Uganda	4 <sup>th</sup> February 2020
15	Wageningen University	Capacity building	22 <sup>nd</sup> January 2020
16	OXFAM NOVIB Uganda	MUCCRI to Conduct study/documentation of climate change impacts on agriculture in Uganda	11 <sup>th</sup> November, 2019
17	Eduardo Mondlane University, Faculty of Veterinary Medicine, Department of Animal Production, Gulu University Faculty of Agriculture and Environment, Women of Uganda Network WOUUNET KYEEMA Foundation	Joint project implemetation, “ Marker-Assisted Breeding of selected Native Chickens in Mozambique and Uganda” MAB-Chicken Project	3 <sup>rd</sup> October, 2019
18	University of Kwazulu –Natal South Africa	To further the development of basic scientific and technological research, graduate and undergraduate education.	19 <sup>th</sup> August, 2019
19	African Centre for Ago-Ecology and Livelihood Systems (ACALISE), Uganda Martyrs University Nkozi Faculty of Agriculture, International Training Course on Organic Agriculture (ITOCOA)	Implementation of International Training Course on Organic Agriculture (ITOCOA)	1 <sup>st</sup> August, 2019
20	Soybean Africa Limited (SAL)	Provide conducive research environment for students , staff and its partners, provide a learning center for Under graduate and graduate students ; Provide in-service training, long life training and state of the art demonstration for partners and communities; Create platform for Public and Private partnership and Incubate start up business for students and staff of Makerere	28 <sup>th</sup> June, 2019

21	MARULA Agribusiness Limited	Publish, conduct research, produce and process animal feeds from Black soldier flies; Train students on production processing and feeding livestock on BSF based animal feed; Carry out outreach to the public and farming communities	15 <sup>th</sup> June, 2019
22	Bongor University, NAFICI Environmental Research Ltd, MUSA BODY Uganda Ltd and ORIBAS Innovators Uganda Ltd.	Collaboration on research project, "STOVERPACK" creating a new value proposition for waste maize Stover in Uganda under the Technology Programme Agri-Tec Catalyst round 7: agriculture and food systems innovation challenge competition for funding	13 <sup>th</sup> May, 2019
23	Water for Governance Institute	Facilitate and enhance collaboration in the fields of training, research, student support, conference meetings and any related capacity development services in water, land use and watershed Management.	3 <sup>rd</sup> April, 2019
24	Kamwenge District Local Government (KBLG), Kamwenge Bee Keepers Cooperative Society (KABECOS), Kyabwanswa Rural Integrated Farming Systems (KRIFS)	To develop and implement mutually beneficial programs, projects and activities.	22 <sup>nd</sup> March, 2019
25	FSBSI-ARC Agricultural Research Centre "Donskoy"	Participate in a collaborative study of maize, sorghum, rice and soybean breeding process and their seed growing	
26	University of Dundee	Joint proposal writing for the project entitled, "Displaced Communities, environmental degradation and substantial livelihoods in East Africa funded by the Scottish Funding Council	26 <sup>th</sup> March, 2019
27	Uganda National Chamber of Commerce (UNCC)	To facilitate academic cooperation between CAES and UNCC in particular, to establish a program entitled, "Towards Demand Driven Teaching in Uganda and Zambia (DDT)" within the framework of the DAAD Programme	4 <sup>th</sup> February ,2019
28	Uganda Timber Growers Association (UTGA)	Undertake Research Leading To Improved Productivity Of Forest Plantations	12 <sup>th</sup> December 2019
29	University of Kisangani(UNIKIS)	Promote training, research, research dissemination and exchanges	12 <sup>th</sup> December, 2019
30	Private Sector Foundation Uganda	Promote supplementary feeding- a government project on Developing a Market oriented and Environmentally Sustainable Beef Meat Industry in Ugand (MOBIP)	13 <sup>th</sup> December, 2019
31	MAAIF	Provision of consultancy services to intertake mid-term reviw process and assessment of implementation of the Agriculture Cluster Development Project	2019
32	SUFINDA C.I.C University of London, UK	Creation and deployment of a database devoted to climate and sustainable financial data	12 <sup>th</sup> December 2019
33	ICRISAT- Telangana , Hyderabad India	Contribute to the implantation of social communication and behavior change activities on the project, youth realities, aspirations opportunity structures in dryland of Uganda, Tanzania and Ethiopia	20 <sup>th</sup> November 2019



# RESEARCH, TECHNOLOGIES AND INNOVATIONS

## 4.0 RESEARCH, TECHNOLOGIES AND INNOVATIONS

The CAES boasts of a multidisciplinary team of researchers capable of writing grant winning proposals and innovative capacities. Five technologies and five innovations developed by CAES scientists were unveiled in the period under review. These include:- Automated Communal Hand Water Pumps (MaK NAI), Makpot- value added to sweet potatoes, New Fruit drying Technology- Refractance Window Drying Technology (RWDT), Thermal Imaging for detection of COVID-19, Three-Dimensional (3D) printing of biodegradable face shields and components for the Bulamu ventilator, the Touchless Handwashing (TW-20) Kit. Others are the Nitrogen Bio- fortified and pelletised commercial-grade organic fertilizer, ProWEAI tool that measures women empowerment in agricultural projects and the Teaching Model for University-Industry Linkage. However, there is lack of support system to go beyond prototypes and making innovations and technologies available to targeted beneficiaries. During the period under review, a number of technologies and innovations have been developed.

### 4.1 Research Ethics Committee (CAES REC)

Research involving humans as research participants is increasing in Uganda and becoming more complex with increasing sophistication of research tools. In line with international and national requirements, there is a need for protection of humans involved in the research process so that research is beneficial and not harmful. According to UNCST (2014), “the National Guidelines for Research involving Humans as research Participants, July 2014, provides a national framework for harnessing the benefits of research while ensuring that the rights, interests, values and welfare of people who take part in the research are not compromised”. These guidelines provide a national framework for regulating the conduct of research involving humans as research participants in the country. They require that anyone wishing to conduct research involving humans as research participants should be knowledgeable in research ethics and observe the provisions of the guidelines. One of the ways of ensuring the conformance to such guidelines is through Research Ethics Committees (RECs) which are tasked with the responsibility of reviewing and approving research involving human subjects as participants so as to ensure their protection.

Makerere University College of Agricultural and Environmental Sciences (CAES) is one of the institutions actively involved in research activities, some of which involve humans as subjects and/or participants. However, the process of obtaining timely research approvals from existing Research Ethics Committees in the country is increasingly becoming cumbersome and thus costly as the volume of research involving human subjects as participants carried out in CAES increases. It was thus found desirable that the College of Agricultural and Environmental Sciences Research Ethics Committee (CAES REC) be established with the following functions:

- (i) Review and approve research study applications so as to ensure compliance with national research ethics guidelines, and
- (ii) Monitor approved research projects to verify information in the applications, ensure adherence to established national research ethics guidelines and assess issues related to the protection of the welfare of human research participants.

This process started in 2018 with the establishment by the College Principal, Prof. Bernard Bashaasha, of an ad hoc Committee chaired by Dr. Daniel Waiswa with Prof. Joseph Obua, Assoc. Prof. Margaret

N. Mangheni, Prof. Archileo N. Kaaya and Dr. Alice Turinawe as members with the main task of operationalizing the College of Agricultural & Environmental Sciences Research Ethics Committee (CAES REC). Since that time, the ad hoc committee has been able, through consultations with stakeholders including Uganda National Council for Science and Technology, existing Research Ethics Committees, and literature review and synthesis, to develop the Standard Operating Procedures (SOPs) for CAES REC which is the guide to CAES REC members, staff, investigators, researchers, consultants and other stakeholders in conduct ethical and scientific reviews in line with national and international guidelines for conduct of research, especially that involving humans as research participants. Additionally, in line with the SOPs and UNCST guidelines, a 13-member CAES REC has been appointed taking into consideration the diversity of research disciplines in the college as indicated in the table below:

### CAES REC Members

No.	Name	Expertise	Title/Occupation	REC Designation
1	Margaret N. Mangheni	Agricultural Extension	Assoc. Professor	Chairperson
2	Gerald Eilu	Forestry	Assoc. Professor	Vice Chairperson
3	Joseph Obua	Forestry, Tourism	Professor	Member
4	Archileo N. Kaaya	Food Science	Professor	Member
5	Gregory Olupot	Soil Science	Senior Lecturer	Member
6	Daniel Waiswa	Biometrics & Geomatics	Senior Lecturer	Member
7	Patrick Byakagaba	Natural Resources Governance	Lecturer	Member
8	Brenda Bonabaana	Tourism	Lecturer	Member
9	Ahmed Zziwa	Bio-Systems Engineering	Assoc. Professor	Member
10	Daudi Batega	Social Science	Senior Lecturer	Member
11	Alice Turinawe	Agric. Economics	Lecturer	Member
12	Rev. Onesmus Assiimwe	Religious Leader /Community Representative	Chaplain, St. Francis Chapel, Makerere University	Member
13	William Gombya-Ssembajjwe	Forestry/ Natural Resource Economics	Retired Professor	Member

Due to delays associated with Covid-19 disruptions, the ad hoc committee is in the final stages of operationalization of CAES REC. As such, the CAES REC office has been set up in the college and the appointment of the CAES REC Administrator is about to be concluded. With a view of having CAES REC operational effective 1st April 2021, the ad hoc committee is planning to have the 13-member committee sworn-in soon and having them undertake the requisite training in human subjects protection followed by submitting an application to UNCST for accreditation.

The CAES boasts of a multidisciplinary team of researchers capable of writing grant winning proposals and innovative capacities. Five technologies and five innovations unveiled in the period under review. These include:- Automated Communal Hand Water Pumps (MaK NAI), Makpot- value added to sweet potatoes, New Fruit drying Technology- Refractance Window Drying Technology (RWDT), Thermal Imaging for detection of COVID-19, Three-Dimensional (3D) printing of biodegradable face shields and components for the Bulamu ventilator, the Touchless Handwashing (TW-20) Kit. Others are the Nitrogen Bio- fortified and pelletised commercial-grade organic fertilizer, ProWEAI tool that measures women empowerment in agricultural projects and the Teaching Model for University-Industry Linkage.

However, there is lack of support system to go beyond prototypes and making innovations and technologies available to targeted beneficiaries. During the period under review, a number of technologies and innovations have been development.

## 4.2 Automation of Communal Hand Water Pumps to Eliminate COVID-19 Transmission-MAK-RIF-Project

Preliminary understanding of COVID-19 suggested that this novel virus could also be transmitted by coming into contact with an infected surface. According to the Ministry of Water and Environment, deep boreholes and shallow wells account for 67.6% of the water sources in rural areas in Uganda, which translate into a supply to 18,540,000 persons who are served from these sources. The process of drawing water from these sources involves repeatedly cranking a metallic handle, which is fixed to the water pump to deliver water from the ground. Normally these wells supply about 300 persons, however, during the dry spells; in some area, it can supply water to more than 1,000 persons. This conventional way of cranking the borehole with hands risks many lives contracting COVID-19. This study aimed at designing a mechanism that converts electrical power to mechanical energy to operate the reciprocation movement of the pump handle to discharge water from the borehole. It's a dual system that can run on both AC and DC energy. This innovation will also eliminate the drudgery associated with hands pumps experienced by the users especially the children, elderly and expecting mothers.



*The MAK NAI Borehole*

In the design, the following variables were determined: maximum power needed to draw water from boreholes, size the PV panel needed to generate the required power, sizes the battery, solar charge controller, inverter, DC motor, gears, pulleys, belt, and reciprocating arm connected to the handle of the water pump. The design system has the capacity to draw water from deep, medium and shallow wells. The mechanism was fitted with a dual switch system with a motion sensor and a foot switch for their operation to limit use of palms as the practice has been. The mechanism was housed in a frame of about 1 m x 0.8 m x 0.7 for protection. MakNai equipment was tested from

3 districts of Wakiso, Mukono, and Buvuma. A representative sample of 9 boreholes that is 3 wells per district was used. During testing, maximum power generated from the system was 1hp and the average time taken to fill a 20 Litre jerrycan was 50 seconds. The equipment runs on a 1.4 hp AC motor, a crank speed of 100rpm, a torque of 68Nm and one pair of pulleys for power transmission.

#### 4.3 Addition of Thermal Imaging, 3D Printing to Fight Against COVID-19



*Prof. Noble Banadda Project PI and Chair DABE explaining how 3D printed face shields are made at a Press Conference on 28th August 2020 in the Main Hall, Makerere University*

The Department of Agricultural and Bio-Systems Engineering (DABE), on Friday 28th August 2020 unveiled three new additions to help control the spread of COVID-19 in public spaces. The Thermal Imaging for detection of COVID-19 as well as Three-Dimensional (3D) printing of biodegradable face shields and components for the Bulamu Ventilator are all aimed at boosting the contribution of local content to the fight against the pandemic. The Principal Investigator of the project Prof. Noble Banadda while welcoming participants to the unveiling acknowledged the support of Makerere University Health Services led by Prof. Josaphat Byamugisha and the University of Liverpool in helping to develop the Thermal Imaging component.

Although the hardware already exists in the public domain, our academic contribution has been the use of Artificial Intelligence (AI) and Machine Language (ML) to develop an algorithm that can; unlike the temperature gun, take readings from four places – the throat, mouth, nose and forehead and come up with an average temperature.

Over 7,000 images obtained with the help of the University Hospital were used to train the algorithm which can enable the Thermal Imaging to detect people with flu-like symptoms unlike the temperature gun. Researchers at the Massachusetts Institute of Technology (MIT) and partners had trained an algorithm that can identify COVID-19 from a cough and this would be integrated into the Thermal Imaging setup in the future.

The PI unveiled the 3D printing aspect with which the project had produced biodegradable face shields and components for the Bulamu Ventilator. The shield component is made of acetate; a biodegradable polymer of wood and cotton, while the clasp was designed in consultation with a professor of medicine to ensure that it doesn't form mist and is comfortable to wear.

The reusable face shield also has antimicrobial properties, is easy to clean and is expected to retail for approximately UGX 5,000. The 3D Printer can also be used to print three dimensional organs for disciplines of medicine, building models for architecture and any other programmes that rely on objects for teaching.

#### 4.4 A Touchless Handwashing (TW-20) Kit as a responsive technology to the COVID-19 Pandemic Launched

The College through the Department of Agricultural and Biosystems engineering (DABE) launched a Touchless Handwashing (TW-20) Kit as a responsive technology to the COVID-19 Pandemic resulting from the need to limit contact with surfaces while ensuring diligent hand hygiene. The technology was launched on 7th August, 2020 at the University Main Building during the Scientific function witnessed by the Assistant Commissioner, Innovations and Intellectual Property Management Patrick J. Mugisha from the Ministry of Science, Technology and Innovation..



*Prof. Barnabas Nawangwe washing hands on the TW-20 kit*

The university was implementing a project titled, "Development of a Green Low Cost Touchless Handwash Technology (TW-20 Kit) for public Shared Spaces", funded by the Government of Uganda through the Makerere University Research and Innovation Fund (Mak-RIF). The project is spearheaded by Dr. Joshua Wanyama as the Principal Investigator (PI) from the Department of Agricultural and Bio systems Engineering, College of Agricultural and Environmental Sciences assisted by Dr. Robert T Ssekitoleko as Co-PI from the Department of Physiology, College of Health Sciences.



The kit is touchless and pedal-less with audio guided user interaction during handwashing in customized languages with English as a default language. This system dispenses soap, gives you time of about 10 seconds to rub before it can give you rinsing water. Other unique features of the TW-20 Kit are: Remote monitoring, digital communication and daily use data transmission via TW-20 view, hand washing with soap as per the recommended WHO guidelines, frugal with good soap and water use metrics. The TW-20 Kit is also a Green technology that uses solar, battery with AC–Mains as back up, it's a low cost technology, appropriate for public shared places like markets, hospitals, schools, restaurants etc and proudly made in Uganda by Ugandans. As of now, one kit costs shs 1.6 million but with big orders the cost may reduce up shs. 800 thousand.

#### 4.5 Piloting Nitrogen Bio-fortified and pelletised commercial-grade organic fertilizer in Uganda

The college in partnership with Tursam (U) Ltd., Sokoine University of Agriculture (Tanzania) Guavay Company Ltd (Tanzania) and Tanzania Commission for Science and Technology piloted a technology for industrial-scale production of Pelletised and Biologically Nitrogen-enhanced organic fertilizer in Uganda.

The three year project (2018-2020) titled, "Nitrogen bio-fortified and pelletised commercial grade organic fertilizer made from urban bio waste to improve soil productivity and livelihoods of smallholder farmers", was led by Prof. Anthony Mushandate from the University of Dar-es-salaam and funded by ICIPE UNDER Bio-Innate Program. At Makerere University, the project is spearheaded by Dr. Stephen Lwasa from the Department of Agribusiness and Natural Resource Economics (DANRE) in the School of Agricultural Sciences.



*One of the trainers displaying the bio-fortified organic fertilizer at Makerere University*

Three crops – Maize, onions and rice were under study at MUARIK and, in the three Ugandan districts of Iganga, Masindi and Wakiso. The objectives of the project are to establish and pilot a technology for industrial-scale production of pelletized and biologically Nitrogen-enhanced organic fertilizer from bio-urban waste.

The other objectives are to; evaluate the performance of the product with selected crops; design and develop a quality control and assurance system for the product; establish techno-economic feasibility of the developed technology and market analysis and; develop a business and investment plan alongside engaging potential investors.

The project focuses on solving two main problems:- One is using the abundant and poorly disposed bio-waste in growing cities by recycling into organic fertilizer. Two; is solving the soil infertility challenge in many soils of East Africa by increasing uptake of commercial-grade and improved organic fertilizers amongst smallholder farmers. Adequate literature on major agro ecological zones, crop nutrient requires, soil nutrient status in Uganda has been undertaken including soil samples from the study areas.

The bio-fertilizer was supplied by Guavay Co. Lt and shared with farmers who have so far appreciated the efforts and innovation.

#### 4.6 ProWEAI Tool that Measures Women Empowerment in Agricultural Projects

9. Calculate the intensity of disempowerment (A)

$$A = \frac{1}{N_{\text{disempowered}}} \sum \frac{\text{number of inadequacies}}{\text{total number of indicators}}$$

$c_{i_w} = \begin{bmatrix} 0 \\ 3/3 \\ 2/3 \end{bmatrix}$	$c_{i_m} = \begin{bmatrix} 0 \\ 0 \\ 2/3 \end{bmatrix}$
$A_w = \frac{\left(\frac{3}{3} + \frac{2}{3}\right)}{2} = \frac{5}{6}$	$A_m = \frac{\left(\frac{2}{3}\right)}{1} = \frac{2}{3}$

Chloe is inadequate in 3 of 3 indicators  
 Audrey is inadequate in 2 of 3 indicators  
 Ara is not included because she is empowered

The tool dubbed, “Project specific Women Empowerment in Agriculture Index (ProWEAI)” was developed in 2012 by the International Food Policy Institute (IFPRI), USAID and Oxford University in Washington DC. The new tool measures women empowerment and disempowerment in agricultural projects. CAES Dr. Brenda Boonabaana was the teammate in the development of the tool and its validation across the world. The objective of this tool is to enable researchers,

National Agricultural Institutes and other agricultural related projects understand how agricultural projects and interventions are empowering women across the different domains of empowerment including intrinsic, instrumental power and collective power with twelve indicators used across those domains.

The tool has since evolved and now under Gender and Agriculture Asset Phase II (GAAP II) Project, researchers are developing the project level women empowerment agricultural index (PROWEA). GAAP II is funded by the Bill and Melinda Gates Foundation USAID and Agriculture for nutrition and health. The reason was to diagnose areas of women disempowerment in agriculture and track empowerment and change over time..

#### 4.7 Teaching Model for University-Industry Linkage

The CAES under the Towards Demand Driven Teaching (DDT) project set up a model for an education system that links universities to industries to address the needs of society and create jobs for the youth. DDT was an initiative among University of Siegen - Centre for International Capacity Development (CICD) in Germany, Makerere University College of

Agricultural and Environmental Sciences in Uganda, University of Zambia (UNZA), Directorate of Research and Graduate Studies, Zambian Chamber of Commerce and Industry (ZACCI), Uganda National Chamber of Commerce and Industry (UNCCI), Agricultural Innovation Systems Brokerage Association, Uganda (AGINSBA), Les Rams consult limited, Uganda, GI Geoinformatik GmbH, Augsburg, Germany and Innotech Ingenieurgesellschaft mbH, Germany.

The initiative worth \$ 400,000 USD was funded by Germany Exchange Services (DAAD) from 2016 to 2019. DAAD is a self-governing organization of German universities with 238 member universities and 107 student bodies.

The Country Coordinator Uganda Assoc. Prof. Majaliwa Jackson Mwanjalolo, from the Department of Geography, Geo informatics and Climatic Sciences, Country Coordinator Zambia Prof. Imasiku A. Nyambe University of Zambia – Directorate of Research and Graduate Studies, Zambia and the Country Coordinator Germany Prof. Ruger Winnegge University of Siegen- CICD, Germany were present during the closing ceremony.

The goal of the DDT initiative was to strengthen partnerships among German, Ugandan and Zambian academic institutions on the one hand, and business partners in the three countries on the other hand.

Practical elements have been incorporated and enhanced in existing Masters-level programs so as to offer a job-oriented education and conduct practical training in Higher Education Institutions (HEI). Additionally, DDT's mandate was to encourage young graduate entrepreneurs to start their own business through integrating universities and business developments in an innovative way.

Overall, this initiative has established and strengthened the partnerships between HEIs, institutions and industry in the region in order to better satisfy the requirements and developments of the job market in the future. There also has been information flow not only from North to South, but in a South-South direction that has strengthened partnerships between African countries.

The biggest achievement in this project has been the link in the chamber to assist the university to grant internship and linkage with the industry. secondly is the strengthening of the partnership between Makerere university and university of Zambia and the chamber of Commerce in Zambia and thirdly, sending students in Germany and making linkages between Makerere university and industries in Germany.

Makerere University had a partnership with the university of Siegen Germany and established two regionally recognized postgraduate programs- the Integrated Watershed Management (IWSM) in Kenyatta University in Kenya and at Makerere University while the University of Siegen had established a program on energy management at University of Zambia.

Partnering universities established a partnership between industries and universities while at Makerere University School of Food Technology Nutrition and Bio engineering had established the Food Technology and Incubation Centre with the support of the Presidential initiative, those are the two elements that promoted the coming up of this project.

#### 4.8 Adding Value to Potatoes to Enhance Productivity and Incomes in Uganda



*Prof. Barnabas Nawangwe inspects the stall for MakPots during the research dissemination workshop at Senate building*

Potato is a potential cash and food crop with edible tubers normally grown in cool weathers and have been in existence for more than 400 years. Potato is a hunger and nutritional security crop that can store well as a tuber, and is able to provide a good amount of calories, proteins and vitamins to both the young and old.

There are quite a number of potato varieties and usually a farmer is selective depending on seed availability and the available markets. In the middle of the beautiful hill of South Western Uganda lies the secret soils in which potato is doing well contributing 87% of the country's potato productivity.

In Uganda, potato production is a good pathway for enhancing household incomes and food security especially among low resource endowed households, however its productivity has stagnated below potential due to a multitude of factors.

Limited access to quality seed, scarcity of other farm resources especially land and capital inputs, limited value addition and a narrow choice of market outlets by farmers' impacts on productivity, profitability and competitiveness of the crop.

It's against this background that the CARP+ project in collaboration with researchers at Makerere University, NARO-Kachwekano Zonal Agricultural Research and Development Institute (KAZARDI); Uganda Industrial Research Institute (UIRI), Kabale Incubation; Agromax (U) Ltd; Excel Hort Consult Ltd (EHC) and a TVET Institution Bukalasa Agricultural Collage (BAC) which represents the plus component on the project joined efforts to improve the potato value chain.

The overall objective of the project is to enhance sustainable potato productivity through reducing the challenges that constrain the capacity of potato value chain actors in Uganda. In its design, the objectives were to be achieved by addressing the major components below.

The seed potato value chain aimed at testing and demonstrating a community-based system for farmers to participate in the production, delivery and use of good quality seed potato. The crop- intensification production component through testing and validating a system of potato intensification (SPI) that optimizes farmers' resources while increasing productivity. Postharvest handling and value addition through developing and testing innovative potato-based value added products with potential for commercialization.



*Prof. Johnny Mugisha, Prof. Barnabas Nawangwe and Prof. Bernard Bashaasha unveil the Mak-Potatoes during the research dissemination meeting*



*Some of the Mak-Potato Products*

At Makerere University the researchers and an MSc student have gone ahead to develop pre-processed frozen chips from promising potato varieties, potato flour from the tiny tubers and potato-based nutrient enhanced weaning formulae. They have also gone ahead to produce cakes

and cookies out of the potato flour. The testing for consumer acceptability of these potato based products has been undertaken in the communities in the project target districts with assistance of TVET Institution (Bukalasa) students.

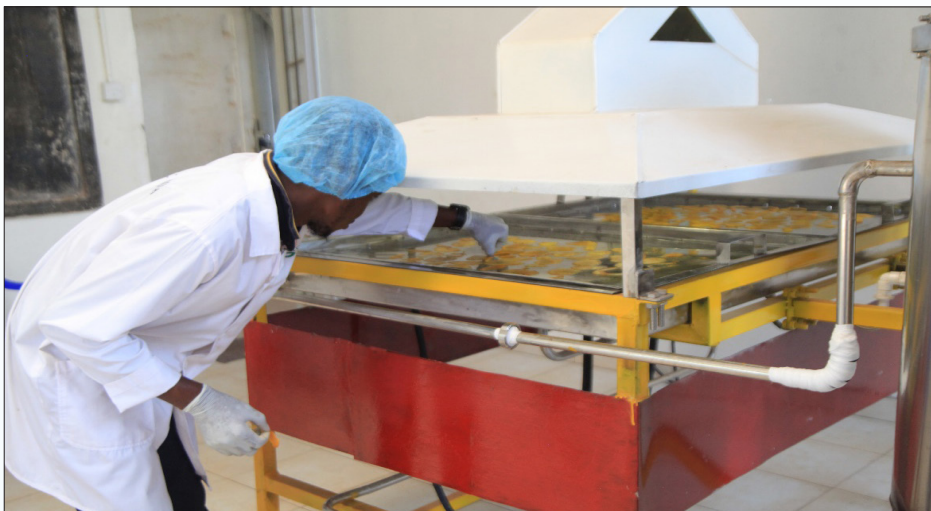
Products with good consumer acceptability have been presented to selected young entrepreneurs for commercial testing. This project will go a long way in boosting potato production and value addition in the country and the region at large once it's well understood and practiced by farmers.

The project uses methodologies that enable potato value chain actors to actively participate in the research processes in order to create linkages between the University, researchers and the private sector. It uses Potato-based Innovation Platforms to establish a community-based system for farmers to participate in production, delivery and use of quality seed potato; Farmer Field Demonstrations to validate a system of potato intensification that optimizes farmers' resources; and will develop and market test potato-based value added products to widen potato market outlets, increase incomes of producers and expand consumer choices.

By its design, the project will strengthen the synergies and working relationships of the University, private and community-based organizations, Research Institutions and an Agricultural College (TVET Institution) that trains Mid-level Cadres in Uganda in areas of agriculture, agribusiness and human nutrition.

#### **4.9 Adaptation and Promotion of the New Fruit Drying Technology-Refractance Window Drying Technology (RWDT) for Production of High Quality Bioproducts**

The school of Food Technology Nutrition and Bio engineering with partner universities in the region have developed a modern solar dryer technology that dries fruits. The Refractance Window Technology prototype can dry varieties of fruits including mangoes, pineapples, jackfruits, bananas among others including herbs. This technology is ready to be taken by farmers for use because it has been fully tested its worthy at Makerere University Agricultural Research Institute Kabanyolo by experts from both the academia and agro processing industries.



*One of the technical staff examines the products in the drying chamber*

Small scale farmers in Uganda and Kenya produce a variety of fruits including mangoes, pineapples, passion fruit, papaya, bananas, avocado, jackfruit, and vegetables among others.

However, the value that small scale farmers derive from these crops is limited due to postharvest losses, seasonal production, limited value addition and market access problems.

The main features of Refractance Window Technology are that, liquid foods, purees or slices are dried on one side of a thin plastic film, whose other side is in intimate contact with hot water at temperatures below the boiling point.

Drying by refractance window technology is very fast, and this is associated with lower product moisture content and better inhibition of microbial growth during the drying process.

Previous studies on RW technology have shown a high retention of product quality (color, vitamins and antioxidants) as compared to other conventional drying methods including spray or freeze drying.



*Some of the staff sharing fruits before machine drying*

This project seeks to explore the utilization of RWDT in production of high value products from common fruits, vegetables and herbs in East Africa including mangoes, pineapple, jackfruit, carrots, and moringa.

Refractance window drying technology has the potential of making a much greater impact by creating products with extended shelf life and high quality.



*Ordinary and Value Added Jack Fruit Products*



INFRASTRUCTURE DEVELOPMENT  
AND EQUIPMENT ACQUIRED



## 5.0 INFRASTRUCTURE DEVELOPMENT AND EQUIPMENT ACQUIRED

### 5.1 A Shs.146m Machine (Sperm Vision) Installed for Testing Quality and Quantity of Semen and Herbs

The College installed a modern machine (the Spermvision) worth \$40,000 (shs146m) in the University's Central Biotechnology Laboratory that was renovated and equipped by the Government of Uganda under the AfDB-HEST project.



*The Sperm Vision installed in the Biotechnology Laboratory at Makerere University*

The machine was installed on 25<sup>th</sup> February, 2020 by Mr. Sepp Weigert, a Technical Product Specialist from Minitube Software Company Winsconsin USA in the Department of Agricultural Production, School of Agricultural Sciences. Sepp Weigert was jetted in Uganda to install the machine and also train staff and students interested in the area of reproductive animal science for four days.

The Professional Spermvision has a semen analysis system that can quantify the semen percentage-wise as well as the concentration and mobility of the semen. Its statistical values and analysis on the microscope allows the user to classify semen as good or bad, semen for use and semen for not using. Staff and students were also trained for four days training focusing on the basic use of the system, the technical aspects of analysing the semen and the analytical chambers of the machine.

The machine is best suited for research and training to investigate the quality and quantity of semen in animals such as bovines, goats and pigs including man. Makerere university's Physiologist Dr. Sadhat Walusimbi is in charge of the University Central Biotechnology Laboratory in the section of the laboratory focusing on reproduction technologies.

Besides the research, the facility can be used to provide service to the community as regards reproduction and improving reproductive efficiency both in humans and other animals for instance the National Resources Genetic Bank and NARO who are collecting semen to be able to package it and freeze.

With this technology, the university can support government departments including Ministry of Health and UNBS in terms of screening the different products that are available on the market which are purported to have effects on reproduction by improving the quality of semen or improving sperm count.

## 5.2 Modification of the SAS Conference Room to a Video Conferencing Facility



*A Section of the Upgraded SAS Conference Room*

Upgrading the School of Agricultural Sciences/CAES Board Room to a modern fully fledged fifty-seater Video Conferencing Facility started in October 2020 under the project titled, “Upgrading and enhancing the institutional capacity of the Department of Agribusiness and Natural Resource Economics (DANRE)” The entire room has been modified and furnished awaiting the installation of the IT Equipment.

The Fifty-Seater SAS/CAES Video Conferencing facility was conceived as a result of the Teaching, Research and Networking focus of the USAID DANRE-KSU Upgrading and enhancing the institutional capacity of the Department of Agribusiness and Natural Resource Economics (DANRE) project. It was a deliberate effort by Project funders and implementers to contribute towards a research vibrant, policy-discourse active, pedagogically evolving and a multidimensional collaborating SAS/CAES which houses DANRE, a primary beneficiary of the project. The spillover effect is the main point of aspiration and big picture of sustainability.

The activity funded by USAID Feed the Future Innovation Labs is being implemented by the Department of Agribusiness and Natural Resource Economics (DANRE) and Kansas State University (KSU) at a cost of USD Forty Thousand (\$ 40,000).

The Project Team comprise the Head, DANRE and Principal Investigator: Dr. Elepu Gabriel, Project Manager: Prof. Jackline Bonabana and the Project Assistant Mr. Brian Ogenrwoth.

Major Equipment already secured for installment include Camera, Logitech display hub, Rally Micpod, Expansion Microphones, Logitech Table hub, Logitech control pad, Rally speakers, Air

conditioners, Network and power connections, internet ports, Projector and TV screens, Lighting system, security system. The primary target beneficiaries are students, staff of SAS/CAES and distant researchers who wish to collaborate with CAES.

Specifically, the activity will be able to improve training and teaching capacity of SAS/CAES, Enhance the research and grantsmanship capacity of staff of SAS/CAES and Facilitate improved coordination with SAS/CAES partners.

***Will communities outside the university be allowed to use the facility?***

Undoubtedly, Makerere University occupies a solid position in the knowledge generation arena, as well as the skills transfer, innovation and research space of Uganda and beyond. In addition, outreach and collaboration with likeminded individuals and institutions is always on top of agenda. However, based on the sensitivity of the security concerns of the conferencing equipment, clear policies will be put in place to factor in such users. For instance, levying an affordable fee to such users to take care of the maintenance of the facility.

***About the USAID DANRE KSU Project:***

The Four-Year Upgrading and Enhancing the Institutional Capacity of the Department of Agribusiness and Natural Resource Economics (DANRE) Project commenced on August 01, 2016. The main implementing partner is Kansas State University.

The DANRE/KSU Project concept was developed in 2011. Virginia Tech carried out the initial DANRE scoping study in 2014, followed by the DANRE Capacity Building Proposal submitted to USAID in 2015. Michigan State University and the Borlaug Higher Education for Agricultural Research and Development (BHEARD) program were brought on board in 2015.

With funding from the U.S. Agency for International Development (USAID), **Makerere University** Department of Agribusiness and Natural Resource Economics (DANRE) partnered with Kansas State University (KSU) Department of Agricultural Economics to implement the objectives of the project.

The specific objectives of the project were to improve teaching capacity (skilling staff, curriculum review, e-learning); strengthen research capacity (Post Doc Fellowships, Grantsmanship trainings, Research platforms) and collaboration and network development (Industry Engagement and Internationalization of DANRE).

Some of the notable accomplishments include; A DANRE strategic plan drafted and finalized, 3 (three) PhD students have completed studies at KSU, Several High Level Round Table policy dialogues organized, 5 (Five) research platforms launched at DANRE(Coffee, Maize, Dairy, Nutrition, Cassava and Fish), DANRE Video Conference Room established (widely utilized by various stakeholders), A Colloquium on Trading in Global Agricultural Economy (Coffee GVC) was also successfully organized, A collaborative PhD curriculum drafted and other curricula (PGD, BSc. AAE, MSc NR&E) ongoing, several exchange learning visits by administrators and faculty members, several short courses (Machine Learning, Experimental economics, grantsmanship among others).

### 5.3 The Construction of the shs.2.8bn WB Funded Office Block and Lecture Theatres nears completion



*Structure of the MaRCCI building under construction*

As part of the World Bank Eastern & Southern Africa Higher Education Centres of Excellence (ACEII) project. Makerere University Regional Centre for Crop Improvement (MaRCCI) was allowed to invest about 2.8 billion shillings into the construction of her home at Makerere University Agricultural Research Institute Kabanyolo (MUARIK).

The Vice Chancellor Makerere University Prof. Barnabas Nawangwe on 16<sup>th</sup> July 2019 opened the ground marking the start of the construction of the Office block and Lecture theatres for MaRCCI under the Eastern & Southern Africa Higher Education Centres of Excellence (ACEII) project.

The construction work being undertaken by Build Base under the supervision of Arch Designs was meant to take 12 months ending July 2020. Unfortunately, after some miles into it, COVID-19 hit stalling the works for nine months. However, the building is expected to be complete within the next 3 or 4 months.

This facility is part of the \$ 6 million grant for MaRCCI which provides for additional scientific and staff support, enhancement of facilities and equipment aimed at modernizing and expanding the teaching, research, and service activities of MaRCCI.

Makerere University is among the beneficiaries of the World Bank Loan extended to the Government of Uganda under the ACE II Project aimed at promoting regional specialization among participating universities within areas that address particular common development challenges, and strengthening the capacities of these universities to deliver high quality training and applied research.

The new structure is a beautiful addition to Makerere University increasing office space, and in the long run, it forms part of the goal of the university and the College of Agricultural and Environmental Sciences to move many activities to Kabanyolo because the farm has a lot of land but with limited infrastructure.

This is a one storied building with two classrooms, 60 and 40 student capacities, so in total we have 100 seater classroom, probably the largest in Kabanyolo right now. It will also host a cafeteria to serve food, offices for visiting professors and post docs and all the MaRCCI staff. The structure has a library, conference and board rooms.

#### 5.4 MaRCCI injects UGX 50 Million in the Rehabilitation of the University Gene Bank

Makerere University Regional Centre for Crop Improvement (MaRCCI) has rehabilitated the Makerere University Gene Bank at the Makerere University Agricultural Research Institute Kabanyolo (MUARIK). The gene bank is being utilized for storing seed and conserving traditional varieties so that they are not lost.

The gene bank has a room for seed preparation. After harvesting seeds they are threshed, cleaned, sorted then undergo treatment and packaged before they are put in the gene bank. The rehabilitated structure was a gene bank that has benefitted from other funding agencies like NORAD, AGRA but had met the expected standards.

The rehabilitation of the gene bank is an important addition and part of the centre's continuous investment in research infrastructure to make the university farm better. Besides utilization by the centre, the gene bank will be used by the College of Agricultural and Environmental Sciences, other research institutes and the entire Uganda.

The centre has also recruited a Seed Specialist Dr. Sharon Tusiime Mbabaazi to run the Gene bank working with cow pea seed and sorghum seeds after the breeding program research to store this seed from one season to another.



*The IT, Plant breeder and Seed experts in the newly refurbished Gene Bank*

This seed store is maintained at 16<sup>0</sup>c and the humidity is about 55 and we pack our seed in the hermetic storage bags so that the seed is safe from any insect or high humidity and that helps it to store for a very long period of time.

This storage is important for the university and our country because normally farmers lose seed from season to season because of poor storage conditions. Makerere and MaRCCI being under research needed to have a program that shows the right way of storing seed in very good conditions so that by the time of planting in the next season it is still viable.

The centre employs one Richard Tusiime mainly handling seed reception. When materials come from the field, they are received in an area where they are dried, threshed, cleaned, sorted then they are packaged and treated but before that, create seed packing lists. These lists are entered in the system so that in future when one needs a specific material, it can easily be retrieved using those packing lists using the computer systems that contains the Breeding Management System (BMS) that helps track the breeding activities. Besides, there is an excel system used to track these materials in addition to BMS.



*Women sorting seeds before storage in the GENE Bank at MUARIK*



# RESEARCH DISSEMINATION, KNOWLEDGE TRANSFER AND PARTNERSHIPS

## 6.0 RESEARCH DISSEMINATION, KNOWLEDGE TRANSFER AND PARTNERSHIPS

Over 20 research dissemination workshops were held for Mak-RIF and other projects. Monthly policy seminar series to re-ignite the debate and bridge the existing knowledge gap between research and policy making on issues of agricultural and rural development inaugurated as highlighted below.

### 6.1 Book on Agriculture and Ecosystem Resilience in Sub-Saharan Africa Launched

The college on 4th December 2020, launched a book titled, *“Agriculture and Ecosystem Resilience in Sub Saharan Africa”*. The book is one of the outputs of the project titled “Regional Capacity Building for Sustainable Natural Resource Management and Agricultural Productivity under Changing Climate” (CAPSNAC).

CAPSNAC is Collaborative Project involving four institutions, one in the North and three in the South and included: Makerere University-Uganda, Addis Ababa University-Ethiopia; University of Juba-South Sudan, Norwegian University of Life Sciences-Norway. Makerere University is the lead institution, and the project is based in CAES, with Prof. Samuel Kyamanywa, as the Principal Investigator (PI) of the Project. It was funded by NORAD through the NORHED program to a tune of NOKs 20 millions.



*CAPSNAC Project PI Prof. Samuel Kyamanywa, Dr. Umar Kakumba and Dr. Gorretie Nabanoga launching the book*

The book was launched by Makerere University Deputy Vice Chancellor in Charge of Academic Affairs (DVC AA) Assoc. Prof. Umar Kakumba at Golden Tulip Hotel in Kampala. He congratulated the PI and his team for the great works and potential Makerere was exhibiting through this work.



The book was edited by Assoc. Prof. Yazidhi Bamutaze as the Lead Editor, Prof. Samuel Kyamanywa, Assoc. Prof. Gorettie Nabanoga as Co-Editors from Makerere University. Others from partnering institutions were Prof. Bal Ram Singh and Rattan Lal.

The volume discusses emerging contexts of agricultural and ecosystem resilience in Sub Saharan Africa, as well as contemporary technological advances that have influenced African agriculture.

In six sections, the book addresses the sustainable development goals to mitigate the negative impacts on agricultural productivity brought about by climate change in Africa while some of the challenges assessed include soil degradation, land use changes, natural resource mismanagement, declining crop productivity, and economic stagnation.

This book will be of interest to researchers, NGOs, and development organizations. Section 1 focuses on climate risk management in tropical Africa. Section 2 addresses the water-ecosystem-agriculture nexus, and identifies the best strategies for sustainable water use.

Section 3 introduces Information Communication Technology (ICT), and how it can be used for ecosystem and human resilience to improve quality of life in communities. Section 4 discusses the science and policies of transformative agriculture, including challenges facing crop production and management. Section 5 addresses landscape processes, human security, and governance of agro-ecosystems. Section 6 concludes the book with chapters uniquely covering the gender dynamics of agricultural, ecosystem, and livelihood resilience.

## 6.2 MAK-RIF 2nd Policy Seminar Series for Researcher's, Policy Makers and Advisors held

With support from the Makerere University Research and Innovation Fund (MAK-RIF) the CAES held the 2<sup>nd</sup> Policy Seminar Series on Rural Development. The seminar held at the School of Food Technology Nutrition and Bio-Engineering was conducted under the topic; *Agro Industrialisation in the Context of Rural Development in Uganda*.

Officiated by the former Agriculture Minister Dr. Kisamba Mugerwa (RIP), the seminar was attended by Researchers, Policy Makers and Advisors across the country. It was moderated by the Principal CAES Prof. Bernard Bashaasha, with participants both physical and virtual.

The presenters included Martin Fowler the Senior Agricultural Advisor USAID Uganda and Jacob Rauschendorfer the Country Economist Bank of Uganda also at the International Growth Centre.

While making a presentation titled, *“the current status, future prospects and possible solutions to pressing challenges”*, Martin Fowler and Jacob Rauschendorfer, observed that COVID-19 had a great impact on agriculture reduction in turnover and sales of 30% seeds, fertilizers, agrochemicals, vet drugs whereas raw materials' supply to processors from out-growers were negatively affected.

The presentation also indicated that there was lack of data on COVID's impact on SMEs, that are a critical force in the economy. It was recommended that focus should be on value chain observing an urgent need to rationalise and prioritize the value-chains that are to form the focus of future national agro-industrialization efforts.

It was also recommended that governments' role in fostering agro-industrial sector growth needs be defined and respected to ensure increased budgetary support required for a more-enabling environment including, electricity grid expansion, land tenure security among others.

While officiating during the seminar, the former Minister for Agriculture Dr. Kisamba Mugerwa called for coordination of all the policies related to agriculture along the value chain. He observed the need to increase production, marketing and processing noting that increasing productivity requires concentrated areas of production in order to ease marketing.

### 6.3 Inauguration of Policy Seminar Series on Agriculture and Rural Development

CAES launched the monthly policy seminar series to re-ignite the debate and bridge the existing knowledge gap between research and policy making on issues of agricultural and rural development.

The initiative supported by the Government of Uganda through the Research and Innovation Fund (RIF), is being spearheaded by Dr. Rosemary Isoto (Principal Investigator (PI)), assisted by Prof Theodora Hyuha and Prof. Bernard Bashaasha, all from the Department of Agribusiness and Natural Resource Economics (DANRE) School of Agricultural Sciences, the latter is also Principal CAES.



*Vice Chancellor Prof. Barnabas Nawangwe (4th), Prof. Ezra Suruma (5th) and Participants pose for a Group Photo after the Launch*

The function attracted over 100 participants physically and virtually and comprised members of the academia from Makerere and Other Universities, Research, Government Ministries and Agencies, Development Partners, the Private Sector and the Civil Society Organizations.

The monthly policy seminar series were officially launched on 24<sup>th</sup> November, 2020, by the Chairperson, National Planning Authority (NPA) represented by the Deputy Chairperson Prof. Sam Obwoya while the Keynote Address was delivered by Makerere University Chancellor Prof. Ezra Suruma at the Conference Hall, School of Food Technology, Nutrition and Bioengineering.

The function was also graced by Makerere University Vice Chancellor, Prof. Barnabas Nawangwe and the Chair, RIF Grants Management Committee (GMC) represented by Mr. John Mutenyo.

The debate on rural development has been on and off and, this is the time for the university to keep this debate to light and make it vibrant because it is important for the good of the citizens. The initiative launched is aimed at building the bridge among actors in the policy chain including the academia, researchers and policy makers.

The project focuses on filling the existing policy gaps. Although there is a lot of research that has been going on and a lot of the research output from the university, there is something missing to link the output from researchers and academicians with the policy makers.

At the end, the project is expected to come up with an institute like a Rural Development Institute which will sponsor the initiatives and even farther it beyond the RIF funding. In addition, the research team is expected to organize monthly seminars bringing together researchers and policy makers and advisors, produce policy briefs by converting the scientific language in journals understandable by policy makers for utilization during the one year period. The team will be able to produce newsletters out of the many research conducted for sharing with policy makers to generate research evidence-based policies. They will be able to tool and skill graduate students and engage them in this project so that they are part of the entire process from being researchers to distilling policy messages to policy output and being able to disseminate them.

Prof. Ezra Suruma observed that rural development has always been focusing on sectors such as agriculture, local government, health, education, trade and industry where ministers have been at the center issuing instructions with hope to impact on the regions, districts, counties, sub counties, parishes, villages, households and citizens but this was not accomplishing. The Chancellor suggested an alternative model-the Parish Model that focuses on household. Every household according to the professor should be enabled to produce a sufficient output for sale resulting to adequate income for the family.

#### **6.4 Research Dissemination Workshop on Enhancing Value Addition on Potato-Sorghum Enterprises for Improved Livelihoods in Uganda (EVaPoSIL) Project, call for setting up a Plant in Western Uganda**

Farmers growing potatoes and sorghum in South Western Uganda have got a reason to smile after their long awaited prayer for value addition has been answered by Makerere University Researchers. This after a team of researchers headed by the Dean School of Agricultural Sciences Prof. Johnny Mugisha came up with a project titled: *Enhancing Value addition on Potato-Sorghum enterprises for Improved Livelihoods in Uganda (EVaPoSIL)*.

The six months' project which was implemented in South Western Uganda was focusing on enhancing the physical, economic and nutrition value of potato (*Solanum tuberlosum*) and sorghum (*Sorghum bicolar*) in Uganda.

While presenting the research finding on Tuesday 15th December 2020 at Makerere University Senate Building, Prof. Johnny Mugisha stressed that Potato and Sorghum are the South-Western region's main enterprises. He however said, they compete for farm resources, yet in terms of household food, they are neither substitutes nor complements.



*Prof. Barnabas Nawangwe inspects the MakPot Stall as PI Prof. Johnny Mugisha explains the technology during the dissemination meeting at Makerere University*

The variety grown (sweet) he said has high socio-cultural value among the population with limited use for local drinks – bushera and muramba and no industrial use. Similarly, in potatoes, value addition is largely limited to consumption of fresh tubers with 92.6% as boiled potato.

This he said has been registering a declining productivity from 7.0 Metric tons per hectare in 2007 to 4.2 in 2017. Furthermore, 30-40% of the output is small size which is non-marketable tubers causing a loss of US\$13.7–18.3 million per annum. Yet, potato and sorghum are potential pathways for enhancing household incomes.

He emphasized that Food and Nutrition security in South-Western Uganda is characterized by land scarcity, decreasing agricultural productivity, high postharvest losses and low per-capita income. This project he said aims at enhancing the value of both crops by innovative value addition that makes them complements, reduce harvest losses, increase incomes, and make available to consumers a diversity of high quality high value products.

EVApoSIL project was conceived on the hypothesis that the economic value of the two competing crops (potato and sorghum) would be increased by making them complementary enterprises through developing composite potato-sorghum based products of higher economic and nutrient value than the potato tubers alone especially the tiny non-marketable tubers and the non-profitable sorghum grains

The major objective of the project is to improve the economic value of potato and sorghum enterprises for improved livelihoods of the value chain actors. This involves determining supply dynamics of raw materials for production of high value potato-sorghum based products that are economically viable, and commercializing the consumer acceptable product. The project provides empirical knowledge on how to technologically maximise returns from potato and sorghum enterprises.

It has indeed confirmed that sorghum and potato compete for the scarce farm resources, their productivity is at a decline, but farmers are not about to drop these enterprises. It has also established production is constrained by limited access to profitable markets and high post-harvest losses.

Building on the MasterCard-RUFORUM funded Community Action Research Project (CARP+) titled *“Making Potato Value Chain Enhance Productivity and Incomes in Uganda”* that tested the feasibility of production of potato flour and other potato-based products, EVaPoSIL has developed and market tested a number of potato-sorghum based food products that are nutrient rich.

Results from market testing show that the products are highly acceptable by a cross section of consumers, and the prices they are willing to pay is above the breakeven point of commercialising the products. Production of a diversity of home-use and commercially viable high-value food products from the current low-value crops will increase the demand for the crops as raw materials for processing, which will incentivise farmers to increase production and productivity.

Creating alternative and profitable use of the tiny non-marketable potato tubers will make them unavailable to farmers who currently recycle them as seed but of inferior quality escalating the declining potato productivity.

The demand and economic value for sorghum grain will increase beyond the current socio-cultural value, also increasing productivity and returns on investment. Farm incomes will increase, post-harvest losses will reduce, and the food value both nutrient and economic will increase.

According to Prof. Mugisha, EVaPoSIL Project is in line with Uganda National Agricultural Policy whose mission is to transform subsistence farming to commercial agriculture as it contributes to NDP III strategic objective of enhancing value addition in key growth opportunities” with a focus on agro-industrialization to transform the subsistence agriculture sector to a commercial and competitive sector. The production and commercialization of high value potato-sorghum products will create jobs for the population including for men, women and youths.

The Half-day Project dissemination meeting was attended among other people by the Vice Chancellor, Makerere University Prof. Barnabas Nawangwe, his Deputy in Charge of Academics Haji Umar Kakumba, the Principal College of Agricultural and Environmental Sciences, Prof. Bernard Bashasha, Officials from the Ministry of Agriculture Animal Industries and Fisheries (MAAIF), NARO, Uganda Cooperative Alliance, African Agribusiness Incubation Network, Uganda National Bureau of Standards, Incubators, Academia’s, Farmers and Students.

The Project Team headed by Prof. Mugisha was also composed of Dr. Abel Atukwase – Makerere University, Dr. Proscovia Ntakyo – Kabale University, Dr. Alex Ariho – Excel Hort Consult Agribusiness Incubator Ltd, Dr. Losira Nasirumbi Sanya – Makerere University, Mr. Napoleon Heri Bahati-Kajunju – Makerere University, Ms. Marion Nyirarukundo – Makerere University and Ms. Bridget Nantambi from Makerere University.

The Project was funded by the Government of Uganda through the Makerere University Research and Innovation Fund (MAK-RIF)

## 6.5 Wakiso Pig Farmers trained on how best to conduct Artificial Insemination in Pigs

CAES has trained about twenty pig farmers in Wakiso District on how best they can practice and embrace Artificial Insemination (AI) in pigs. The training attended by farmers, Wakiso District

officials and researchers from Makerere University was conducted under a research project combining both research, outreach and training with funding from Makerere University Research and Innovation fund (MAK-RIF). In attendance was Catherine Anen a Gender Specialist, Kafuluma Paul Mukasa a Senior Veterinary Officer at Wakiso Town Council among others.

The Principal investigator Prof. Donald Kugonza, an animal scientist said this project focused on pig artificial insemination which they have been able to upscale, refine and come up with methods to use.



*Project Team and Pig Farmers pose for a group photo after the training workshop in Wakiso*

*“In this particular phase, we are working on developing an extender for semen that we use in AI, we are working on development of boar fluid for heat-trust detection to be able to use something like a swab or a spray to induce the female to come on heat since people don’t keep males,”* he said.

According to Animal Scientist Professor Donald Kugonza, about 52% of the Pig Farmers in Central and Western Uganda do not keep boars but rely on moving their females to neighbors or using AI. Some of these trainees had been working as service providers particularly in Wakiso, Luwero and Kamuli which are the project areas.

During the inception meeting and stakeholder’s engagement, it was realised that the technicians had capacity even at the district level but lacked the means of reaching the farmers. It was decided that instead of Makerere coming and doing the training, technicians could be empowered to turn the training into backing them up.

The trainings were conducted in three sub-counties of Wakiso including Kakiri, Namayumba, Luwero and in Kamuli district.

As part of the project, they have renovated the structures where they keep the boars, have restocked ten new boars from elite lines, refurbished the semen laboratory at Kabanyolo with a big room than what was in existence.

The project worth Shs. 180 million had four objectives including carrying out research and developing an AI model that is sustainable. The project looked at production, delivery and use of semen. The project is also running aside survey to farmers areas trying to understand and looking at pricing, delivery mode and even service providers.

## 6.6 CAPSNAC Dissemination Workshop held in Mbale

The College on 7th December 2020, held a Research Dissemination Workshop in Mbale to disseminate the findings of the five year NORAD funded project. The Project titled *“Regional Capacity building for Sustainable Natural Resource Management and Agricultural Productivity under Climate Change (CAPSNAC)”* was funded through the NORAD Program, NORHED at a total of about 17 million NOKS (approx. \$2.5m)

The funds channeled through Makerere University as the lead university in collaboration with other three universities of Addis Ababa (Ethiopia), University of Juba (Southern Sudan) and the Norwegian University of Life Sciences (Norway) was aimed at strengthening the capacity of universities to address issues to do with climate change, environment and natural resource management.

The dissemination workshop held at Mbale Resort was graced by the Resident District Commissioner for Mbale District Ogajo Barasa who also called upon the district residents to sustainably manage the environment and also stop natural resource degradation. The workshop was also attended by farmers, Farmer Organizations, Environmental Officers and District Local Council Chairpersons from the Greater Mbale including Researchers and Scientists from Makerere University, Staff and Graduate Students undertaking their research in the Eastern Region. Other dignitaries in attendance was the Deputy Principal, CAES Prof. Gorettie Nabanoga who also heads the gender aspect of the project.

The workshop was aimed at creating awareness, disseminate results and experiences of the five year CAPSNAC project to key stakeholders in the field of agriculture productivity and natural resource management in view of climate change. It was also aimed at fostering effective and interdisciplinary interactions among researcher’s practitioners and policy makers.

Prof. Samuel Kyamanywa the Principal Investigator (CAPSNAC) explained that the regional project was covering four countries that’s is Uganda, South Sudan and Ethiopian.

“We have been coordinating four Universities, three from the South and one from the North which is the Norwegian University of Life Sciences.

This project has been running for the last five years, conducted research, curriculum review for different universities and developed infrastructures.



*Participants posing for a group photo during break session at Mbale Resort Hotel*

Among the achievements the project has registered include training 10 PhD students, 16 MSc students, two post-doctoral and conducting short training courses in the area of Climate and Natural Resource Management.

One of the other physical products the project has registered as an achievement include the book produced and a manual for extension and development workers for East Africa.

Some of the completed project researches that were disseminated during the workshop include; Climatic Predictions for Eastern Uganda and their Implications for Agricultural Development, Natural Resources and Community Livelihoods by Dr. Yazidhi Bamutaze, Gender Vulnerability and Climate Change Adaptation Choices in Eastern Uganda by Dr. Kenneth Balikoowa, Small Holder Farmers Resilience to Climate Variability in Mt Elgon Area, Eastern Uganda by Dr. Narisi Mubangizi, Water Storage and Flood Mitigation Capacity of Wetlands in Lake Kyoga Basin Eastern Uganda by Dr. Ellen Kayendeke, Carbon Sequestration Potential of Agro-forestry Systems by Assoc. Prof. Gorretie Nabanoga.

Others are: Optimization of Cropping Practices to Enhance Productivity and Adaptation to Climate Variability in Small holder Farming Systems of Eastern Uganda by Olga Ayiya Charles and Institutional and Policy Changes for Climate Risk Management in Eastern Uganda by Dr. Paul Muwanga.

## 6.7 GREAT Project hold Symposium on Gender Responsive Breeding

On November 23rd and 24th November, 2020, Makerere University's Gender Responsive Researchers Equipped for Agricultural Transformation (GREAT) hosted its First Virtual Symposium on Gender Responsive Crop Breeding: Sharing Evidence and Experience from the Field. Day 1 was Internal to the GREAT Community of Practice, while Day 2 was open to the Public and accessible by Zoom and Facebook Live.

The event brought together interdisciplinary research teams of plant breeders, pathologists, socio-economists, anthropologists, food processing and quality experts from more than 10 countries in Anglo and Francophone Sub-Saharan Africa to share their work. The presenters were from a range of institutions including National Agricultural Research Institutions, Universities, and CG Centres in Uganda, Ghana, Kenya, Cameroon, USA, Benin, Thailand, Malawi, Mali, Nigeria, Madagascar, Burundi, Burkina Faso, and India. The event summarized the teams' research work on crop improvement aimed at delivering equitable benefits to women, men, boys, and girls. Since its establishment in 2016, GREAT has trained more than 250 professionals in gender responsive agricultural research methods.

The presenters were GREAT Fellows drawn from different cohorts over the last 5 years, as well as GREAT mentors and trainers. The presentations revolved around gendered participatory varietal selection, gender dynamics in breeding systems, intra-household relations influencing seed access among others. There was also an expert panel discussing what it takes to be a "gender specialist" in a breeding program.

Key presentations at the Symposium included;

- Dynamics of Farm Work, Household Duties and Labour Engagement for Men and Women in Maize Production in Northern Ghana by Eyrat Natson;



- Gendered varietal and trait preferences of common bean value chain actors in Uganda: Implications for breeding by Eileen Nchanji;
- Gender dynamics in banana seed systems and impacts on banana bunchy top disease recovery in Cameroon, by GREAT Fellows Lillian Nkengla and Bonaventure Omondi;
- Insights and lessons from gender-responsive RTB food product profiling studies in East and West Africa by Lora Forsthye.
- Reflections on Gender Integration at the Feed the Future Innovation Lab by Jessica Marter Kenyon.

## 6.8 The 1st International GORILLA Conference Opens at Makerere University



*Participants pose for a group photo with the VC Prof. Barnabas Nawangwe at Protea Hotel Kampala*

The Inaugural International Conference on Geographical Science for Resilient Communities, Ecosystems and Livelihoods under Global Environmental Change (GORILLA) was opened at Makerere University Uganda. This conference had earlier been planned for May 2020, but was postponed due to the COVID Pandemic.

The Two-Day GORILLA Conference (3rd-5th December, 2020) targeted sharing knowledge and research on emerging science, technology, tools and innovations around resilient communities, ecosystems and livelihoods.

The conference brought together distinguished scholars, students from a range of geographically aligned disciplines and community of practice as well as policy and decision makers from across the world. 200 people from 43 countries worldwide submitted the abstracts organized around the topics which generally inform the global resilience and sustainability agenda.

The conference was officially opened by the Vice Chancellor Makerere University Prof. Barnabas Nawangwe on 4th December, 2020 at Protea Hotel in Kampala. The function was also joined by the President International Geographical Union (IGU)- Prof Michael Meadows and the Executive Director the National Environment Management Authority (NEMA) Dr. Tom Okurut. It was graced by the Principal College of Agricultural and Environmental Sciences, Makerere University (CAES) Prof. Bernard Bashaasha and his Deputy Assoc. Prof. Gorette Nabanoga and the Dean, School of Forestry, Environmental and Geographical Sciences, Assoc. Professor Fred Babweteera.

Prof. Michael Meadow of the IGU, Prof. Noble Banadda of Makerere University and Prof. Wenwu Zhao presented the keynote addresses during the official opening session.

The conference was organised by the International Geographical Union (IGU), International Association of Landscape Ecology (IALE), IGU Commission on African Studies, IGU Commission on Bio Geography and Biodiversity, IGU Commission on Geography of Future Earth and the Uganda Geographical Association (UGA).

It was sponsored by the Government of Uganda, Makerere University, the National Environmental Management Authority (NEMA), Africa IALE, Brac, ARUA Water for Communities, the Embassy of Sweden and the UK Research and Innovation among others.

## 6.9 Policy Dialogue on Lake Victoria Water Rising Levels and Pollution in Masaka

Lake Victoria Basin (LVB) being a critical trans-boundary natural resource, underpinning the economy and livelihoods of the population, acts as a waste repository and provides food, energy, irrigation, drinking water, tourism and transportation to the economy.

During the period of late January 2020, the effect of Lake Victoria bursting its banks started to be felt with several landing sites and settlements damaged by floods leaving almost half a million people homeless and property worth billions of money had been lost in Uganda, Kenya and Tanzania.

The Efd-Mak Centre is mandated to carry out training, research and policy engagement in the realm of environment and natural resources and to advise government on the best way the environment can be managed using evidence generated from research.

The university was in Masaka because , it is one of the districts bordering Lake Victoria especially, the Bukakata area where the catchment area has been grossly degraded, forest cover cut with rampant swamp reclamation.

The meeting discussed several issues about Lake Victoria's hydrology change and pollution which were related to water quality and livelihood. The livelihood question addressed the question of fishing just as a component.

The workshop held at Hotel Brovad attracted about 40 participants including the Resident District Commissioner (RDC), Chairperson Local Council V (LCV), District Natural Resources' Officers, officials from the Environmental Police Unit, Civil Society Organizations and the Private Sector among others.

The deliberations under the theme, "Lake Victoria's Hydrology, Water Quality and Livelihoods", focused on the status of the Environment and Natural Resources in the district more especially the rising water levels on Lake Victoria and the resultant impacts on the socio economic welfare on the people, challenges faced in the management of the natural resources and how to sustainably use the environment while realizing economic development.

## 6.10 A Poultry Training Manual to address key capacity and knowledge gaps within the poultry sector designed



*Poultry farmers in Nangabo pose for a group photo with Makerere Researchers after the research dissemination meeting*

About 100 poultry farmers in Wakiso district have been given free Poultry Training Manuals that will give them tips on how to do poultry farming better so that they can realize better profits and stay afloat.

The manual is a user-friendly information exchange material (IEC) presented in a tone and format to ease understanding and application aimed at addressing key capacity and knowledge gaps within the poultry sector for improved productivity and profitability.

These information exchange materials were designed by a multidisciplinary team of researchers basing on the study findings for the Mak-RIF COVID Special project titled, *“Strengthening the resilience and visibility of peri-urban poultry farmers in Wakiso district for better marketing and profitability through feeding, postharvest handling, value addition and resources recovery”*.

The team comprises Assoc. Prof. Zziwa Ahamada, Principal Investigator (PI) and Dr. Robert Kyeyune Kambu Department of Agricultural and Bio-systems Engineering, Dr. Simon Kizito, from the Department of Forestry, Biodiversity and Tourism, Ms. Rebecca Mukebezi, from the Department of Extension and Innovation Studies and Mr. Henry Magala from the Department of Agricultural Production.

Makerere University Research and Innovations Fund (Mak-RIF) with funding support from the Government of Uganda put up a call for Makerere University lecturers to come up with innovations and research projects that could address the challenges farmers were facing during COVID 19 lock down.

In June 2020, the team embarked on studying problems and challenges that poultry farmers in Wakiso district were facing during COVID 19 using desk review, baseline survey, Focus Group Discussions then Key Informant Interviews. The study targeted 200 poultry farmers in total from five town councils of Kira, Kyengeru, Nansana, Nangabo and Wakiso with 40 participants from each town council.

After data collection, the research team identified farmers' needs, synthesized, prioritized and transformed them into thematic areas which formed the key topics for this manual. The training manual focuses on five topical issues namely; Quality Control and Value Addition, Resource recovery innovations; Business Management; Poultry health, Hygiene and feeding; Poultry housing and Common interest farmer groups.

The team also held two research dissemination meetings and farmer trainings at Wakiso and Nangabo town councils to get back to farmers, share the study findings, go through the information exchange materials and also make them aware of existing support systems within the local government structures that would enable them address some of the challenges on continuous basis even in the absence of the researchers.

Where the dissemination meetings were held, the research team created farmers' virtual groups that would serve as areas of continuity of learning and information sharing.

The team also made strong connections and linkages with some of the actors in the poultry value chain who would keep supporting the farmers on a day to day basis.

### 6.11 Mak RIF COVID 19 Special Project Unmasks the Gendered Impact of COVID 19 guidelines on Market Vendors of Perishable Goods in Urban and Peri-urban Areas of Uganda



*Participants pose for a group photo with the Chief Guest after the meeting in the Forestry Conference Room*

Over 100 participants from academia, business, private sector, research and government ministries and agencies convened physically and virtually to discuss the findings of the Mak-RIF COVID-19 Special study on the gendered impact of COVID 19 on market vendors of the perishable goods in urban and peri-urban areas of Uganda.

The workshop held on Wednesday 18<sup>th</sup> November 2020 attracted 40 participants physically at the Conference Room, School of Forestry, Environmental and Geographical Sciences while over 60 participants attended via zoom.

The School of Agricultural Sciences (SAS), College of Agricultural and Environmental Sciences (CAES), Makerere University conducted a study on food markets following the distortions caused

by COVID-19 pandemic. The study titled *“The Gendered Impact of COVID-19 Guidelines on Market Vendors of Perishable goods in Urban and Peri-Urban areas of Uganda”* was funded by the Government of Uganda through the Makerere University Research and Innovation Fund (Mak-RIF) COVID-19 Special Grant.

The research team comprised of Dr. Losira Nasirumbi Sanya, Principal Investigator (PI) & Lecturer, Department of Extension and Innovation Studies (DEIS); Professor Johnny Mugisha, Co-PI & Dean, School of Agricultural Sciences and; Ms. Florence Nakazi, a Research Analyst, Economic Policy Research Centre (EPRC).

The dissemination workshop was officially opened by the Deputy Principal CAES who is also a gender expert, Assoc. Prof. Gorettie Nabanoga as Guest Speaker. It was closed by Makerere University Deputy Vice Chancellor in charge of Academic Affairs (DVC (AA) represented by Assoc. Prof. Eria Hisali, who is also Principal College of Business and Management Sciences (CoBAMS).

The function was also graced by officials from the Ministry of Trade, Industry and Cooperatives led by Dr. Joshua Mutambi Commissioner, In-Charge of Processing and Marketing; Representatives from the National Research Organization (NARO), the Economic Policy Research Centre (EPCR) and Kampala City Capital Authority (KCCA).

Other invited guests were the Makerere University Director, Directorate of Graduate Research and Training Prof. John Buyinza Mukadasi, the Principal CAES Professor Bernard Bashaasha. Dr. Hellen N. Nkabila representing the Mak RIF Grants Management Committee also, doubling as Council Member, Mrs. Phoebe Lutaya, Deputy Coordinator Mak-RIF and Ms. Carol Kamugira from the Mak-RIF Secretariat. Other special guest were representatives of market vendors, members from civil society organizations and the private sector.

The Overall Objective of the study was to generate evidence on the impact of COVID-19 on the livelihoods of the market vendors especially vendors of perishable goods. The specific objectives were to determine the extent or magnitude of market distortions in terms of; supply, demanded, prices, physical and economic losses, and cost of responding to the guidelines and the implications on sales and profits and general market performance.

The second objective was to quantify short term impacts of the above on the market vendors' welfare, including those who have lost the jobs and third was to propose potential alternatives and strategies on how market vendors can withstand future similar market shocks.

The study employed a mixed research design covering the Central Region of Uganda with focus on the Central Business District (CBD) of Kampala and its rounding Wakiso, Mukono and Mpigi.

The study mainly targeted female and male vendors trading in selected perishable goods namely; bananas, tomatoes and leafy vegetables in selected markets of Kalerwe, Kasubi, Nakawa, Matugga, Bombo, Mpigi, Mukono, Gayaza and Kawempe.

The commodity choice was informed by the supply areas and main staple for bananas, major spice for tomatoes and nutritional aspect of leafy vegetables. A total of 347 (118 banana vendors, 115 for tomato and 114 vendors for the leafy vegetables) participated in the study during the period of March and May 2020.

In addition to key informant interviews targeting market leaders to ascertain the changes, their opinion on the guidelines and how they were being implemented, the PI said, in-depth interviews

with market vendors were conducted to capture their personal lived experiences as relates to the study variables; as well as market survey with vendors using semi-structured questionnaire to quantify the distribution effects of the pandemic. Descriptive and regression analyses were used to analyse data.

Overall, the study found that COVID-19 led to a mismatch between supply and demand hence a profound shock to markets, their operations and marketing systems. There were multiple interrelated impacts of the pandemic on the vending business and vendors; supply quantities, sales, diversity of buyers, prices and income.

Although all vendors experienced the distortions caused by the pandemic, its severity was more among those in the urban relative to the peri-urban markets, and among women compared to men. Shrinking margins amidst increased business costs negatively impacted on the livelihoods of vendors and heightened the care burdens among women who solely depend on the vending business for their livelihood". Ms. Nakazi stressed.

Suggested policy recommendations from the vendors' perspective included; supporting vendors with cash transfers, improving market shelter, sanitary/hygiene, and infrastructure to integrate health first aid facilities. Other proposals from vendors were expansion and establishment of more markets to decongest existing markets, promotion of value addition, provision of processing, storage and preservation facilities. Improvement on stall spacing, enhancement of knowledge and skills for value addition and linking vendors to markets for perishable goods were also proposed.

In terms of study recommendations for policy and practice, the study presented three main interventions namely; the need to prioritize short-run support for COVID-19 response, investing in long-term recovery and resilience and lastly, inclusive and effective marketing system.

That COVID-19 response takes into account the disproportionate impact of measures on men and women; Organize traders per commodity (have a section for every commodity); Improve marketing strategies where traders/sellers get closer to the buyers using various means i.e. ICT and; Establish and nurture relationships with potential buyers.

There was need for cash transfers (and access to affordable finances) to support vendors revitalise and boost their businesses and creation of robust, resilient and gender-responsive marketing systems that integrates the needs of men and women. Others were, the need to equip markets by investing in basic market infrastructure and processing/preservation technologies; Streamlining necessary services provision through supportive government policies and; Promoting networks in vending business.

In the Key messages to government the study appealed to Government and other development partners to advance a complete recovery package to support market vendors' essential needs.

Such a package should entail: Support to vendors to transition to e-commerce trading platforms and home delivery applications to retain and increase their customers; Avail soft loans to facilitate uptake of innovative technologies/bring businesses back to normal in the new socially distant world; Stimulus package to support vendors to offset the inevitable trading conditions. This would amount to a direct subsidy to market vendors and reduce losses through improved commodities storage facilities and preservation of perishables.

## 6.12 Mak-RIF Project unveils Uganda's Potential to Process Powdered and Liquid Eggs for Domestic and International Market



*Project Team and Participants posing for a group photo after the Opening Ceremony*

Makerere University Special Mak-RIF COVID Researchers come up with interventions for Government, Public Private Partners and Private Investors to make Egg Production in Uganda more feasible and profitable.

The project team has produced a comprehensive report, a business plan based on the research findings that will be a guide for investors who would like to make capital investments in egg processing plants and a policy brief entailing policy interventions and options for the egg industry.

The proposed method of operation for government interventions entailed;- conducive tax regimes, financing mechanisms, enforceable standards and targeted extension services .

The proposed method of operation for public private investments were financing of capital investments, export expansion, consumer education, enhancing bio-security measures, collective action, targeted extension services and youth platforms.

The Private Investment calls for Investments in improved technology and buffer stocks, Innovations in processed egg uses and contract egg production.

The recommendations were made during the blended online and face to face research dissemination workshop for the study titled, *“Exploring Egg Processing as a Sustainable Market Solution for Ugandan Poultry Farmers During and Post Covid-19 Pandemic”* held on 14<sup>th</sup> October 2020 at the Conference Hall, School of Food Technology, Nutrition and Bioengineering. Thirty key stakeholders including, policy makers, farmers, academia and other stakeholders participated and another 50 stakeholders via the webinar.

The study was spurred by the advent of the Covid-19 pandemic in December 2019 and associated restrictions which disrupted the agriculture value chains including the egg value chain. For the egg value chain in particular, alternatives such as processing channels to add value and increase the shelf life of the shell eggs to absorb the excess supply were limited.

The study was funded by the Government of Uganda at an estimated budget of UGX 60 million through the Mak-RIF to support government initiatives to fight COVID-19 pandemic and to specifically address the need of the Ugandan poultry farmers who were greatly affected during the lock down period.

The objectives of the study were: 1) To characterize and profile the egg producers as well as assess the trends in egg production in Uganda; 2) Understand challenges and opportunities in the egg value chain and propose possible solutions; 3) To understand the current marketing channels for eggs and; 4) To assess the profitability of egg processing in the Ugandan context.

The Research Team was composed of four namely: Dr. Rosemary Emegu Isoto (PI, CAES); Prof. Bernard Bashaahsa (Co-PI and Principal, CAES); Ms. Caroline Kamugira (RIF, CAES) and Noreen Munabi Nkuraija (CAES).

After four months of the research work, the project team in conjunction with the Makerere Research and Innovation Fund held a dissemination workshop with the objective of sharing and discussing with stakeholders, key findings from the project research.

The workshop was officially opened by the Deputy Principal College of Agricultural and Environmental Sciences, Assoc. Prof. Gorette Nabanoga as the Chief Guest.

### 6.13 Donation of the Touchless Handwashing Kits to Health Facilities



*The VC Prof. Barnabas Nawangwe (2nd) Presiding over the Hand Over of the TW-20 Kits*

The college donated three Touchless Handwashing (TW-20) Kits to Mulago National Referral Hospital and another one to the College of Health Sciences (CHS). The donation was presided over by the University Vice Chancellor Prof. Barnabas Nawangwe at the University Main Hall during the media engagement and handover ceremony on 24<sup>th</sup> August, 2020.

The three kits donated to Mulago hospital were handed over to Dr. Christine Byanyima who represented the Hospital Director. She expressed appreciation for the identification of Mulago Hospital as a beneficiary and a long term partner.

*“Mulago has treated over 6,000 patients of COVID 19 and has currently over 50 patients on ward. Uganda is in Phase 3 of the pandemic with community infections and it is so distressing when patients come in. This donation will go a long way in the prevention and control of infections. Mulago will deploy it in areas of more traffic”, Dr. Byanyima said.*

The Kit for Makerere University College of Health Sciences was handed over to Dr. Waiswa Gonzaga. Dr. Waiswa was grateful to the research team and the university for considering the college among the first recipients of the donation. He said this donation will boost the college



capacity since it did not close because the Post Graduate students were heavily engaged with activities of COVID 19, and at the same time, conducting teaching and learning.

#### 6.14 Policy Tour to Bugiri District over Lake Victoria's rising Water Levels and Pollution

Environmental economists from the Environment for Development Initiative (EfD-Mak Centre) were on 28<sup>th</sup>-29<sup>th</sup> October 2020 in Bugiri District in Eastern Uganda to dialogue with the local government officials on L. Victoria's water rising levels and pollution.

The team led by the Director EfD-Mak Centre Assoc. Prof. Edward Bbaale met with Bugiri District Local Government Officials including the administrative and technical arms of the district at the district headquarters.

Officials met include the Chief Administrative Officer (CAO), The Resident District Commissioner (RDC), Clerk to Council, Chairperson Local Council V, District Speaker, the District Police Commander and officers from the Environmental Police Protection Unit. The technical team was largely composed of the District Natural Resources' Officer, Forestry and Water officers, District planners and engineers. The meeting was also attended by representatives from the Civil Society Organizations (CSO) and the Private Sector.

Lake Victoria Basin (LVB) is a critical trans-boundary natural resource, underpinning the economy and livelihoods of the population, acting as a waste repository and provides food, energy, irrigation, drinking water, tourism and transportation to the economy and is the primary modulator of the region's climate.

Despite its importance, the LVB has undergone intense environmental degradation for decades, resulting in significant ecological and economic challenges. During the period of late January 2020, the effect of Lake Victoria bursting its banks started to be felt with several landing sites and settlements damaged by floods leaving almost half a million people homeless and property worth billions of money h lost in Uganda, Kenya and Tanzania.

The EfD-Mak Centre is mandated to carry out training, research and policy engagement in the realm of environment and natural resources and to advise government on the best way the environment can be managed using evidence generated from research.



*Makerere Environmental Economists pose for a group photo with Bugiri District Officials after a Dialogue*

The university was in Bugiri because of its location and unique features. Bugiri district is located in Busoga Sub-region in Eastern Uganda in a flat and rolling topographical zone with 90% of its landmass constituting the drainage basins of Lake Victoria and Lake Kyoga. As a result, there are many swamps that criss-cross the district and landing sites. However, the catchment areas have been grossly degraded, forest cover cut and swamps reclaimed.

The objectives of the policy dialogue was to discuss with district officials on the status, challenges and to come up with strategies how to have a nuance existence between the environment and human development.

### 6.15 Policy Dialogue on Lake Victoria's Hydrology, Water Quality and Livelihoods in Jinja District

Environmental economists from the Environment for Development initiative (EfD-Mak) Centre on 26th August 2020 held a policy dialogue with Jinja district local government officials on the theme, "Lake Victoria's Hydrology, Water Quality and livelihoods".

The workshop held at Jinja District Council Hall attracted about 40 participants including the Resident District Commissioner (RDC), Chairperson Local Council V (LCV), District Natural Resources' Officers, Officials from the Environmental Police Unit, Civil Society Organizations and the Private Sector among others.

The objective of the meeting was to discuss and brainstorm on the status of the environment in the district more especially the rising water levels on Lake Victoria and the rivers within the district, challenges faced in the management of the natural resources and identify possible solutions to mitigate environmental degradation.

### 6.16 GREAT Project held Virtual Annual Meeting to take Stock of its Achievements in Phase I



*Makerere Gender experts and trainers in a photo session at the Freedom Square*

Makerere University's Gender responsive Researchers Equipped for Agricultural Transformation (GREAT) project on 5-6 August, 2020 held its 5<sup>th</sup> Annual meeting via the webinar to take stock of her achievements in Phase 1, reflect on lessons learnt and project into the future.

The project is in the final stages of wrapping up Phase 1 since its inception in 2015. The project will end in April 2021, with a possibility of a phase 2 in collaboration with other international agricultural players. The zoom meeting reviewed the progress of GREAT Year 5 and paved a way forward for the pending period and post-Phase 1.

The meeting brought together 16 and 45 participants on day 1 and 2 from various institutions active in the gender and agriculture ecosystem locally and globally.

Participants were drawn from:- the CGIAR GENDER Platform; CGIAR Excellence in Breeding; CGIAR Gender & Breeding Initiative; African Women in Agricultural Research and Development (AWARD); LANDESA; Canada's International Development Research Centre (IDRC); Oxford University; Bill & Melinda Gates Foundation; United States Agency for International Development (USAID); International Food Policy Research Institute (IFPRI); ALIne Impact, Makerere University and Cornell University .

Makerere University leadership was represented by the Vice Chancellor, Prof. Barnabas Nawangwe, the Principal, College of Agricultural and Environmental Sciences (CAES) Prof. Bernard Bashaasha and the Principal, College of Humanities and Social Sciences (CHUSS) Prof. Josephine Ahikire. Prof. Bashaasha and Prof. Ahikire are members of the Project External Advisory Committee (EPAC). Cornell leadership was represented by Prof. Max Pfeffer, the Executive Dean, College of Agriculture and Life Sciences.

The main objective of the project was to establish a Centre of Excellence for Gender and Agricultural Research. Through targeted recruitment, the project has equipped selected national agricultural research institutions with a critical mass of trained staff with potential to catalyze institutional transformation.

The University is poised to be a knowledge and training hub for gender responsive agricultural training and research in Sub-Saharan Africa .The project has created a strong team of 13 faculty trainers and researchers at Makerere University across diverse units, established a vibrant network of researchers in gender and agriculture and fostered new institutional linkages between Makerere University and Cornell University.

In addition, the GREAT project has attracted more international collaborators such as the Innovation Lab for Crop Improvement program of Cornell University, the Accelerated Genetic Gain in Rice (AGGRi) Alliance of the International Rice Research Institute (IRRI), and the Innovation Lab for Peanut at the University of Georgia, USA.

### 6.17 CAPSNAC Project Writeshop

Graduate research requires that communication along the impact pathway has satisfactory depth and / or breadth as desired by the respective stakeholders. Inefficient writing and communication skills make scientists unable to widely disseminate research outputs for the benefit of society and promotion of academic and public debates. Inability to write and communicate also makes scientists unable to attract funding from policy makers and technocrats and inhibits their contribution towards desired societal changes.

Most times, graduate students face the above mentioned challenges and it was in that context that CAPSNAC, the NORHED funded project at Makerere University recognized this challenge and advocated for remedial and retooling courses to equip students in science communication

to quicken their dissertation completion process.

The four days' write-shop was spread over a two-weeks period with the first one held on 13th-14<sup>th</sup> August 2020 and the second scheduled for 27<sup>th</sup> – 28<sup>th</sup> August 2020 targeting the back-log of CAPSNAC students.

The main objective was to help the students complete writing their papers and theses so that they are able to complete their program before the NORHED CAPASNAC project cost extension ends on 31<sup>st</sup> December 2020 deadline. The workshop was not intended just to train students to write but assisting them to write. The key outcome envisaged from the write-shop was that students will immediately submit their dissertations given that the NORHED CAPSNAC project cost extension was coming to an end and graduate at the planned Makerere University graduation in 2021.

By the end of the write-shop, students were expected to fill their intentions to submit their dissertations for examination, feel a deeper sense of ownership of their own writing, have draft dissertations and paper manuscripts for submission and identify strategies towards completion of their graduate studies.



*Instructors Guiding PhD and MSc Students during the Writeshop*

## 6.18 Government Officials trained on Environmental Valuation

Over 40 trainees including representatives from Uganda line Ministries, Departments and Agencies including the Ministry of Lands and Housing, the Ministry of Water and Environment, the National Forest Authority (NFA) the National Environmental Management Authority (NEMA), the Uganda Wildlife Authority (UWA) the National Planning Authority (NPA) and Civil Society Organizations on 10<sup>th</sup> July 2020 converged at Makerere University for a one day training on Environmental Valuation.

The training organized by the Environment for Development Initiative (EfD-Mak) Centre Uganda was also attended by the Member of Parliament Ora County Zombo district Hon. Biyika Lawrence Songa who is the Chairperson of Parliamentary Committee in charge of Climate change.

The purpose of training government officials was to equip them with the relevant skills and knowledge in their areas of work, so that they can work better and technically.

The training was justified basing on a number of reasons: The first one is that the Gross Domestic Product (GDP) which does not reflect the destruction of environmental goods because the value of the natural resources is not known.

The second reason for training evaluaters is the litigation cost. The reason was that if NEMA takes someone to court and then the person is found guilty, the value should be there so that the magistrate just says, you destroyed Mabira forest you should pay this amount of money.

The third reason was that the World Bank is also trying to encourage getting the country's wealth in not only monetary values but also in the natural resources.

### 6.19 Mak RIF AI Project well received in Wakiso District



*Participants posing for a group photo after the training at Wakiso District Headquarters*

Farmers, technicians and district staff in Wakiso expressed readiness to implement the Makerere University proposal to improve the piggery sector by upscaling the Pig Artificial Insemination Technology (AI) and improved genetics funded by Government of Uganda through the Makerere University Research and Innovation Fund (Mak-RIF).

A multi-disciplinary research team from Makerere University working on the project titled, *"Integrating Assisted Reproductive Technologies and Elite Pig Genetics to transform the Pig Value Chain in Uganda"*, on 18<sup>th</sup> March, 2020 held a consultative meeting with piggery farmers, veterinary officers and AI technicians at Wakiso District headquarters.

The project was conceived by a team of five including Assoc. Prof. Donald Rugira Kugonza (PI) from the Department of Agricultural Production, School of Agricultural Sciences, College of Agricultural and Environmental Sciences (CAES). Others are Dr. Anena Catherine Pauline from

the College of Humanities and Social Sciences (CHUSS), Dr. Gideon Nadiope Director, IOWA State University - Uganda Program (ISU-UP), Lydia Magala from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and Mr. Robert Natumanya the AI expert from the Department of Agricultural Production, School of Agricultural Sciences (CAES).

The project idea was to upscale the previous initiatives on promoting pig AI technology in Uganda by helping farmers, maintaining the Boar study at Makerere University Agricultural Research Institute Kabanyolo (MUARIK), collecting semen and sending to farmers.

## 6.20 Researchers Trained in Experimental Economics

About forty researchers on 30<sup>th</sup>-31<sup>st</sup> July 2020 converged at Makerere University for refresher training to sharpen their skills in Experimental Economics. The training held at the College of Business and Management Studies (CoBAMS) was organized by Environment for Development Initiative (EfD-Mak Centre). The two day training was officially opened and closed by the the Deputy Principal CoBAMS Prof. Bruno Yawe.

EfD is a global network of fifteen environmental research centers with EfD Mak in Uganda being one of the newest following its admission in November 2018 in Vietnam Honai

Part of the mandate of EfD is to undertake research meant to inform policy in the area of environment and natural resource economics but also training, the reason why EfD is involved in a number of short term but also long term trainings.

The EfD-Mak centre brings another marriage between the College of Agricultural and Environmental Sciences (CAES) and the College of Business and Management Sciences (COBAMS). The training focused on understanding the theoretical underpinnings of experimental economics driving it from experimental practices of research and on the real practice having, for example data doing it, trying to see how the impact is measured in case of impact evaluation.

It also looked at different designs of experiments and then, different types of experiments-quasi experiment for example looked at lab and field experiments, with practical trials and designs. It also focused on impact evaluations, using RCTs, process evaluation.

In all those types of experiments done, some practicals having hands on data with analysts, simple analyses to show people how experimental research is done were conducted.

## 6.21 GREAT Gender Awareness Training for Students and Scientist working on Ground Nut Projects in Sub-Saharan Africa

Women make up half of the Agricultural workforce of Africa and historically, women issues have not been well incorporated into agricultural sciences and development. Considering details of women's' life and the youth might have a huge impact on the outcome of agricultural research projects and whether the technologies and varieties developed are accepted or fail on the farm.

Gender is being recognized as critical component of global agricultural development. Makerere University Gender-Responsive Researchers Equipped for Agricultural Transformation (GREAT) project in collaboration with USAID Feed the Future Innovation Lab for Peanut has conducted a gender awareness training for students and scientist working on Ground nut projects in Sub-Saharan Africa to explore how gender can impact the objective data that comes from their research.

The three-day gender sensitization workshop was hosted by Makerere University at Royal Suites hotel Bugolobi a Kampala suburb from 10<sup>th</sup>-12<sup>th</sup> March 2020. It was attended by 19 participants including Co-PIs and students working on the Feed The Future Innovation Lab projects in four countries-Uganda, Kenya, Malawi, Zambia, and Mozambique.

The University of Georgia, College of Agricultural and Environmental Sciences (CAES) are the lead entity that won the bid for the Feed the Future Innovation Lab for Peanut under the leadership of Professor David Hoisington.

The Lab works to alleviate hunger by helping farmers in developing countries grow and profit from healthy peanut crops. The new program builds on the many successes of the previous Peanut & Mycotoxin Innovation Lab in developing new varieties, pre- and post-harvest management and processing.

The Feed the Future Innovation Lab for Peanut also works in the new research areas of peanut-based nutrition, gender and youth to develop a better understanding of the roles gender and youth play in peanut value chains in each target country based on scientific studies, and examples of gender-sensitive research products having impacts.

The participants comprised teams of researchers from the USA, Universities and research organizations from Sub-Saharan Africa. From Makerere University, the training was attended by Professors, lecturers and graduate students from the School of Public Health, School of Agricultural Sciences, and the School of Food Technology Nutrition and Bio-Engineering.

On the other hand, instructors were drawn from the School of Agricultural Sciences, School of Forestry, Environmental and Geographical Sciences, School of Veterinary Medicine, and the School of Women and Gender Studies. Other facilitators were from the Uganda National Agricultural Research Organization (NARO) and the University of Georgia USA.

## **6.22 Webinar on Harnessing the COVID-19 Recovery Programs to Combat Climate Change in Uganda**

The Efd Mak Centre Uganda in collaboration with Efd-Tanzania on 24th June, 2020 held a Webinar with a purpose of distilling lessons learned from the COVID-19 response and how these can be transposed to climate change campaign. The Webinar also highlighted how COVID-19 recovery packages can be harnessed to address climate change effects and curtail environmental degradation.

The electronic meeting brought together both state and non-state actors. Over 70 participants including the Manager Efd Secretariate in Sweden Dr. Franklin Omuakua, Dr. Razack Lokina from Efd-Tanzania, Dr . Wisdom from Efd-Ghana and Nigeria's Nnaemeka Chukuone.

Representatives from Uganda government Ministries, Departments and Agencies including Mr. Aoron Welikhe from the National Planning Authority (NPA), Dr. Daniel Babikwa from the National Environmental Management Authority (NEMA) also participated. The meeting was also joined by students and staff from Makerere University.

**THEME**

**Harnessing the COVID-19 Recovery Programmes to Combat Climate Change in Uganda.**

**Panelist**  
Dr. Daniel Babikuma (NEMA)

**Panelist**  
Prof. Razack Lokina  
Director EID - Tanzania

**Panelist**  
Mr. Aaron Walukha  
National Planning Authority

**Presenter**  
Prof. Edward Bbunde  
Director EID - MAK Centre

**Moderator**  
Dr. Madina Guloba  
EPRC.

**Wednesday, 24th June, 2020**

**Time:**  
11:00am - 1:00pm

**Zoom Meeting ID: 957 1931 9281 Password: 057026**

The Corona Virus Disease (COVID-19) was declared a global pandemic on 11<sup>th</sup> March 2020. Countries world over are experiencing and trying to cope with its unprecedented rapid spread that has claimed many lives and devastated the social economic activities.

Given the absence of a vaccine, partial and total lockdowns, social distancing, wearing of face masks, handwashing and sanitizing were recommended by the World Health Organization (WHO) as the global remedy for to contain the spread of COVID-19.

Accordingly, the Government of Uganda imposed a total lock down defined by closure of the national borders, the international

airport save for cargo flights, and restriction of public gatherings, people movements and public and private means of Transport. As of 3<sup>rd</sup> June, 2020 there were 489 confirmed cases of COVID-19 with 82 recoveries in Uganda.

COVID-19 pandemic has left a trail of direct negative impacts on the global economy entailing disruption of supply chains, collapse of businesses with the International Monetary Fund forecasting an imminent severe economic recession only second to the 1930's economic depression.

Other anticipated secondary impacts include; unemployment, food and nutritional insecurity and worsening of existing vulnerabilities such as climate change and social inequality with repercussions on progress towards achieving the Uganda Vision 2040 and the 2030 Agenda.

Climate change being an equally lethal challenge with life threatening effects, the response to COVID-19 will inevitably have implications on the scale and progress of global and local climate change actions.

The colossal recovery packages to revive economies can go a long way in either worsening climate change or containing its effects to realize the Paris Agreement goals of limiting global average temperature rise to below 2°C above the preindustrial levels by the end of this century.

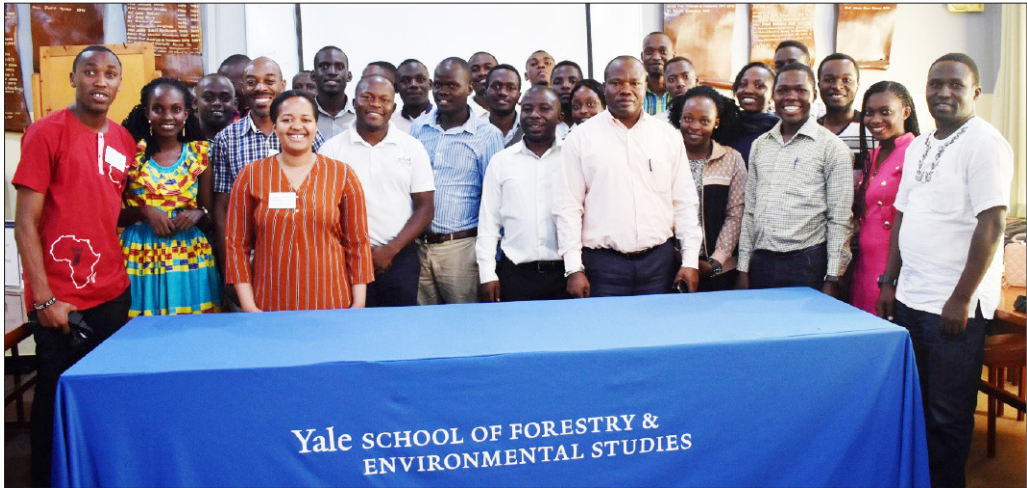
### 6.23 Engagement of Alumni for Student Study Opportunities at Yale School of Forestry

The School of Forestry, Environmental and Geographical Sciences (SFEGs) on 11<sup>th</sup> March 2020 hosted an information and networking outreach session spearheaded by students from Yale University School of Forestry and Environmental Studies (F&ES) in the US.

Students undertaking the Masters of Environmental Management degree program (MEM2020) were led by Paul Mukiza Hatanga, a former student of BSc. Forestry (2002-2006) at Makerere University. Others were Lysa Uwizeyimana from Rwanda and James Wainaina Ndung'u from Kenya.



The trio met the Makerere University staff and students who recently graduated from the SFECS in school's conference room where they discussed the available opportunities in different programs offered at Yale University, admission requirements, the application procedure and how to navigate the process of financial aid.



*Yale Students, Makerere Students and Staff take a Group Photo after the Meeting*

The meeting was presided over by the Dean SFECS represented by Assoc. Prof. Edward Mwavu who is also Head, Department of Forestry, Biodiversity and Tourism (FBT).

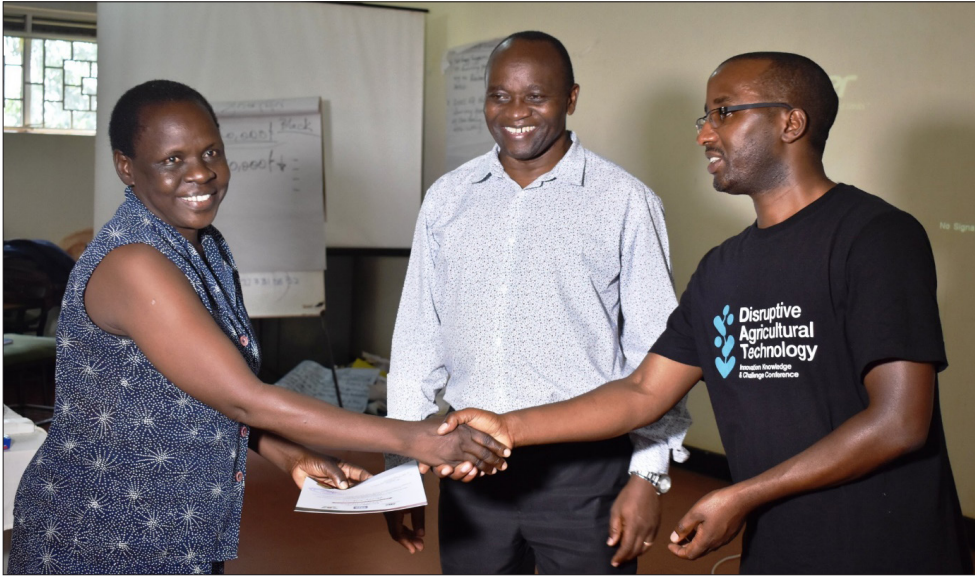
Dr. Mwavu welcomed and thanked the team from Yale University for considering to hold a career guidance at Makerere University and their interest in the enrolment of African students. The students from Yale had been to Nairobi University two days before.

Yale University Student Team Leader Paul Mukiza Hatanga said the visit to Makerere University was organized under the Africa Student Interest Group that encourages African students at the university to push for the students' agenda. The Africa Students Interest Group is funded by the Career Guidance Office.

Yale School of Forestry & Environmental Studies has a diverse student body of about 300 masters and 75 doctoral students from more than 35 countries and from across the U.S.

The school provides a combination of need-based, merit and general funding to assist students. The school provides a total support of \$6,800,000 for masters' students per year consisting Tuition (\$ 5,300,000), Summer internship (\$700,000), Student employment (\$600,000), Travel and other student activities (\$200,000).

## 6.24 District Agricultural Officers retooled



*Apac District Agricultural Officer Betty Okori picks her Certificate*

Seventy (70) Agricultural Officers from selected district across Uganda where the Agricultural Cluster Development Project (ACDP) is being implemented underwent a 5 days refresher training on Integrated Production and Pest & Disease Management courses (IPPM) at the Continuing Agricultural Education Centre (CAEC) at the Makerere University Agricultural Research Institute Kabanyolo (MUARIK).

This was the second group following the assessment of the first training of 72 participants that was trained by the university in August 2019 based on the same content.

Under the National Agricultural Policy (2016), Makerere University College of Agricultural and Environmental Sciences (CAES), is mandated among others to provide refresher training for extension staff in Uganda.

This has been spelt out in a Memorandum of Understanding (MoU) between the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and CAES. So far, over 2,200 district extension workers have been trained under this initiative, funded by the World Bank and other development partners including IFAD.

This particular training that started on 2<sup>nd</sup> – 6<sup>th</sup> March 2020 was supported by MAAIF under the ACDP funded by the World Bank at a total budget of about shs. 240 million.

Makerere University Senior Lecturer and Program Coordinator Dr. Bernard Obaa said the main goal of the training is to strengthen the capacity of extension workers based at sub counties.

The main goal is to strengthen their capacity in three key areas for five priority crops for Agricultural Cluster Development Project (ACDP). These priority crops are beans, coffee, rice, maize and Cassava. The training focused on three main aspects namely Climate Smart Agronomic Practices, Diseases and Pest management and Post-harvest Handling. The other aspect was on Cross cutting issues including Soil Management, Cost benefit analysis and Ethics in farming as business.

MAAIF organized the TOT for IPPM to harmonize the understanding between the extension officers, researchers and trainers from Makerere University. The other is to harmonize the ministry's understanding on new technologies to increase production and productivity of the main commodities that are being promoted under the ACDP so that trainers from this course can go and train others to extend services to the farmers as the target beneficiaries.

The training is trying to address the issue of low production on grounds that as a country the target is to increase marketable volumes for beans, coffee, rice, maize and Cassava.

### 6.25 Mak RIF Pig AI Team in Consultative Meeting with Kamuli Piggery Farmers

Stakeholders in the piggery sector in Kamuli District have endorsed the proposal by Makerere University research team to integrate Artificial Insemination Technology and Elite genetics to transform the Pig Value Chain in the district. The farmers also agreed to be trained and have exchange visits.

The farmers were ready to meet on Friday 6<sup>th</sup> March 2020 to continue deliberating on the issue, identify farmers to benefit under this project and agree on the type of breeds to be promoted for the project implementation.

The consensus was reached during the farmers consultative meeting organized by a multidisciplinary research team from Makerere University on 3<sup>rd</sup> February 2020 at Kamuli district headquarters where over twenty (20) pig farmers including Pig AI Technicians, Extension staff and district officials attended.



*Kamuli Local Government Officials Meeting Makerere Pig AI Researchers*

Makerere University received a special funding from the Government of the Republic of Uganda (the Research and Innovation Fund (RIF) to complement available research funding to address unfunded priorities critical to accelerating development across different sectors of the economy in Uganda.

The project titled, *“Integrating Assisted Reproductive Technologies and Elite Pig Genetics to transform the Pig Value Chain in Uganda”*, is being led by Assoc. Prof. Donald Rugira Kugonza from the Department of Agricultural Production, School of Agricultural Sciences, College of Agricultural and Environmental Sciences (CAES).

Other team members are Dr. Anena Catherine Pauline from the College of Humanities and Social Sciences (CHUSS), Dr. Gideon Nadiope Director, Iowa State University–Uganda Program (ISU-UP) and Lydia Magala from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

The reserachers received shs. 180, 490, 000 to be spent by June 2020. This project funded by government was going to provide 1000 dozes of semen meaning at least 1000 pigs will become pregnant provided from Makerere AI station and then 200 of these dozes will be given to farmers free of charge. Transport and service fees for the extension officer will also be paid. There will be trainings facilitated and paid for by the project plus exchange.

## 6.26 Policy Dialogue in Mukono District on Governance of Natural Resources

Environmental Economists from the Environment for Development (EfD-Mak) Centre on Thursday 20<sup>th</sup> February 2020 conducted a policy tour to Mukono District Local Government headquarters where they a had a dialogue with Councilors on how natural resources were being managed in the district.

The purpose was to discuss the status of the environment and natural resources in the district and debate how to accelerate economic growth while preserving the environment

Over 80 participants including the Resident District Commissioner, LC5 Chairman, Chief Administrative Officers, District Natural Resources’ Officers and officials from the Environmental Police unit converged at the District Administrative Hall where they deliberated on the status, challenges in the management of Natural resources and possible solutions to mitigate degradation.

While officially opening the dialogue, the Secretary for Production, Environment and Natural Resources Mr. Faisal Kigongo Luggya thanked Makerere University for championing the move to protect the environment and conducting research on Natural resources to guide policy formulation.

## 6.27 Launch of the Mak RIF Project on Empowerment of Agro Processing Industries (EAPI)



*Project PI's, Invited Guests and Participants pose for a group photo after the launch*

Makerere University RIF Project on the Empowerment of the Agro processing Industry to meet the Quantity and Quality for local and Export Market was launched. The programme focusing on enhancing the practical skills of students in Makerere university was officially launched by the Commissioner of Processing and Marketing from the Ministry of Trade, Industry and Cooperatives Dr. Joshua Mutambi on Thursday 6<sup>th</sup> February, 2020 at the Conference Hall, School of Food Technology, Nutrition and Bio-engineering.

The function brought together officials from the line ministries and agencies, the private sector mainly agro processing industry, civil society organizations, and the academia among others.

In the Financial Year (2019/20), Makerere University received special funding totaling 30 Billion Uganda shillings (equivalent to US\$ 8,100,000) under the Government Research and Innovation Fund (RIF) to complement available research funding to address unfunded priorities critical to accelerating development across different sectors of the economy in Uganda of this, 15 Billion Uganda shillings was disbursed by the Ministry of Finance on the Makerere University Account.

Out of over 700 proposals submitted to the RIF Secretariat, 222 were awarded across the different Colleges and other units (MUBS inclusive). Thirty (30) CAES staff proposals were considered for funding from the RIF Round 1, No. 1, Financial Year 2019/2020

This particular project, *“Empowerment of the Agro processing Industry to meet the Quantity and Quality for local and Export Market; a program focusing on enhancing the practical skills of students in Makerere University”*, is led by Dr. Julia Kigozi as Principal Investigator at an estimated cost of UGX 223 million.

Micro, Small and Medium Scale Enterprises (MSMEs) contribute substantially to provision of basic goods and services and generation of export and tax revenue for national socio economic development and therefore require focus in the nations development agenda. The MSMEs require to enhance their capacity to compete in the domestic, regional and international markets so as to enhance Uganda’s agenda for industrialization.

Academia-Industry-Government (Tripple Helix Partnership) projects have been seen to catalyze phenomenal economic growth. In this project, the School of Food Technology, Nutrition and Bio engineering in partnership with UNBS and the UEPB will train practitioners in 40 Agro processing MSMEs in skills that enable them to develop processes leading to quality products that meet standards for certification as well as the ability to meet the capacity required for the local and export markets. Dr. Julia said

As a partners, the UNBS brings on board the aspect of adherence to national and international standards while the Uganda Export Promotion Board brings in the aspect of product marketing and preparation for export markets. On the other hand, the School of Food Technology, Nutrition and Bio-engineering offer the project modules including Process and value chain management; Product optimization; Application of GMP and Hygiene; Processing; Efficient Quality control; Efficient Waste Management and; Infrastructure development to meet quality and production capacity.

The project goals include to establish a hub that brings together agro processing industry, UNBS, SFNB and UEPB; Train 40 Agro processing MSME’s; Train processors to certification of 40 Agro processing MSME’s; Optimize product quality and food process chain for 20 Agro processors and; to develop plans for quality control, waste management, plant design and product marketing.

Other goals are; train all staff at each of the 20 MSME's facilities in hygiene; enhance skills in critical thinking, problem solving, leadership, teamwork, creativity and communication of graduate students at the school and; establish a hub for design fabrication and dissemination of food processing of equipment.

By the end, the project is expected to have created an information desk, developed training modules, trained 40 students and 40 MSME personnel and enhanced collaboration between the school and food industry stakeholders.

The other expected project outcomes are protocol for collaboration between the university, government and industry; Effective UNBS and UEPB service delivery; Development of locally homegrown solutions for agro processing industry and; students with relevant skills for industry.

## 6.28 CAPnex Policy Dialogue on Water Quality and Food Security

CAES on 31<sup>st</sup> January, 2020 held a policy dialogue on water and food security under the auspices of the project on, "Capacity-building on the Water-Energy-Food Security Nexus (CapNex) in Kenya and Uganda". The policy dialogue was a follow up activity on the research dissemination workshop held in Busia with the beneficiary communities that came up with good recommendations for policy.

The function held at the Conference Hall, School of Food Technology, Nutrition and Bio-Engineering brought together officials from the line ministries and agencies such as Ministry of Water and Environment, (MWE) Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the National Agricultural Research Organization (NARO), the National Environmental Management Authority (NEMA) and the Uganda National Federation of Farmers( UNFFE).

Also present were assorted NGO's, district leaders from Tororo, Namisindwa, Busia and Bungoma, researchers from Makerere, Kyambogo and Uganda Christian University as well as international visitors from Boku University –Austria.



Group leaders presenting the outcome of their discussions during the meeting

The policy dialogue was officially opened by the Head of Office Austrian Embassy Development Cooperation Dr. Roswitha Kremser. The function was also graced by the Vice Chancellor Makerere University represented by the Principal CAES Prof. Bernard Bashaasha.

The objective of the policy dialogue was to discuss the findings of the project and design pathways for sustainable use of local natural resources to provide water, food and other needs of the communities.

CapNex is an Austrian partnership program in higher education and research for development (APPEAR) project being implemented by Makerere University (Uganda), Technische Universität (Vienna), Boku (Austria) and the Technical University of Kenya.

The four-year project (December 2016-2020) is funded by Austrian Development Cooperation (ADC) through the Austrian Agency for International Cooperation in Education and Research (OeAD) at an estimated budget of Euros 390,000.

The project case study was the Sio-Malaba-Malakisi River basin of Uganda and Kenya which traverses Uganda's districts of Tororo, Busia, Namisindwa and Bungoma in Kenya.

The project aimed at illustrating challenges and pathways for sustainable use of local natural resources to provide water, energy, food and building up capacities on the nexus at university and non-university level.

At Makerere University, the project is coordinated by Assoc. Prof. Jeninah Karungi from the Department of Agricultural Production while Dr. Jakob Lederer is the Coordinator Technische Universität Wien Austria.

## 6.29 GREAT 4 Course on Gender-Responsive Plant Breeding

The GREAT course on gender-responsive plant breeding that began in July 2019, ended earlier this month on January 17<sup>th</sup>, six months later. The five-day final phase of the course was held at the Forest Cottages in Bukoto-Kampala on 22<sup>nd</sup>-31<sup>st</sup> July 2019. The course was attended by 26 participants (14 social scientists, 12 biophysical scientists; 7 women, 16 men) from India, Thailand, Benin, Cameroon, Ghana, Malawi, Niger, Sierra Leone, Tanzania, Togo, Uganda, Kenya and Zimbabwe in addition to the 11 trainers from Makerere University, National Agricultural Research Organization (NARO), Cornell University (USA), and University of Wisconsin (USA).

GREAT has advanced and trained more than 120 participants working on various breeding programs in Africa. The project targeted Sub-Saharan Africa but as time went on, the demand went higher and applications started coming in from areas beyond Sub-Saharan Africa.

Participants are expected to become gender champions, and to be agents of change for gender-responsive research in their respective institutions.

The closing ceremony was officiated by Dr. Christine Leuenberger, who represented Cornell University. In her remarks, Dr. Leuenberger applauded Makerere University for its willingness to partner with Cornell University to implement the GREAT course.

### 6.30 Policy Dialogue on Governance of Natural Resources in Wakiso



*Wakiso Local Government Officials and Makerere Environmental Scientists pose for a group photo during the break session*

Environmentalists and Economists from Environment for Development Initiative (Efi-Mak Centre) set out from the Ivory Tower to Wakiso district headquarters to dialogue with the councilors on the governance and management of natural resources in the district.

The dialogue held on 9<sup>th</sup> January, 2020 under the theme, *“Governance and Natural Resource Utilization; Challenges, Gaps and Opportunities”* attracted district executives, (Chairperson for committees, town council chairpersons and clerks, sub-county chairpersons and sub county chiefs, Municipality mayors, town clerks, physical planners, engineers, environmental and tourism officers and councilors from the district committee of Natural Resources.

The policy tour was a follow up activity of the initial dialogue held in November 2019 with government ministry officials, agencies, private sector and civil society that discussed some of the research findings the university had come up with that were important to government when implementing policies. The objective was to come up with workable solutions that can accelerate the rate of growth of the economy without compromising the status of the environment.

The dialogue was officially opened by the Vice Chairperson Wakiso District, Hon. Betty Naluyima who decried the level of depletion of natural resources in the district. Wakiso district is endowed with natural resources including lake and water resources, wetlands, forests, land, sand, clay, stones, minerals, wildlife, air, soil, the sun, human beings etc, the environment and the resources were at stake due to the high population and unsustainable use with land and water resources being big constraints needed for construction and development.

However Environmental degradation in the district is alarming for example the quarry site has not been restored, wetlands have been filled for construction. The oil spills on the lake resulting from the methods of sand mining and trucks has affected fish breeding and will cost us and generations to come. Fish stocks are lower and the population is not accessing the lake site.



### 6.31 RUFORUM Vice Chancellors, Principals, and Deans meeting at Cape Coast Ghana on Continental Agenda 2063

Vice Chancellors, Principals, and Deans from 121 RUFORUM partnering Universities, and stakeholders in agriculture and education convened at Cape Coast Ghana to deliberate on Africa's Universities contribution to the Continental 2063 Agenda.

The meeting dubbed the Vice Chancellors forum was part of the events to mark the 15th RUFORUM Annual General Meeting (2<sup>nd</sup>-6<sup>th</sup> December 2019) hosted by University of Cape Coast-Ghana.



*Prof. Johnny Mugisha and Dr. Abel Atukwase attending the meeting*

Incentivizing research, gender disparities in STEM, limited funding for infrastructure, critical skills training gap was key on agenda. Vice Chancellors, Principals, and Deans from 121 RUFORUM partnering Universities, and stakeholders in Agriculture and education convened at Cape Coast Ghana to deliberate on what it will take to deliver Africa's Universities Agenda for Higher Education, Science, Technology and Innovation (AHESTI). The meeting dubbed the Vice Chancellors forum was part of the events to mark the 15th RUFORUM Annual General Meeting (2<sup>nd</sup>-6<sup>th</sup> December 2019) hosted by University of Cape Coast-Ghana.

Makerere University's Deputy Vice Chancellor in charge of Academic Affairs, Dr. Umar Kakumba, Deputy Principal College of Agricultural and Environmental Sciences Assoc. Prof. Gorette Nabanoga, Dean, School of Agricultural Sciences Prof. Johnny Mugisha, Dean, School of Food Technology, Nutrition and Bio Engineering Dr. Abel Atukwase, Assoc. Prof. Denis Mpairwe from the Department of Agricultural Production and other members were part of the week long activities of the RUFORUM AGM.

The Vice Chancellors forum was held on 4th December, 2019 presided over by the Zambian Minister of Higher Education Dr. Brian Mushimba who delivered the key note address. Hon. Prof. Aiah Gbakima, Minister of Technical and Higher Education, Sierra Leone was the Lead speaker and a team of five panelists from Ghana, Namibia and Dr. Florence Nakayiwa Mayega Deputy Executive Secretary RUFORUM.

Session one of the meeting focused on Enhancing delivery of Africa's Universities Agenda for Higher Education, Science, Technology and Innovation while the second session was on re-engineering Universities in Africa to deliver transformative graduates and innovations.

### 6.32 Post Doctoral Students retooled on Project Management at the RUFORUM AGM Cape Coast

Makerere University Post-Doctoral fellows joined their counterparts from the RUFORUM partnership universities for the skills enhancement training in project management and leadership at University of Cape Coast Ghana.



*A Section of the Makerere team attending the training*

The training was part of the activities to mark the 15th RUFORUM Annual General Meeting (2<sup>nd</sup>-6<sup>th</sup> December 2019) hosted by University of Cape Coast under the theme, “Delivering on Africa’s Universities Agenda for Agricultural Higher Education Science Technology and Innovation (AHESTI): What will it be?”

The aim of the training was to enlighten and improve the trainees’ research setting and future research projects and above all to be more impactful in whatever they are doing, understand why they are doing research, for whom and how to get the best for the farmers and consumers.

The lead instructor from the Netherlands Prof. Gerard Ouden, also specialist in tropical agriculture and program management of research projects decried the poor management and supervision of projects saying, something must be done to improve research projects.

“Many projects we see which pass our desks and donors are of often of poor quality design. So, I thought there was need to equip post-docs to improve skills of developing and managing projects at whatever level especially in agricultural fields.

I designed this course in project management and leadership in such a way that I introduce little by little aspects ranging from stakeholder analysis, how to hold meetings with internal and external parties, financial and risk management, personal development of projects and people have to explain what they think can be done, criticizing one another and applying peer to peer review system”. Prof. Gerard said.

He explained that the idea is that they should be able to apply the knowledge and skills back home because most of the trainees are leading projects, PhD and master’s students and technical staff of international environment.

The training was attended by Dr. Sarah Akello Esimu, Dr. Gabriel Karubanga, and Dr. Sebuliba Mutumba from the Department of Extension and Innovation Studies. Others were Dr. Sarah Chikuta, Dr. Blessing Odogwu and Dr. Hellen Biruma among others.

### 6.33 Graduate Students in Training during RUFORUM AGM in Cape Coast



*Makerere MSc Plant Breeding Students chat with Dr. Richard Edere after the training*

Makerere University Graduate students participated in the training organized by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) and University of Cape Coast (UCC) Ghana.

The training attracted Masters, PhD students and emerging scientists from RUFORUM, a network of 121 universities from 38 African countries. In addition, students from non-RUFORUM universities like Togo, Kenya and Nigeria on mobility scheme also took part in the training.

The five – day training which started on 29<sup>th</sup> November – 3<sup>rd</sup> December 2019, was part of the activities to mark the 15<sup>th</sup> RUFORUM Annual General Meeting (2<sup>nd</sup>-6<sup>th</sup> November 2019) hosted by University of Cape Coast under the theme, “Delivering on Africa’s Universities Agenda for Agricultural Higher Education Science Technology and Innovation (AHESTI): What will it be?”

The training targeted graduate students about to collect research data and those who had finished collecting data. In various universities, students undertake courses such as biometrics and introductory statistics before they go to the field and, by the time they go to the field, they would have forgotten the knowledge hence the need for scientific data management course as a recap.

Most of the students undertaking the course on scientific data management are funded by Mastercard Foundation. In addition to students from RUFORUM, students from Makerere University Regional Centre for crop improvement MaRCCI also attended the training.

Makerere University dons were invited by RUFORUM among the key resource persons to deliver lectures on proposal development, scientific writing and presentation as well as Scientific Data Management and publication.

“The importance of the Scientific Data Management Course is to facilitate students to be able to handle their data especially those at the stage of data analysis so that they can learn what appropriate statistical methods they can use and complete on time”.

### 6.34 GREAT Gender Responsive Rice Breeding Training

GREAT in collaboration with the International Rice Research Institute (IRRI) on 11<sup>th</sup>-16<sup>th</sup> November, 2019 held training on gender responsive rice breeding that attracted over 30 plant breeders and social scientists from Sub-Saharan Africa.

Gender-Responsive Researchers Equipped for Agricultural Transformation (GREAT) is a five-year (2015-2020) joint certificate program funded by the Bill and Melinda Gates Foundation implemented jointly by Makerere University and Cornell University, USA.

The training held at Metropole Hotel in Kampala Uganda was sponsored by IRRI. Participants were drawn from ten countries including Uganda, Kenya, Zanzibar, Tanzania, Madagascar, Mozambique, Senegal, Coted’voire, Burundi, Germany and USA. The objective of the training was to make rice breeding more gender responsive. IRRI and National Agricultural Research Systems and all partners in Asia and Africa have a program that is trying to make rice breeding to move to a more gender responsive plant breeding program.

In order to do that there was need to influence the mindsets and thinking of those who need the skills that are needed to implement the new way of doing breeding in the multi-disciplinary team. The training brought together breeders and agronomists, economists and social scientists including gender researchers together to make that shift.



*Participants pose for a group photo during the break session*

The training was the first step to a longer journey with the GREAT program and Makerere University to make sure that the change started gets established and deep rooted in the organizations involved.

The course based on gender responsive rice breeding targeted researchers from National Agricultural Research Systems from Africa and Japan. The trainers came from the College of Agricultural and Agricultural Sciences and the School of Women and Gender Studies and

partners from Cornell University USA and Dr. Ranjitha – the team leader and a gender expert from Asia. The idea is that the products of the research are able to meet the needs of men and women creating equitable agricultural systems. The focus was also on analysis with a lot of qualitative and quantitative gender data analysis and how to package this so that the product informs the rice breeding program.

### 6.35 GREAT holds first TOT in the world on Women Specific Empowerment in Agriculture Index

Makerere University Gender-Responsive Researchers Equipped for Agricultural Transformation (GREAT) Project hosted the first Trainers of Trainers (ToT) course on the new tool dubbed, “Project specific Women Empowerment in Agriculture Index (ProWEAI) that measures women empowerment and dis-empowerment in agricultural projects.

The three-day training (23<sup>rd</sup>-25<sup>th</sup> October 2019) held at Forest Cottages in Bukoto, a Kampala Suburb, attracted over 30 participants composed of the GREAT Fellows from Sub-Saharan Africa who have gone through the different cohorts, Makerere university Faculty and GREAT Trainers.

This empowerment measure based on the Women’s Empowerment in Agriculture Index (WEAI) was developed in 2012 in Washington DC by the International Food Policy Institute (IFPRI), the United States Agency for International Development (USAID) and Oxford Poverty and Human Development Initiative (OPHI), and will be adapted for project use.



*Participants pose for a group photo after the training session*

The International Food Policy Research Institute received a second round of support from the Bill & Melinda Gates Foundation to adapt and validate a measure of women’s empowerment that agricultural development projects can use to diagnose key areas of women’s (and men’s) dis-empowerment, design appropriate strategies to address deficiencies, and monitor project outcomes related to women’s empowerment.



*One of the Instructors presenting on the Pro-WEAI Tool*

### 6.36 Mak Agricultural Day and Exhibition

The college on 25<sup>th</sup> September, 2019 held an Agricultural Day and Exhibition in the Freedom Square under the theme, “Enhancing Youth involvement in Agriculture to Mitigate increasing Food insecurity and unemployment in Uganda”.

The Agricultural Day and Exhibition was a university-wide event that was spearheaded by students from the College of Agricultural and Environmental Sciences aimed at refocusing the youth towards active involvement in agriculture.

Over 100 exhibitors comprising of staff and students from different colleges mounted stalls showcasing advances in research, technologies and innovations aimed at addressing challenges in the agricultural sector and related fields.

The function was presided over by the President of Republic of Uganda, Gen. Yoweri Museveni. The president was impressed by the technologies and innovations, and invited all Makerere researchers to State House after the independence anniversary in October 2019 to discuss how university technologies and innovations could be scaled out to cause transformation in the agricultural sector.

The president also directed the line ministries including the Ministry of Science and Technology to be part of this conference to forge a way of establishing a government fund to support graduate training especially in the science disciplines.



*President Yoweri Museveni inspects the Mak Soy Stall during the Makerere Agriculture Day and Exhibition*

### List of CAES Exhibitors

SN	Name of exhibitor(s)	Technologies
1	Dr. Opolot Emmanuel	Mak-Soil Test Kit
2	Christopher Mugambe	Mak- Bio fertilizer-Rhizobia Packs
3	Dr. Fred Kabi	Earthworm and Black Solider Fly breeding
4	Ogwang Bobby	
5	Mr. Okiror Anthony	Tissue Culture technology (In-Vitro)
6	Mr. Kyeyune Gerald	Mushroom production (From Seed production to processing)
7	Dr. Stephen Lwasa	Agri-Business Planning, Records Enterprise Selection, Enterprise Combination And Profit Assessment
8	Ms. Nabirye Winfred	
9	Prof. Phinehas Tukamuhabwa	Improving Soybean Productivity
10	Mr. Tonny Obua	
11	Ms. Mercy Namara	
12	Byamukama Julius	
13	Dr. Edema Richard	Value addition to traditional Sorghum and Cowpea and breeding for improved productivity and resistance to diseases, pest and climate stress
14	Dr. Sarah Esimu	
15	Dr. Isaac Dramatri	
16	Papius Tumusingize	Hydroponics and Smart Greenhouses Agro technology
17	Tukamushaba Judith	
18	Dr. Ssegawa Apollo	Coffee Value Addition -CURAD
17	Karyowa Tonny	
19	Dr. Balimuni Hussein	Value addition to Agricultural products (With a Mobile Juice Extractor)
20	Ms. Manda Eugene	Choice of the right foods for Health maintenance

21	Mr. Kasujja	Commercializing Organic Farming Using Biological Control Agents
22	Mr. Aziz Charles Dara	Energy Saving Technologies
23	Mr. Tweyambe Chrysostom	Commercial Feed Formulation
24	Ssali Mukisa Ronald	Bamboo the Miracle Crop
25 26 27	Kagezi B. Kabali Rwanchende	Portable Waste Management Anaerobic Digester/ Biogas Digester
28	Sabiiti Christopher	Art and Crafts
29	Jonathan Byaruhanga	Agribusiness Aspects of Honey, Bakery and Personalized Notebooks
30	Makerere University Food Science Students Association	Moringa Enhanced Composite Flour Vanilla, Strawberry and Coffee Flavoured Ice Cream.
31	Nutrilite Uganda	Nutrition Education and Counselling
32 33 34	Samuel Mabonga Tereza Najjalwambi Gideon Mpungu	Certification and Documentation Simplified
35	Stellah Nuwasasira	Enhancing Youth Involvement in Agriculture to Mitigate increasing Food Insecurity and Unemployment in Uganda
36	Students Of Land Use Management (MULUMA)	Sustainable Smart Agriculture for Small and Large Scale Production
37	Tasobya Rollings	Solar Powered Cooling System
38 39 40 41 42 43 44 45	Ouga Moses Kemigisha Fortunate Basime Deus Bagonza Gerald Kabanda Issa Bazimudde Jackie Jackie Bazimudde Kakembo Henry	Agricultural engineering technologies(Cocoa Grinding Machine ,Cassava Chipper, Milking Machine, fruit pulper, rice planter , Gnut sheller, Feed mixer etc
46 47	Tunta Umalu Ssengooba Ramathan	Soil design for Hydrogel Technology, Maize Chilly and pepper value addition
48	Nabirye Winfred	Agribusiness aspects of farming
49	Abomugisha Porito	Grain Amaranth Production and Processing (GAPP)
50	Akanyijuka Susan	Mushroom Exhibition
51	Segawa Mike	Fabrication of an Acre Mobile Passion Fruit Garden
52	Mutyaba Yusuf Bagansimbe	Biochar Presentation
53 54 55	Mwesigwa Jonah Balinda Roland Mujungu Baluku Samuel	Catamaran Boat Models
56	Kemigyisha Fortunate	Air Cleaning Chamber and Manual Milking Machine
57 58 59 60	Mabonga Samuel Najjalwambi Tereza Mpungu Gideon Ondoma William	Certification and Documentation Simplified
61	Ocen Ambrose	Agribusiness aspects of farming
62 63	Wekesa Julius Ngamville Osole Joel	Pasture production
64 65	Maniae Merab Natwijuka Brian	Juice, pumpkin porridge, Superchilo



66 67	Martin Bugembe Baguma Joshua	Banana juice production
68 69 70	Nshaka Kalim Z Bagamba Nathan Nuwasasira Stellah	Beads Value Addition & Jewellery
71	Ssegawa Mike	Passion fruit production
72	Kalumba Mathew	Honey production and value addition
73 74	Katuro Moses Nantume Hajara	Skilling the youth/ students for agri- entrepreneurship skills (service entity)
75	Rwothomio Joseph	Production of Sugar cane juice

### 6.37 College Publications and Branding Materials Secured

CAES Strategic Planning Committee of 5 was constituted. The College Strategic Plan (2020-2030) drafted, shared with College Stakeholders and the University Planning Committee for input. College branding materials including banners, tear drops, flyers and brochures were procured.



# HUMAN RESOURCE FUNCTION

## 7.0 HUMAN RESOURCE FUNCTION

### 7.1 Academic Staff Career Development/Promotion

In the last quarter, Dr. Jackie Bonabana Wabbi was promoted to Assoc. Professor, Prof. Phinehas Tukamuhabwa and Prof. Bernard Bashaasha were offered Post Retirement Contracts, Dr. Anthony Mwijje was confirmed into University Service while Assoc. Prof. Lwasa Shuaib resigned.

At its 638<sup>th</sup> meeting held on 17<sup>th</sup> July 2020 the Appointments Board made the following decisions

Name	Post Considered	Department	Decision
Prof. Joseph Obua	Professor	Forestry, Bio diversity and Tourism	Offered Post Retirement Appointment
Dr. Amos Ochieng	Assistant Lecturer	Forestry, Bio diversity and Tourism	Contract Renewed

At its 638<sup>th</sup> meeting held on 3<sup>rd</sup> March 2020 the Appointments Board made the following decisions

Name	Post Considered	Department	Decision
Dr. Denis Male	Lecturer	Food Technology and Nutrition	Confirmed
Dr. Robert Fungo	Lecturer	Food Technology and Nutrition	Confirmed
Ms. Ayaa Filda	Assistant Lecturer	Agricultural and Biosystems Engineering	Confirmed

### 7.2 Staff / Student Awards

#### 7.2.1: CAES recognizes the best science student of the Mak 70<sup>th</sup> Graduation Ceremony

The CAES recognized Ms. Sarah Namayengo with a plaque and shs. 500,000 for her outstanding academic performance as Best Science student at Makerere University during the 2018/2019 Academic year.



Ms. Namayengo displays her Plaque after the award

Ms. Namayengo was recognized on 27<sup>th</sup> February 2020 during the College Academic Board Meeting held at the Conference Room, School of Agricultural Sciences. Namayengo was presented before the Academic Board by the Dean, School of Forestry, Environmental and Geographical Sciences Assoc. Prof. Fred Babweteera.

The College Academic Board was chaired by the Principal CAES Prof. Bernard Bashaasha flanked by his Deputy Assoc. Prof. Gorretie Nabanoga. Ms. Namayengo Sarah undertook a four years' course in Bachelor of Conservation Forestry and Products Technology under the Department of Forestry, Biodiversity and Tourism (FBT), School of Forestry, Environmental and Geographical Sciences (SFEsG).

She emerged the overall Best Science student during the Makerere University 70<sup>th</sup> Graduation with a CGPA 4.83. Presenting the student before the College Academic Board, the Dean SFEs Assoc. Prof. Fred Babweteera said the school had agreed to recognize the students for exemplary performance.

*“Thank you for being the best student in the department, at the school level, the college and the entire university”,* Assoc. Prof. Fred Babweteera said. Handing over the Award, the Principal CAES Prof. Bernard Bashaasha said the college was going to work on modalities to retain Ms. Sarah Namayengo.

This was the second time the university is recognizing Ms. Sarah Namayengo. During the first day of Makerere University’s 70<sup>th</sup> Graduation Ceremony the Makerere University Convocation awarded Namayengo Sarah with UGX 1 million and a Plaque as a token of appreciation for her hard work. For this College Award, Ms. Namayengo had this to say: *“I am happy for the recognition. I owe my success to my teachers, friends and family”,* the joyful Sarah said.

### **7.2.2: Dr. Emmanuel Opolot wins the Future Leaders African Independent (FLAIR) Research Fellow 2020-2022**

Dr. Emmanuel Opolot won the Future Leaders African Independent (FLAIR) Research Fellowship 2020-2022 under the project title: *Digital soil information for targeting soil, water and nutrient management options for enhanced crop yields and livelihoods in Uganda (FLR\R1\201004)*. This fellowship is supported by the Royal Society in collaboration with the African Academy of Sciences. With a funding of £288,333, this research aims at improving access to soil information by smallholder farmers for sustainable soil, water and nutrient management, and consequently increased crop yields and incomes. The main deliverables will include soil water budgets, irrigation scheduling charts, nutrient use efficiencies and fertilizer recommendations for five irrigation schemes in Uganda. Part of the funding will go to buying soil physics lab equipment and research costs for 2 MSc students in soil science and integrated watershed management.

### **7.2.3: Assoc. Prof. Donald R. Kugonza appointed member of the African Technology and Innovation Incubators Advisory Committee (ATIAC).**



In consideration of his profile and expertise in technology development and innovation, Assoc. Prof. Donald Kugonza was selected to act as a member of the African Technology & Innovation Incubators Advisory Committee (ATIAC) by the Director and Head of Mission of the African Union Interafrican Bureau for Animal Resources (AU-IBAR) Prof. Ahmed El-Sawalhy, in an appointment letter dated 30th March, 2020.

The African Union Interafrican Bureau for Animal Resources (AU-IBAR) is a specialized technical office of the African Union under the Department of Rural Economy and Agriculture (DREA) of the African Union Commission mandated to support and coordinate the utilization of animals as a resource for the wellbeing of humans in the member states of the African Union and to contribute to economic development particularly rural area.

Dr. Donald Kugonza was also appointed by the Minister of Education as Chairperson of the Governing Council, Fisheries Training Institute, Uganda for a three year term. He was also appointed by the Director of the African Union Interafrican Bureau for Animal Resources to the expanded Animal Genetic Resources Taxonomy Advisory Group (AnGR-TAG). He was re-appointed by NARO Governing Council as Chairman of the Advisory Committee for National Livestock Resources Research Institute (NARO-NaLIRRI).

**7.2.4: Prof. Noble Banadda selected among the 10 O.R. Tambo Africa Research Chairs Initiative (ORTARChI)**



*Prof. Noble Banadda attends the Virtual Launch of the O.R. Tambo Africa Research Chairs Initiative on 27th October 2020, AICAD Project Office, Makerere University, Kampala Uganda.  
Prof. Banadda is one of ten recipients of the ORTARChI.*

Prof. Noble Banadda was on 27<sup>th</sup> October 2020 inaugurated among the 10 Oliver Reginald Tambo Africa Research Chairs Initiative (ORTARChI). The inauguration ceremony was held via zoom from South Africa. In Uganda and Makerere University, the ceremony was witnessed by media at Prof. Banadda's AICAD Project Office.

For the next five years, Prof. Banadda will be receiving 250,000 US dollars annually and an additional offer of 100,000 Euros from Wageningen University for the next 15 years. The grants will be utilized in supervising research in agricultural waste management on farms with a target of 15 PhDs, 9 Post Doctorates and 27 Masters.

This ORTARChI chair and grant feeds into the University Vision as enshrined in its new Strategic Plan (2020-2030) that is geared towards being a research-led. Secondly, it is the first time Makerere wins a research chair that is funded at Makerere.

Under this grant, Makerere University will work with South Africa's Stellenbosch University and Wageningen University of the Netherlands to expose students to different environments that also feeds into university's internationalization agenda.

The Virtual O.R. Tambo Africa Research Chairs Initiative launch was facilitated by Joy Doreen Biira, Moderator & Media Personality (Kenya) while the welcome address was delivered by Dr. Molapo Qhobela CEO, National Research Foundation (South Africa).

ORTARChI is an initiative of South Africa's National Research Foundation (NRF) and the Department of Science and Innovation (DSI), in partnership with the Oliver & Adelaide Tambo Foundation (OATF), Canada's International Development Research Centre (IDRC), and seven councils of the Science Granting Councils Initiative in Sub-Saharan Africa (SGCI).

For the next five years, the chairs at these public universities in seven countries across the African Continent will conduct research and support high-end skills development on a diverse range of topics including climate, public health, entrepreneurship and youth employment. Aligned to the global concept of research chairs, these world-class researchers will not only lead multidisciplinary research teams, but also train the next generation of researchers, said Dr. Molapo Qhobela, Chief Executive Officer, NRF. This initiative builds on the work of Oliver Tambo, a prominent South African and Pan-Africanist with a science education background, who believed in creating change through education and in cooperation and solidarity among African nations.

### **7.2.5: Dr. Prossy Isibakalu recognized as an International Gender Champion**



High Commissioner Alison Chartres is committed to highlighting achievements of incredible women in East Africa. In October 2020, the High Commissioner celebrated Dr. Prossy Isibakalu, a Senior Lecturer at the Department of Extension and Innovation Studies. Dr. Isibakalu is also an Alumnus of the Australian Center for International Agricultural Research (ACIAR) Jogh Dillion Fellowship where she took an executive leadership course on agricultural research and management at the University of Sunshine Coast in Queensland Australia. Dr. Isibakalu continues to work on ACIAR supported projects in Uganda to improve food security and resilient livelihoods for women and girls.

### **7.2.6: Dr. Robert Fungo inducted as Fellow Uganda Academy of Sciences (UNAS)**



Dr. Robert Fungo was inducted to the coveted Uganda National Academy of Sciences (UNAS) as fellow on 22<sup>nd</sup> October 2020, at the 20<sup>th</sup> Annual Scientific Conference and General Meeting because of his exemplary works and expertise. The two-day induction ceremony took place virtually. Out of 18 participants, Dr. Fungo was the youngest nominee in the cohort this year. Recruitment and induction is done from recommendations provided by Senior Scientists and Academicians at UNAS. Dr. Fungo was nominated by Assoc. Prof. Donald Kugoza and seconded by Prof. John Muyonga. He is the only Fellow inducted this year from CAES. Applications are

open to other African nationals.

UNAS is a multidisciplinary platform that gives top scientists and research students a platform for networking and collaborating with fellow scientists. It is a forum of academicians that promotes knowledge sharing in science and providing evidence-based advice to government, on how to address issues of development in the country. These areas range from health, nutrition, education, agriculture and other development focus areas.

Dr. Fungo's work involves working with local communities by using local solutions such as local foods especially beans to address malnutrition in Africa by tapping into the multidisciplinary teams cutting across agriculture, environment and nutrition, health, policy and governance, children and youth, areas that CAES's work is keen on addressing through bean research and development. The UNAS platform will leverage local foods as vehicle foods for enhancing nutrition, food security and income among vulnerable populations in Africa. The platform will also be a chance to collaborate with other science colleagues in joint proposals with colleagues at UNAS.

### **7.2.8: Prof. Elly Sabiiti Triple Appointment**



Senior University Staff, Prof. Elly Sabiiti was appointed by Minister of Education and Sports as Council Member on Busitema University representing Government effective July 2020-2024. He was also elected Chairperson Appointments Board of Busitema University Council with effect from July 2020-2024 and Vice President for the African Academy of Sciences representing Eastern Africa 2020-2023.

### **7.3 Contract Staff**

A total 24 contract staff are paid by the college. College was unable to handle payment of contract staff. Some contract staff had not been paid for nine months.

### **7.4 Staff Retooling**

Academic staff were engaged in a series of ODeL /Blended learning training. Student and staff access to MUELE Limited by data costs and slowness of the internet. There is need to upgrade MUELE server to handle increased volume of data. The e-learning focal teams at college and school levels were established.

### **7.5 Vacant Positions**

CAES had only the Position of Technician Food Science advertised. The advertisement was for the requests for the period 1<sup>st</sup> January to June 2020. The Vice Chancellor had allowed a mop-up to be urgently done for the period 1<sup>st</sup> January 2019 to 31<sup>st</sup> December 2019. Positions that fell vacant between July 2019 to June 2020 were sent to the Human Resource. The position of College Registrar, Chief Custodian and Web Administrator are vacant plus gaps for technicians.

### **7.6 COVID 19 Screening**

Sanitizers were availed at all unit entrances, temperature guns availed to schools by the Center and masks wearing made mandatory for entry to the college buildings. The university also embarked on free mass staff testing in the freedom square.

### **7.7 Staff Offices in the New Graduate Teaching Laboratory at MUARIK**

Members were allocated offices and asked to pick keys from custodian MUARIK. However these were not enough for all interested staff.

## 7.8 Academic Staff Establishment as of October 2020

### 7.8.1: School of Agricultural Sciences

Department of Agribusiness and Natural Resource Economics							
Rank	Est	Filled	Vacant	Name	Gender	Status	Comment
Professor	2	6		Mugisha Johnny	M	Permanent	Dean
Professor				Sserunkuuma Dick	M	Permanent	
Professor				Bashaasha Bernard	M	Permanent	Principal
Professor				Hyuha Theodora S	F	Contract	
Professor				Buyinza Mukadazi	M	Permanent	Director DRGT
Associate Professor	3	0	3	Vacant			
Senior Lecturer	6	5	1	Elepu Gabriel	M	Permanent	HOD
Associate Professor				Bonabana Jackline	F	Permanent	
Senior Lecturer				Bagamba Fredrick	M	Permanent	
Senior Lecturer				Diiro Gracious Malton	M	Permanent	
Senior Lecturer				Walekwa N Peter	M	Permanent	
Lecturer	8	4	4	Tatwangire Alex	M	Permanent	
Lecturer				Ilukor John	M	Permanent	
Lecturer				Isoto Rosemary Emegu	F	Permanent	
Lecturer				Turinawe Alice	F	Permanent	
Assistant Lecturer	8	5	3	Bukenya Mohamed	M	Permanent	
Assistant Lecturer				Lwiza Florence Nsereko	F	Permanent	
Assistant Lecturer				Lwasa Stephen	M	Probation	
Assistant Lecturer				Ahikiriza Elizabeth	F	Contract	
Assistant Lecturer				Omait George William	M	Probation	
Part Time Assistant Lecturer				Nelson Nsereko	M	Part Time	
Part Time Assistant Lecturer				Deusdedit Turyomurwego	M	Part Time	
Part Time Assistant Lecturer				Christopher Tugatungire	M	Part Time	
Part Time Assistant Lecturer				Grace Flavia Lamuno	F	Part Time	
Department of Agricultural Production							
Professor	5	4	1	Bareeba Felix Budara	M	Contract	
Professor				Sabiiti Elly Nyambobo	M	Contract	
Professor				Kyamanywa Samuel	M	Contract	
Professor				Tukamuhabwa Phinehas	M	Permanent	
Associate Professor	5	11	-6	Mutetikka David	M	Contract	Ends Sept 2020
Associate Professor				Basamba Ali Twaha Ateenyi	M	Permanent	
Associate Professor				Nabasirywe Margeret	F	Contract	
Associate Professor				Karungi Jeninah	F	Permanent	
Associate Professor				Talwana Herbert	M	Permanent	
Associate Professor				Kabi Fred	M	Permanent	
Associate Professor				Mukasa Settumba Blasio	M	Permanent	
Associate Professor				Kugonza Donald Rugira	M	Permanent	



Associate Professor				Mpairwe Denis R	M	Permanent	
Associate Professor				Tenywa Stephen	M	Contract	
Associate Professor				Nambi-Kasozi Justine	F	Permanent	
Senior Lecturer	12	9	3	Tusiime Geofrey	M	Permanent	
Senior Lecturer				Edema Richard	M	Permanent	
Senior Lecturer				Ebanyat Peter	M	Permanent	
Senior Lecturer				Katongole Constantine Bakyusa	M	Permanent	
Senior Lecturer				Katusabe Alice Amoding	F	Permanent	
Senior Lecturer				Tumuhairwe John Baptist	M	Permanent	HOD
Senior Lecturer				Bisikwa Jenipher	F	Permanent	
Senior Lecturer				Ochwo Ssemakula M K N	F	Permanent	
Senior Lecturer				Katuromunda Sylvester	M	Contract	
Lecturer	18	12	6	Tibayungwa Francis	M	Permanent	
Lecturer				Nagaya Lukman Mulumba	M	Probation	
Lecturer				Wasswa Peter	M	Permanent	
Lecturer				Olupot Giregon	M	Permanent	
Lecturer				Walusimbi Sadhat	M	Permanent	
Lecturer				Odong Thomas Lapaka	M	Permanent	
Lecturer				Zziwa Emmanuel	M	Permanent	
Lecturer				Ongom O Robert Cyrus	M	Permanent	
Lecturer				Opolot Emmanuel	M	Permanent	
Lecturer				Taulya Godfrey	M	Permanent	
Lecturer				Musinguzi Patrick	M	Permanent	
Lecturer				Nuwamanya Epraim	M	Contract	
Assistant Lecturer	16	7	9	Tibezinda Mary	F	Probation	
Assistant Lecturer				Kamatara Kanifa	F	Permanent	
Assistant Lecturer				Magala Henry	M	Probation	
Assistant Lecturer				Mwije Anthony	M	Permanent	
Assistant Lecturer				Idibu Joachine	M	Probation	
Assistant Lecturer				Simon John Bright	M	Contract	
Assistant Lecturer				Obua Tonny	M	Contract	
<b>Department of Extension and Innovation Studies</b>							
Professor	2	2	0	Agea Jacob Godfrey/Hod	M	Permanent	
Professor				Turyahabwe Nelson	M	Permanent	HOD
Associate Professor	3	3	0	Najjingo Mangheni M K	F	Contract	
Associate Professor				Kibwika Paul	M	Permanent	
Associate Professor				Nabanoga Gorette	F	Permanent	Deputy Principal
Senior Lecturer	5	5	0	Miir Richard	M	Permanent	
Senior Lecturer				Isubikal Prossy	F	Permanent	
Senior Lecturer				Kyazze Florence Birungi	F	Permanent	
Senior Lecturer				Obaa Bernard Bonton	M	Permanent	

Senior Lecturer				Okiror John James	M	Permanent	
Lecturer	8	5	3	Karuhanga Monica	F	Permanent	
Lecturer				Karubanga Gabriel	M	Permanent	
Lecturer				Mubangizi Narisi	M	Permanent	
Lecturer				Nasirumbi Losira	F	Probation	
Lecturer				Akello Sarah	F	Probation	
Assistant Lecturer	8	5	3	Orum Emuria Boniface	M	Permanent	
Assistant Lecturer				Mulugo Lucy	F	Permanent	
Assistant Lecturer				Mawa Christopher	M	Permanent	
Assistant Lecturer				Mukebezi Rebecca	F	Permanent	
Assistant Lecturer				Biryomumaishe Dickson		Contract	

### 7.8.2: School of Food Technology, Nutrition and Bio-Engineering

#### Department of Food Technology and Nutrition

Professor	1	3	-2	Muyonga John	M	Permanent	Sabbatical Leave
Professor				Kaaya Archileo	M	Permanent	
Professor				Muyanja Charles	M	Permanent	
Associate Professor	1	4	-3	Kyamuhangire William	M	Permanent	To Retire In Sept. 2020
Associate Professor				Byaruhanga Yusuf	M	Permanent	
Associate Professor				Nakimbugwe Ndawula Dorothy	F	Permanent	
Associate Professor				Mukisa Muzira Ivan	M	Permanent	HOD
Senior Lecturer	3	3	0	Kabahenda Margaret	F	Permanent	
Senior Lecturer				Atukwase Abel	M	Permanent	Dean
Senior Lecturer				Acham Hedwig	F	Permanent	
Lecturer	4	6	-2	Nabubuya Agnes	F	Permanent	
Lecturer				Turyashemerwa Mary Florence	F	Permanent	
Lecturer				Mugabi Robert	M	Permanent	
Lecturer				Tumuhimbise Gaston Ampek	M	Permanent	
Lecturer				Fungo Robert	M	Probation	
Lecturer				Male Denis	M	Probation	
Assistant Lecturer	4	1	3	Lukwago Fred Brany	M	Permanent	
Pilot Plant Supervisor	1	1	0	Vacant			
Chief Technician				Balamaze Joseph	M	Permanent	
Part Time Lecturer				Magara-Nyago Christine	F	Part Time	

#### Department of Agricultural and Biosystems Engineering

Professor	1	1	0	Banadda Noble Ephraim	M	Permanent	HOD
Associate Professor	2	1	1	Zziwa Ahamada	M	Permanent	
Senior Lecturer	4	6	-2	Kawongolo John Bosco	M	Permanent	
Senior Lecturer				Wanyama Joshua	M	Permanent	
Senior Lecturer				Kiggundu Nicholas	M	Permanent	

Senior Lecturer				Komakech Allan John	M	Permanent	
Senior Lecturer				Kabenge Isa	M	Permanent	
Senior Lecturer				Kivumbi Hussein Baimunsi	M	Permanent	
Lecturer	4	4	0	Mulamba Peter	M	Permanent	
Lecturer				Kambuğu-Kyeyune Robert	M	Permanent	
Lecturer				Kigozi Bulya Julia	M	Permanent	
Lecturer				Tumutegyeize Peter	M	Probation	
Assistant Lecturer	4	4	0	Ayaa Filder	F	Probation	
Assistant Lecturer				Okori Francis	M	Contract	
Assistant Lecturer				Cherotech Sam	M	Contract	
Assistant Lecturer				Nakawuka Rossy	F	Contract	
Assistant Lecturer							

### 7.8.3: School of Forestry, Environmental and Geographical Sciences

#### Department of Forestry, Bio-Diversity and Tourism

Professor	4	5	-1	Nyakaana Jockey Baker	M	Contract	
Professor				Banana Abwoli Yabezi	M	Contract	
Professor				Tweheyo Mnason	M	Permanent	
Professor				Nyeko Philip	M	Permanent	
Professor				Obua Joseph	M	Contract	
Associate Professor	4	6	-2	Eilu Gerald	M	Permanent	
Associate Professor				Okullo John Bosco	M	Permanent	
Associate Professor				Babweteera Fred	M	Permanent	Dean
Associate Professor				Ahebwa W Manyisa	M	Permanent	
Associate Professor				Mwavu Nector Edward	M	Permanent	HOD
Associate Professor				Balaba Susan Tumwebaze	F	Permanent	
Senior Lecturer	10	5	5	Bahati Joseph Basikhan	M	Permanent	
Senior Lecturer				Mugabi Paul	M	Permanent	
Senior Lecturer				Nakabonge Grace	F	Permanent	
Senior Lecturer				Orikiriza Baguma Lawrence Justus	M	Permanent	
Senior Lecturer				Ayorekire Jim	M	Permanent	
Lecturer	10	7	3	Mbogga Michael Ssekaayi	M	Permanent	
Lecturer				Nagawa Christine Betty	F	Permanent	
Lecturer				Muhwezi Deus Kamunyu	M	Permanent	
Lecturer				Rutabatiina Abraham Mwesigye	M	Permanent	
Lecturer				Mugizi Francis	M	Permanent	
Lecturer				Kizito Simon	M	Permanent	
Lecturer				Ssekuubwa Enoch	M	Permanent	
Assistant Lecturer	10	4	6	Byaruhanga Micheal	M	Probation	
Assistant Lecturer				Kimbowa Francis	M	Probation	
Assistant Lecturer				Sseremba Owen Emmanuel	M	Permanent	

Assistant Lecturer				Syofuna Agatha	F	Permanent	
Part Time Teaching Assistant				Waako Fred	M	Part Time	
Part Time Teaching Assistant				Omony A. Komakech	M	Part Time	
Part Time Teaching Assistant				Ojiambo Patrick Lwande	M	Part Time	
Part Time Teaching Assistant				Semakula Samora	M	Part Time	
Part Time Teaching Assistant				Agaba Ezra Joab	M	Part Time	
Part Time Teaching Assistant				Kawungezi Sarah	M	Part Time	
Part Time Teaching Assistant				Aweebwa John	M	Part Time	
Part Time Teaching Assistant				Ochieng Amos	M	Part Time	
Lecturer				Boonabana Brenda	F	Part Time	
Department of Environmental Management							
Professor	5	2	3	Kansiime Frank	M	Permanent	
Professor				Tabuti John Robert Stephen	M	Permanent	
Associate Professor	5	2	3	Muwanika Bampalana Vincent	M	Permanent	
Associate Professor				Tumusiime David D M	M	Permanent	Ag. Director MUBFS
Senior Lecturer	10	4	6	Namaalwa Justine	F	Permanent	HOD
Senior Lecturer				Nakileza Roga Bob	M	Permanent	
Senior Lecturer				Egeru Anthony	M	Permanent	
Senior Lecturer				Nyombi Kenneth	M	Permanent	
Lecturer	10	3	7	Byakagaba Patrick	M	Permanent	
Lecturer				Musaali Paul	M	Permanent	
Assistant Lecturer	15	6	9	Nalwanga Faridah S	F	Permanent	
Assistant Lecturer				Natumanya Ezra	M	Permanent	
Assistant Lecturer				Kayendeke Ellen	F	Permanent	
Assistant Lecturer				Erima Godwin	M	Permanent	
Assistant Lecturer				Yikii Fred	M	Permanent	
Assistant Lecturer				Balikoowa Kenneth	M	Permanent	
Part Time Lecturer				Barasa Bernard	M	Part Time	
Part Time Lecturer				Kinobe Joel	M	Part Time	
Part Time Lecturer				Aboda Caroline	F	Part Time	
Part Time Lecturer				Mulinde Catherine	F	Part Time	
Department of Geography, Geo-Informatics and Climatic Sciences							
Professor	3	0	3	Vacant			
Associate Professor	3	4	-1	Lwasa Shuaib	M	Permanent	Resigned
Associate Professor				Tumwine Fredrick Ruguma	M	Permanent	
Associate Professor				Bamutaze Yazidhi	M	Permanent	
Associate Professor				Mugagga Frank	M	Permanent	HOD
Senior Lecturer	6	4	2	Twinomuhangi Revocatus	M	Permanent	
Senior Lecturer				Waiswa Daniel	M	Permanent	
Senior Lecturer				Isolo Mukwaya Paul	M	Permanent	
Senior Lecturer				Mfitumukiza David	M	Permanent	

Lecturer	10	9	1	Nanteza Jamait	F	Permanent	
Lecturer				Nimusiima Alex	M	Permanent	
Lecturer				Twinorugyendo Penninah	M	Permanent	
Lecturer				Sabiiti Geoffrey	M	Permanent	
Lecturer				Semakule Musoke Henry	M	Contract	
Lecturer				Ddumba Saul Daniel	M	Permanent	
Lecturer				Wasswa Hannington	M	Permanent	
Lecturer				Mugume Isaac	M	Permanent	
Lecturer				Nseka Denis	M	Probation	
Assistant Lecturer	8	8	0	Vacant			
Part Time Lecturer				Basaliwa Charles P.K.	M	Part Timer	
Part Time Lecturer				Nadhomi Daniel	M	Part Timer	
Assistant Lecturer				Aboda Carloline	F	Part Timer	
Assistant Lecturer				Mulinde Catherine	F	Part Timer	

## 7.9 Administrative and Support Staff

Principal's Office			
Rank	Name	Gender	Status
Principal	Bashaasha Bernard	M	Principal
Deputy Principal	Nabanoga Gorette	F	Deputy Principal
College Registrar	Vacant		
Assistant Accountant/Team Leader	Akatukiza Joeseline	F	Permanent
Asst. Procurement Officer	Ikomo David	M	Permanent
Procurement Clerk	Niyonzima Dismas	M	Permanent
Librarian	Mulumba Onan	F	Permanent
Principal Communication Officer	Anyango Jane	F	Permanent
Human Resources Officer	Hawa Harriet J	F	Permanent
Administrative Secretary	Nantale Mary	F	Permanent
Senior Administrative Assistant	Apolot Christine O.	F	Permanent
Web Administrator	Vacant		
Secretary	Vacant		
Assistant Grants Accountant	Namusoke Terry	F	
Assistant Grants Accountant	Mbabazi Grace	F	
Chief Custodian	Vacant		
Systems Administrator	Muhumuza Kiiza Albert	M	Contract/College
Records Clerk	Dinah Acheko	F	Contract/College
Custodian	Muhairwe Jude	M	Contract/College
Messenger	Namirembe Rose	F	Contract/College
Driver	Mabongo Wilson	M	Contract/College
Driver	Makonzi Eric	M	Contract/College
Office Attendant	Kisembo Wilson	M	Contract/College
Watchman	Kayima Humalu	M	Contract/College

Watchman	Oundo Dominic	M	Contract/College
Dean's Office School of Agricultural Sciences			
School Registrar	Makune Hilda Eve	F	Contract/College
Administrative Assistant	Sanyu Vicky	F	Contract
Personal Secretary	Nanziri Sarah	F	Permanent
Messenger	Masika Astaluzi	F	Contract
Head Cleaner	Mayanja Gorretti	F	Permanent
Cleaner	Nankya Teddy	F	Permanent
Cleaner	Nsubuga Michael	M	Permanent
Cleaner	Kiggundu Habibu	M	Permanent
Cleaner	Birungi Rose	F	Permanent
Sanitary Cleaners	Nassanga Costancy	F	Permanent
Sanitary Cleaners	Mwiyeretsi James	M	Permanent
Driver	Kato Tom	M	Permanent
Turn Boy	Buzimwa Muhammadi	M	Permanent
Turn Boy	Wairagala Bonny	M	Permanent
Custodian	Vacant		
Security Officer	Alelo Christine	F	Permanent
Security Officer	Musaazi Matthias	M	Permanent
Security Officer	Collin Wandwali	M	Contract
Department of Agribusiness & Natural Resources Economics			
Principal Technician	Aguttu Gorreti	F	Permanent
Pool Stenographer	Nakafeero Immaculate	F	Permanent
Cleaner	Serugendo Jones	M	Permanent
Cleaner	Nalukwago Maria	F	Permanent
Department of Agricultural Production			
Chief Technician	Kyeyune Gerald	M	Permanent
Chief Technician	Kiirya David	M	Permanent
Principal Technician	Serunjoji Katende Steven	M	Permanent
Principal Technician	Natumanya Robert	M	Permanent
Principal Technician	Kakooza Lydia	F	Permanent
Senior Technician	Mutebi Emmanuel	M	Permanent
Technician II	Muzee Patrick	M	Permanent
Technical Assistant	Najjuma Christine	F	Permanent
Lab. Attendant	Nagaddya Harriet	F	Permanent
Lab. Attendant	Kawooya Teddy Mary	F	Permanent
Cleaner/Messenger	Nabimanya Deborah	F	Permanent
Cleaner/Messenger	Kyobutungi Edith	F	Permanent
Cleaner	Kabonesa Grace	F	Permanent
Cleaner	Ssempija Steven	M	Permanent
Cleaner	Bukenya Joseph	M	Permanent

Cleaner	Nanozi Margaret	F	Permanent
Labourer	Muhereza Richard	M	Permanent
Labourer	Ndaba Andrew	M	Permanent
Labourer	Bukenya Joseph	M	Permanent
Gardener	Onyera Mary	F	Permanent
General Farm Worker	Nantale Agnes	F	Permanent
Copy Typist	Nakaana Peninah	F	Permanent
Technical Assistant	Nabutanda Juliet	F	Contract/College
<b>Extension &amp; Innovation Studies</b>			
Senior Copy Typist	Nambatya Ruth	F	Permanent
Lab. Technician	Kasujja Geoffrey	M	Permanent
Cleaner/Messenger	Ndagire Deborah	F	Permanent
<b>School of Forestry, Environmental and Geographical Sciences</b>			
<b>Dean's Office</b>			
Assistant Registrar	Kiganda Dan	M	Permanent
Cusdtodian	Nankunda Bennet	F	Permanent
Secretary	Conslata Nakiyemba	F	Permanent
Lab Attendant	Namukwaya Ruth	F	Permanent
Records Clerk	Busingye Joan	F	Contract/College
Computer Technician	Lutalo William	M	Contract/College
<b>Department of Forestry Bio-Diversity and Tourism</b>			
Technician	Vacant	M	Permanent
Computer Technician	Sentomero Dan	M	Permanent
C/Messenger	Musoke Harriet	F	Permanent
Cleaner	Sombi Kella	F	Permanent
Cleaner	Namukywaya Margret	F	Permanent
Cleaner	Nalugo Teopista	F	Permanent
S/ Cleaner	Nagawa Maimuna	F	Permanent
Driver	Kushemererwa Agrey	M	Permanent
Security Guard	Wabuye Simon	M	Permanent
<b>Department of Environmental Management</b>			
Copy Typist	Vacant		
Custodian	Vacant		
Librarian	Nsoby Joseph	M	Permanent
C/Messenger	Nagayi Teddy	F	Permanent
Cleaner/Messenger	Ndagire Aidat	F	Permanent
Security Guard	Atanansi Mulinda	M	Permanent
Sanitary Cleaner	Vacant		
<b>Department of Geography, Geo-Informatics and Climatic Sciences</b>			
Administrative Secretary II	Tumwesigye Phoebe	F	Permanent
Library Assistant	Nanteza Florence	F	Permanent

Computer Technician	Kisitu Daniel	M	Contract
Messenger/Cleaner	Namirembe Goretti		Permanent
Cleaner	Nanozi Catherine		Permanent
Sanitary Cleaners	Were Charles	M	Permanent
Cartographer	Vacant		
<b>School of Food Technology, Nutrition and Bio-Engineering</b>			
<b>Dean's Office</b>			
Assistant Registrar	Apili Grace	F	Permanent
Mobile Plant Processing Attendant	Vacant	M	Contract
Secretary	Hamba Loyce	F	Permanent
Driver	Ntambi Jimmy	M	Permanent
Driver	Walusimbi Peter Kabule	M	Contract
Cleaner	Vacant		
Chief Custodian	Vacant		
Security Guard	Magal John Bosco	M	Permanent
Security Guard	Kidyanyi Paul	M	Permanent
Security Guard	Mbonyintwari Daruis	M	Contract/College
Cleaner	Kyomugisha Nice	F	Contract/College
Technician	Nkinzehiki Allan Moses	M	Contract/College
Secretary	Namukwaya Gorret	F	Contract/College
Computer Technician	Wamala Robert	M	Contract/College
<b>Department of Food Technology and Nutrition</b>			
Principal Technician	Okalany Emmanuel	M	Permanent
Senior Technician	Vacant		
Technician	Nkinzehiki Allan Moses	M	Contract
Copy Typist	Kaahwa Jessica	F	Permanent
Lab. Attendant	Sendegeya Ponsiano	M	Permanent
Security Guard	Kibirango Charles	M	Permanent
Security Guard	Tenywa Ivan	M	Permanent
Cleaner	Emuron Everest	M	Permanent
Cleaner	Nasanga Juliet	F	Permanent
Cleaner	Namubiru Justine	F	Permanent
Cleaner	Namudu Sarah	F	Permanent
Cleaner	Namayanja Teopista	F	Permanent
Cleaner	Kaitesi Benny	F	Permanent
<b>Department of Agricultural &amp; Bio-Systems Engineering</b>			
Principal Technician			
Technician II	Makubuya James K	M	Permanent
Secretary	Nannyonga Annet	F	Permanent
Ox Men	Tumwujukye John	M	Permanent
Ox Men	Nsobywa Roald	M	Permanent



Tractor Driver	Nabyama Emmanuel	M	Permanent
Cleaner	Nakalema Imelda	F	Permanent
Makerere University Agricultural Research Institute Kabanyolo			
Director	Alice Turinawe	M	Acting Director
Farm Manager Crop	Tweyambe Chrysostom		Acting Farm Manager
Assistant Foreman	Vacant		
Assistant Foreman	Banjwa H. Samuel	M	Permanent
Capenter	Okello Richard	M	Permanent
Artizan	Katongole Samuel	M	Permanent
Tractor Driver	Samanya Alex	M	Permanent
Tractor Driver	Kiwanuka Robert	M	Permanent
Driver	Musoma Moses	M	Permanent
Stockwoman	Vacant		
Sanitary Cleaner	Musisi Vincent	M	Permanent
Sanitary Cleaner	Ntongo Edith	F	Permanent
General Farm Worker	Mwandha John	M	Permanent
General Farm Worker	Mutungire Bowers	M	Permanent
General Farm Worker	Toko George	M	Permanent
General Farm Worker	Kaaja Yusuf	M	Permanent
General Farm Worker	Nabwire Immaculate	Ff	Permanent
General Farm Worker	Musisi Godfrey	M	Permanent
General Farm Worker	Male Stuart	M	Permanent
General Farm Worker	Nambaziira Harriet	F	Permanent
General Farm Worker	Nambooze Joyce	F	Permanent
General Farm Worker	Byekwaso Denis	M	Permanent
General Farm Worker	Ssentamu Godfrey	M	Permanent
General Farm Worker	Sekalyowa Joseph	M	Permanent
General Farm Worker	Nabisubi Kasifa	M	Permanent
General Farm Worker	Namutebi Annet	F	Permanent
General Farm Worker	Nuwagaba Abias	M	Permanent
General Farm Worker	Mwandha Jesca	F	Permanent
General Farm Worker	Ndezaho Godfrey	M	Permanent
General Farm Worker	Zaguma Godfrey	M	Permanent
General Farm Worker	Nanfuka Harriet	F	Permanent
General Farm Worker	Nandawula Margret	F	Permanent
Security Guard	Ambayo Bosco	M	Permanent
Security Guard	Draluma Godfrey	M	Permanent
Security Guard	Mugisha Davis	M	Permanent
Security Guard	Owor Julius	M	Permanent
Security Guard	Candia Patrick Oleya	M	Permanent
Security Guard	Kasajja Peter	M	Permanent

Security Guard	Kiggundu Geoffrey	M	Permanent
Security Guard	Nandulya Paul Masaba	M	Permanent
Storeman	Twesigye Moses	M	Permanent
Custodian	Ashok Ogutti Benjamin	M	Contract/College
Assistant Accountant	Muguluka Lugard	M	Contract/College
Dairy Value Chain	Tarembwa Precious	M	Contract/College
<b>Makerere University Biological Field Station, Kibale</b>			
Director	Tumusiime David D M	M	Ag. Director
Clerk of Works	Berunga Wifred	M	Permanert
Assistant Accountant	Tumukunde Hehert	M	Permanert
Librarian	Tumushabe Janet	F	Permanert
Assstant Domestic Bursar	Kato Innoent Mwesige	M	Contract
Security Guard	Kasajja Ebenezer		Contract/College
Security Guard	Mugisha Expedito		Contract/College
Trail Cutter	Rutenta Wilson		Contract/College
Trail Cutter	Bamukusa Francis		Contract/College
Trail Cutter	Nyakahuma Richard		Contract/College
Trail Cutter	Atuhaire Samuel		Contract/College
Trail Cutter	Birungi Charles		Contract/College
Trail Cutter	Katuramu Clovis		Contract/College
Trail Cutter	Kisembo Vicent		Contract/College
Headman	Kugonza Robert		Contract/College
Trail Cutter	Kusemererwa Charles		Contract/College
Trail Cutter	Kyalimpa Wilson		Contract/College
Trail Cutter	Tibeya Adolphus		Contract/College
Trail Cutter	Zahuma James		Contract/College
Cook	Kaayo Malyamu		Contract/College
Security Guard	Kasajja Ebenezer		Contract/College
Driver	Ssembatya Paul		Contract/College
Store Man	Kemigisha Patience		Contract/College
Office Attendant	Tumusiime Yosinta		Contract/College
Trail Cutter	Sabiiti Charles		Contract/College
Security Guard	Byaruhanga Andrew Simon		



FINANCE FUNCTION

## 8.0 FINANCE FUNCTION

### 8.1 Budget Performance

The Budget performance was interrupted by the COVID 19 lock down. The College isolated all resources for recess term and internship for ring-fencing at the center. College committed all resources that can be feasibly spent by June 30 2020.

#### ***Budget Performance Report as at 30th June 2020***

CODE	PARTICULARS	BUDGET	COMMITTED	ACTUAL	BALANCE/ UNSPENT BALANCES	
01-002-136080000-00-00-0000-0000-071401-211103	Allowances (Inc. Casuals, Temporary)	229,308,840	-	227,691,184	1,617,656	Some contract staff lacked valid contracts to benefit from contract salaries
01-002-136080000-00-00-0000-0000-071401-213002	Incapacity, death benefits and funeral expenses	17,000,000	-	15,242,000	1,758,000	Due to lockdown some claims were not submitted
01-002-136080000-00-00-0000-0000-071401-221001	Advertising and Public Relations	48,800,000		43,787,900	5,012,100	Suppliers delayed to supply hence no proper documentation
01-002-136080000-00-00-0000-0000-071401-221002	Workshops and Seminars	36,700,020	-	36,700,020	-	
01-002-136080000-00-00-0000-0000-071401-221007	Books, Periodicals & Newspapers	10,108,284	-	8,180,765	1,927,519	No newspapers were not bought between Mar-June 2020
01-002-136080000-00-00-0000-0000-071401-221008	Computer supplies and Information Technology	52,893,190	-	52,658,277	234,913	Due to lockdown some claims were not submitted
01-002-136080000-00-00-0000-0000-071401-221009	Welfare and Entertainment	64,786,800		63,801,500	985,300	Lockdown could not allow activities to flow properly
01-002-136080000-00-00-0000-0000-071401-221011	Printing, Stationery, Photocopying and Binding	67,604,470	-	67,604,470	-	
01-002-136080000-00-00-0000-0000-071401-222001	Telecommunications	26,640,000	-	26,639,201	799	
01-002-136080000-00-00-0000-0000-071401-222002	Postage and Courier	23,890,000	-	16,292,464	7,597,536	Due to lockdown some students could not submit their thesis for posting
01-002-136080000-00-00-0000-0000-071401-224004	Cleaning and Sanitation	35,926,040	-	35,790,674	135,366	Due to lockdown some claims were not submitted

01-002-136080000-00-00-0000-0000-071401-227001	Travel inland	22,283,566	-	22,270,566	13,000	
01-002-136080000-00-00-0000-0000-071401-227004	Fuel, Lubricants and Oils	143,669,502	-	143,669,502	-	
01-002-136080000-00-00-0000-0000-071401-228001	Maintenance - Civil	3,200,000	-	3,050,000	150,000	
01-002-136080000-00-00-0000-0000-071401-228002	Maintenance - Vehicles	30,300,000	-	30,166,814	133,186	
01-002-136080000-00-00-0000-0000-071401-228003	Maintenance – Machinery, Equipment & Furniture	15,397,192		14,455,496	941,696	Some repairs delayed because of lockdown
01-002-136080000-00-00-0000-0000-071401-228004	Maintenance – Other	25,910,396	-	25,909,217	1,179	
01-002-136080000-00-00-0000-0000-071401-282103	Scholarships and related costs	1,384,065,112		1,381,447,872	2,617,240	Due to lockdown some students activities were not conducted
	<b>TOTAL</b>	<b>2,238,483,412</b>	<b>-</b>	<b>2,215,357,922</b>	<b>23,125,490</b>	

### Budget Performance July-December 2020

CAES	Description	Released Budget	Encumbrance	Paid	Balance
01-002-136080000-00-00-0000-0000-071401-211103	Allowances (Inc. Casuals, Temporary)	16,000,000	0	0	16,000,000
01-002-136080000-00-00-0000-0000-071401-282103	Scholarships and related costs	15,000,000	0	0	15,000,000
01-002-136080000-00-00-0000-0000-071406-211103	Allowances (Inc. Casuals, Temporary)	26,636,960	0	23,885,055	2,751,905
01-002-136080000-00-00-0000-0000-071406-213002	Incapacity, death benefits and funeral expenses	4,000,000	0	0	4,000,000
01-002-136080000-00-00-0000-0000-071406-221001	Advertising and Public Relations	1,250,000	0	0	1,250,000
01-002-136080000-00-00-0000-0000-071406-221002	Workshops and Seminars	20,000,000	0	0	20,000,000
01-002-136080000-00-00-0000-0000-071406-221007	Books, Periodicals & Newspapers	3,196,364	0	0	3,196,364
01-002-136080000-00-00-0000-0000-071406-221008	Computer supplies and Information Technology (IT)	3,393,583	0	0	3,393,583

01-002-136080000-00-00-0000-0000-071406-221009	Welfare and Entertainment	23,975,000	14,578,800	4,115,100	5,281,100
01-002-136080000-00-00-0000-0000-071406-221011	Printing, Stationery, Photocopying and Binding	19,614,990	5,756,276	11,580,000	2,278,714
01-002-136080000-00-00-0000-0000-071406-222001	Telecommunications	8,910,000	0	4,640,000	4,270,000
01-002-136080000-00-00-0000-0000-071406-224004	Cleaning and Sanitation	14,500,000	12,809,041	0	1,690,959
01-002-136080000-00-00-0000-0000-071406-227004	Fuel, Lubricants and Oils	47,950,000	0	23,500,000	24,450,000
01-002-136080000-00-00-0000-0000-071406-228001	Maintenance - Civil	9,418,475	0	0	9,418,475
01-002-136080000-00-00-0000-0000-071406-228002	Maintenance - Vehicles	12,997,500	3,463,400	2,885,000	6,649,100
01-002-136080000-00-00-0000-0000-071406-228003	Maintenance – Machinery, Equipment & Furniture	27,016,103	3,200,000	0	23,816,103
01-002-136080000-00-00-0000-0000-071406-228004	Maintenance – Other	55,121,072	4,838,000	1,607,000	48,676,072
<b>TOTAL</b>		<b>308,980,047</b>	<b>44,645,517</b>	<b>72,212,155</b>	<b>192,122,375</b>

## 9.0 REPORT ON MAKERERE UNIVERSITY AGRICULTURAL RESEARCH INSTITUTE KABANYOLO (MUARIK)



### 9.1 Introduction

MUARIK is one of the institutes of the College of Agricultural and Environmental Sciences (CAES), Makerere University whose role is to support CAES' Teaching, Research, Outreach and Production mandates. MUARIK started as a University Farm in 1953 and was later upgraded to a fully-fledged research institute in 1996. It is endowed with 230 hectares of land. The institute also houses the Centre for Continuing Agricultural Education (CAEC), Makerere Regional Centre for Crop Improvement (MaRCCI), Centre of Excellence in Waste Management, Centre for Soybean Improvement and Development and the Consortium for enhancing University Responsiveness to Agribusiness Development Limited (CURAD).

MUARIK also has hostels that accommodate over 70 undergraduate and about 20 graduate students who stay at the institute to gain practical experience of life and research in typical farming conditions. It also hosts regional graduate training programs in plant breeding systems with students drawn from different countries in the East and Central Africa region such as the Democratic Republic of Congo, Rwanda, Zambia, Zimbabwe, Tanzania to mention a few. MUARIK also offers student tour services. MUARIK also serves as a center for experiments and practical work for other research projects based at the College of Agricultural and Environmental Sciences including research on edible insects, worms as alternative feed for animals, agroforestry and food processing for value chain improvement among others.

## 9.2 General Structure of MUARIK

### 9.2.1: Functioning of MUARIK

The major mandates of MUARIK are training, research and outreach and crop and livestock production. Other important Units housed at MUARIK include, a Health Clinic under the University Hospital, Students Hostel headed by the Warden under the Dean of Students, Security Unit under the University Security Unit, a Police Post under the under the Uganda Police, Agricultural Engineering Workshop under the Department of Agriculture and Bio-system Engineering, Animal and Crop Laboratories, Green Houses as well as a Goat Unit under the Department of Agricultural Production, among others.

### 9.2.2: Management of MUARIK

MUARIK Policy Committee is the body in charge of MUARIK Management and reports to CAES Management Council. This committee is comprised of the following members:

1. The Principal (Chairman)
2. Director MUARIK (Secretary)
3. Prof. Jacobs Agea, SAS
4. Prof. Jonnie Mugisha, SAS
5. Dr. Alice Amoding
6. Dr. Bernard Obaa
7. Assoc. Prof. Fred Babweteera
8. Dr. Ampe Gastone Tumuhimbise
9. The Farm Manager (in attendance, from Secretariat)

The day to day management of MUARIK is run by MUARIK Management Committee that reports to the Principal and MUARIK Policy Committee. The members on this committee are:

1. The Director (Chairperson)
2. The Farm Manager (Secretary)
3. Assist. Farm Manager (Crops)
4. Training Coordinator
5. Head Security
6. In-charge Police Unit
7. Mechanization and Workshop Unit Head
8. Stores Assistant
9. General Workers' Supervisor
10. Head of Dairy Value Chain (DVC) Unit

The Dairy Value Chain (DVC) also has a Steering Committee with following membership:

1. Principal, Chairman
2. Director, Secretary
3. DVC Coordinator
4. Mrs. Beartice Byaruhanga, MAAIF
5. Mr. Kanyike, Dairy farmer
6. Dr. Dennis Mpairwe, Head DAP
7. Dr. Justine Nambi
8. Mr. Kisirinya, Private Sector Foundation
9. Representative from Dairy Cooperation



### 9.3 Enterprises at MUARIK, their Status and Challenges

MUARIK is endowed with good soils, pasturelands, wetlands, woodlots (agroforestry, pine and eucalyptus), fish pond, rivers, valley dam all sitting on 230 hectares of land. A summary of the enterprise at MUARIK and brief notes about them is given in table 1 below:

No.	Enterprise	Status	Comment/Status/Challenge
1	Pastures	Active,	-A promising enterprise -Producing less than market demand -Currently has positive margins
2	Dairy	Active	-Covers the whole value Dairy value chain from pasture/feed production to milk processing -Has staffing challenges -Faces insufficient investment capital -Currently has negative margins due to under investment
3	Feed mill	Active	-Has very high potential for income generation -Lacks capital
4	Silage business	Active	-Currently being used occasionally for MUARIK only -High market potential for silage
5	Study tours and learning	Active	-Potential high income generator for MUARIK
6	Poultry	Under renovation	-The facilities needed heavy renovations. -Lack of technical skills has made it very difficult to realize profits
7	Piggery	Active	-Potentially profitable. -Has been very difficult to run profitably due to lack of skilled labor, thefts and limited capital -There need to re-stock, get skilled labor, and add capital
8	Banana	Active	-This plantation has been improved to a great extent -The market for the banana is ever sure -This plantation doesn't lead to losses -Challenge of thieves -Labor intensiveness in face of labor shortage -Acreage has been increase from 7 acres to 14 acres
9	Annual crops (Maize, soybean)	Active	-Mainly maize and soya bean are grown -Has been very challenging due to shortage of labor and pests especially the fall army worm
19	Horticulture and floriculture(Passion Fruits, vegetables, flowers)	Closed for MUARIK, open for the department	-There is one screen house available for demonstration to students/farmers -The prospects are very high for this section but a lot is needed -Has an established a mango fruit mother garden with financial support from Principals office -Requires hiring labor Crops that can be grown under this include passion fruits, flowers, tomatoes and other high value crops
11	Fish farming	Closed	-This was also closed due to lack of staff -It needs to be re-opened as it can potentially generate a lot of funds.
12	Rabbit	Closed	-This was closed. -Lack of staff was the main challenge.
13	Coffee	Open, not generating any funds	-The 6 acres coffee plantation has a lot of prospects -Its rehabilitation is being constrained by lack of funds -There's lack of adequate labor and skills to effectively maintain. -Not profitable at the moment

14	Goat farming	Closed for MUARIK	-Technical staff was lacking -Currently run by a researcher from the department of agricultural production at CAES.
15	Forestry	Open	-4 acres of eucalyptus and 4 acres of pine trees -Lack of Labor to effectively manage the young eucalyptus -Termite damage is a big challenge -There is need to recruit more skilled labour to maintain the plantations

#### 9.4 Achievements in 2019/2020

- Within this year, MUARIK has expanded the banana plantation and planted 7 additional acres of a new plantation. The total acreage now stands at about 14 acres.
- The Institute has commenced renovation activities for the poultry unit which had been closed due to the poor state of the building structures at the institute that compromised efficiency and quality of training.
- MUARIK has partnered with the Makerere University Centre for Soybean Improvement and Development, to become one of the out-growers. The acreage of the soya bean has doubled in the year 2018-2020.
- To increase income and ability to feed animals, MUARIK has also planted over 15 acres of Chloris Gayana pasture and 5 acres of elephant grass. This was done with the aid of funds from ADB HEST project. This commercial pasture growing has increased the farm revenue from both seed production for sale, hay making, and has caused a boost in individual and group trainings. Sales from hay and pasture seed, as well as feeding of the livestock have improved. The production of sugar napier and nandi-setaria has boosted livestock production.
- In stores, records have been put in place and updated regularly. Requisition books, material transfer note book, bin cards and registers have been put in place. Accountability has improved as a result of ensuring that funds advanced to users are spent appropriately and items bought are received, checked, recorded and issued following store management procedures. The MUARIK store is now an independent unit.
- Although the coffee plantation maintenance and quality of the crops is still a challenge, MUARIK has created an arrangement for MUARIK workers to weed the whole coffee plantation and plant annual crops as they maintain the plantation. This has improved quality of the plantation by reducing the weeds that had become a trademark of the roadside plantation.
- In the plumbing section, this year MUARIK has been able to discover, with the help of a new skilled plumber, illegal water connections to establishments and households neighbouring MUARIK. This has helped to reduce the costs of water at the institute and better regularise the supply of water to MUARIK units.
- The training mandate of the institute has shown great potential, and before the COVID 19 pandemic, the training components was generating about 45% of the institute's revenues. In 2019/2020, MUARIK hosted 225 schools, and raised about 32 million Uganda shillings from study tours and service learners. For study tours, MUARIK trained 8,068 students, while 153 service learners were trained.

- MUARIK has also hosted several student and staff projects in this year. Table 2 provides a summary of undergraduate student projects, while table 3 indicates graduate research projects and the respective researchers.

### Summary of the Undergraduate Student Projects at MUARIK

Crop	No of Students
Mashroom production	03
Poultry	03
Soybean	10
Hot pepper	05
Tomatoes	01
Pasture	01
Horticulture (sukumawiki)	01
Green house	06
Cassava	01

**Table 3 indicates projects for Masters, PhD students and researchers that support the institute to feed into the National Research System**

### Graduate Research Projects initiated in 2019-2020

No	Name of Researcher	Project
	Dr. Fred Kabi	-Waste management -Unearthing the potential of Earthworms
	Prof. Philip Nyeko	Grass hoppers
	Mr. Kyeyune	Mushroom
	Dr.Edema Richard	Cereal/ Legumes (sorghum and cowpeas)

## 9.5 Staff at MUARIK

MUARIK currently employs a total of 69 workers. A list of the workers at MUARIK is shown in the table below.

### List of Staff working at MUARIK

No.	Name	Title	Status	Paid by University/ MUARIK
1	Dr. Alice Turinawe	Director	Permanent	University
2	Tweyambe Chrysostom	Ag. Farm Manager	Permanent	University
3	Mr. Banjwa H. Samuel	Asst. Foreman	Permanent	University
4	Mr. Okello Richard	Carpenter	Permanent	University
5	Samanya Alex	Tractor driver	Permanent	University
6	Kiwanuka Robert	Tractor driver	Permanent	University
7	Musoma Moses	Driver	Permanent	University

8	Musisi Vincent	Sanitary Cleaner	Permanent	University
9	Ntongo Edith	Sanitary cleaner	Permanent	University
10	Mwanda John	General Farm Worker	Permanent	University
11	Mutungire Bowers	General Farm Worker	Permanent	University
12	Toko George	General Farm Worker	Permanent	University
13	Kaaja Yusuf	General Farm Worker	Permanent	University
14	Nabwire Immaculate	General Farm Worker	Permanent	University
15	Male Stuart	General Farm Worker	Permanent	University
16	Nambaziira Harriet	General Farm Worker	Permanent	University
17	Musisi Godfrey	General Farm Worker	Permanent	University
18	Nambooze Joyce	General Farm Worker	Permanent	University
19	Byekwaso Denis	General Farm Worker	Permanent	University
20	Ssentamu Godfrey	General Farm Worker	Permanent	University
21	Sekalyowa Joseph	General Farm Worker	Permanent	University
22	Nabisubi Kasifa	General Farm Worker	Permanent	University
23	Namutebi Annet	General Farm Worker	Permanent	University
24	Nuwagaba Abias	General Farm Worker	Permanent	University
25	Ndezaho Godfrey	General Farm Worker	Permanent	University
26	Nandawula Margret	General Farm Worker	Permanent	University
27	Nanfuka Harriet	General Farm Worker	Permanent	University
28	Zaguma Godfrey	General Farm Worker	Permanent	University
29	Twesigye Moses	General Farm Worker	Permanent	University
30	Balyejjusa Samuel	General Farm Worker	Permanent	University
31	Owor Julius	Security	Permanent	University
32	Ambayo Bosco	Security	Permanent	University
33	Draluma Godfrey	Security	Permanent	University
34	Mugisa Davis	Security	Permanent	University
35	Candia Patrick Oleya	Security	Permanent	University
36	Kiggundu Geoffrey	Security	Permanent	University
37	Nandulya Masala Paul	Security	Permanent	University
38	Kasaja Peter	Security	Permanent	University
39	Muguruka Lugard	Accounts and Logistics	Contract	MUARIK
40	Nabukalu Racheal	Office Secretary	No Contract	MUARIK
41	Aziz Dara Charles	Machinery	No Contract	MUARIK
42	Nakigozi Annet	General Farm Worker	No Contract	MUARIK
43	Nalugoye Grace	General Farm Worker	No Contract	MUARIK
44	Namwanje Robinah	General Farm Worker	No Contract	MUARIK
45	Baleba John	General Farm Worker	No Contract	MUARIK

46	Kalenzi Festo	Horticulture	No Contract	MUARIK
47	Ssemambo Joseph	Piggery Unit	No Contract	MUARIK
48	Nuwagira Saxson	Plumber	No Contract	MUARIK
49	Elmani Stella	Laboratory Cleaner	No Contract	MUARIK
50	Akankwasa Julius	Horticulture	No Contract	MUARIK
51	Muguruka Lugard	Accounts and Logistics	No Contract	MUARIK
52	Nakigozi Annet	General Farm Worker	No Contract	MUARIK
53	Nalugoye Grace	Laboratory Cleaner	No Contract	MUARIK
54	Namwanje Robinah	General Farm Worker	No Contract	MUARIK
55	Baleba John	General Farm Worker	No Contract	MUARIK
56	Kalenzi Festo	General Farm Worker	No Contract	MUARIK
57	Ssemambo Joseph	General Farm Worker	No Contract	MUARIK
58	Nuwagira Saxson	Plumber	No Contract	MUARIK
59	Elmani Stella	Laboratory Cleaner	No Contract	MUARIK
60	Nanfuka Sarah	General Farm Worker	No Contract	MUARIK
61	Atiku Kennedy	Security	No Contract	MUARIK
62	Ajawa William	Security	No Contract	MUARIK
63	Taremwa Precious	Coordinator	Contract	College
64	Agaba Issa	Herd man	No Contract	MUARIK
65	Byaruhanga Richard	Herd man	No Contract	MUARIK
66	Aruho Benon	Feed Mill attendant	No Contract	MUARIK
67	Kaliisa Julius	Banana Plantation Attendant	No Contract	MUARIK
68	Philip Basasibwaki	Zero grazing attendant	No Contract	MUARIK
69	Taremwa Precious	Coordinator	No Contract	MUARIK

## 9.6 Financial Report

Table 5 below is a statement major revenue sources and the amount received in the period running from July 2019 to June 2020.

**Table 5: Income and Expenditure for MUARIK from July 2019 to June 2020**

Unit Name	Income	Expenditure	Deficit/Surplus
Training	32,45,000	5,161,000	27,584,000
Poultry	307,500		307,500
Piggery	2,020,000	1,92,000	228,000
Horticulture	68,000	2,000	66,000
Pastures	46,947,300	11,982,000	34,965,300
Crops (general)	3,950,000	4,823,000	(873,000)
Coffee	178,000	331,000	(153,000)
Bananas	6,981,000	1,278,000	5,703,700
Machinery	4,580,000	10,008,600	(5,428,600)
Land use	1,575,000		1,575,000
Compound		3,436,900	(3,436,900)
Office Management		3,637,000	(3,637,000)
Exhibitions		2,440,000	(2,440,000)
Plumbing		1,694,000	(1,694,000)
Welfare		3,50,000	(3,50,000)
Farm labour (monthly)		40,330,000	(40,330,000)
Hired labour for Casual work		3,231,600	(3,231,600)
Miscellaneous	911,000	3,001,200	(2,090,200)
DVC - Dairy Value Chain	51,452,500	86,659,300	(35,206,800)
<b>Total</b>	<b>151,716,000</b>	<b>183,557,600</b>	<b>(31,841,600)</b>

## 9.7 Challenges Faced at MUARIK

### Staffing

MUARIK's staffing challenges stem from both lack of sufficient numbers of staff and lack of skills. For a long time, MUARIK's workers who retire or get transferred have not been replaced. This greatly contributes to low levels of production, and high levels of inefficiency including thefts. There is need to re-equip the institute with skilled staff. To fill this gap, MUARIK has resorted to hire of temporary staff, which is very expensive. The table below shows the number of staff existing at MUARIK compared to the number required at the institute.

### Staffing needs at MUARIK

Position Name	Required No. staff	Filled	Retirement	Resignations	Death	Vacant	Deficit
Director	1	1	-	-	0	-	0
Farm Manager	1	1	Dec.2020	-	0	0	1
Assist. Farm Manager	4	0	-	-	-	-	4
Accounts Clerk	1	1	2	-	-	-	0

Secretary	1	1	2	-	-	-	0
Foreman	7	1	-	-	-	-	3
Assistant Foreman	14	2	-	-	-	5	2
Headman	1	0	2	-	-	1	1
Plumber	2	1	1	-	-	1	1
Electrician	2	1	-	-	-	1	1
Poultry Attendant	1	0	-	-	-	1	1
Receptionist	1	0	-	-	-	1	1
Cleaners	2	0	-	-	-	2	2
Sanitary Cleaners	2	1	-	-	-	1	1
Stockman	2	0	-	-	-	2	2
Messenger	1	0	-	-	-	1	1
Driver	2	1	1	-	-	1	1
Tractor Operator	2	2	-	-	-	0	0
Recorder	2	2	-	-	-	0	0
Store Keeper	2	2	-	-	-	0	0
Mechanic	2	0	2	-	0	2	2
Herdsmen	4	4	-	-	-	-	0
Feed Mill Technician	1	0	-	-	-	1	1
Training Coordinator	2	1	-	-	-	1	1
General Farm Worker	160	30	-	-	-	-	130

### ***Encroachment on MUARIK Land***

Encroachment on MUARIK land takes several forms: Shifting of boundaries by encroachers, unauthorized use and expansion of land and disputed ownership of sections of land. There is urgent need to re-survey all land at MUARIK and put clearer, more prominent boundaries/poles. In addition, it will be necessary to send teams on scheduled tours of the borders.

### ***Poor Financial Status***

MUARIK's financial status is very challenging and derails all efforts to operate efficiently. The institute has no budget vote from the center. Because of this, there is underinvestment in units that would otherwise generate profits. These are currently underperforming, some in the negative as shown in table 5. There is need to have a budget for MUARIK from the center to allow sufficient investment in units with high potential. Many of MUARIK's units are operating below break-even because of lack resources to invest and upgrade the units. It is also not possible to maintain infrastructure due to limited resources. Maintenance, repair and services of equipment is also regularly affected by lack of funds.

## **9.8 Opportunities for Improvement**

### ***MUARIK presents Numerous Opportunities:***

- **Land Resources:** The large acreage at MUARIK totaling 230 hectares (562.5 acres) has high potential for training students in a variety of crop, forestry and animal enterprises including development of skills using the existing wood and metal workshops.

- **Proximity to Urban Area and to NaCRRI:** MUARIK has excellent access to a ready market with good a road connection to both Kampala city and NARO’s National Crop Research Resources Institute at Namulonge.
- **Academic and Support Staff:** MUARIK has access to CAES’s endowment of skills and knowledge in the fields of agriculture, food, forestry and environmental sciences-an enviable multidisciplinary mix of professionals that few other institutions can access under one roof. MUARIK has an excellent opportunity to use these skills by engaging in profitable enterprises for food production, value addition and environmental management to make a significant contribution towards food and nutritional security at Makerere University and Kampala City to begin with.
- **Laboratory Facilities:** Some of our best laboratory facilities including tissue culture, biotechnology, and others are now located at MUARIK.
- **Basic Assets and Infrastructure:** These include farm tools of various kinds, farm structures, farm houses and staff and student housing. These also include livestock such as cattle a few pigs and goats.
- **Research:** Currently the institute does not have core researchers but hosts research of staff and students from the main campus. Ongoing research in the Departments is largely delinked from crop and livestock production processes and activities at MUARIK. For MUARIK to take up and consolidate its position in agricultural research it will require recruitment of full time scientists dedicated to core research at MUARIK. Alternatively, academic staff should be identified and mandated to dedicate a percentage of their time to research at MUARIK.
- **Outreach:** The farm usually receives pupils and students interested in physical observation of machinery, tools, forage, weed, pests and diseases specimen that are covered and school curriculum but not easily available in schools. The farm also receives farmers and other visitors interested in learning how to produce organic pigs, coffee and fruit tree seedlings, flowers, grafting, mixing feeds, produce hay bales, compost manure, and local/crossed chicken. Increasingly companies promoting new crop varieties, agrochemicals are getting interested in establishing roadside demos. The service can also be extended to various hatcheries that supply one day old chicks to establish structures and demonstrate the performance of their broilers and layers.
- **Proposed Short Training Courses:** Due to very high demand of short duration training in the field of general Agriculture, we proposed the a training program focusing holiday makers, school drop outs, famers and general public interested in agriculture.



## 10.0 REPORT ON MAKERERE UNIVERSITY BIOLOGICAL FIELD STATION (MUBFS)



### 10.1 About Makerere University Biological Field Station (MUBFS)

The original name of the field station was Kibale Forest Project funded by the New York Zoological Society (currently known as Wildlife Conservation Society). The field site was established in 1970 by Dr. Thomas Struhsaker at Kanyawara. He came to Uganda to study the behavioral ecology of the Uganda Red Colobus (*Procolobus rufomitratu*s) and endangered species. With eleven species of sympatric primate species, Dr. Struhsaker soon realized that Kibale offered a great opportunity for comparative studies on the behavioral ecology of the various primate species in the area. The diversity of primate species attracted more researchers and this made Kibale an internationally important site for primatological research. As time went on, research expanded to include studies on rodents, insects and forest gap dynamics.

Although Kibale Forest Project was never advertised as a destination for tourists, people learnt about the place through published research. In the mid-1980s visitors started arriving at the station mostly uninvited and unexpected. To avoid the research site from becoming a tourism area and not to disappoint those who come to Kibale as tourists, the idea of establishing a tourist center at Kanyanchu, currently a popular tourist destination in Uganda was initiated by researchers at Kanyawara.

The objectives of Kibale Forest Project were research, education and conservation which are still upheld up to present. As research progressed, the researchers realized that they could not work in isolation from the neighboring communities and national institutions. An outreach program was initiated to teach conservation to the local communities and schools. They also helped in distributing tree seeds and seedlings in an effort to encourage people grow their own trees. On the conservation front, Kibale Forest Project helped the Forest Department in patrolling the forest and also lobbied government to elevate the conservation status of Kibale Forest.

Prior to his departure in 1987, Dr. Struhsaker arranged to hand over the project to Makerere University for its long-term survival. At this time Kibale Forest Project became Makerere University Biological Field Station (MUBFS)

The mission statement was agreed upon in a stake holders meeting that took place at Kanyawara 5-7 February 1998 and it was as follows:

*The Makerere University Biological Field Station is committed to undertaking and providing opportunities for high quality, multi-disciplinary research and education in tropical ecosystems, with the underlying objective of contributing to the conservation and development needs of Kibale National Park and its surrounding ecological and human communities.*



*Prof. Bernard Bashaasha and CAES Management Team on the visit to the Field Station*

## 10.2 Facilities and Accessibility

MUBFS is located in Kibale National Park and it has two research sites. The main research site is located at Kanyawara and a smaller camp at Ngogo which is only a three to four hours' walk from the Kanyawara. Both sites are easily accessible by road. The journey from Kampala, the capital city of Uganda, to MUBFS headquarters at Kanyawara via Mubende and Fort Portal takes five to six hours. This will even become shorter once the repairs on the Kampala to Mityana road are finished. By car, the journey from Kanyawara to Ngogo takes about two hours but this requires a four-wheel drive vehicle.

Because of its good research track record, MUBFS received massive funding from USAID and the European Union during the 1990s and this transformed the station into a world class field station. Currently, the facilities at Kanyawara can accommodate up to 80 researchers and trainees. There is an extensive library with books covering a wide range of topics in the fields of conservation, ecology, botany and zoology. Housing at Kanyawara includes two-bedroom houses, duplexes and dormitories. A kitchen and dining hall are also available. Catering services are available at a reasonable rate for groups of at least ten people; smaller groups can cook for themselves using MUBFS' kitchen and utensils. A laboratory with rudimentary equipment is also available. MUBFS maintains trail systems at Kanyawara, about 15 km<sup>2</sup>, and at Ngogo, about 10 km<sup>2</sup> for easy access to the forest.

Accommodation at Ngogo has remained limited; there are only four houses that house up to three senior researchers and support staff. Graduate students, up to six, generally sleep in tents. It must however be emphasized that Ngogo is a great site for studying chimpanzees. The chimpanzee community at Ngogo is comprised of about 150 individuals, the largest ever recorded in the wild.

### 10.3 Research and Training Opportunities

With the tremendous species diversity in Kibale, the research opportunities are endless. MUBFS is mainly known the world over for its research track record on primates notably: chimpanzees (*Pan troglodytes*), the red colobus monkeys (*Procolobus rufomitratus*), Blue monkeys (*Cercopithecus mitis*), red tail monkeys (*Cercopithecus ascanius*), gray-cheeked mangabey (*Cerocebus albigena*), and black-and-white colobus (*Colobus guereza*). Two other species of diurnal primates the Lhotse's monkey (*Cercopithecus lhoesti*) and the olive baboons (*Papio Anubis*), and the three nocturnal primates Demidoff's bush baby (*Galago demidoff*), Thomas's galago (*Galago thomasi*) and the poto (*Perodicticus potto*) remain unstudied.



CAES Management Team touring the Field Station

Research interests at MUBFS have expanded beyond primates to include: (1) ecological and behavioral studies of other taxa including fish, birds, insects and amphibians; (2) studies of forest regeneration in logged areas, in former pine plantations, in grasslands and on abandoned croplands; (3) long-term ecological monitoring, including climatic monitoring, plant phenological patterns, swamp and river limnology, fish populations, etc.; and (4) socio-economic and socio-ecological studies including studies of the effects of animal crop raiding have also come to be major foci of research.

MUBFS currently holds four international training courses a year. The McGill course attracts students from the McGill University, Canada; the Liverpool and Imperial College Courses cater for students from the respective institutions; and the Tropical Biology Association (TBA) Course combines European and African participants. Locally, users of MUBFS for training purposes include Makerere University Institute of Environment and Natural Resources, Botany Department

and Zoology Department; Uganda Wildlife Training Institute, Kasese; the Kasiisi Project and Local Government Workshops.

The demand for access to chimpanzee research groups is high. This is mainly the result of former graduate students at Ngogo and Kanyawara wanting to continue with research on chimps at the respective sites. Obviously this can lead to overcrowding because these alumni of MUBFS are also recruiting their own students. The solution to this problem is to establish new satellite sites in the vicinity of the territories of the existing study groups. This will facilitate the study of female dispersal and gene flow among chimpanzee communities.

#### 10.4 Achievements 2019-2020

Makerere University Biological Field Station (MUBFS) undertakes long term studies in and around Kibale National Park. Within this year, we have among others:

- Concluded censuses of all primate and terrestrial mammal densities, including elephants. This made a 50+ year record of population dynamics of primates and 30-year record for elephants. These results are extremely positive as the abundance of all of the populations that were monitored have increased.
- Monitored changing leaf, flowering, and fruiting patterns of tree species used by primates and terrestrial mammals, for which we have continuous data since 1970.
- We are currently grappling with what telemetry methods to employ to monitor the movements of problem elephants that crop-raid. The cost of satellite technology is currently prohibitive, but we hope to apply two satellite transmitters to an individual in each of two elephant herds. We have received funding to collaborate in a telemetry study of this nature in Murchison National Park, Uganda to the north of Kibale, this will allow us to refine the techniques, learn the darting procedures, and test out technologies. But we still need to obtain additional funding for the telemetry project in Kibale. However, we have established what we call a virtual boundary such that once breached in real time we will be alerted via cell-phone technology. The latter will be useful for providing farming communities on the forest edge with warnings of impending crop raiding by elephants.
- We have planned to monitor elephant movement through genetically identifying individuals by sampling DNA in the dung and by following track of groups after then leave a crop raiding site. We have been successful at getting DNA from elephant dung already (Omeja et al. 2017). Trials at following tracks have been successful at following crop raiding individuals for up to 3 km into the park after which time the crop raiding group would often join another group of animals and we could not conclusively state who we were following subsequently.
- With the help of a group of engineering students at McGill University students we have developed an elephant odor gun, that can spray an aerosolized liquid into the air and the smell of that liquid spreads rapidly. The gun is made of locally available PVC pipe, and with the exception of a 25 cent washer, can all be bought and easily build in Uganda. With the aid of an Evolutionary Chemist at Ulm University in Germany we have developed a number of scents that elephants should not like (none would hurt the animals or children if they were exposed to them or sprayed in the eye). We have permission to test what chemical the elephants appear to find very disgusting and move away from for a captive group of rehabilitant elephants in South Africa.

- Nutrition analyses of forest foods and crops has been initiated.
- Continuation of the collection of behavioral data on the Chimpanzee and Monkey communities at Kanyawara and Ngogo areas.
- The Kibale Snare Removal Project working in collaboration with Uganda Wildlife Authority (UWA) to reduce illegal activities, especially snaring. As predicted, illegal activities increased due to the lockdown with 700% increase in April and May. However, this was quickly curtailed by aggressive joint patrols organized by UWA.
- Kibale Forest Schools Program (KFSP) conducts Health and Conservation education in 16 Government-aided Primary schools that are within 5Km of the western side of Kibale National Park.

### 10.5 MUBFS Publications

Mawa, C., Babweteera, F., Tabuti, J. R. S., & Tumusiime, D. M. (2020). Changes in vegetation characteristics following a decade of community forest management in mid-western Uganda. *International Forestry Review*, 22(3), 323-338.

Ochieng, A. & Tumusiime, D.M. (2020). Tourism Revenue as Catalyst for Sustainable Development, in: Bakar, A.N. & Suratman, M.N. (ed.), *Protected Areas, National Parks and Sustainable Future*, IntechOpen.

Tumusiime, D.M. and Rukarwa, R.J. (2020). Review of Jan-Bart, G., Spierenburg, M. and Wels, H. Book, *Nature Conservation in Southern Africa: Morality and Marginality: Towards Sentient Conservation?* *Canadian Journal of African Studies*

Mukisa, P. K., Tumusiime, D. M., Webersik, C., Liwenga, E. T., & Tabuti, J. R. S. (2020). Dissenting voices in a consenting village: lessons from implementation of free, prior and informed consent at a REDD+ pilot in Tanzania. *International Forestry Review*, 22(1), 120-131.

Chapman, Colin A., Júlio César Bicca-Marques, Amy E. Dunhan, Pengfei Fan, Peter J. Fashing, Jan Gogarten, Songtao Guo, Michael A. Huffman, Urs Kalbitzer, Changyong Ma, Ikki Matsuda, Patrick A. Omeja, Raja Sengupta, Juan Carlos Serio-Silva, Yamato Tsuji, and Nils Chr. Stenseth. 2020. Primates can be a rallying species to promote tropical forest restoration. *Folia Primatologica*. DOI: 10.1159/000505951.

Kalbitzer, Urs, Victoria McInnis, Patrick A. Omeja, Sarah Bortolamiol, and Colin A. Chapman. 2019. Does the presence of elephant dung create hotspots of seedling growth for existing seedlings? *Journal of Tropical Ecology* 35:132-139.

Chapman, Colin A., Patrick A. Omeja, and Claire A. Hemingway. Africa needs better science capacity to meet environmental challenges. *The Conversation* <https://theconversation.com/africa-needs-better-science-capacity-to-meet-environmental-challenges-119677>.

Rosati AG, L Hagberg, DK Enigk, E Otali, M Emery Thompson, MN Muller, RW Wrangham, ZP Machanda. 2020. Social selectivity in aging wild chimpanzees. *Science* 370: 473-476.

Negrey JD, M Emery Thompson, KE Langergraber, ZP Machanda, JC Mitani, MN Muller, E Otali, LA Owens, RW Wrangham & TL Goldberg. 2020. Demography, life history trade-offs, and the gastrointestinal virome of wild chimpanzees. *Philosophical Transactions of the Royal Society, B*. 375: 20190613.

Phillips SR, TL Goldberg, MN Muller, ZP Machanda, E Otali, S Friant, J Carag, KE Langergraber, JC Mitani, EE Wroblewski, RW Wrangham & M Emery Thompson. 2020. Faecal parasites increase with age but not reproductive effort in wild female chimpanzees. *Philosophical Transactions of the Royal Society, B*. 375: 20190614.

Emery Thompson M, ZP Machanda, SA Fox, KH Sabbi, E Otali, NA Thompson, MN Muller & RW Wrangham. 2020. Evaluating the impact of physical frailty during ageing in wild chimpanzees (*Pan troglodytes schweinfurthii*). *Philosophical Transactions of the Royal Society, B*. 375: 20190607.

Thompson González NA, E Otali, ZP Machanda, MN Muller, RW Wrangham & M Emery Thompson. 2020. Urinary markers of oxidative stress respond to infection and late-life in wild chimpanzees. *PLOS One*. 15: e0238066.

Enigk DK, M Emery Thompson, ZP Machanda, RW Wrangham & MN Muller. 2020. Competitive ability determines coalition participation and partner selection during maturation in wild male chimpanzees (*Pan troglodytes schweinfurthii*). *Behavioral Ecology and Sociobiology* 74: 89.

Muller MN, NG Blurton Jones, F Colchero, M Emery Thompson, DK Enigk, JT Feldblum, BH Hahn, KE Langergraber, EJ Scully, L Vigilant, KK Walker, RW Wrangham, EE Wroblewski & AE Pusey. 2020. Sexual dimorphism in chimpanzee (*Pan troglodytes schweinfurthii*) and human age-specific fertility. *Journal of Human Evolution*. 144: 102795.

Emery Thompson M, SA Fox, A Berghänel, K Sabbi, S Phillips-Garcia, D Enigk, E Otali, ZP Machanda, RW Wrangham & MN Muller. 2020. Aging of the glucocorticoid stress response in wild chimpanzees. *PNAS*. 117: 8424-8430.

Sabbi KH, MN Muller, SA Fox, ZP Machanda, E Otali, RW Wrangham & M Emery Thompson. 2020. Human-like adrenal development in wild chimpanzees: A longitudinal study of cortisol and dehydroepiandrosterone-sulfate. *American Journal of Primatology*.

## 10.6 Other MUBFS Achievements

- One MSc Students (Anke) has successfully defended her thesis addressing, *“The Effect of Lantana Camara L. on the Recovery of a Moist Semi-Deciduous Forest at Mainaro, Kibale National Park, Uganda”*.
- The Other two Ugandan Masters Students finished their field work, analysis; one (Anna) has finalised the write up and has her thesis titled, *“Factors Influencing Farmers’ Willingness to Pay for Reduction in Human-Wildlife Conflict around Kibale National Park”* submitted.
- Emmanuel Abwa is in the final stages of his thesis write-up. His thesis is titled, *“Rural livelihood diversification on food insecurity in the area around Kibale National Park, a case study of the area around Kibale National Park in Kabarole district”*.
- Mr. Samuel Angedakin, Manager Ngogo Chimpanzee Project has been admitted to a PhD Program at the School of Forestry, Environmental and Geographical Sciences. The title of his study is; *“Conservation and Livelihood Impacts of Long-term Research Presence in an African Tropical Rainforest”*. To be supervised by Prof. Mnason Tweheyo and Assoc Prof. David Mwesigye Tumusiime.

## 11.0 THE NATIONAL BIODIVERSITY DATABANK (NBDB)

The National Biodiversity Data Bank (NBDB) was established at Makerere University's then Institute of Environment and Natural Resources (MUIENR) in 1990 as a direct response to conservationists' need to have readily available data and information regarding the country's biodiversity thus acting as a central repository for biodiversity data and information. The vision of NBDB is "To be the leading center of excellence in quality biodiversity and environmental data collection, processing and management in Uganda" while its mission is "To inventory and monitor the national biological resources and provide biodiversity information to conservationists, government agencies, land managers and others interested in the conservation and sustainable utilisation of these resources". Since the restructuring of the University academic structures in 2010, the NBDB is one of the specialized units in CAES and is hosted by the Department of Environmental Management.

Although the NBDB has for some time been facing challenges that have been hindering its performance, the College Administration has taken serious initiatives to revamp it in the recent past. These include the on-going institutionalization of the NBDB together with the changes in the NBDB Management Structure with the introduction of a Coordinator, NBDB supported by a Data Bank Manager, Research Scientists, NBDB Administrative Assistant and volunteers. In addition, the NBDB Advisory Board consisting of among others eminent members representing Ministries, Departments, Agencies and the Civil Society including NEMA, UWA, NFA, NAFIRRI, WCS Uganda Country Program and Makerere University among others has been inaugurated. The NBDB Technical Committee has also been re-constituted to enhance its effectiveness.



*NBDB Board Members with the Representative of the Principal, CAES, Assoc. Prof. Fred Babweteera at Fairway Hotel, Kampala on 12<sup>th</sup> November 2020.*

The new management team led by the Coordinator, Dr. Daniel Waiswa, is now engaged in fundraising efforts including writing research proposals, and reaching out to stakeholders. In fact, the current efforts are majorly a result of a successful grant application to Makerere University Research and Innovations Fund, that NBDB is really grateful to as it gave back life to the NBDB. It is worth reporting that there is now more stakeholder engagements and networking, data mobilization is ongoing, and also increased online presence of the NBDB having launched its online application in September 2019. The space and infrastructure has also been upgraded for improved service to stakeholders. As we move into 2021, we are majorly faced with the challenges of sustainability of NBDB staffing and funding of NBDB activities yet these are critical for our operations. As such, there is a need for university management to fully offer employment to the current project employees supporting the NBDB and also offer budget support to NBDB as we also call upon stakeholders to continue their engagements with us so that we can together contribute to conservation of biological resources.



## 12.0 MAKERERE UNIVERSITY CENTRE FOR CLIMATE CHANGE RESEARCH AND INNOVATIONS (MUCCRI)

Launched in 2013, Makerere University Centre for Climate Change Research and Innovations (MUCCRI) <https://muccri.mak.ac.ug/> is a unit in CAES that focuses on research, training, and policy engagements in climate change. MUCCRI is also founder member of the Least Developed Countries Consortium on Climate Change (LUCCC) initiative, <http://www.luccc.org/>, a south-south long-term capacity-building programme involving universities in LDCs aimed at increase the capacity of LDCs to build their own capacity to address climate change through research, knowledge sharing and education.

During the reporting period MUCCRI has been engaged in various initiatives and has made the following achievements:

- Secretariat to the UN Sustainable Development Solutions (SDSN) Uganda national network (see <http://www.sdsn-uganda.org/>) that is hosted by Makerere University and coordinated by CAES. SDSN Uganda brings together SDSN members in the country to identify, develop and implement transformative solutions for sustainable development. It mobilizes universities, research and knowledge centers, civil society, private sector, and special interest groups to promote the achievement of 2030 sustainable development agenda and the Paris Agreement on climate change.
- Partnering with Cities Alliance, Jinja City Council and ACTogether in the implementation of pilot project on migration that is strengthening capacity for urban migration management and improving migrant livelihoods in Jinja City, Uganda (see <https://jinjacity-learning.com/>).
- Collaborating with the International Office of Migration (IOM) in Uganda to conduct research on migration, environment and climate change nexus in Uganda. The study sites include Amudat, Katakwi and Bududa districts.
- Collaborated with Oxfam NOVIB in Uganda to documented the impacts of climate change and coping practices in agriculture in Uganda with case studies in Arua, Buduada, Hoima, and Kotido districts. A documentary film was also produced.
- A partner of a wider north-south collaborative research project to deepen understanding of the role of universities as knowledge brokers in influencing climate resilience policy and networks. The research involves four universities in four countries across three regions: Europe, East Africa and South Asia; including the London School of Economics (LSE) UK as lead, TH Köln University of Applied Sciences (Germany), the Independent University in Bangladesh (Bangladesh), and Makerere University (Uganda).
- Participating in the Worldwide University Network (WUN) Research Development Fund grant entitled “Education in a Warming World: A Collaborative Research Network on Education and Climate Change”. The project aims to bring together researchers to undertake innovative, high quality, sustainable research that addresses global challenges. The research team involves University College Dublin (lead); University of Lausanne; University of Leeds; Maastricht University; The University of Western Australia University of Ghana and Makerere University.

- A partner in a comparative research program that is investigating sustainable energy transitions in developing countries. The study team is composed of an interdisciplinary team of academics from Canada will work with counterparts across three countries in East Africa—Tanzania, Uganda, and Kenya—to develop and validate a common methodology bringing together research traditions in energy system modeling, geography and comparative political economy of development. The research team is composed of the Université du Québec à Montréal (UQAM) as lead, Ryerson University in Ontario, Makerere University, University of Nairobi and University of Dar es Salaam.

### Some Challenges

While the longer-term aim is institutionalization of MUCCRI as climate change centre of excellence at Makerere University, it is still being run as a unit in CAES and yet to be approved by Senate to become a fully-fledged centre of Makerere University. The Centre does not have a university budget or fulltime staff and remains highly dependent on project funds. The COVID-19 pandemic and its associated restrictions have not allowed the centre to conduct short courses and trainings, and have reduced research activities.



# PUBLICATIONS

2019/2020

## 13.0 PUBLICATIONS 2019/2020

Over 250 Staff Publications in revered journals recorded for the Academic Year 2019/2020.

1. A. Akwero, D. Ocan, W. Akech, J. Lamo, M. Ochwo-Ssemakula and P. Rubaihayo. 2020. Allelic variations in aroma gene in cultivated rice varieties. *African Crop Science Journal*, 28 (2), 241- 254
2. A. Badji, L. Machida, D. B. Kwemoi, F. Kumi, D. Okii, N. Mwila, S. Agbahoungba, A. Ibanda, A. Bararyenya, S. N. Nghituwamhata, T. Odong, P. Wasswa, M. Otim, M. Ochwo-Ssemakula, H. Talwana, G. Asea, S. Kyamanywa and P. Rubaihayo. Factors Influencing Genomic Prediction Accuracies of Tropical Maize Resistance to Fall Armyworm and Weevils. Pre-print version 2. <https://doi.org/10.20944/preprints202007.0336.v2>
3. A. Badji, D. B. Kwemoi, L. Machida, D. Okii, N. Mwila, S. Agbahoungba, F. Kumi, A. Ibanda, A. Bararyenya, M. Solemanegy, T. Odong, P. Wasswa, M. Otim, G. Asea, M. Ochwo-Ssemakula, H. Talwana, S. Kyamanywa and P. Rubaihayo. 2020. Genetic Basis of Maize Resistance to Multiple Insect Pests: Integrated Genome-Wide Comparative Mapping and Candidate Gene Prioritization. *Genes* 11, 689. <https://doi:10.3390/genes11060689>
4. Akumu, G.; Atukwase, A. Tibagonzeka, J. E.; Apil, J. Wambete, J. M. Atekyereza, P. R.; Kiyimba, F. J. Muyonga, J. H. 2020. On-farm evaluation of effectiveness of improved postharvest handling of maize in reducing grain losses, mold infection and aflatoxin contamination in rural Uganda. *African Journal of Food, Agriculture, Nutrition & Development*, 20: 16522-16539.
5. Akullo, D., Kigozi, J., & Muyonga, J.H. 2020. Nutritional, sensory and shelf life quality of tilapia and Nile perch sausages enriched with fish bone soup. *International Journal of Fisheries and Aquatic Studies*, 8(3): 646-653.
6. Alamu, E. O., Nuwamanya, E., Cornet, D., Meghar, K., Adesokan, M., Tran, T., ... & Davrieux, F. (2020). Near-infrared spectroscopy applications for high-throughput phenotyping for cassava and yam: A review. *International Journal of Food Science & Technology*.
7. Aboda, C., Vedeld, P., Byakagaba, P., Mugagga, F., Nabanoga, G., F., Tumwine, R.F., Mukwaya, P. (2019). Socio-economic Consequences of Displacement and Resettlement: A case of the Planned Oil-Refinery– Development Project in the Albertine Region of Uganda. *Journal of Refugee Studies*. <https://doi.org/10.1093/jrs/fez066>
8. Aryampa, S., Basant Maheshwari, E. Sabiiti, N., L. Bateganya and B. Bukenya. Status of Waste Management in the East African Cities: Understanding the Drivers of Waste Generation, Collection and Disposal and Their Impacts on Kampala City's Sustainability. 2019. *Sustainability* 2019, 11(19), 5523; <https://doi.org/10.3390/su11195523>
9. Aboda. C., F. Mugagga., Byakagaba, P., G. Nabanoga (2019). Development Induced Displacement; A review of Risks Faced by Communities in Developing Countries. *Sociology and Anthropology*. 7 (2): 100 – 110. DOI: 10.13189/sa.2019.070205
10. Aboda. C., F. Mugagga., Byakagaba, P., G. Nabanoga 2019 Development Induced Displacement; A review of Risks Faced by Communities in Developing Countries. *Sociology and Anthropology Journal* vol. 7 series ,2 pgs 10 DOI: 10.13189/sa.2019.070205
11. Aganyira, K., Kabumbuli, R., Muwanika, V.B., Nampanzira, D., Tabuti, J.R.S., Sheil 2019. Learning from Failure: Lessons from a Forest Based Carbon and Charcoal Project *International Forestry Review Journal Paper* <https://doi.org/10.1505/146554819825863744>
12. Ambole, Amollo Musango, Josephine Kaviti Buyana, Kareem Ogot, Madara Anditi, Christer Mwau, Baraka Kovacic, Zora Smit, Suzanne Lwasa, Shuaib Nsangi, Gloria Sseviiri, Hakimu Brent, Alan C 2019 Mediating household energy transitions through co-design in urban Kenya, Uganda and South Africa *Energy Research & Social Science Journal* vol. 55 pgs 9 [10.1016/j.erss.2019.05.009](https://doi.org/10.1016/j.erss.2019.05.009)
13. Arfang Badji, Michael Otim, Lewis Machida, Thomas Odong, Daniel KWEMOI, Dennis Okii, Symphorien Agbahoungba, Natasha Mwila, Frank Kumi, Angele Ibanda, Stephen Mugo, Samuel Kyamanywa, Patrick Rubaihayo 2019 Maize combined insect resistance genomic regions and their co-localization with cell wall

- constituents revealed by tissue-specific QTL meta-analyses. *Frontiers in Plant Sciences Journal Paper* vol. 9
14. Aryemo, I.P., Akite, I., Kule, E.K., Kugonza, D.R., Okot, M.W. & Mugonola, B 2019 Drivers of Commercialization: A Case of Indigenous Chicken Production in Northern Uganda *African Journal of Science, Technology, Innovation & Development Journal Paper* vol.11 10.1080/20421338.2019.1573957
  15. Astere Bararyenya, Phinehas Tukamuhabwa, Paul Gibson, Wolfgang Gruneberg, Reuben Ssali, Jan Low, Thomas Odong, Mildred Ochwo-Ssemakula, Herbert Talwana, Natasha Mwila, Robert Mwanga 2019 Continuous Storage Root Formation and Bulking in Sweetpotato. *Gates Open Research Journal Paper* vol.3
  16. Ayorekire J., Obua J. and Byaruhanga B.M. 2019 Broadening Uganda's tourism product base through indigenous cultural resource utilisation *Routledge Book Chapter* 79
  17. Ayorekire J., Obua J. and Manyara G. 2019 Regional tourism in Inter-Governmental Authority on development: a comparative policy and institutional best practice approach *International Journal of Tourism Policy Journal Paper* 9 1 50
  18. Baidhe, E., Kigozi, J. & Kambugu, R.K. Design, Construction and Performance Evaluation for a Maize Weeder Attachable to an Ox-Plough Frame. *J. Biosyst. Eng.* (2020). <https://doi.org/10.1007/s42853-020-00045-y>
  19. Bararyenya, A., Olukolu, B.A., Tukamuhabwa, P., Grüneberg, W.J., Ekaya, W. Low, J. Ochwo-Ssemakula, M., Odong, T.L., Talwana, H., Badji, A., Kyalo, M., Nasser, Y. Gemenet, D., Kitavi, M. and Mwanga, R.O.M. 2020. Genome-wide association study identified candidate genes controlling continuous storage root formation and bulking in hexaploid sweetpotato. 2020. *BMC Plant Biology* 20:3. <https://doi.org/10.1186/s12870-019-2217-9>
  20. Bashaasha, B., Namulondo, R., Emegu, R.I., Webb, P., Ghosh, S., and Agaba E. (2020). Association between bio-fortification and child nutrition among smallholder households in Uganda. *Journal of Agricultural Economics and Rural Development (AJAERD)*. Vol. 6(2), pp. 744-7515
  21. Bater, J., Lauer J. M., Ghosh, S., Webb, P., Agaba, E., Bashaasha, B., Turyashemererwa, F.M., Shrestha, R., and Duggan, C.P. (2020). Predictors of low birth weight and preterm birth in rural Uganda: findings from a birth cohort study. *PLOS ONE*. PONE-D-20-04920R2 (Forthcoming).
  22. Bbosa, T., Ndagire, C, T., Mukisa, I.M., Fiaboe, K.K.M., & Nakimbugwe D. (2019). Nutritional characteristics of selected insects in Uganda for use as alternative protein sources in food and feed. *Journal of Insect Science*, 19 (6).
  23. Byarugaba, R., Nabubuya, A., & Muyonga, J.H. 2020. Descriptive sensory analysis and consumer preferences of bean sauces. *Food Science & Nutrition*, 8: 4252-4265.
  24. Byakika, S., Mukisa, I. M., Byaruhanga, Y. B., & Muyanja, C. (2020). Probiotic Potential of Lactic Acid Starter Cultures Isolated from a Traditional Fermented Sorghum-Millet Beverage. *International Journal of Microbiology*, 2020.
  25. Byakika, S., Mukisa, I.M., Mugabi, R., & Muyanja, C. 2019. Antimicrobial activity of lactic acid bacteria starters against acid tolerant, antibiotic resistant and potentially virulent *E. coli* isolated from a fermented sorghum-millet beverage. *International Journal of Microbiology*.
  26. Byakika, S., Mukisa, I.M., Wacoo, A.P., Kort, R., Byaruhanga, Y., & Muyanja, C. (2019). Potential application of lactic acid starters in the reduction of aflatoxin contamination in fermented sorghum-millet beverages. *International Journal of Food Contamination*, 6 (4): 1-8..
  27. Byakika, S., Mukisa, I.M., Muyanja, C., & Byaruhanga, YB. (2019). A review of criteria and methods for evaluating the probiotic potential of microorganisms. *Food Reviews International*, 35 (5): 427-466.
  28. Byakika, S., Mukisa, I. M., Byaruhanga, Y. B., Male, D., & Muyanja, C. (2019). Influence of food safety knowledge, attitudes and practices of processors on microbiological quality of commercially produced traditional fermented cereal beverages, a case of Obushera in Kampala. *Food Control*, 100: 212-219.
  29. B. Sadina, A. Amoding, R. Amayo & M. Biruma 2019 Integrating Soybean Residues with Nitrogen Fertilizer for Improved Maize Production in Eastern Uganda *Journal of Agricultural Science* , vol. 11 series 8, pgs 10 10.5539/jas.v11n8

30. Baguma, J.K., Mukasa S.B., Kawuki, R., Tugume, A.K. Buttibwa, M., Nalela, P., Eyokia M., Oshaba, B., Ceballos, H., Lentini, Z. and Baguma, Y. 2019 Fruit set and plant regeneration in cassava following interspecific pollination with castor bean. *African Crop Science Journal* Journal Paper vol. 27 series, 1 pgs 9 DOI: <https://dx.doi.org/10.4314/acsj.v27i1.8>
31. Balamaze J, Muyonga JH and YB Byaruhanga 2019 Production And Utilization Of Jackfruit (*Artocarpus Heterophyllus*) In Uganda *African Journal Of Food Agriculture, Nutrition & Development (Ajfand)* vol. 19 pgs 2 14289 Doi: 10.18697/Ajfand.85.17290
32. Balikoowa, K. Nabanoga, G. Tumusiime, D.M. and Mbogga, M. S. 2019 Gender differentiated vulnerability to climate change in Eastern Uganda, *Climate and Development Journal Paper* vol.11 10.1080/17565529.2019.1580555
33. Bamutaze, Y. (2019). Morphometric conditions underpinning the spatial and temporal dynamics of landslide hazards on the volcanics of Mt. Elgon, Eastern Uganda, p. 57-81, In F.I. Rivera, ed. *Emerging Voices in Natural Hazards Research*. Elsevier, Cham. ISBN: 978-0-12-815821-0, DOI:10.1016/B978-0-12-815821-0.00010-2 Elsevier Book Chapter 24 DOI:10.1016/B978-0-12-815821-0.00010
34. Bamutaze, Y., Kyamanywa, S., Singh, B.R., Nabanoga, G., Lal, R. Eds. (2019). *Agriculture and Ecosystem Resilience in Sub Saharan Africa: Livelihood Pathways Under Changing Climate*. Springer. ISBN 978-3-030-12973-6. Springer Book 765 10.1007/978-3-030-12974-3
35. Bararyenya A., Tukamuhabwa, P., Gibson, P., Gruneberg, W., Ssali, R., Low, J., Odong, T., Ochwo-Ssemakula, M., Talwana, H., Mwila, N. and Mwangi, R. 2019 Continuous Storage Root Formation and Bulking in Sweetpotato Gates Open Research Journal Paper vol. 3 pgs 83 <https://doi.org/10.12688/gatesopenres.12895.1>
36. Bashaasha B., Ravonborg, H. M., Turinawe, A., and Aलोbo Loison, S., (2019). Tenure Security and Land Improvements in Uganda. *Makerere University Journal of Agricultural and Environmental Sciences (MUJAES)*. Volume 8.
37. Bekele H and Turyashemererwa F 2019 Feasibility and acceptability of food based complementary feeding recipes using Trials of Improved Practices among poor families in rural Eastern and Western Uganda. *Journal of Food Science and Nutrition* vol. 7 pgs 16
38. Bianca Colombo, Mariana Villegas Calvo, Tommy Pepè Sciarria, Barbara Scaglia, Simon Savio Kizito, Giuliana D'Imporzano, Fabrizio Adani 2019 "Biohydrogen and polyhydroxyalkanoates (PHA) as products of a two-steps bioprocess from deproteinized dairy wastes" *Waste Management Journal Paper* 95 15-Jul-19 9 <https://doi.org/10.1016/j.wasman.2019.05.052>
39. Birungi Kyazze, F., Mubangizi, N., Mukwaya, P. I., and Kyamanywa, S. 2019 "Using Indigenous Knowledge to Enhance Rainfall Forecasts Among Smallholder Farmers in Mt. Elgon Region, Eastern Uganda. *Climate Change Management book series (CCM) Book Chapter* <https://doi.org/10.1007/978-3-030-12974-3>
40. Byakagaba, P., F. Mugagga., D. Nakayima (2019). The Socio-economic and Environmental Implications of Oil and Gas Exploration. Perspectives at the Micro Level in the Albertine Region of Uganda. *The Extractives and Society*. DOI: <https://doi.org/10.1016/j.exis.2019.01.006>
41. Byakika, S., Mukisa, I. M., Byaruhanga, Y. B., Male, D., & Muanja, C 2019. Influence of food safety knowledge, attitudes and practices of processors on microbiological quality of commercially produced traditional fermented cereal beverages, a case of Obushera in Kampala Food Control Journal Paper 100 <https://doi.org/10.1016/j.foodcont.2019.01.02>
42. Byakika, S., Mukisa, I.M., Wacoo, A.P., Kort, R., Byaruhanga, Y., & Muanja, C 2019 Potential application of lactic acid starters in the reduction of aflatoxin contamination in fermented sorghum-millet beverages *International Journal of Food Contamination* vol. 6 pgs 4 <https://doi.org/10.1186/s40550-019-0074-9>
43. Charles Andiku, Phinehas Tukamuhabwa, James Mukasa Ssebuliba, Hebert Talwana, Silver Tumwegamire and Wolfgang J. Grüneberg 2019 Evaluation of the American Yam Bean (*Pachyrhizus* spp.) for Storage Root Yield Across Varying Eco-geographic Conditions in Uganda *Journal of Agricultural Science Journal Paper* vol. 11series 8, pgs 13 doi:10.5539/jas.v11n8p100

44. D. Akullo and J. Kigozi, 2020. Nutrition knowledge, attitudes and practices regarding fish sausage consumption among young adults: Case study of Makerere University students *Journal of advances in food science and Technology*. 7(1): 1-5, 2020 ISSN: 2454-4213
45. D.B. Magala, M.N. Mangheni, R. Miiro 2019 Actor social networks as knowledge sharing mechanisms in multistakeholder processes: a case of coffee innovation platforms in Uganda *Journal of Agricultural Education and Extension Journal Paper* 10.1080/1389224X.2019.1629971
46. Deborah Ruth Amulen, Marijke D’Haese, Eline D’Haene, James Okwee Acai, Jacob Godfrey Agea, Guy Smagghe, Paul Cross 2019 Estimating the potential of beekeeping to alleviate household poverty in rural Uganda *Public Library of Science (PLoS)* vol. 14 pgs 3 <https://doi.org/10.1371/journal.pone.0214113>
47. Denis Nseka, Vincent kakembo, Yazidhi bamutaze and frank Mugagga 2019 Analysis of topographic parameters underpinnine landslide occurrence in kigezi highlands of South Western Uganda *Journal of natural hazards Journal Paper* NHAz-D-18-01526
48. Diaz, M., Kellingray, L., Akinyemi, N., Adefiranye, O. O., Olaonipekun, A. B., Bayili, G. R., ... & Mukisa, I. M. (2019). Comparison of the microbial composition of African fermented foods using amplicon sequencing. *Scientific Reports*, 9(1), 1-8.
49. E. Baidhe, J. Kigozi, I. M. Mukisa, C. Muyanja, L. Namubiru, B. Katarikawe. (2020). Unearthing the Potential of Pineapple Waste in Kangulumira sub-county, Kayunga District in Uganda: A review (Draft Manuscript)
50. E. Nuwamanya, O. Ampurire, Y. Mukasa, A. Katungisa, M. Kanaabi and E. Sserunjogi Mukiibi (2020) Phenotypic diversity and chemical properties of pawpaw fruit quality in Ugandan germplasm. *African Crop Science Journal*. Vol:28 (4). DOI: <https://dx.doi.org/10.4314/acsj.v28i4.4>
51. E. Nuwamanya, S. Acheng, P. Vuzi , H. Muyinza, M. Matovu, E. Atwijukire, G. Menya, K. Wanda, E. Nyakaisiki and B.A. Adebayo 2019 “Effectiveness Of Pruning And Waxing In Reducing Postharvest Physiological Deterioration In Uganda Local Cassava Varieties” *African Crop Science Journal* vol. 27, series 2, pgs 13 <https://dx.doi.org/10.4314/acsj.v27i2.9>
52. Egeru, A., Barasa, B., Nampijja, J., Siya, A., Makooma, M. T., & Majaliwa, M. G. J. 2019 Past, Present and Future Climate Trends Under Varied Representative Concentration Pathways for a Sub-Humid Region in Uganda. *Climate Journal Paper* vol.7 <https://doi.org/10.3390/cli7030035>
53. Egeru, A., Wasonga, O., Gabiri, G., MacOpiyo, L., Mburu, J., Majaliwa, M.G.J 2019 Land Cover and Soil Properties Influence on Forage Quantity in a Semi-arid Region in East Africa *Applied and Environmental Soil Science Journal* 6874268 15 <https://doi.org/10.1155/2019/6874268>
54. Elbeltagy, A., Bertolini, F., Fleming, D.S., Van Goor, A., Ashwell, C.M., Schmidt, C.J., Kugonza, D.R., Lamont, S.J. & Rothschild, M.F 2019 Natural selection footprints among African chicken breeds and village ecotypes. *Frontiers in Genetics Journal Paper* vol 10 series 376 pgs 16 [10.3389/fgene.2019.00376](https://doi.org/10.3389/fgene.2019.00376).
55. Ephraim Nuwamanya, Evans Atwijukire 2019 Advances in carotenoid increments in storage parts of African staple crops *Journal of Plant Breeding and Crop Science* vol. 11 series 3, pgs 11 <https://doi.org/10.5897/JPCS2018.0776>
56. Esuma, W. Nanyonjo A.R., Miiro, R., Angudubo, S. & Kawuki, S.K. 2019 Men and women’s perception of yellow-root cassava among rural farmers in eastern Uganda” *Agriculture & Food Security Journal* vol 8, pgs 10 <https://doi.org/10.1186/s40066-019-0253-1>
57. Evans Atwijukire Joseph Ffuna Hawumba, Yona Baguma, Enoch Wembabazib, Williams Esuma, Robert Sezi Kawuki Ephraim, Nuwamanya 2019 Starch quality traits of improved provitamin A cassava (*Manihot esculenta* Crantz) *Heliyon Journal Paper* 5 vol.2 pgs 10 <https://doi.org/10.1016/j.heliyon.2019.e01215>
58. Farrow, A., Ronner, E., Van den Brand, G., Boahen, S., Leonardo, W., Wolde-Meskel, E. , Adjei-Nsiah, S., Chikowo, R., Bajjukya, F. P., Ebanyat, P., Sangodele, E. , Phiphira, L., Woomer, P., Ampadu-Boakye, T., Baars, E., Kanampiu, F. , Vanlauwe, B., Giller, K., 2019 From best fit technologies to best fit scaling: Incorporating and evaluating factors affecting the adoption of grain legumes in sub-Saharan Africa *Experimental Agriculture Journal Paper* vol.6 pgs 16 DOI: [10.1017/S0014479716000764](https://doi.org/10.1017/S0014479716000764)

59. Finke, P., Opolot, E., Balesdent, J., Berhed, A.A., Boeckx, P., Cornu, S., Harden, J., Hatte, C., Williams, E., Doetterl, D. (2019). Can SOC modelling be improved by accounting for pedogenesis? *Geoderma*, 338: 513–524. *Geoderma Journal Paper* vol.338 pgs 11 <https://doi.org/10.1016/j.geoderma.2018.10.018>
60. Florence Birungi Kyazze, Narisi Mubangizi, Paul Isolo Mukwaya & Samuel Kyamanywa 2019 Using Indigenous Knowledge to Enhance Rainfall Forecasts Among Smallholder Farmers in Mt. Elgon Region, Eastern Uganda Springer Nature Book Chapter 23 [https://doi.org/10.1007/978-3-030-12974-3\\_31](https://doi.org/10.1007/978-3-030-12974-3_31)
61. FR Muwanika, LK Atuhaire, B Ocaya, RE Isoto 2019 Consequences of Climate Variation on Malaria Incidence in Uganda *Climatol Weather Forecasting Journal Paper* 7 1 6 10.4172/2332-2594.1000244
62. Frank Mugagga, Julius Elepu, Alex Nimusiima and Yazidhi Bamutaze 2019 Institutional Determinants to Climate Variability Adaptation by Smallholder Irish Potato Farmers in Rubanda District, South Western Uganda *American Journal of Climate Change* vol. 8, pgs 7793
63. Fred Brany Lukwago, Ivan M.Mukisa, Abel Atukwase, Archileo N.Kaaya and Susan Tumwebaze 2019 Mycotoxins contamination in foods consumed in Uganda: A 12- year review (2006-2018). Published by Elsevier B.V. on behalf of African Institute of Mathematical Sciences/ Next Einstein Initiative. *Journal Paper* 3 <https://doi.org/10.1016/j.sciaf.2019.e00054>
64. Fungo R & Tieguhong J C 2019 Nutrient and Bioactive Analyses of Forests Foods for Policy Making on Food and Nutrition Security in Central. *Nutri Food Sci Int J. Journal Paper* 8 3 555737 10.19080/NFSIJ.2019.08.555737
65. Fungo, R.; Muyonga, J.H.; Ngondi, J.L.; Mikolo-Yobo, C.; Iponga, D.M.; Ngoye, A.; Nchuaji Tang, E.; Chupezi Tieguhong, J 2019 Nutrient and Bioactive Composition of Five Gabonese Forest Fruits and Their Potential Contribution to Dietary Reference Intakes of Children Aged 1–3 Years and Women Aged 19–60 Years *Forests, Journal Paper* vol.10 pgs 86
66. Frances Nakakawa, Johnny Mugisha, Gracious M. Diiro, Archeleo N. Kaaya, Nazarious M. Tumwesigye, (2020) Food and nutrition status of households with women living with HIV in Uganda, *Scientific African*, Volume 8, 2020, e00394, ISSN 2468-2276, <https://doi.org/10.1016/j.sciaf.2020.e00394>.
67. F. Kasule, P. Wasswa, S.B. Mukasa, A. Okiror And A.W. Mwang'ombe (2020). Effective Isolation Distance for prevention of Cassava Virus Infections in Uganda. *African Crop Science Journal*, Vol. 28 Issue Supplement, s1 pp. 1- 13 ISSN 1021-9730/2020. DOI: <https://dx.doi.org/10.4314/acsj.v28i1.1S>
68. Frank Mugagga , Alex Nimusiima and Julius Elepu (2020): An Appraisal of Adaptation Measures to Climate Variability by Smallholder Irish Potato Farmers in South Western Uganda. *American Journal of Climate Change*. 9, 228-242. <https://doi.org/10.4236/ajcc.2020.93015>
69. Fungo, R., Tieguhong, J.C., Iponga, D.M., Tchatata, M., Kahindo, J.M., Muyonga, J.H., Mikolo-Yobo, C., Donn, P., Tchingsabe, O., Kaaya, A.N., Ngodi, J.L., Tutu, S., Emeleme, R., Odjo, S., Loo, J., & Snook, L. 2020. Can wild forest foods contribute to food security and dietary diversity of rural populations adjoining forest concessions? Insights from Gabon, DR Congo and Cameroon. *International Forestry Review*, 22 (S2).
70. Gracious Malton Diiro Menale Kassie, Beatrice Wambui Muriithi, and Clifford Mutero. Gender heterogeneous effects of malaria risk on agriculture productivity: Empirical Evidence from Rural Ethiopia. [under review, *Journal of Developing areas*].
71. Gracious M. Diiro, Menale Kassie, Beatrice Wambui Muriithi, Nancy G. Gathogo, Michael Kidoido, Rose Marubu, John Bwire Ochola and Clifford Maina Mutero. (2020). Are Individuals Willing to Pay for Community-based Eco-friendly Malaria Vector Control Strategies? An auction Experiment of Mosquito Larviciding using Plant-based Biopesticides in Kenya. *Sustainability*, 12, 8552; doi:10.3390/su12208552
72. Gabriel Karubanga, Jacob Godfrey Agea, Florent Okry, Steven Kiwewesi and Joseph Lwanga Kiggundu Mugerwa 2019 Factors Effecting Change in Rice Production Practices and Technologies among Smallholder Farmers in Kamwenge District, Uganda *Indian Journal of Ecology* (2019) 46(2): 316-324 vol. 46 series 2. pgs 8
73. Giregon OLUPOT, Ali Basamba Ateenyi TWAHA, Peter EBANYAT, Patrick MUSINGUZI, Emmanuel OPOLOT, Alice A. KATUSABE, Mateete A. BEKUNDA, Bal Ram SINGH 2019. Making Sense Out of Soil Nutrient Mining



- and Depletion in Sub-Saharan Africa Taylor & Francis Book Chapter
74. Githiomi, Caroline & Muriithi, Beatrice & Irungu, Patrick & Mwangi, Chris M. & Diro, Gracious & Affognon, Hippolyte & Mburu, John & Ekesi, Sunday 2019 Economic analysis of spillover effects of an integrated pest management (IPM) strategy for suppression of mango fruit fly in Kenya Food policy Journal Paper 84 DOI: 10.1016/j.foodpol.2019.03.006
  75. Godfrey Ssebulime, Kenneth Nyombi, Godfrey Kagezi, Samuel Mpiira, Simon Byabagambi, Wilberforce Tushemereirwe, Eldad Karamura, Isaac Kiyangi, Hussein Kivumbi Balimuni & Charles Staver 2019. "Assessing the potential of trees to sustain soil fertility in the banana agroforestry system in Uganda Agroecology and sustainable food systems Journal Paper 2168, <https://doi.org/10.1080/21683565.2019.1566190>
  76. Gorettie N. Nabanoga , Justine Namaalwa and Allan Bomuhangi 2019. The Impacts of Climate Change on Small Holder Households in Mt. Elgon Region of Uganda- Does Gender matter?, Springer Book Chapter 17 10.1007/978-3
  77. Gwandu, C., Ochwo-Ssemakula, M. and Sseruwagi, P. 2019. Whitefly Resistance in African Cassava Genotypes. African Crop Science Journal 27(2), 213 – 228
  78. H. Mackay, F. Mugagga, L. Kakooza & L. Chiwona-Karlton 2018 1. Doing things their way? Food, farming and health in two Ugandan cities Cities & Health Journal Paper 23 DOI:10.1080/23748834.2017.1414425
  79. Habinshuti, S.J., Maseko, S.T. & Dakora, F.D. 2019 Symbiotic N<sub>2</sub> fixation, C accumulation and plant water use efficiency in common bean (*Phaseolus vulgaris* L.) grown in farmers' fields in the Eastern Cape and Limpopo Provinces in South Africa, measured using relative ureide abundance and <sup>13</sup>C natural abundance (in progress) Plant Physiology Journal Paper
  80. Hirwa, C.D., Kugonza, D.R., Kayitesi, A., Murekezi, T., Semahoro, F., Uwimana, G. and Habimana, R. 2019. Phenotypes, production systems and reproductive performance of indigenous chickens in contemporary Rwanda. International Journal of Livestock Production, 10(10): 213–231.
  81. H. Wagaba, P. Kuria, P. Wangari, J. Aleu, H. Obiero, G. Beyene, T. Alicai, A. Bua, W. Esuma, E. Nuwamanya, S. Gichuki, D. Miano, P. Raymond, A. Kiggundu, N. Taylor, B.M. Zawedde, C. Taracha & D.J. MacKenzie (2021) Comparative compositional analysis of cassava brown streak disease resistant 4046 cassava and its non-transgenic parental cultivar, GM Crops & Food, 12:1, 158-169, DOI: 10.1080/21645698.2020.1836924
  82. Iragaba, P., Hamba, S., Nuwamanya, E., Kanaabi, M., Nanyonjo, A.R., Mpamire, D., Muhumuza, N., Khakasa, E., Tufan, H.A. and Kawuki, R.S., Identification of cassava quality attributes preferred by Ugandan users along the food chain. International Journal of Food Science & Technology.
  83. Ilukor J, Isoto RE, Turinawe A, Muwanika FR 2019 Do Investments in Agricultural Extension Deliver Positive Benefits to Health, Trade and Industry, Water and Environment? International Journal of Agricultural Education and Extension, Journal Paper 5 series 1 pages 22
  84. Isaac O.Omagor, Julia Kigozi, Charles Muyanja, Mary Namwanje and Sloans K. Chimatiro, 2020. Effect of Artisanal (Small-Scale) Processing on the Quality Attributes of *Rastrineobola argentea* (Silver cyprinid). International Journal of Fisheries and Aquatic Studies. International Journal of Fisheries and Aquatic Studies 2020 8(4): 265-273
  85. Isaac. O.Omagor, Julia Kigozi, Charles Muyanja, Mary Namwanje and Sloans K. Chimatiro Artisanal, 2020. Processing and Preservation Practices Carried out by Silver Cyprinid (*Rastrineobola argentea*) Processors along the Shores of Lake Victoria in Uganda. Journal of advances in food science and Technology. 7(1): 6-11, 2020 ISSN: 2454-4213
  86. James Menya, Peter Tumutegyereize, Isa Kabenge and Julia Kigozi. Performance evaluation of cassava drying technologies: a case study from Uganda. MOJ Food Process Technol. 2020;8 (2):46–51.
  87. Julia Kigozi, Derick Akatukunda, Emmanuel Baidhe and Isaac Oluk, 2020. Simulation of Heat Transfer in a Charcoal Soybean Roaster Using Computational Fluid Dynamics (CFD). Journal of Basic and Applied Research International. 26(4): 33-38, 2020 ISSN: 2395-3438 (P), ISSN: 2395-3446 (O)

88. J. Balamaze, J. H. Muyonga & Y. B. Byaruhanga 2019 Physico-chemical Characteristics of Selected Jackfruit (*Artocarpus Heterophyllus* Lam) Varieties Journal of Food Research vol. 8, pgs 4 10.5539/jfr.v8n4p11
89. J.A. Ruley, Alice Amondong, J.B.Tumuhairwe, T. Basamba, Opolot E, H. Oryem-Origa 2019 Organic Manure Enhances Phytoremediation Of Hydrocarbon Contaminated Soil International Journal Of Environment, Agriculture And Biotechnology Journal Paper
90. Johnny Mugisha, Christopher Sebatta, Kai Mausach, Elizabeth Ahikiriza, David Kalule Okello & Esther M. Njuguna 2019 Bridging the gap: decomposing sources of gender yield gaps in Uganda groundnut production. Gender, Technology and Development/ Taylor and Francis Journal Paper 23 doi: 10.1080/09718524.2019.1621597
91. Juliet E. Tibagonzeka, Grace Akumu, Florence Kiyimba, Abel Atukwase, Julius Wambete, Joseph Bbemba, John H. Muyonga (2019) Post-Harvest Handling Practices and Losses for Legumes and Starchy Staples in Uganda Agricultural Sciences Journal.
92. Justine Namaalwa and Patrick Byakagaba 2019. Analysis of Uganda's policy and legal framework for the implementation of REDD+ Environmental Science and Policy Journal Paper. 10.1016/j.envsci.2019.02.003
93. Justine Namaalwa., Susan.B. Tumwebaze, Ritah Kigonya and Gorettie N. Nabanoga 2019. Aboveground species diversity and carbon stocks in small holder Coffee-Agroforestry in the highlands of Uganda Springer, Book Chapter 12 10.1007/978-3
94. J. Kigozi, E. Baidhe, I. Oluk, I. M. Mukisa, C. Muyanja, L. Namubiru, B. Katarikawe. (2020). Impact of EAPI Agro-processing Skills training course on Micro, Small, and Medium Scale (MSMEs) Agro-processors In Uganda (Draft Manuscript)
95. J. Kigozi, E. Baidhe, I. M. Mukisa, C. Muyanja, L. Namubiru, B. Katarikawe. (2020). Impact of Fieldwork on Preparedness for the Job Market among Food-related Students: A Case Study of EAPI Student Skills Enhancement Program (Draft Manuscript)
96. J. Ssengo, P. Wasswa, S.B. Mukasa, A. Okiror And S. Kyamanywa (2020) Portable PCR Field-Based Detection Of Sweetpotato Viruses. African Crop Science Journal by African Crop Science Society. DOI: <https://dx.doi.org/10.4314/acsj.v28i3.3>
97. Kalule, S.W., Sseguya, H., Ongeng, D., & Karubanga, G. 2019 Contextual Determinants of Learning Behaviour Differentials amongst Host-farmers of University-Student Outreach in Uganda Advances in Agricultural Sciences vol. 7 series 2, pages 14
98. Kalule, S.W., Sseguya, H., Ongeng, D., & Karubanga, G. 2019 Facilitating conditions for farmer learning behaviour in the student-to-farmer university outreach. The Journal of Agricultural Education and Extension The Journal of Agricultural Education and Extension vol. 25, series 3 pgs 14 <https://doi.org/10.1080/1389224X.2019.1604389>
99. Kalule, S.W., Sseguya, H., Ongeng, D., & Karubanga, G. 2019 Social cognitive drivers of farmer learning behaviour in the student-to-farmer university outreach in Uganda, African Journal of Science, Technology, Innovation and Development African Journal of Science, Technology, Innovation and Development vol 1586114 pgs 11 10.1080/20421338.2019.1586114
100. Karubanga, G., Agea, J.G., Okry, Florent., Kiwewesi, S., & Lwanga., M.K.J. 2019 Factors Effecting Change in Rice Production Practices and Technologies among Smallholder Farmers in Kamwenge District, Uganda Indian Journal of Ecology vol 46, series 2 pgs 9
101. Kayendeke E.J., French H.K 2019 Characterising the Hydrological Regime of a Tropical Papyrus Wetland in the Lake Kyoga Basin, Uganda Springer. Book Chapter [https://doi.org/10.1007/978-3-030-12974-3\\_10](https://doi.org/10.1007/978-3-030-12974-3_10)
102. Keneth Tumwebaze, Lawrence J. B. Orikiriza 2019 Sowing Depths and Seed Germination of four Wild Medicinal Plants, *Albizia coriaria*, *Prunus Africana*, *Warbugia ugandensis* and *Hoslundia opposita* in Uganda (in Press) African Journal of Agricultural Research Journal Paper
103. Kenneth Nyombi 2019. Soil data importance in guiding maize intensification and yield gap estimations in East Africa. Archives of Agronomy and Soil science. DOI:10.1080/03650340.2018.1528497

104. Kiggundu N, Ddungu S.P, Wanyama J, Cherotich S, Zziwa E, Mutebi F, Falcucci A 2019. Greenhouse gas emissions from Uganda's cattle corridor farming systems. *Agricultural systems Journal Paper* vol. 176
105. Kugonza, D.R. 2020. Africa under attack: a continent-wide mapping of pathogens, parasites and predators afflicting the hived honey bee *Apis mellifera* L. (Hymenoptera: Apidae). *African Journal of Rural Development*, 5(2): 1-22.
106. Kumi F., Arfrang B., Mwila N., Odong T., Ochwo-Ssemakula, M., Tusiime, G., Gibson P., Biruma, M., Prom L.K., Cuevas H.E., Agbahoungba, S. and Rubaihayo, P. 2019. New sources of sorghum resistant genotypes to downy mildew disease in Uganda. *Biodiversitas* 20(11), 3391-3397. DOI: 10.13057/biodiv/d201136
107. Kyallo, M., Ateka, E.M. Ndunguru, J., Ssemakula, M.O., Skilton, R.A., Kiarie, S.M. and P. Sseruwagi. 2019. First Report of East African cassava mosaic virus-Uganda Infecting the Nile Tulip Tree in Western Kenya. *Plant Disease* 103(1): 164-165. DOI: 10.1094/PDIS-07-18-1133-PDN
108. Kyazze, F.B, Mubangizi, N., & Mukwaya, P.I. 2019 Using Indigenous Knowledge to Enhance Rainfall Forecasts Among Smallholder Farmers in Mt. Elgon Region, Eastern Uganda Springer Book Chapter 22
109. L. Probst, L. Bardach, L. Mulumba, H. Ogwali, A. Owamani 2019 A transformative University learning experience contributes to sustainable attitudes, skills and agency *Journal of Cleaner Production* vol. 232 pgs 9
110. L.P. Lugoi, L.P., Y. Bamutaze, V. Martinsen, Ø.B. Dick, Å.R. Almås. (2019). Ecosystem productivity response to environmental forcing, prospect for improved rain-fed cropping productivity in lake Kyoga Basin. *Applied Geography* 102 (2019) 1–11. DOI: 10.1016/j.apgeog.2018.11.001. *Applied Geography Journal* vol. 12 10.1016/j.apgeog.2018.11.001.
111. L. Probst, L. Mulumba, A. Owamani, 2019 Does Certified Organic Agriculture Increase Agroecological Health. Evidence from four farming systems in Uganda *International Journal of Agricultural systems*
112. Larson A. M., Iliana Monterroso, Nining Liswanti, Tuti Herawati, Abwoli Banana, Karin Rivera, Pamela Cantuarias, and Esther Mwangi 2019 Models for formalizing customary and community forest lands: The need to integrate livelihoods into rights and forest conservation goals. *CIFOR Inforbrief Journal Paper* 12 DOI: 10.17528/CIFOR/007273
113. Lucy Mulugo, Charles Galabuzi, Gorettie Nsubuga Nabanoga, Nicole Sibelet, Gerald Eilu 2019 Cultural knowledge of forests and allied tree system management around Mabira Forest Reserve, Uganda *Journal of Forestry Science Journal Paper* DOI: 10.1007/s11676-019-00961-6
114. Lucy Mulugo, Paul Kibwika, Florence Birungi Kyazze, Enoch Kikulwe and Omondi Bonaventure 2019 Unraveling technology-acceptance factors influencing farmer use of banana tissue culture planting materials in Central Uganda. *African Journal of Science Technology Innovation & Development Journal Paper* 10.1080/20421338.2019.1634900
115. Lukwago, F. B., Mukisa, I. M., Atukwase, A., Kaaya, A. N., & Tumwebaze, S. (2019). Mycotoxins contamination in foods consumed in Uganda: a 12-year review (2006-2018). *Scientific African*, 3 e00054.
116. Mawa, C., Babweteera, F., Tabuti, J. R. S., & Tumusiime, D. M. (2020). Changes in vegetation characteristics following a decade of community forest management in mid-western Uganda. *International Forestry Review*, 22(3), 323-338.
117. Mukisa, P. K., Tumusiime, D. M., Webersik, C., Liwenga, E. T., & Tabuti, J. R. S. (2020). Dissenting voices in a consenting village: lessons from implementation of free, prior and informed consent at a REDD+ pilot in Tanzania. *International Forestry Review*, 22(1), 120-131.
118. M. Nabateregga, C. Mukankusi, B. Raatz, R. Edema, S. Nkalubo and B. M. E. Alladassi 2019 . Quantitative trait loci (QTL) mapping for intermittent drought tolerance in BRB 191 × SEQ 1027 Andean Intragene cross recombinant inbred line population of common bean (*Phaseolus vulgaris* L.). *African Journal of Biotechnology* vol. 18, series 21 pgs 9 DOI: 10.5897/AJB
119. M.N. Mangheni, H.A. Tufan, L. Nkengla, B.O. Aman, B.Boonabana 2019 Gender norms, technology access and women farmers' vulnerability to climate change in sub-saharan Africa Springer Nature Book Chapter

120. Magala, D. B., Mangheni, M. N. & Miuro, R.F. 2019 Actor social networks as knowledge sharing mechanisms in multi-stakeholder processes: a case of coffee innovation platforms of Uganda. *The Journal of Agricultural Education And Extension* <https://doi.org/10.1080/1389224X.2019.1629971>
121. Mangheni, M.N., Tufan, H. A, Boonabana, B., Musiimenta, P., Miuro, R. Njuki, J. 2019 Building gender research capacity for non-specialists: Lessons and best practices from gender short courses for agricultural researchers in sub-Saharan Africa. *Building gender capacity for agricultural researchers in sub-Saharan Africa. Advances in Gender Research. EMERALD Book Chapter*
122. Masilin Gudoshava, Herbert O. Misiani, Zewdu T. Segele, Suman Jain, Jully O. Ouma, George Otieno, Richard Anyah, Victor S. Indasi, Hussen Seid Endris, Sarah Osima, Christopher Lennard, Modathir Zaroug, Emmah Mwangi, Alex Nimusiima, Alfred Kondowe, Bob Ogwang, Guleid Artan and Zachary Atheru (2020): Projected effects of 1.5 and 2 °C global warming levels on the intraseasonal rainfall characteristics over the Greater Horn of Africa. *Environ. Res. Lett.* 15 (2020) 034037. <https://doi.org/10.1088/1748-9326/ab6b33>
123. Menale Kassie, Monica Fisher, Geoffrey Muricho, Gracious Diiro, (2020) Women’s empowerment boosts the gains in dietary diversity from agricultural technology adoption in rural Kenya, *Food Policy*, 2020,101957,ISSN 0306-9192, <https://doi.org/10.1016/j.foodpol.2020.101957>.
124. Monica Fisher, Endeshaw Habte , William Ekere 3, Tsedeke Abate 4, and Paul A. Lewin 2019. Reducing gender gaps in the awareness and uptake of drought-tolerant maize in Uganda: The role of education, extension services, and social networks *Gender, Agriculture, and Food Security Journal Paper vol.1*
125. Mubangizi, M., Birungi Kyazze, F., and Mukwaya, I. P 2019 “Determinants of Strategies that Enhance Farmers’ Resilience to Rainfall Variability in Mt. Elgon Region, Eastern Uganda. *Climate Change Management book series (CCM) Book Chapter* <https://doi.org/10.1007/978-3-030-12974-3>
126. Mugagga, F., Tibakunirwa, L. & Musali, P. (2020). Compensation Packages and Implications on Social Networks Among Development-induced Displaced Persons in Uganda’s Albertine Graben. *Development in Practice. In Press*
127. Mugagga, F., J. Elepu., A. Nimusiima (2020). An appraisal of Adaptation Measures to Climate Variability by Smallholder Irish Potato Farmers in South Western Uganda. *American Journal of Climate Change.* 9, 228-242. DOI. <https://doi.org/10.4236/ajcc.2020.93015>
128. Mugagga, F., N. Nakanjakko., B. Nakileza., D. Nseka (2020). Vulnerability of smallholder sorghum farmers to climate variability in a heterogeneous landscape of Kigezi Highlands, South-western Uganda. *Journal of Disaster Risk Studies (Jãmbá)*, 12(1), a849. <https://doi.org/10.4102/jamba.v12i1.849>
129. Mary Namwanje, Julia Kigozi, Ivan M. Mukisa, Isaac Omagor and Sloans K. Chimatiro,2020. Storage practices for silver cyprinid (*Rastrineobola argentea*) at landing sites around Lake Victoria and markets in Kampala. *International Journal of Fisheries and Aquatic Studies* 2020; 8(4): 294-300.
130. Mary Namwanje, Julia Kigozi, Ivan M. Mukisa, Isaac Omagor, Sloans K. Chimatiro. Effect of packaging on the stability of stored dry silver cyprinid (*Rastrineobola argentea*). *Cogent Food and Agriculture*. Accepted . DOI-10.1080/23311932.2020.1844512.
131. Masilin Gudoshava, Herbert O. Misiani, Zewdu T. Segele, Suman Jain, Jully O. Ouma, George Otieno, Richard Anyah, Victor S. Indasi, Hussen Seid Endris, Sarah Osima, Christopher Lennard, Modathir Zaroug, Emmah Mwangi, Alex Nimusiima, Alfred Kondowe, Bob Ogwang, Guleid Artan and Zachary Atheru (2020): Projected effects of 1.5 and 2 °C global warming levels on the intraseasonal rainfall characteristics over the Greater Horn of Africa. *Environ. Res. Lett.* 15 (2020) 034037. <https://doi.org/10.1088/1748-9326/ab6b33>
132. Mukisa, I. M., Ssendagala, G. W., & Byakika, S. (2020). Microbiological safety and physicochemical composition of Bongo, a traditional fermented milk product from Lyantonde district, Uganda. *Scientific African*, e00583.
133. Mukisa, I. M., Serwanga, A., & Byakika, S. (2020). Application of refrigerated and frozen sorghum malt slurries in preservation of starter cultures for Obushera from Uganda. *Food ScienTech Journal*, 2 (2).

134. Mugagga, F., Byakabaga, P., Tibakunirwa., L. (2019) Unraveling the Centrality of Tenure Security in Determining Resettlement Packages for Oil Displaced Persons in Uganda's Albertine Graben. *Social Change*, 1-14. DOI: 10.1177/0049085719872865
135. Mugagga. F., J. Elepu., A. Nimusiima., Y. Bamutaze (2019). Institutional Determinants to Climate Variability Adaptation by Smallholder Irish Potato Farmers in Rubanda District, South Western Uganda. *American Journal of Climate Change*. 8 (1), 77-93, DOI: 10.4236/ajcc.2019.81005
136. Mugisha J., Sebatta C., Mausch K., Ahikiriza E., Kalule O. D. and Njuguna E.M. 2019 Bridging the gap: Decomposing sources of gender yield gaps in Uganda groundnut production *Gender, Technology and Development Journal Paper* <https://doi.org/10.1080/09718524.2019.1621597>
137. Mishra K, Sam AG, Diro GM, Miranda MJ. (2020). Gender and the dynamics of technology adoption: Empirical evidence from a household-level panel data. *Agricultural Economics*. 2020;1–14.<https://doi.org/10.1111/agec.12596>
138. Mukisa, I. M., Byakika, S., Meeme, R., Wacoo, A. P., Sybesma, W., & Kort, R. (2019). Adopting traditional fermented foods as carriers for probiotics. *Nutrition & Food Science*.
139. Mulinde, C., Majaliwa, J.G. M., Twinomuhangi, R., Mfitumukiza, D., Komutunga, E., Ampaire, E., Asimwe, J., Asten, P., Jassogne, L. 2019 Perceived climate risks and adaptation drivers in diverse coffee landscapes of Uganda *NJAS-Wageningen Journal of Life Sciences* vol. 88, pgs 31 <https://doi.org/10.1016/J.NJAS.2018.12.002>
140. Musabyemungu, A., Wasswa, P., Alajo, A., Chelagat, D.M., Otema, M.A., Musana, P., Rukundo, P., Gibson, P., Edema, R., Pecota, K.V., Yencho, G.C. and Yada, B.2019 Adaptability of a U.S. purple-fleshed sweetpotato breeding population in Uganda. *Australian Journal of Crop Science* vol.13 pgs 8 10.21475/ajcs.19.13.01.p1023
141. Mutimba, J.K, Margaret Najjingo Mangheni, Charles Masangano 2019 A step by step guide to agricultural extension research Mambo Press, Gweru Zimbabwe Book
142. Nabanoga N. Gorettie, Namaalwa J. Justine and Bomuhangi Allan 2019 Impacts of Climate Change on Small Holder Households in Mt. Elgon Region of Uganda: Does Gender Matter? Springer Book Chapter 9 10.1007/978-3-030-12974-3\_30
143. Najjingo-Mangheni, M., Tufan, H, A., Boonabaana, B., Musiimenta, P., Miro, R, Njuki, J. (in press) 2019 Building gender research capacity for non-specialists: lessons and best practices from gender short courses for agricultural researchers in sub-Saharan Africa. Book Chapter
144. Nakamya, J. Tumuhairwe,J.B, Sabiiti,E.Strachan,N,Avery,L. and Smith,J. 2020. Influence of Biogas Digesters on Faecal Indicator Organisms in Digestate and around Homesteads in Ethiopia.J. Biomass and Bioenergy.142:1055746. DOI:10.1016/j.biombioe.
145. Nakabugo, R., Mukwaya, I. P., & Sabiiti, G. 2019 Adoption of Climate Smart Agricultural Technologies and Practices in Drylands in Uganda: Evidence from a Microlevel Study in Nakasongola District. Springer, Cham Book Chapter In *Agriculture and Ecosystem Resilience in Sub Saharan Africa* 541
146. Nakamya, J, Tumuhairwe, J.B, E.N. Sabiiti, Strachan, N.J.C, Avery, L.M.,Smith, J. 2019. Influence of Biogas digester installation on faecal indicator organisms in digestate and around homesteads in Ethiopia *Biomass and Bioenergy Journal Paper* vol.7
147. Nalunga A., Mugisha J., Walekwa P. and Smith J. 2019. The dynamics of Household labor allocation to biogas production, farm and non-farm activities in central Uganda *Renewable Energy; Elsevier Journal Paper* 142-461
148. Namaalwa et al., 2019 Aboveground Species Diversity and Carbon Stocks in Smallholder Coffee Agroforestry in the Highlands of Uganda *Agriculture and Ecosystem Resilience in Sub Saharan Africa* Book Chapter 10 10.1007/978-3-030-12974-3\_1
149. Narisi Mubangizi, Florence Birungi Kyazze & Paul Isolo Mukwaya 2019 Determinants of Strategies that Enhance Farmers' Resilience to Rainfall Variability in Mt. Elgon Region, Eastern Uganda Springer Nature Book Chapter 31 [https://doi.org/10.1007/978-3-030-12974-3\\_23](https://doi.org/10.1007/978-3-030-12974-3_23)

150. Nicholas Kiggundu, Stanley Peter Ddungu, Joshua Wanyama, Sam Cherotich, Denis Mpairwe, Emmanuel Zziwa, Faizal Mutebi, Alessandra Falcucci 2019 Greenhouse gas emissions from Uganda's cattle corridor farming systems Elsevier Journal Paper vol. 176 102649 <https://doi.org/10.1016/j.agsy.2019.102649>
151. Nimusiima, Y. Bamutaze 2019 Institutional Determinants to Climate Variability Adaptation by Smallholder Irish Potato Farmers in Rubanda District, South Western Uganda. American Journal of Climate Change. Vol. 8 series, pgs1 77 DOI: 10.4236/ajcc.2019.81005
152. Nkonya, E, Bashaasha, B, Kato, E, Bagamba, F and Danet, M, (2019). Impact of creative capacity building of local innovators and communities on income, welfare and attitudes in Uganda: a cluster randomised control trial approach, 3ie Impact Evaluation Report. New Delhi: International Initiative for Impact Evaluation (3ie). Available at: <https://doi.org/10.23846/PW2IE10X>
153. Nkurunziza, G., Asea, G., Kwemoi, D.B. and Wasswa, P. 2019 Performance and inheritance of yield and maize streak virus disease resistance in white maize and yellow conversions. African Crop Science Journal vol. 27 pgs 14 10.4314/acsj.v27i1.
154. Nseka Denis, Kakembo Vincent, Bamutaze Yazidhi and Mugagga Franky 2019 Analysis of Topographic parameters underpinning landslide occurrence in kigezi highlands of South Western Uganda Journal of Natural Hazards Journal Paper 19EHAZ863-TRA
155. Nseka, D., Y. Bamutaze, F. Mugagga, and B. Nakileza., 2019 Nseka, D., Y. Bamutaze, F. Mugagga, and B. Nakileza., (2019). The Fragility of Agricultural Landscapes and Resilience of Communities to Landslide Occurrence in the Tropical Humid Environments of Kigezi Highlands in South Western Uganda. In Agriculture and Ecosystem Resilience in Sub Saharan Africa (pp. 279-305). Springer Book Chapter 25 [https://doi.org/10.1007/978-3-030-12974-3\\_13](https://doi.org/10.1007/978-3-030-12974-3_13)
156. Nseka, D., Kakembo, V., Bamutaze, Y., Mugagga, F. (2019). Analysis of Topographic Parameters Underpinning Landslide Occurrence in Kigezi Highlands of South Western Uganda. Natural Hazards. <https://doi.org/10.1007/s11069-019-03787-x>
157. Nyakaisiki, K., Mugume, I., Ngailo, T., Nakabugo, R.(2019). The Use of Indigenous Knowledge in Predicting Changes in Seasonal Rainfall by Smallholder Farmers of Ruteete Sub-county, Kabarole District. Journal of Geoscience and Environment Protection Vol. 7 pgs 10 DOI: 10.4236/gep.2019.71002.
158. Namwanje, M., Kigozi, J., Mukisa, I. M., Omagor and Sloans, I., & Chimatiro, K. Storage practices for silver cyprinid (*Rastrineobola argentea*) at landing sites around Lake Victoria and markets in Kampala, Uganda. (2020). International Journal of Fisheries and Aquatic Studies, 8(4): 294-300
159. Nkonya E., Kwamong, N.A., Kato, E. Rwamigisa, P., Bashaasha, B., and Mangheni, M., (2020) Chapter 5: Uganda. Agricultural Extension: Global status and Performance in Selected Countries. Kristine E.D; Babu S.C. and Ragasa Catherine (Ed.). International Food Policy Research Institute (IFPRI). Pp378.
160. Ndikuryayo C., Ochwo-Ssemakula M., Gibson P. and Lamo J. 2020. Resistance to Rice yellow mottle virus and performance of selected improved rice genotypes in central Uganda. Crop Protection 129 105041. <https://doi.org/10.1016/j.cropro.2019.105041>
161. Natabirwa, H. Nakimbugwe, D., Lun'gaho, M. Mumwesigye, K.S., & Muyonga, J.H. 2020. Bean-based nutrient-enhanced puffed snacks: Formulation design, functional evaluation, and optimisation. Food Science & Nutrition, 8: 4763-4772.
162. Natukunda, S., Kamoga, K.R., Kizza, M.D., Namayengo, F.M., & Muyonga, J.H. 2020. Optimisation of extrusion conditions for production of instant millet-soybean blended flour. Journal of Food Studies, 9(1): 42-60.
163. Nansikombi, N., Muyonga, J.H. & Byaruhanga, Y.B. 2020. Optimising drying conditions for maximum nutritional quality and bioactivity of Cucurbita pepo L var. fastigata flesh and seeds. Journal of Horticulture and Postharvest Research, 3: 333-346.
164. Natabirwa, H. Nakimbugwe, D., Lun'gaho, M. Mumwesigye, K.S., & Muyonga, J.H. 2020. Bean-based nutrient-enhanced puffed snacks: Formulation design, functional evaluation, and optimisation. Food Science & Nutrition, 8: 4763-4772.

165. Nasirumbi Sanya, L., Sseguya, H., Kyazze, F. B., Diiro, G. M., & Nakazi, F. (2020). The role of variety attributes in the uptake of new hybrid bananas among smallholder rural farmers in central Uganda. *Agriculture & Food Security*, 9(1), 1-13. <https://doi.org/10.1186/s40066-020-00257-7>
166. Natukunda, S., Kamoga, K.R., Kizza, M.D., Namayengo, F.M., & Muyonga, J.H. 2020. Optimisation of extrusion conditions for production of instant millet-soybean blended flour. *Journal of Food Studies*, 9(1): 42-60.
167. Nansikombi, N., Muyonga, J.H. & Byaruhanga, Y.B. 2020. Optimising drying conditions for maximum nutritional quality and bioactivity of Cucurbita pepo L var. fastigata flesh and seeds. *Journal of Horticulture and Postharvest Research*, 3: 333-346.
168. Nakabonge, G., Namukasa E. & Tumwebaze B. S. (2020). Susceptibility of Eucalyptus hybrid clones to Botryosphaeria canker in Uganda, *Journal of Sustainable Forestry*, 39:4, 407-416, DOI: 10.1080/10549811.2019.1673182
169. Nakabonge, G. Nangonzi R., Tumwebaze, B.S., Kazibwe, A., Samukoya. C., Baguma Y.(2020). Production of virus-free cassava through hot water therapy and two rounds of meristem tip culture. *Cogent Food & Agriculture*, 6(1), 1800923. <https://doi.org/10.1080/23311932.2020.1800923>
170. Nakimbugwe, D., Ssepuuya, G., Male, D., Lutwama, V., Mukisa, I. M., & Fiaboe, K. K. M. (2020). Status of the regulatory environment for utilization of insects as food and feed in Sub-Saharan Africa-a review. *Critical Reviews in Food Science and Nutrition*, 1-10.
171. Ochieng, A. & Tumusiime, D. M. 2019 Tourism revenue as catalyst for sustainable development. In: Bakar A. (ed.) *Protected Areas, National Parks and Sustainable Future*. IntechOpen. In press. Intech Open Book Chapter
172. Ochieng, A. & Tumusiime, D.M. (2020). Tourism Revenue as Catalyst for Sustainable Development, in: Bakar, A.N. & Suratman, M.N. (ed.), *Protected Areas, National Parks and Sustainable Future*, IntechOpen.
173. Odong TL, Tenywa JS and Nabasiye 2019 Revisiting application of statistics for Agricultural Research in sub-Saharan Africa: Entry points for improvement. *African Crop Science Journal*
174. Opiro, R., Sabiiti, G., Nimusiima, A., Mugume, I., & Sansa-Otim, J. (2020). WRF Simulations of Extreme Rainfall over Uganda's Lake Victoria Basin: Sensitivity to Parameterization, Model Resolution and Domain Size. *Journal of Geoscience and Environment Protection*, 8(04), 18.
175. Ojok J., Omara P., Opolot E., Odongo W., Olum S., Gijs D.L., Gellynck X., De Steur H., Ongeng D. (2019). Iodine Agronomic Biofortification of Cabbage (*Brassica oleraceavar. capitata*) and Cowpea (*Vigna unguiculata L.*) Is Effective under Farmer Field Conditions. *Agronomy*, 9, 797; doi:103390/agronomy9120797
176. Olupot, G., Twaha A. A. B., Ebanyat, P., Musinguzi, P., Opolot, E., Katusabe, A.A., Bekunda, M.A., Singh, B.R. (2019). Making Sense Out of Soil Nutrient Mining and Depletion in Sub-Saharan Africa. Book Chapter (3), in *Soil Degradation and Restoration in Africa*. *Advances in Soil Science*, 23p. Edited By Rattan Lal, B. A. Stewart
177. Omulo, G., Banadda, N., Kabenge, I. and J. Seay 2019 Optimizing slow pyrolysis of banana peels wastes using response surface methodology. *Environmental Engineering Research Journal Paper vol. 24 series 2 pages 8* <https://doi.org/10.4491/eer.2018.269>
178. Opoke R, Nyeko P, Malinga GM, Rutaro K, Roininen and H Valtonen A 2019 Host plants of the non-swarming edible bush cricket *Ruspolia differens* *Ecology and Evolution Journal* vol. 9 pgs 3899
179. Opoke R, Rutaro K, Malinga GM, Nyeko P, Roininen and H Valtonen A 2019 Seasonal pattern in population dynamics and host plant use of non-swarming *Ruspolia differens* Serville (Orthoptera: Tettigoniidae) *Journal of Applied Entomology* vol. 143 pgs371
180. Owen Emmanuel Sseremba, Paul Mugabi, Abwoli Yabezi Banana, Brand Wessels, Marius Duplessis, 2019 Variation of Basic Density, Calorific Value and Volumetric Shrinkage within tree height and tree age of Ugandan grown *Eucalyptus grandis* (W.Hill ex Maiden) wood. *Journal of Forestry Research Journal Paper*
181. Owomugisha, G., Nuwamanya, E., Quinn, J. A., Biehl, M., & Mwebaze, E. (2020, January). Early detection of plant diseases using spectral data. In *Proceedings of the 3rd International Conference on Applications of Intelligent Systems* (pp. 1-6).

182. Patrick Byakagaba, Frank Mugagga and Dianah Nnakayima 2019 The socio-economic and environmental implications of oil and gas exploration: Perspectives at the micro level in the Albertine region of Uganda. *The Extractive Industries and Society Journal Paper* 10.1016/j.exis.2019.01.006
183. Patrick Musinguzi, Rao Karuturi, Josephine Nampijja, Jackline Bonabana-Wabbi, Majaliwa Mwanjalolo, Sridhar Gummadi, Moses Tenywa 2019 DSSAT model simulations on adaptation to climate change in maize production by Mid and End of the 21st Century Weather and Climate Extremes.
184. Paul Mugabi and Emmanuel Otuko 2019 Effectiveness of Copper Chrome Arsenate and used engine oil in protecting fencing posts of Ugandan grown eucalypt clone GC550 and Phoenix reclinata against termite attack. *Maderas Ciencia Y Tecnologia Journal Pvol. 21 series,1pgs 8* 10.4067/S0718-221X2019005000109
185. Prudence Atukunda, Grace K M Muhoozi, Tim J van den Broek, Remco Kort, Lien M Diep, Archileo N Kaaya, Per O Iversen, Ane C Westerberg 2019 Child development, growth and microbiota: follow-up of a randomized education trial in Uganda. *Journal of Global Health vol.9*, pgs 1 10.7189/jogh.09.010431
186. R. Asiimwe and J. H. Ainembabazi and A. Egeru and R. Isoto and D. Aleper and J. Namaalwa and G. Diiro (2020). The role of camel production on household resilience to droughts in pastoral and agro-pastoral households in Uganda , *Pastoralism*, volume 10: 1-12.
187. Ronald Opio, Geoffrey Sabiiti, Alex Nimusiima, Isaac Mugume and Julianne Sansa-Otim (2020): WRF Simulations of Extreme Rainfall over Uganda's Lake Victoria Basin: Sensitivity to Parameterization, Model Resolution and Domain Size. *Journal of Geoscience and Environment Protection* 8, 18-31. doi: 10.4236/gep.2020.84002
188. Robert Fungo, John H. Muyonga, Judith Laure Ngondi 3, Christian Mikolo-Yobo , Donald Midoko Iponga, Alfred Ngoye, Erasmus Nchujji Tang and Julius Chupezi Tieguhong 2019 .Nutrient and Bioactive Composition of Five Gabonese Forest Fruits and Their Potential Contribution to Dietary Reference Intakes of Children Aged 1–3 Years and Women Aged 19–60 Years *Forests Journal vol. 10 series 86*, pgs 12 10.3390/f10020086
189. Ronner, E., Descheemaeker, K., Almekinders, C. J., Ebanyat, P., Giller, K 2019 Co-design of improved climbing bean production practices for smallholder farmers in the highlands of Uganda *Agricultural Systems Journal Paper*, vol.175 pgs 12 DOI:10.1016/j.agry.
190. Ruley A.J., Tumuhairwe J.B., Amoding A., Opolot E., Oryem-Origa H., Twaha B.A. (2019). Assessment of plants for phytoremediation of hydrocarbon-contaminated soils in the Sudd Wetland of South Sudan. *Plant, Soil and Environment*. <https://doi.org/10.17221/322/2019-PSE>
191. Ruley A.J., Tumuhairwe J.B., Amoding A., Twaha B.A., Opolot E., Oryem-Origa H. (2020). Enhancement effect of organic manure on phytoremediation of hydrocarbon-contaminated soils in the Sudd wetlands, South-Sudan. *Applied and Environmental Soil Science*. <https://doi.org/10.1155/2020/4614286>
192. Sanya, L.N., Sseguya, H., Kyazze, F.B., Gracious M. Diiro and Florence Nakazi. (2020). The role of variety attributes in the uptake of new hybrid bananas among smallholder rural farmers in central Uganda. *Agric & Food Secur* 9, <https://doi.org/10.1186/s40066-020-00257-7>
193. Simon Kizito, Hongzhen Luo , Jiaxin Lu , Hamidou Bah , Renjie Dong and Shubiao Wu 2019 “Role of Nutrient-Enriched Biochar as a Soil Amendment during Maize Growth: Exploring Practical Alternatives to Recycle Agricultural Residuals and to Reduce Chemical Fertilizer Demand” *Sustainability Journal Journal Paper* 11 3211 22 ; doi:10.3390/su11113211
194. Siya, A., Bazeyo, W., Tuhebwe, D., Tumwine, G., Ezama, A., Manirakiza, L., Kugonza, D.R. and Rwego, I.B. 2019. Lowland grazing and Marburg virus disease (MVD) outbreak in Kween district, Eastern Uganda. *BMC Public Health* 19: 136 doi.org/10.1186/s12889-019-6477-y.
195. Ssamula, A., Okiror, A., Avrahami-Moyal, L., Tam, Yt, Gal-On, A., Gaba, V., Mukasa, S.B. and Wasswa, P. 2019 In silico prediction and segregation analysis of putative virus defense genes based on SSR markers in sweet potato F1 progenies of cultivars ‘New Kawogo’ and ‘Resisto’. *African Journal of Biotechnology Journal Paper* vol.18 series 16 pages 12 10.5897/AJB2018.16724



196. Stellah Byakika, Ivan Muzira Mukisa, Yusuf Byenkya Byaruhanga & Charles Muyanja 2019 A Review of Criteria and Methods for Evaluating the Probiotic Potential of Microorganisms Food Reviews International Journal Paper DOI: 10.1080/87559129.2019.1584815
197. Stellah Byakika, Ivan Muzira Mukisa, Yusuf Byenkya Byaruhanga, Denis Maleb, Charles Muyanja 2019 Influence of food safety knowledge, attitudes and practices of processors on microbiological quality of commercially produced traditional fermented cereal beverages, a case of Obushera in Kampala Food Control Journal vol.r 100 pgs 212 <https://doi.org/10.1016/j.foodcont.2019.01.024>
198. Tadeo Mibulo and Julia Kigozi, 2020. Overview of Post-Harvest Technology utilization in Uganda. Journal of Basic and Applied Research International. 26(5): 9-15, 2020 ISSN: 2395-3438 (P), ISSN: 2395-3446 (O)
199. Tao, S. Li, Y. & Mugume, I. (2019) Model terrain correction using variational adjoint method with Tikhonov-total variation regularization. Journal of Physics: Conference Vol1176, Pages 11 DOI10.1088/1742-6596/1176/2/022034
200. Tao, S., Li, Y., Mugume, I., & Shen, S. (2020). The spectral conjugate gradient method in variational adjoint assimilation for model terrain correction II: Numerical test. MS&E, 768(7), 072043.
201. Tugume Patience, Buyinza Mukadasi, Kakudidi Esezah. 2019 Non-Timber Forest Products Markets: Actors and Incomes Determinants. Researchjournal's Journal of Forestry Journal Paper Vol 6 series 1 pgs 20
202. Tumusiime, D.M. and Rukarwa, R.J. (2020). Review of Jan-Bart, G., Spierenburg, M. and Wels, H. Book, Nature Conservation in Southern Africa: Morality and Marginality: Towards Sentient Conservation? Canadian Journal of African Studies
203. Tumuhimbise, G.A., G. Tumwine., Kyamuhangire, W 2019 Amaranth leaves and skimmed milk powders improve the nutritional, functional, physico-chemical and sensory properties of orange fleshed sweet potato flour Foods Journal Paper 8 13 15 <https://doi.org/10.3390/foods8010013>
204. Wacoo, A. P., Mukisa, I. M., Meeme, R., Byakika, S., Wendiro, D., Sybesma, W., & Kort, R. (2019). Probiotic Enrichment and Reduction of Aflatoxins in a Traditional African Maize-Based Fermented Food. Nutrients, 11(2), 265.
205. Were, D., Kansime, F., Fetahi, T., Cooper, A., and Jjuuko, C 2019. Carbon Sequestration by Wetlands: A Critical Review of Enhancement Measures for Climate Change Mitigation Earth Systems and Environment (Springer) Journal Paper. <https://doi.org/10.1007/s41748-019-00094-0>
206. Yazidhi Bamutaze, Samuel Kyamanywa, Bal Ram Singh, Gorettie Nabanoga, Rattan Lal 2019 Agriculture and Ecosystem Resilience in Sub Saharan Africa Springer Book 747 10.1007/978-3-030-12974-3
207. Yimam A.Y., Bekele A.M., Nakawuka P., Schmitter P., Tilahun S.A. 2019. Rainfall-Runoff Process and Groundwater Recharge in the Upper Blue Nile Basin: The Case of Dangishta Watershed Springer, Cham. Book Chapter 274 volume1410.1007/978-3-030-15357-1