University Of Eldoret 2022/2023 Research Highlights

The University hosts a number of externally funded research projects in collaboration with a variety of national and international partners with the aim of meeting the needs and aspirations of the dynamic societal challenges. The research projects address diverse areas of sustainable exploitation and management of natural resources, solving environmental challenges and food and nutritional security all of which synchronizes with the national goals. Table 1 gives a summary of some of the ongoing research projects.

Table 1: Current externally funded Research Projects at the University

S/No	PROJECT TITLE	COLLABORATORS	PI
1.	Shark Conversation Funds	*Rockefeller Philanthropy Advisors, University of Eldoret*	Prof. Boaz Kaunda Arara
2.	Pyrethrum improvement through application of mutation and enhancing technologies (KENTEGRA project)	*University of Eldoret, Laikipia University, Ndabibi and Mau Narok*	Prof Miriam Kinyua
3.	SCIFSA project – Partnership for Training Scientists in Crop Improvement for Food Security in Africa	*Makerere University, Cairo University, University of Dakar, University of Ghana, University of Eldoret.*	Prof. Julius Ochuodho
4.	Mcknight Foundation Project	*Mcknight Foundation, USA, University of Eldoret*	Prof. Wilson Ng'etich
5.	McKnight Sorghum Project	*McKnight Foundation, University of Eldoret, Moi University*	Prof. Beatrice Were
6.	The World Academic of Science (TWAS) Research Grant	*Swedish International Development Cooperation (SIDA), University of Eldoret*	Prof. Lizzy Mwamburi
7.	Moca Project	*CARIPLO Foundation, University of Eldoret*	Prof. Odipo Osano
8.	Natural Environment Research Polaris Way North STA	*Natural Environment Research Council, University of Eldoret*	Prof. Odipo Osano
9.	VLIR-UOS SOUTH INITIATIVE PROJECT-Characterization of water quality and biosorption treatment of drinking water in Athi river, Kenya	*University of Eldoret, Gent University in Belgium*	Prof. Maurice Oduor Okoth
10.	ADCLIM project	*KU-Leuven, IITA , University of Eldoret*	Dr. Abigael Otinga
11.	UNICARSSA PROJECT	*University of Lisbon, Makerere University, Royal Tropical Institute, University of Eldoret*	Dr. Abigael Otinga
12.	International Foundation for Science (IFS) Rice Project –Exploiting genetic variations in the rice germplasms to outsmart blast disease in Kenya.	*International Foundation for Science, University of Eldoret*	Dr. Benson Nyongesa
13.	Optica Foundation Project	*Optical Society of America, University of Eldoret*	Dr. Dismas Choge
14.	Sustainable Waterpans	*University of Eldoret, IHE Delft Institute for Water Education, Netherlands, Tanzania*	Dr. Frank Masese

15.	COTRA Project	*EU funded, Makerere University, Mzuzu University, Rhodes University, Bukavu University,*	Prof. Phillip Raburu
16.	Fish Genetics and Genomics Laboratory Project	*National Research Fund, University of Eldoret*	Dr. James Barasa.
17.	Wondergro-Fips Project	*University of Eldoret , FIPS Africa Limited*	Dr. Ruth Njoroge
18.	ECLINUM Project	*African Plant Nutrition Institute, University of Eldoret*	Dr. Ruth Njoroge
19.	AFR Eldoret-Iten Water Fund, Kenya	*The Nature Conservancy, Kenya, University of Eldoret*	Dr. Ruth Njoroge
20.	GRCF Grants	*Royal Holloway University of London, University of West London, University of Eldoret*	Dr. Salinah Rono
21.	PIPFA project (Prosperity & Innovation in the Past and Future of Agriculture in Eastern Africa)	*University College London, University of Eldoret*	Dr. Wilson Kipkore
22.	SOPHEA Project : Strengthening One Planetary Health Eastern Africa Project	*University of Wurzburg, Catholic University for Health and Allied Sciences (CUHAS-BUGANDO)*	Ms. Melvin Anyango

Below is a description giving a highlight of some of the projects

1.0. Planetary Health Project

Principal Investigator: Ms. Melvine Anyango

2.0 Development of an All-Male Tilapia (Eldo-Male) Strain for Commercial Aquaculture in Kenya

Principal Investigator: Dr. James Barasa

This is a collaborative research project between the University of Eldoret, Kenya and the University of Potsdam, Germany.

Objective: The long term aim is to develop an all-male tilapia strain for commercial aquaculture in Kenya. Economic production of farmed tilapias globally relies on use of all-male tilapia seed, since males grow faster than females, and mixed sex cultures lead to prolific breeding in culture facilities, yielding many small sized fish of low market value.

The Problem: Current methods of producing monosex male tilapia seed are inefficient, technically complex, require large facilities and pure tilapia species and strains, which are difficult to achieve at farms and hatcheries. Furthermore, the most

common method, the use of steroids is environmentally unfriendly, and only achieves at most 70-94% sex reversal of the batch. This potentially leads to spawning in culture, despite the farmer having purchased and paid for all-male tilapia seed from hatcheries. Such seed is also unsuitable for stocking in cages in Lake Victoria, as fry from breeding activities in cages escape to the open waters of the lake, where they negatively interact with natural tilapias of the lake. A more efficient and easier method of producing 100% all-male tilapia seed for use by farmers is therefore an urgent need.

The project: The approach involves studying molecular pathways of sex determination in tilapias, in combination with several strategies including sex reversal, hybridization and genomic selection to develop a strain that yields 100% all-male fry.

The first phase is underway, initiated last year with the visit to Germany by the Kenyan PI, James Barasa. During the visit, requisite genomic resources were developed, tested and validated via laboratory analyses, at the University of Potsdam. The visit was supported by the German Research Fund (DFG) and the Third World Academy of Sciences (TWAS).

The Kenyan PI, Dr. James Barasa working in the laboratory at the Institute of Evolutionary Biology and Biochemistry, University of Potsdam, Germany.

The second phase of the project was initiated this year, by the visit of the PI from Germany, Prof. Dr. Ralph Tiedemann and co-PI Dr. Marisol Dominguez to the University of Eldoret, Kenya, in September. During the visit, the researchers

undertook joint fieldwork, for fish sampling at different lakes and fish farms. They also carried out technical backstopping and discussions with members of the management committee for the Fish Genetics and Genomics Training and Research Laboratory. Their visit and fieldwork was supported by the University of Potsdam Research grant for collaborative activities in sub Saharan Africa.

From left: Dr. Marisol Dominguez, Dr. James Barasa and Prof. Ralph Tiedemann during fieldwork at Lake Baringo, Kenya.

Packaging live fish for transportation from the field to the hatchery.

Next steps: The project will seek support from diverse funding streams to support research work, especially by postgraduate students, both at the Fish Genetics and Genomics Training and Research Laboratory and fish hatchery at University of Eldoret, Kenya, as well as at the Institute of Evolutionary Biology and Biochemistry at University of Potsdam, Germany.

3.0 Sustainable Waterpans Project

Principle Investigator: Dr. Frank Masese

The Sustainable Waterpans Project is five-year (2023-2027) project, funded by the Dutch Government. The project is multidisciplinary and multi-institutional, and led by IHE-Delft Institute for Water Education, the Netherlands in partnership with the University of Eldoret, the International Livestock Research Institute (ILRI, Nairobi), the Water Quality Lab in Musoma (Tanzania), and OIKOS East Africa and Mara Women Empowerment Assistance NGOs in Tanzania. At a broader level, the project aims to develop a better understanding of ecological processes and risks from climate shocks and, through action research, provide empirical evidence to inform regional policies and practices. Kenya is a water-scarce country, and in order to enhance water-harvesting technologies, excavation of the earth to harvest rainwater runoff has been adopted by national, County and non-governmental organizations to increase water access and availability in arid and semi-arid lands. Waterpans play hidden and underestimated functions in achieving universal access to safe and affordable water. Since 2015, the number of people without safely managed drinking water in sub-Saharan Africa has increased from 703 to 766 million, and 8 out of 10 live in rural areas. In water-scarce areas, constructed or natural waterpans store seasonal rains and frequently act as the only water source for households, livestock and wildlife. Moreover, as populations grow and settlements expand around rivers and lakes, waterpans can shorten long, physically onerous and perilous journeys of mostly women and children, to fetch water. However, current approaches to constructing and operating waterpans in the region face several challenges.

This project is hosted at the Department of Fisheries and Aquatic Science, University of Eldoret with three PhD and three MSc students benefitting from the project through full scholarships. The research of the students on the waterpans aims to understand their biogeochemistry, role in improving animal, human and or environmental health using the one health approach, and the waterpans as social-ecological-technological systems. The UoE will also participate in the review of legal and institutional frameworks on the management of waterpans, and develop syllabi and educational material for training communities, students and water resources managers on sustainable water resources management.

Photo: The University of Eldoret and IHE Delft Waterpans project team. From left to right – Prof. Hellen Ipara, Dr Frank Masese, Dr Konstantina Katsanou (IHE Delft), Prof. Kennet Irvine (IHE Delft) and PhD students Edith Jepchirchir Kurui and Elizabeth Wambui Wanderi.

4.0. Greenhouse Gas Emissions, Soil Carbon Stocks and Livestock Watering Points in Agropastoral Rangelands of Taita Taveta Hills, Kenya (GRESOL Project)

Principal Investigator: Dr. Frank Masese

The GRESOL Project is multi-institutional and is funded under the RUFORUM consortium of African Universities from 2021 to 2023. This project is a partnership between UoE (Dr Frank Masese, Prof. Gelas Simiyu and Dr Ruth Njoroge) and the International Livestock Research Institute Nairobi (Dr Polly Ericksen and Dr Sonja Leitner), IHE-Delft Institute for Water Education (Dr Gretchen Gettel and Prof. Anne van Dam). This project seeks to contribute much-needed data on GHG emissions from ruminant production in sub-Saharan Africa (SSA) by focusing on livestock watering points and aquatic ecosystems that are neglected in the literature. Livestock movement within agro-pastoral landscapes is related to spatial and temporal dynamics of soil carbon stocks and nutrients, which are precursors of GHG emissions from terrestrial and aquatic ecosystems. In aquatic ecosystems, livestock loading of organic matter (dung) and urine during watering enhances biogeochemical processes leading to increased GHG emissions. However, data are limited on GHG fluxes from livestock watering points in sub-Saharan Africa (SSA).

The project is transdisciplinary and brings together scientists and farmers (citizen science) to achieve the following objectives: 1) determine the effect of livestock production systems on water quality, 2) determine spatial and temporal dynamics of GHGs emissions and soil and sediment carbon stocks from livestock watering points, and 3) identify physical and chemical factors related to GHG emissions from LPS.

The project outputs envisaged include empowering communities on sustainable livestock production for improved water quality and reduced GHG emissions. The project is currently supporting four MSc students at the UoE.

Photos: Upper left- Sorting of invertebrates by the Wundanyi River by the project PI (Dr Frank Masese) and students. Upper right. MSc students Christine Owade and Evan Sicharani practising sampling of greenhouse gases from the Athi River. Lower left: Drs Abigael Otinga and Ruth Njoroge taking an MSc student Godfrey Owuor on the sampling protocols for GHGs emissions from the soil. Lower right- Dr Gretchen Gettel discussing field techniques with MSc student Evans Sicharani.

5.0. **AD**APTING TO **CLIM**ATE-RESILIENT FARMING SYSTEMS IN WESTERN KENYA: THE SUSTAINABLE PATHS BY EMBEDDING AGROECOLOGY IN RESEARCH, EDUCATION AND OUTREACH **(ADCLIM)**

5.1. Background

The ADCLIM project which will run from 2022 to 2027 is funded by VLIR-UOS: Cooperation between Belgian Universities and universities in the South. The partners include KU Leuven-Belgium, Swiss Federal Institute of Technology (ETH) Zurich, Switzerland, International Institute of Tropical Agriculture (IITA), Jaramogi Oginga Odinga University of Science and Technology (JOOUST). The project PI is Dr. Abigael N. Otinga from the School of Agriculture and Biotechnology, Department of Soil Science

5.2. Project Summary

ADCLIM in its second year of implementation envisages the co-creation of agroecology-based strategies for climate change adaptation, using the UoE's Outreach Centre as an entry point. We take cognisance of the degradation of landscapes and explore the possibilities of adoption of Agroecology in transitioning to sustainable food systems. In this project exploratory studies using modelling and data from long-term field experiments identify promising technology options that are refined, tested and validated in both short term and long term on-farm field trials through three postgraduate students (One MSc. in Soil Science, One MSc. in Agricultural Extension Education and one PhD in Soil Science).

On farm short term trials are scheduled to begin in the long rains of 2024 while the long-term experiments were designed between 20 years ago by the International Institute of Tropical Agriculture (IITA) to explore the sustainability of several Integrated Soil Fertility Management (ISFM) options including the combination of organic and inorganic inputs, improved germplasm and local adaptation geared towards improving efficiency of inputs, risk spreading and preserving biodiversity. These options mirror several elements of agroecology.

In ADCLIM, the co-created knowledge is the cornerstone for capacity building with relevant stakeholders within the community, especially targeting youth in agriculture. This involves short courses for farmers, scientists of various disciplines, and agricultural extension officers. The short courses are organised and implemented by the UoE's Outreach Centre to ensure a continuous engagement of the university in the communities. As an integrative exercise on the project, a two-week field course is also embedded in selected MSc programs. In this course, students have to resort to a multidisciplinary approach allowing them to tackle the interconnected societal challenges imposed by climate change. This course builds on previous editions funded under another VLIR-UOS Programme titled *'Research-Based Education for Sustainable Rural Development*' that was funded between 2018 and 2022.

The multidisciplinary approach, coupled with a hands-on training and multicultural dimension exerts a direct impact on the sector since UoE agricultural based graduates are commonly absorbed in extension services, agricultural research institutions, academia, outreach programmes and policy. Teaching & research at UoE is strengthened through the project by (i) an enriched hands-on approach and by (ii) incorporating topics of agroecology and climate change in both the BSc. And MSc. curricula and the short course training at the Outreach Centre. ADCLIM envisages that this will not only attract students to the agriculture-based BSc. but also enhance the relevance of MSc. and PhD Programmes.

Figure 1: Students from UoE and KUL Belgium studying both the Landscape and Farm scale features in the one of the Tropical Field Course editions.

Figure 2: Students from UoE and KU Leuven Belgium evaluating components of different farming systems in Elgeyo Marakwet during one of the editions of the Tropical Field Course. Students are trained in field methods and learn to integrate both the social and biophysical aspects in solving societal problems. In ADCLIM, students analyse the agroecosystems and propose interventions that can be adapted by farmers towards increasing their resilience to climate change.

Figure 3. (a) European students arriving in Eldoret for the Tropical Field Course **(b)** One of the student teams comprising both European and African students in the field.

Figure 4. Participants of the field course **(a)** during a briefing session and **(b)** in student teams presenting their findings in an oral evaluation

Figure 5. UoE and KUL students and lecturers after a successful completion of the one of the editions of the Tropical Field Course

INTELLECTUAL PROPERTY MANAGEMENT

1.0 Background

Innovations are creations of the mind that lead to the development of new products, processes, or services that benefit society or improve the quality of life. To protect Intellectual property (IP) from the output of our researchers, staff, and students, the University Management established the Intellectual Property Management Office (IPMO) office which is housed under the Directorate of Research and Innovation. The

office is mandated to promote innovations and Intellectual Property (IP) development and technology transfer from the University to the public.

The office receives and evaluates all innovation and invention disclosures and facilitates the acquisition of IP rights from the relevant authorities. The IPMO strives to sensitize researchers and promote awareness and enthusiasm for generating exploitable IP for the university by organizing training workshops and seminars. So far, several innovations from the University have been protected through patents, utility models, plant breeder's rights, and copyrights in areas relating to food security, energy (bioenergy utilization), and waste management. The IPMO organizes and participates in annual Innovation Weeks to showcase the inventions and innovations from the University. The office is also committed to the commercialization of innovations and technology transfer of innovations to solve societal problems and contribute to the achievement of the Kenya Vision 2030 and the United Nations Sustainable Development Goals (SDGs).

1.2. Recent Innovations

From November 2022 to November 2023, a total of 67 innovations were generated from different schools and sections under different categories as shown in Figure 1 below. Most of the innovations have been in agri-technologies, digital technologies, and food security and nutrition from the School of Agriculture and Biotechnology, and the School of Engineering.

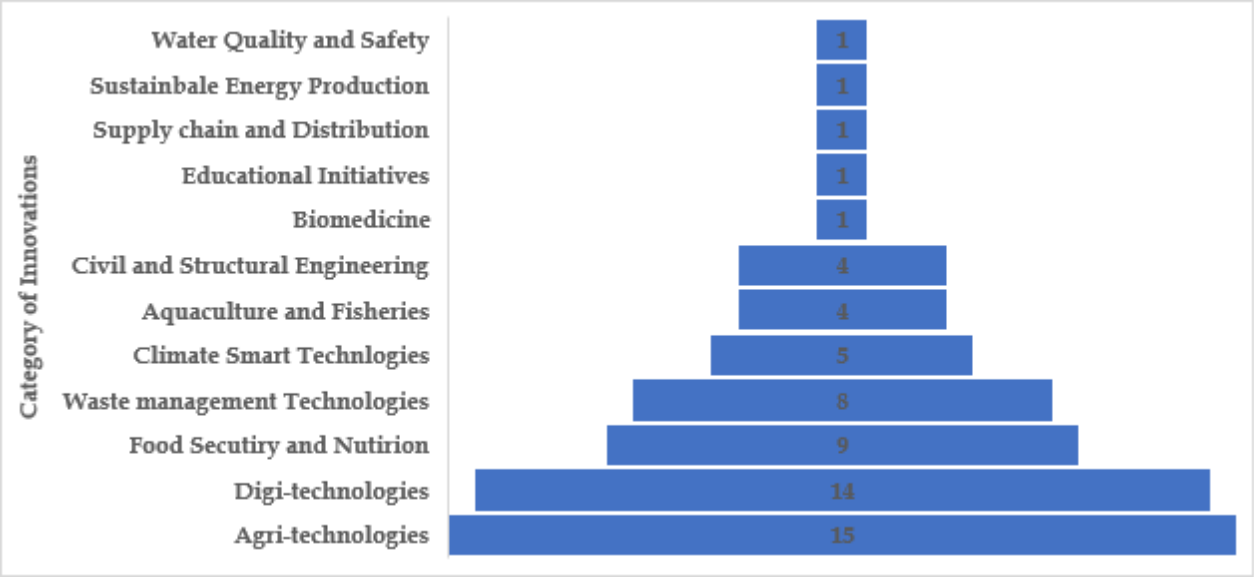

Figure 1: Number of Innovations in the University over the past 1 year

1.3 Patented/Copyrighted Innovations

Table 1 below contains the patented and copyrighted innovations in the University up to June 2023.

S/N	Title of Invention	Description of Product	Year of Patenting/Copyrighting	Registration Reference Number	Name of Innovator(S)	Application of Innovation
1	Potato Variety Eldo Amani	Mutant Irish potato with resistance to late blight, and high yielding. Good for processing and table	2023	Kenya Gazette notice no. 4515	Prof Miriam Kinyua	Seed
2	Potato Variety Eldo Fanaka	Mutant Irish potato with resistance to early and late blight, and high yielding. Good for table	2023	Kenya Gazette notice no. 4515	Prof Miriam Kinyua	Seed
3	Tour guide Finder	An ICT-enabled peer-to-peer tour guiding app, that connects tourist guides with visitors and remotely monitors the conduct of guides. The system front-end is a mobile app, with a web-based back end for onboarding tourist guides and recording geo-coordinates for tourist attractions and infrastructure	2022	RZ37983	George Ariya	Engaging partners for scaling
4	Extruded Instant flour containing	Flour that makes instant thin and thick porridge and offers convenience in preparation and	2021	KE/P/2019/3308	Prof. Violet Mugalivai	A method for manufacturing instant

	sorghum-maize-amaranth blend, fortified with natural fortificants and preparation method of thick and thin porridge	can be processed in different variations to cater to consumers. It is a natural product and excellent for food nutrition and health.				nutritional flour which includes whole grain maize, whole grain sorghum, and micronutrients rich plant ingredients like baobab fruit powder and grain amaranth flour
5	Novel portable clean biogas packaging for sustainable bio-energy utilization	A cylinder made of steel shell or plastic or any other suitable material that can withstand pressure and used to contain pressurized biogas which makes it possible for utilization by gas burners	2020	KE/P/2020/3400	Eng. Muhamed Swaleh, Jacob Mbego, and Harisson Tarus	Clean biogas for utilization in gas cookers
6	Novel gluten-free bread prepared from green banana pumpkin seed	Nutritious and gluten-free flour blended with green banana, pumpkin seed, and avocado seeds to improve the rheological, sensorial and textural	2020	KE/P/2020/3399	Lilian Songok, Dr. Charlotte Serrem, Dr. Florence Wamunga,	Food and nutrition

	and avocado seed composite flour	characteristics and provide supplementary proteins, vitamins, and minerals for celiac patients.			Clavince Onyango	
7	Dolichos Bean ELDO – KT MARIDADI	Dolichos bean that is high-yielding and early maturing	2015	Kenya Gazette Notice No. 313	Prof Miriam Kinyua	Seed
8	Dolichos bean ELDO – KT CREAM	Dolichos bean that is high-yielding and early maturing	2015	Kenya Gazette Notice No. 313	Prof Miriam Kinyua	Seed
9	Dolichos Bean ELDO – KT BLACK 1	Dolichos bean that is high-yielding and early maturing	2015	Kenya Gazette Notice No. 313	Prof Miriam Kinyua	Seed
10	Wheat Variety Eldo Mavuno	Wheat variety resistant to stem rust Ug99	2014	Kenya-Gazette Notice No. 255	Prof Miriam Kinyua	Seed
11	Wheat Variety Eldo Baraka	Wheat variety resistant to stem rust Ug99	2013	Kenya-Gazette Notice of 2014	Prof Miriam Kinyua	Seed

1.4. Annual Innovation Weeks at the University

To give a platform of expression to innovators and inventors, the University hold annual Innovation Weeks to provide a platform for students and staff to showcase innovations and inventions. So far, 5 Innovation Weeks have been held in the University. This year, the University held its 5th Annual Innovation Week from 1-3 November 2023 under the theme 'Innovating for a Greener and Sustainable Future' and showcased over 40 innovations from staff, students, and partners. The Department is committed to increasing awareness of IP uses among students and staff, capacity-building for innovation, and commercialization of innovations.

1.5. Innovative Research by Postgraduate Students

Table **3** summarizes some of the innovative research by the postgraduate students of the University of Eldoret from among those graduating in the 12th Graduation Ceremony.

SN	Title of Project	Researchers	School
1.	Treating wastewater from wastepaper recycling mill by blending *Moringa oleifera* with synthetic coagulants	Nymbura Wambui Janerose, Dr. Orori Benard, Prof. Simiyu Gelas	Environmental Sciences and Natural Resource Management
2.	Antibacterial activities of green synthesized ZnO and CuO nanoparticles from leaf extracts of *Warburgia ugandensis*	Lemeitaron Njenga, Dr. Kiplagat Ayabei, Prof. Teresa Akenga, Zipporah Onyambu, Jackson Kiptoo, Martin Onani	Science
3.	**Dietary Influence on the nutritional composition of desert locust *Schistocerca gregaria* as an alternative source of proteins**	Sylvia Mmbone, Prof. Linnet Gohole, Prof. Fredrick Wanjala, Dr. Amos Ronoh	Science
4.	Desert locust (*S. gregaria*) frass as an organic fertilizer for the Growth of Kales (*Brassica oleracea* L.) under open field conditions	Mmbone Sylvia, Prof. Wanjala Fredrick, and Prof. Gohole Linet	Science

5.	Biocontrol of *Alternaria solani* in tomatoes by *Trichoderma harzianum* and *Bauveria bassiana*	Emmy Cheruiyot	Science
6.	*Pavonia urens* as Biosorbent in Phytoremediation of Metal Pollutants through Complexation	S. Rutto, Prof. K. Lusweti, Dr. Ayabei K, Wetungu M.	Science
7	Response of Improved Kienyeji chicken fed on maize-substituted sorghum-based rations	Eric Misiko Manuya	Agriculture and Biotechnology
8.	Dam site identification using multi-criteria analysis and spatially weighted overlay	Gladys Chelagat Biwott, Andrew Kiplagat, Dr. Job K. Ngetich, Prof. Dr. Emmanuel C. Kipkorir and Dr. Charles Kigen	Environmental Sciences and Natural Resource Management
9.	Defluorination effectiveness of modified bio-sand filters	Okademi Nnancy, Dr. Odipo Osano, Dr. Khazenzi Judith	Environmental Sciences and Natural Resource Management

1.6 New Potato Varieties from University of Eldoret

Potato is the second most important staple food after maize in Kenya. However, the yield levels are too low at 9t/ha, compared to a potential yield of 20-40t /ha. The low yields are attributed to biotic and abiotic stresses which include inadequate quality seed and planting materials, low soil fertility, low yielding varieties, diseases and insect pests, poor adaptability and yield stability to different environment and climatic changes among others. The University released 3 new varieties of Irish potatoes (*Solanum tuberosum*) with high yields and resistance to common diseases in 2023 through the research lead by Prof. Mirium Kinyua of the School of Agriculture and biotechnology. The varieties are as specified in the table below:

Table 4: Three new varieties of Potatoes (Solanum tuberosum) release by the University

Variety Name	Release Name	Owner (S) Licensee	Areas Of Production	Maturity Duration	Yield (T/Ha)	Special Attributes
ELDO IP1	Eldo Amani	UOE	Altitude: 2100-2700 AEZ: UM1-3; LH 1-3; UH 1-3 Sites: ALL Potato growing counties	3-3.5 months	58- 60	1 month dormancy, white skin, white flesh, early maturing, good for chipping. High specific gravity
ELDO IP2	Eldo Fanaka	UOE	Altitude: 2300-3000 AEZ: LH 1-3; UH 1-3 Sites: ALL Potato growing counties	4-4.5 months	59-62	Moderately resistant to BW, resistant to Early and late blight, long dormancy, deep red skin, white flesh, good for table
ELDO IP3	Eldo Bidii	UOE	Altitude: 2100-3000 AEZ: LH 1-3; UH 1-3 Sites: ALL Potato growing counties	3.5-4 months	55-59	Moderately resistant to BW, resistant to Early and late blight, medium dormancy, pinkish skin, white flesh, good for table, fair for chipping

CONTRIBUTION OF ACADEMIC MOBILITY PROGRAMMES TO RESEARCH AT THE UNIVERSITYOF ELDORET

The University has undertaken three very successful Academic mobility programmes. These programs have contributed immensely to internationalization of the University and postgraduate research activities at the University and the region at large. Below is an overview of the contributions made by three Academic Mobility Projects which are at the tail end of their implementation.

1. COLLABORATIVE TRAINING IN FISHERIES AND AQUACULTURE IN EAST, CENTRAL AND SOUTHERN AFRICA (COTRA)

Principal Investigator: Prof. Phillip Raburu
Project Coordinator: Dr. Frank Masese

1.1. Project Background Information

COTRA is an EU funded project under the Intra-Africa Academic Mobility Scheme to support the training of graduate students in African universities. In this mobility programme, five African partner institutions and one EU Technical partner are collaborating in the training of professionals to achieve sustainable fisheries management and aquaculture resources that shall lead to increased fish production and enhanced food and nutritional security, and hence, improved livelihoods and household revenues for communities.

The University of Eldoret project team include **Prof. Phillip Raburu** (Project PI and first coordinator), **Dr Frank Masese** (Current Project Coordinator), and Mr Vincent Chesire (Project Accountant). The project partners include Makerere University (Uganda), Mzuzu University (Malawi), Official University of Bukavu (DRC), and Rhodes University (South Africa). The technical partner of the project is BOKU University (Austria).

A total of 24 Masters (6 credit-seeking, 18 degree-seeking) and 12 Doctorate (4 credit-seeking, 8 degree-seeking) students have been trained in the thematic areas of Fisheries Management, Aquaculture, Fisheries and Aquatic Sciences. In addition, 10 administrative staff participated in a capacity-building program mainly in areas of financial and international student management, among others. The project provided full fellowships for PhD and MSc students as well as short-term mobility for students and staff among partner institutions. The project was implemented from 1st November 2017 until 31st October 2023.

The objectives of the project were to achieve sustainable fisheries management and aquaculture resources leading to increased fish production and enhanced food and nutritional security, and hence, improved livelihoods. Specifically, the project aims to improve skills and competencies of academic staff in research, training, and supervision; improve the capacity of administrative staff in implementing international mobility; and

enhance the quality of graduate students training leading to innovative and fit-for-purpose professionals.

Upper left: PhD student Benjamin Kondowe (left) analyzing water samples for nutrients at the UoE lab. Upper right: MSc student Thaddeus Zaabwe analysing samples in the laboratory at Mzuzu University. Bottom left: MSc student Nelly Nakangu setting up a research project for her thesis at the UoE Fish Farm. Bottom right: COTRA students at UoE during a field trip to the Sondu-Miriu River, Kenya.

1.2. Thesis Research Activities

The project contributed widely to research in Kenya by UOE students and international students who undertook their postgraduate training at the University of Eldoret and in partner Universities in other countries. The table below shows the MSc / Ph.D research thesis titles of COTRA UoE Students at Partner Institutions.

Table 2: The COTRA Students theses topics and the partner Universities they come from

#	Student Name	Thesis Title	Partner University
	MSc students from UOE		
1	**Christine Owade**	Drivers of structural and functional composition communities of macroinvertebrates of Afromontane-savanna rivers	**Rhodes University, South Africa**

2	**Victor Okong'o**	Environmental assessment of cage culture fisheries in Lake Victoria Kenya	**Rhodes University South Africa**
3	**Mutua Grace Nduku**	Virus community and welfare of pond and caged Nile tilapia within Lake Victoria basin	**Makerere University Uganda**
4	**Kimeli Joshua Koskei**	Occurrence of pesticides residues in feeds, the pond environment and farmed fish in Kenya	**Makerere University Uganda**
5	**Lubembe Indasi Sharon**	Effects of fish cage culture on water quality and macro-zoobenthic communities in Lake Kivu, Southern Basin	**Official University of Bukavu DRC**
	Ph.D Students from UOE		
6	**Petronilla Mwangudza**	Assessment and mitigation of biosecurity risks associated with microalgae inclusion in farmed abalone diets	**Rhodes University, South Africa**
7	**Elizabeth Obado**	The potential of ebb-and-flow technology and salt tolerant crop on nutrient removal from a brewery effluent	**Rhodes University, South Africa**
8	**Leah Cherop**	The life history traits of African Lungfish (*Protopterus aethiopicus*, Heckel 1851) and influence of environmental variability in Lake Baringo, Kenya	**Makerere University Uganda**
MSc Thesis for Students from Partner Universities at UOE			
9	**Nakangu, Nelly Furaha**	Food, feeding habits and population structure of "Ningu" (*Labeo victorianus*, BOULENGER, 1901) in four selected rivers of the Lake Victoria basin, Kenya	**Makerere, Uganda**
10	**Kadeka, Ellen Consolatar**	Influence of land use on leaf litter decomposition in upland streams of the Nzoai River Basin	**Mzuzu University, Malawi**
11	**Fekadu, Masresha Birara**	Influence of land use on macroinvertebrate assemblages in upland streams of the Nzoai River Basin	**Bahir Dar University, Ethiopia**

12	**Nabayunga, Stella**	Value chain Analysis of farmed fish *Oeroechromis niloticus* in Kakamega County	**Makerere University Uganda**
13	**Josephine Buluma**	Effect of feeding ratios on the performance of an integrated *Oreochromis niloticus* (Nile tilapia) – *Mentha spicata* (Spearmint) aquaponics system	**Makerere University Uganda**
Ph.D Thesis for Students from Partner Universities at UOE			
14	**Walumona, Jacques Riziki**	Modelling influence of lake level changes, water balance, and fisheries of Lake Baringo, Kenya	**University of Bukavu, DRC**
15	**Kondowe Benjamin**	Influence of lake level changes, water balance, and fisheries of Lake Kanyaboli, Kenya	**Mzuzu University, Malawi**

Graduation of ***Walumona, Jacques Riziki*** *(From D.R. Congo)* ***and Kondowe Benjamin*** **(***from Malawi)* *during the University of Eldoret 11th Graduation Ceremony.*

1.3. Publications by students from COTRA Project

1. Kondowe BN***, Masese F.O., Raburu PO, Singini W, Walumona RJ*** (2022). A review of water quality and ecological status of Lake Kanyaboli, Kenya. *Lakes & Reservoirs: Science, Policy and Management for Sustainable Use.* 27, e12401. https://doi.org/10.1111/lre.124012.

2. Kondowe BN, Masese FO, Sitati A, Walumona RJ***, Singini S, Raburu PO. (2022). Seasonality in environmental conditions drive variation in plankton communities in a shallow tropical lake. *Frontiers in Water*. https://doi.org/10.3389/frwa.2022.883767
3. Kondowe BN, Masese FO, Sitati A, Walumona RJ, Singini S, Raburu PO. Dynamics of fish assemblage characteristics in a shallow Afrotropical Lake in western Kenya: community diversity, species composition and catches. Submitted to *Aquaculture, Fish and Fisheries.*
4. Kadeka EC**, Masese FO, Lusega DM, Sitati A**, Kondowe BN*** and Chirwa ER (2021). No Difference in Instream Decomposition Among Upland Agricultural and Forested Streams in Kenya. *Front. Environ. Sci.* 9:794525. DOI: https://doi.org/10.3389/fenvs.2021.794525
5. Kadeka EC**, Sitati A**, Kondowe BN**, Lusega DM, Chirwa ER and Masese FO. 2021. Effects of deployment period on decomposition and colonization of leaf litter of differing quality by invertebrates. *African Journal of Education, Science and Technology*, *6*(3), 16-27. DOI: http://www.ajest.info/index.php/ajest/article/view/532
6. Nakangu NF**, Masese FO**,** Barasa JE, Matolla GK, Riziki JW***, Molongaibalu M (2021). Influence of the changing environment on food composition and condition factor in *Labeo victorianus* (Boulenger, 1901) in rivers of Lake Victoria Basin, Kenya. *Aquaculture and Fisheries.* DOI: https://doi.org/10.1016/j.aaf.2021.09.006
7. Nakangu NF**, Barasa JE, Matolla GK, Riziki JW***, Mbalassa M and Masese FO**.** (2021). Condition Factor and Length-Weight Relationship of *Labeo victorianus* (Boulenger, 1901) in the Selected Rivers of the Lake Victoria Basin, Kenya. *African Environmental Review Journal,* 4 (2): 39-48. DOI: http://aer-journal.info/index.php/journals/article/view/123
8. **Walumona, J.R.**, Kaunda-Arara, B., Odoli, O.C., Murakaru, J.M., Raburu, P., Muvundja, A. F., Nyakeya, K., Kondowe, B.N., 2021b. Effects of lake-level changes on water quality and fisheries production of Lake Baringo, Kenya. Ecohydrology, e2368. https://doi.org/10.1002/eco.2368,
9. **Walumona, J.R.**, Odoli, C.O., Raburu, P., Amisi, F.M., Murakaru, M.J., Kondowe, B.N., Kaunda-Arara, B. 2021a. Spatio-temporal variations in selected water quality parameters and trophic status of Lake Baringo, Kenya. Lakes & Reservoirs: Research & Management 26,1-16. DOI: 10.1111/lre.12367 .
10. **Walumona, R.J**., Kaunda-Arara Boaz, Odoli, C.O., Raburu P. , Kondowe, B.N., Kobingi, N., Murakaru, M.J., Masilya, M.P., Mbalassa M., & Amisi F.M.:Modeling food web properties and fisheries dynamics in Lake Baringo using Ecopath mass-balanced model (submitted to Ecological modeling journal).
11. Fekadu, Masresha Birara, Simon Agembe, Clement Kiprotich Kiptum, and Minwyelet Mingist. "Impacts of anthropogenic activities on the benthic macroinvertebrate assemblages during the wet season in Kipsinende river, Kenya." *Turkish Journal of Fisheries and Aquatic Sciences* 22, no. 6 (2022).

2. SCIENTIST FOR CROP IMPROVEMENT AND FOOD SECURITY IN AFRICA (SCIFSA)

Project PI: Prof. Julius Ochuodho

2.1. Background Information

The EU under its Intra-Africa Academic Mobility Scheme to train Scientist for Crop Improvement and Food Security in Africa **(SCIFSA)** funded the Academic Mobility Project to train graduate students in African universities worth EUR 1,398,975. In this mobility program five African partner institutions namely Makerere University, **Uganda**; University of Eldoret, **Kenya**; University of **Ghana**, Legon; Cairo University, **Egypt** and Universite Cheikh Anta Diop de Dakar, **Senegal**) and one EU technical partner Silesian University of Technology, **Poland** successfully collaborated in the training of professionals to achieve sustainable crop varieties improvement that lead to increased crop production and enhanced food and nutritional security, and hence, improved livelihood and household revenue.

A total of 24 Masters (6 credit seeking, 18 degree-seeking) and 12 Doctorates (4 credit seeking, 8 degree-seeking)] were trained in the thematic areas of Plant breeding and seed systems, Biotechnology, Seed science and technology, Pomology and Vegetable crop production, Pesticides and plant protection and Plant and microbial technology. The project provided fellowships for full degree programs (PhDs and MSc) as well as short term mobility for students and staff and was expected to run from 1st November 2017 until 31st October 2022. However, due to COVID 19 pandemic, the project was extended for one more year to 2023.

The project which was locally coordinated by **Prof. Julius Onyango Ochuodho** was expected to contribute to a) improved skills and competences of academic staff in, research, training and supervision, b) enhanced quality of graduate training that will lead to innovative and fit-for-purpose professionals in Crop production improvement c) improved skills and competences of administrative staff in implementing international mobility. Subsequently, a procedure/platform to support the harmonisation and internationalisation of Crop production programmes among African Universities has been achieved.

2.2 Student Theses Research Topics

The tables below provide the Theses Research Topics and publications made by the postgraduate students who participated in the SCIFSA Academic Mobility Project while at the University of Eldoret.

Table 3: Theses Topics of Students of SCIFSA Project

Student Name	**Thesis**	**Partner University**
1. Hillary Botey Mireku	Physiological And Biochemical Basis For Seed Germination Behaviour Of The African Eggplant (*Solanum Aethiopicum*, L.)	**University of Ghana, Legon**
2. Gerard Oballim	Seed Development And Maturation In Bambara Nut (*Vigna Subterranea* (L.) Verdc.)	**Makerere University, Uganda**
3. Morish Obura	Enhancement Of Seed Germination In Bambara Groundnut (*Vigna Subterranea* L. Verdc)	**Makerere University, Uganda**
4. Mamie Souadou Diop	Influence Of Phosphorus Fertilization On Growth And Seed Quality Of Velvet Bean (*Mucuna Pruriens* (L.) Dc.)	**Universite Cheikh Anta Diop de Dakar, Senegal**
5. Boyce Monau Pako	Seed Quality Parameters In *Cleome Strigosa* & Kenaf (*Hibiscus Cannabis*)	**University of Botswana**

2.3 Publications by Students

The table below presents the publications made by international students who were attached to the University of Eldoret during their academic mobility projects. The project contributed immensely to the research publications at the University.

Table 4: List of Publications made by SCIFSA Mobility Project Students

Student Name	Title of Publications
Hillary Botey	**1.** Physiological quality of African eggplant seedsas influenced by natural fermentation and drying methods. JHF/03.05.21/0669
	2. Fruit and Seed Physiological quality changes during seed development and maturation in African Eggplant (*Solanum aethiopicum*, L.) AJAR/03.07.21/15690
	3. Temperature and Light effects on germination behaviour of African eggplant (*Solanum aethiopicum* L.) seeds. ARCC/A-623
	4. Qualitative and Quantitative Assessment of African Eggplant Seed Germination in Relation to Seed Maturation. Agricultural and Food Science Journal of Ghana Vol. 14: 1443-1455 https://dx.doi.org/10.4314/afsjg.v14i1.9
	5. H. M. Botey, J. O. Ochuodho, L. Ngode & H. Dwamena (2022). Fruit Maturity & After-Ripening Improve Seed Physical and Physiological Quality of *Solanum aethiopicum* L. Ghana J. Sci. 63 (2), 2022, 1 - 11 https://dx.doi.org/10.4314/gjs.v63i2.1
Gerard Oballim	**6.** Production and utilization of Bambara nut (Vigna subterranea (L.) Verdc.) in Northern and Eastern Uganda. African Journal of Agricultural Research, 18(11): 977–990. doi: 10.5897/AJAR2022.16158
	7. Changes in seed quality during seed development and maturation of Bambara nut (Vigna subterranea (L.) Verdc.) landraces. International Journal of Agronomy: (In press).
	8. Tannins and flavonoids contents influence seed pigmentation and seed quality aspects during seed development of Bambara nut (*Vigna subterranea* (L.) verdc.) landraces. (submitted manuscript)
	9. Phytic acid, protein and oil content and their relationship with seed quality during seed maturation of Bambara nut (*Vigna subterranea* L. verdc.) landraces (submitted manuscript)
Obura Morish	**10.** M. Obura, G. Oballim, J. O. Ochuodho, F. N. W. Maina and V. E. Anjichi. 2021. Effect of Phosphorus Fertilizer Rates and Seed Priming Treatments on Seed Quality of Bambara Groundnut. Agricultural and Food Science Journal of Ghana, 14: 1337-1353. https://dx.doi.org/10.4314/afsjg.v14i1.2
Mamie Diop	**11.** Production, Seed Management and Utilization of Velvet Bean (*Mucuna pruriens* L. Dc) in Western Kenya. African Journal of Education, Science and Technology, May, 2021, Vol 6, No. 3, pages 27-44
	12. Seed Quality of Velvet Bean Seeds (*Mucuna pruriens* L. Dc) In Western Kenya. African Journal of Education, Science and Technology, April, 2023, Vol 7, No. 3, pages 154-165

Boyce Pako Monau	**13.** Effect of Leaf Harvesting on Yield Parameters and Seed Quality of Kenaf (*Hibiscus cannabinus* L.)" Journal of Crops, Livestock and Pests Management, ISSN: 3005-2181

Plate 1: One of the SCIFSA PhD students – Gerard Oballim – assessing his trial in West Nile in Uganda in 2021; the crop is Bambaranuts

2.4. Short term exchange program for faculty and non-academic staff

The project also had student and staff exchange; and non-academic staff exchange and the following participated in the project life time.

Table 5: Students, Tachnical and Administrative staff that participated in the Project

S/No.	Name	From/Sending	To/Hosting	Activity
1	Fanuel Leting (PhD student, NMU, Arusha)	UoE - SCHS	Makerere, Uganda	Study storage pests of Dolichos lablab
2	Leanard Agan (MSc student)	UoE - SES	UCAD, Senegal	Study environmental toxicology using frogs
3	Denish Onen (MSc student)	Makerere	UoE	Study diversity and population dynamics of fruit fly in Mangoes in Siaya county
4	Beartrice Cheserek (Administrator)	UoE - ReMSI, directorate	Makerere	Experience administration/management of resources, gender and internationalization of institutions
5	Baguma (Registrar Academic)	Makerere	UoE	Experience administration/management of Academic division

6	Juma Hawa (HR Manager)	Makarere	UoE	Experience human resource management

3. GRADUATE TEACHING ASSISTANTSHIP (GTA)

3.1 Students and their programs

The third Academic Mobility Program, The Graduate Teaching Assistantship (GTA) by RUFORUM aimed at training academic staff for African universities by other African universities with stronger programs. The programme was coordinated by Prof. Julius Ochuodho at the University benefitted the following students who undertook their studies at the University of Eldoret.

Table 6: International Students that participated in the GTA Project

S/No	Name	Home university	Program
	COHORT I – 2014/15		
1	Jean Marie Vianney Senyanzobe	**National University of Rwanda**	Biological science- Plant ecology
	COHORT - II 2018/19)		
2	Ousman S. Dorley	**University of Liberia**	Seed Science
3	Sheriff Saliah	**University of Liberia**	Environmental Biology
4	Mandela Hinneh	**University of Liberia**	Aquaculture and Fisheries
5	Sellu Mawundu	**Njala University, Sierra Leone**	Aquaculture and Fisheries
	COHORT III to registered for Year 1 courses (2020/21)		
6	Tamba Nyuma SAGR/SOS/P/001/20	**University of Liberia**	Soil Science
7	Emmanuel Pope SAGR/SCH/P/004/20	**University of Liberia**	Agronomy
8	Nicole Nshobole Migabo	**Catholic University, Bukavu, DR Congo**	Forestry
9	Nacishali Nteranya Jean	**DR Congo**	Environment

2.2. Student Theses

No.	Name	Thesis Title
1	Emmanuel Momolu Pope (Liberia)	Response of Upland Rice Cultivars to Drought Stress at Different Growth Stages in Kenya
2	Henry Nyuma Tamba (Liberia)	Fortification and Palletization of Agroforestry-Based Amendments: an Integrated Nutrient Management Option for Small Holder Agriculture
3	Ouman Salia Dorley (Liberia)	The Seed Industry in Liberia: A Case Study of Rice (Oryza Sativa) Seed Quality and Sustainable Seed Health Management – **Awaiting Graduation 2023**
4	Salia S. Sheriff (Liberia)	Phytoremediation of Potentially Toxic Metals Contaminated Agricultural Soil Using Putative Brassica Napus and Raphanus Raphanistrum in Uasin Gishu County, Kenya – **Graduated 2022**
5	Mandela Klon-Yan Hinneh (Liberia)	Evaluation of Nutritional Quality and Performance of Farm- Made and Commercial Feeds on Growth and Economic performance of Nile Tilapia (Oreochromisniloticus Linnaeus, 1758) In Liberia
6	Sellu Mawundu (Sierra Leone)	Ecological Carrying Capacity and Growth performance of Nile Tilapia (Oreochromisniloticus) Cage Aquaculture Within Lake Victoria, Kenya
7	Nacishali Nteranya Jean (D.R. Congo)	Modeling Land Degradation for Conservation Planning in Kalehe Territory, Eastern D.R. Congo
8	Nicole Nshobole Migabo (DR Congo)	Climate change foot prints in Kakamega lowland tropical rain forest
9	Jean Marie Vianney Senyanzobe (Rwanda)	Environmental impact of *Pteridium aquilinum* L KUHN var centrali-Africanum (HIERON): An invasive species in Nyungwe Forest, Rwanda

Plate a: International students at the Outreach Center during the last Cultural day. Standing is one of the GTA students – Nicole Nshobole Migabo from Dr Congo

Plate b: The graduation of Salia F Sheriff from Liberia in 2022

The University has also managed to solicit more academic mobility projects which are starting this year. Regionally the project is being coordinated by other partner institutions but the University are key partners. These include:

4.0. BUILDING CLIMATE RESILIENT MIXED CROP-LIVESTOCK AND AGRO PASTORAL FARMING SYSTEMS IN ELGEYO MARAKWET COUNTY THROUGH AGROECOLOGY: quantification, reduction and community sensitization on greenhouse gas emissions **(CRAPAE)**

Project PI: Dr. Abigael Otinga

The GRAPAE project which is funded by Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) is being coordinated at the University of Eldoret through the Department of Soil Science, School of Agriculture and Biotechnology and will be implemented from October 2023-September 2025. The project was awarded under the two-year Graduate Research Grants (GRGs) funded by the Government of New Zealand, in support of the Global Research Alliance on Agricultural Greenhouse Gases (GRA; https://globalresearchalliance.org/).

4.1. Project Summary

Agriculture is the driver of many Sub-Saharan African (SSA) economies but has continued to perform dismally in comparison to maximum possible yields. Over 80% of the population in the east African region derive their livelihoods from agriculture and this sector contributes to over 35% to the regions' GDP. Most of the agriculture is rain-fed and influenced by increasingly depleted soils, high temperatures, vulnerability to frequent drought and/or devastating floods, and pest and disease outbreaks exacerbated by the changing climate. Consequently, most households' food production is hardly sufficient resulting in food insecurity, malnutrition and high poverty levels. Mixed crop-livestock and agro-pastoral (AP) systems are no exception to these effects.

Intense research and initiatives by governments in the region has gone into improving the sector for the purpose of increasing productivity, improving livelihoods and feeding the burgeoning populace. As agriculture is intensified to meet the food and feed needs of the African continent, a heightened use of fertilizer, manure and crop residues is foreseen, which will lead to surges of GHG fluxes (Hickman et al., 2015; Leitner et al., 2020). The target community-EMC- is characterised by both mixed crop-livestock farming systems and agro-pastoralism with poor manure management and high temperatures that contribute to GHG emissions. The entry point in terms of reductions of GHG emissions and increasing the resilience of this community to effects of climate change is adapting their livestock and agro-pastoral systems to the principles of Agroecology (AE) (FAO, 2018). We believe that in order to be effective, strategies have to adhere to principles of AE while special attention is needed for possible tradeoffs.

Agroecology is fundamentally different from other approaches to sustainable development. It is based on bottom-up processes, helping to deliver contextualized solutions to local problems. Agroecological innovations are based on the co-creation of knowledge, combining science with the traditional, practical and local knowledge of producers. By enhancing their autonomy and adaptive capacity, agroecology empowers producers and communities as key agents of change (Wezel et al., 2020).

The overall objective of **CRAPAE**, therefore, is to contribute towards increasing the resilience of mixed crop and livestock and agro-pastoral farming systems to the effects of

climate change through adapting the systems to the principles of agroecology. The research is three-pronged and involves (i) exploratory studies that establish a baseline on common AE practices in mixed crop and livestock agro-pastoral systems, (ii) on-farm field experiments aimed to establish the common drivers of GHG emissions in the use of inorganic and organic (FYM) fertilizers for producing food and fodder in these livestock systems, and (iii) co-creation of knowledge and information sharing between researchers and the community. We will follow an integrated approach and address several of the thematic areas laid down in the GRA-GRG call viz; '*improving African livestock GHG inventories*', '*Manure management*', '*Traditional indigenous farming systems*', '*extension of mitigation knowledge to farmers*' but narrow the focus to the '*quantification of* CH_4, N_2O *and* CO_2'. Specifically, we seek to make our contribution towards the understanding of GHG emissions in the African mixed crop and livestock and agro pastoral systems through data collected on farm and on the landscape. We also endeavour to contribute to the body of knowledge on potential AE practices that can reduce GHG emissions but increase the mixed crop and livestock and agro pastoral systems in a sustainable manner.

The expected project outputs include (i) GHG inventories across different mixed crop and AP systems, (ii) rates of organic and inorganic fertilizers that contribute to reduced emissions relative to yield in mixed crop and livestock and AP established, (iii) AE practices with the most potential for higher yields and lower emissions in mixed crop and AP systems delineated and documented, (iv) knowledge on cost-effective management of mixed crop and AP systems in the context of AE generated, documented and shared amongst various stakeholders including the community and the central and county governments, and (v) strengthened collaboration between participating institutions and Elgeyo Marakwet County. Graduate training is an integral part of this project and as such two MSc. students will be trained.

Envisioned achievements of **CRAPAE** are to contribute to data on the quantification of GHGs in SSA. This data will help in the development and implementation of policies for reduction in GHGs in the agricultural sector. We take cognisance of the fact that our results will be influenced by yield and emissions and farmer preferences but in future researches, analysis of the gross margins for farmers and the societal economic costs and benefits will be necessary follow-ups. We also endeavour to sensitise and create awareness to mixed crop-livestock and agropastoral communities about effects of climate change and co-create knowledge on how they can adapt and/or mitigate against these effects through appropriate interventions embedded in the principles of agroecology.

By directly training two MSc. Students and several others indirectly through seminars and workshops, university staff, farmers and extension officers, **CRAPAE** will have made a great achievement in capacity building. We shall empower key personnel and expertise at the University's Outreach Centre in climate change and agroecology and enhance the university's curricula by incorporating modules in these topics both for the

undergraduate and postgraduate programmes. Finally, we endeavour to bring knowledge together for a holistic view of practices, to see which practices deliver yield and potential resilience, sustainability, and lower GHG emissions. In general, the focus is to reduce GHG emissions from the mixed crop and livestock and AP practices but more so make a comparison of all factors in light of yield and resilience. Of importance also is that such practices can be taken up by farmers for example, if results show they are feasible, farmers "like" them, or if costs associated with them are low as compared to the conventional ones. This knowledge will be shared amongst the stakeholders through the Outreach Centre of University of Eldoret.

DISSEMINATION OF RESEARCH FINDINGS

1.0. Background

The quality Objective number 4 of the University of Eldoret stipulates that the University should disseminate 60% of research findings to the community annually. The University strives to achieve this goal through publications, seminars /workshops / conferences, Public lectures, Innovation Fairs, and research outreach to communities.

1.2. Publications

The faculty members of the University of Eldoret makes a major contribution the scientific community by researching and publishing quality research findings in reputable refereed international journals. During the 2022/2023 financial year the faculty and students published **126 articles** in refereed journals as shown per quarter in Figure 2.

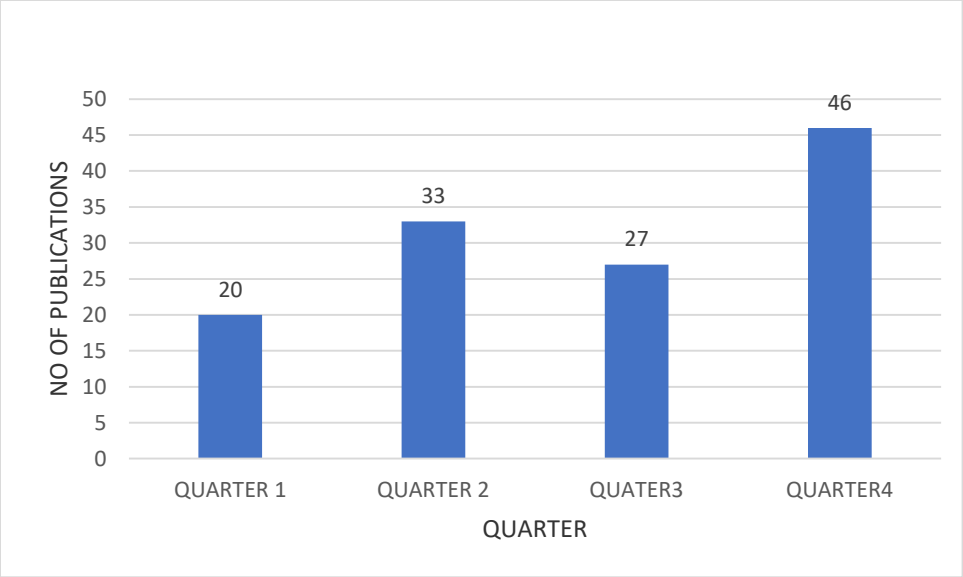

Figure 2: Articles published by the University in refereed journals in FY 2022/2023

1.3. Public Lectures and Conferences

Research finding addressing societal problems and to the scientific community have been disseminated through many internal, national and international seminars, conferences and workshops. In order to enhance dissemination of knowledge on research, technology and skills generation, the Directorate conducts Public Lectures annually. Since the last graduation, the University hosted 3 public lectures. These include public lectures delivered by the following personalities:

a) Public Lecture on ***The Quest of Intelligent Design*** by Dr. Casey Luskin and Dr. Brian Miller from Discovery Institute (Plate 4a)
b) Public lecture delivered by Mr. Godfrey Kalerwa from NACOSTI, who represented his CEO on the topic: ***Research and Intellectual Property Management in Universities and Research Institutions*** (Plate 4b)

c) Public Lecture ***Life University as a Leading Vitalistic Institute for Health and Wellness*** was delivered by Dr. John Downes and Dr. Hussein Elsangak from Life University, USA. (Plate 4c)

Plate 4a and 4b: Speakers delivering public Lectures at the University

Plate 4c: Group photo of participants during the Public Lecture at Kerio Hall

2.2.4.2 Thesis and Publications for Post-graduate Students

Table 2: below is a list of thesis and publications for Post graduate Students per school during the 12th UOE Graduation Ceremony.

S/NO	NAME	THESIS TITLE	PUBLICATION TITLE
1.	Chemwetich Joseph Rotich	Characterization And Domestication Potential Of Wild Yam In Kenya	Neodomestication and its Effect on Growth and Production of Wild Yam in Baringo and Uasin Gishu Counties of Kenya.
			Identification and Determination of Wild Yam Distribution in Kenya.
2.	Arusei Geoffrey Kipkorir	Physical And Optical Properties Of Titanium-Based Max Phases: A Density Functional Theory Study.	Mechanical and Elastic Properties of Selected 211 MAX Phases: A Density Functional Theory Study
			The Elastic Properties and Lattice Dynamics orSelected 211 Max Phases: A DFT Study
3.	Werunga Mispah	Weather - Based Ecological Factors That Influence Abundance And Species Richness Of Myomorph Rodent Pests In Maize And Wheat Farms Of The University Of Eldoret, Uasin Gishu County, Kenya.	The Effect of Ecological Factors on the Distribution of Myormoph Rodent Pest Species Infesting the University of Eldoret Farms, Uasin Gishu County, Kenya
			The Rodent Pest Species Infesting Maize (Zea mays L) and Wheat (Triticum aestivum L) Farms at University of Eldoret, Uasin Gishu County, Kenya
4.	Chepkwony Jacob Kurui	Mathematical Modeling Of Hiv/Aids Dynamics Among Fisherfork As Vector For Hiv: A Case Study Of Lake Victoria Metapopulations	Coupling and Synchronization of HIV/AIDS Fisherfolk Metapopulations
			Mathematical Modeling of Optimal Control of HIV/AIDS Prevalence among Fisherfolk in Lake Victoria Region
5.	Mmbone Sylvia		Effects of diet on the Nutritional Composition of the Desert Locust Schistocerca gregaria (Orthoptera: Acrididae)

		Elucidation Of Locust And Grasshopper Consumption And Prospects Of Their Rearing As Food And Feed In Western Kenya	Exploring Desert Locust (S. gregaria) Frass as an Organic Fertilizer for the Growth of Kales (Brassica oleracea L.) under Open Field Conditions
6.	Wamalwa Stella Wanjala	Socio-Economic Status And Bioassessment Of The Ecological Integrity Of King'wal Wetland, Nandi County, Kenya.	Utilization and Management of Wetland Resources of King'wal Wetland by the Riparian Community.
			Macro-invertebrate Assemblages as Indicator of Ecological Integrity of King'wal Wetland
7.	Lemeitaron Njenga Peter	Biogenic Synthesis Anc Characterization Of Zno And Cuo Nanoparticles From Entada Abyssinica And Warburgia Ugandensis Leaf Extracts For Anti-Bacterial Applications.	Anti-Bacterial Activities of Green Synthesized ZnO and CuO Nanoparticles from Lead Extracts of Warburgia ugandensis.
8.	Ngeno K. Benard	Antidiabetic Properiteso F Tarchonanthus Camphoratus In Fructose-Induced Diabetic Wistar Rats.	Antidiabetic Properties of Tarchonanthus camporatus in Fructose-Induced Diabetic Wistar Rats.
9.	Tanui Samuel Kipkogei	Evaluation Of Trichoderma Spp. And Mycorrhiza On Growth And Management Of Pestalotiopsis Theae Causing Grey Blight In Tea.	In-Vitro Evaluation of Three Trichoderma spp. Isolates Against Grey Blight Disease (Pestalotiopsis theae) of Tea.
10.	Rutto Salina	Investigation Of Pavonia Urens As A Potential Biosorbent In Heavy Metal Removal Through Complexation	Investigation of Pavonia urens as Potential Biosorbent in Phytoremediation of Metal Pollutants through Complexation.
11.	Salbei T. Christine	Effects Of Acacia Polyacantha Crude Bark Extracts Administration In Mice Infected With Leishmania Donovani.	
12.	Jerop Rael	Modelling Covid-19 Dynamics (Spread And Control) And The Effects Of A Preventive Vaccine.	Effect of Vaccination on Mathematical Modeling of COVID-19
			Optimal Control Analysis of Meningococcal Meningitis Disease with Varying Population Size
13.	Cheruiyot Jeptoo Emmy	Biocontrol Potential Of Trichoderma Harzianum Rifai (1969) And Beauveria Bassiana (Bals. Criv.) Vuill. (1912) Against	Acceptance paper: UoE journal

		Phytophtora Infestans And Alternaria Solaris Causing Blight In Tomato	
14.	Makokha O. Josephat	Taxonomy, Diversity, Structure, Uses And Threats Of Plant Species In Cherangani Forest Of Elgeyo Marakwet, Kenya	Taxonomy and Diversity of Vascular Plant Species in Cherangani Forest of Marakwet West in Kenya
15.	Makori Peris Nyaboke	Genetic Conservation Of The P104 Gene Used For Pcr-Based Diagnosis And Surveillance Of The Theileria Parva Parasite	Conservation and Variation in the Region of the Theileria parva p104 Antigen Coding Gene used for PCR Surveillance of the Parasite
S/NO	**NAME**	**THESIS TITLE**	**PUBLICATION TITLE**
		School of Agriculture & Biotechnology	
	Ousman Sarlia Dorley	The Seed Industry in Liberia: A Case Study of Rice (oryza sativa L.) Seed Quality and Sustainable Seed Health Management	(i)Evaluation of Antifungal Properties of Botanical Extracts in the Management of Common Spoilage Fungi of Rice (Oryza sativa L.) (ii)Fungal Pathogens Affecting the Quality of Rice (Oryza sativa L.) Seed in Selected Agro-ecological Zones of Liberia (iii)Rice: Seed Systems, Production Characteristics and Fungal Infections of stored grains in Major Production Zones of Liberia
	Stephen Kipchirchir Kimno	Morpho-genetic Diversity of gamma irradiated dolichos Lablab (Lablab purpureous (L.) Sweet genotypes for climate change adaptation	(i)Evaluation of Proximate and Mineral Composition of Mutant Dolichos Lablab (Lablab purpureus L.) Accessions in Kenya (ii)Characterization of Effect of Gamma Ray Induced Mutations on Morpho-Agronomic Traits of Dolichos Lablab (Lablab purpureus l.) Sweet (iii)Genetic Variability, Heritability and Genetic Advance of Yield and Yield Contribution Characters in Putative M2 Dolichos Bean (Lablab purpureus L.) Accessions

	David Munyao Musyimi	Influence of ridging and intercropping on sorghum productivity in Arid and Semi Arid Lands	Effect of Ridging and Intercropping on Sorghum Productivity in Arid and Semi-Arid Lands of Eastern Kenya
	Clotilda Nekesa Ondiko	Assessment of Productivity and Quality of Brachiaria Grass Cultivars in Coastal Lowlands of Kenya	Establishment and early growth of Brachiaria grass cultivars in Coastal Lowlands in Kenya
	Mamie Souadou Diop	Influence of Seed Aspects and Phosphorus Fertilization on Seed Quality of Velvet Bean (Mucuna-Pruriens L.) in Western Kenya	(i)Seed Quality of Velvet Bean Seeds (Mucuna pruriens L. Dc) in Western Kenya (ii) Production, Seed Management and Utilization of Velvet Bean (Mucuna pruriens L. Dc) in Western Kenya
	Jane Wahu	Food Price Effects on Dietary intake of Pre-primary Children in Low-income households in Eldoret, Uasin Gishu County, Kenya	Effects of Food Prices on Dietar Intake of Pre-Primary Children in Low Income Peri-Urban Households in Uasin Gishu County, Kenya
	Lynn Mugotitsa M'mbaitsa	Prevalence of Overweight and Obesity Among Women Traders aged 20-50 years in Eldoret Municipal Market	Physical Activity levels associated with Overweight and Obesity amongst female traders in Municipal Markets in Eldoret, Kenya
	Eric Misiko Manuya	Rearing dynamics and Performance of Improved Indigenous Chicken on Sorghum-Based Tations in Drylands of Western Kenya	Response to and cost effectiveness of Improved Kienyeji Chicken fed on Maize-Substituted Sorghum-Based Rations
	Philip Kiplel Biamah	Factors Affecting Conception rates of dairy cattle among Smallholder farms in Uasin Gishu County, Kenya	Factors Affecting Days Opea among Smallholder Dairy Cattle in Uasin Gishu County, Kenya

SCHOOL OF EDUCATION				
S/No	**Reg. No. and Name**	**Programme**	**Research Title**	**Publication**
1.	MUTHURI AMBROSE KINOTI	MEd	Determinants of Implementation of Competency-Based Education and Training in Technical and	Muthuri, A. K., Kiplagat, H. & Kutto, N. (2023). The Influence of Trainer Factors on Implementation of Competency-Based Education and Training in Technical

			Vocational Training Institutions in Meru County.	and Vocational Training Institutions in Meru County, Kenya. International Journal of Engineering, Science, 12(8), ISSN: 2320-0294 Impact Factor: 6.765 e
2.	YUCABETH NYABOKE NYAMWAYA	MEd	Factors Affecting the Implementation of Solar Technology in Kenya: The Case of Nyamira County, Kenya.	Nyaboke N, Ondieki S, Dr. Wanami S, & Dr. Nang'endo I, (2023). Influence of TVET training on Implementation of Solar Streetlights project in Kisii County; Kenya, International Journal of Engineering Research & Technology (Ijert), 12(06)
3.	MUIRURI PETER MOSE	MEd	Efficacy of Remote Learning in Technical and Vocational Education and Training Institutions in Bungoma County, Kenya.	Mose, P., Kiplagat, H. & Kibiwott, P. (2023). Trainers' and Trainees' Attitude towards Remote Learning in Technical and Vocational Education and Training institutions in Bungoma County, Kenya. International Journal of Innovative Science and Research Technology, 8(7): 2388-2394. https://doi.org/10.5281/zenodo.8224463 ISSN No:-2456-
4.	MUIRURI JOSEPH NJUGUNA	MEd	''An Investigation on Fire Disaster Preparedness in Secondary Schools in Uasin Gishu County, Kenya.''	Muiruri, J., Kiplagat, H. & Muthoka, K. (2023). Availability of School-based Psychosocial Support Programs on Fire Disaster Preparedness in Secondary Schools in Uasin Gishu County, Kenya. International Journal of Innovative Science and Research Technology, 7(7),
5.	ODHIAMBO DOUGLAS OKUKU	MEd	Influence of Selected Correlates on Career Adaptability of Technologists Working in Kenya TVET Institutions.	Odhiambo O. D., Kyalo N. M., & Ferej K. A. (2023). Influence of Non-Academic Factors on Career Adaptability of Technology Education Graduates Working in Kenyan Technical and Vocational Institutions
6.	RAPHAEL MWASI CHOLA	MEd	''Determinants of Course Choice in Vocational Training Centres in Taita Taveta County, Kenya.''	1. Chola, R. M., Kiplagat, H. & Mubichakani, J. (2023). Influence of Parents' Expectations on Course Choice in Vocational Training Centres in Taita Taveta County, Kenya. J Adv Educ Philos, 7(8): 317-322.

7.	MUTEBI RONALD	PhD	Efficacy of an Online Pedagogy on TVET Practical Skills Training in Uganda.	1. Mutebi, R., Kerre B. & Mubichakani, J. (2023). Challenges of an Online Pedagogy as a Method for TVET Practical Skills Training Delivery and Assessment. East African Journal of Education Studies, 6(2), 396-405, doi:10.37284/eajes.6.2.1383 2. Mutebi, R., Kerre, B. & Mubichakani J. (2023). Efficacy of an Online Pedagogy on TVET Practical Skills Training Delivery: A Quasi-Experimental Study. International Journal of Vocational Education and Training Research, 9(2), 41-51, doi:10.37284/eajes.6.2.1383
8.	SISIMWO FAITH	MEd	Factors Influencing Implementation of E-Learning in Technical and Vocational Education Training Institutions in Usain Gishu County, Kenya.	Sisimwo, F. M., Kiplagat, H. & Ochieng, R. (2023). Influence of Infrastructure on Implementation of E-Learning in Technical Vocational Education and Training Institutions in Uasin Gishu County, Kenya. J Adv Educ Philos, 7(8): 296-301.10.36348/jaep.2023.v07i08.007 ISSN 2523-2223 (Online)
9.	VITALIS AYIEKO ONYANGO	MEd	''Preparedness of TVET Institutions for the Implementation of Mechanical CBET Courses in Selected Counties of Kakamega, Nandi and Uasin Gishu, Kenya.''	Vitalis O.Ayieko; Peter Okemwa; Dr.Kyalo Muthoka(2023): Enhancing TVET Institutions through Robust Partnerships and Industrial Collaborations in Kakamega County, Kenya. International Journal of Innovative Science and Research Technology(ijisrt), 8(9), 566-571, DOI: https://doi.org/10.5281/zenodo.8366698
10.	MANGENI GLADYS NASAMBU	PhD	Effect of Problem Based Learning Strategy on Achievement in Physics in Sub-County Girls' Secondary Schools in Bungoma County-Kenya.	1. Mang'eni, G., Waswa, P. & Samikwo, D. (2023). Teaching within the Lens: The Use of Problem-Based Learning Strategy for Learner's Attainment of Critical Thinking Skills in Public Secondary Schools in Kenya. Journal of Research Innovation and Implications in Education, 7(4), 130 – 142. https://doi.org/10.59765/34utfgth. 2. Mang'eni, G. N., Waswa, P. & Samikwo, D. (2023). Can Learners Taught through Problem-Based Learning Strategy Demonstrate an Obligation to Conveying Positive Motivation towards Physics Enhanced Enrolment? Journal of Research Innovation and

				Implications in Education, 7(3), 191 – 200. https://doi.org/10.59765/zirh0217.
11.	JEPKOSGEI PURITY	MEd	Effects of Laboratory Method on Mathematics Performance and Motivation Among Secondary School Students in Kapsaret Sub-County, Kenya.''	Jepkosgei P., Mubichakani J. & Ochieng R. (2023). Impact of Laboratory Method on Students' Motivation of Mathematics in Secondary Schools of Kapseret Sub County Kenya. Journal of Advances in Education and Philosophy J Adv Educ Philos, 7(8): 277-282.
12.	ALVIN MOTURI	MEd	Effect of Online Based Concept Maps on Secondary School Students Performance in Biology in Endebess Sub-County, Kenya.	Moturi, A., Ouma, P., & Chemoiwo, E. (2023). Effect of Online Based Concept Maps on Secondary School Students' Academic Performance in Biology in Endebess Sub-County, Kenya. African Journal of Education,Science and Technology, 7(3), 788-798. https://doi.org/https://doi.org/10.2022/ajest.v7i3.912
13.	IRENE CHERONO	MEd	Resource Mobilizations in the Implementation of Free Day Secondary School Education in Emgwen Sub-County, Nandi County-Kenya.	Cherono Irine, Lydia Kipkoech, and Erastus Muchimuti (2023). Influence of stakeholders' involvement in resource mobilization and implementation of Free Day Secondary School Education in Emgwen Sub-County, Kenya. J Adv Educ phil, 8(10)
14.	IRENE CHEMUTAI SANG	MEd	''Effects of Student's Attitude Towards Biology Practical Work on Academic Performance in Turbo Sub-County, Kenya.''	Sang, I. C., Samikwo D., Korir B., (2023). Student's Gender and Attitude towards Biology Practical Work affects Academic Performance: A Case Study of Turbo Sub-County, Kenya. International Journal Of Engineering, Science and Maths, 12(09) ISSN: 2320-0294 Impact Factor: 6.765 http://www.ijmra.us
15.	NABIBYA KING GEORGE	PhD	Influence of Monitoring and Evaluation on the Implementation of Infrastructure Projects in Public Secondary Schools in Kakamega County.	1. Nabibya G.k, Dimo H, & keter J; (2023). Influence of Monitoring and Evaluation of Stakeholder Participation on Implementation of Infrastructure projects in Public Secondary School in Kakamega County, Kenya. Elixir Social Science, Elixir International Journal 180(2023)56987_56993.

				2.Nabibya G. K, Dimo, H., & Keter J. (2023) Influence of Monitoring and Evaluation of Financial Resources on Implementation of Infrastructure projects in Public Secondary School in Kakamega County, Kenya. Global Scientific Journals GSI 11(8) Online: ISS N 2320_9186.
16.	KOSGEI ANITA JERONO	MEd	Changing Dynamics and Their Effect on Digital Learning in Public Universities During the Post Covid 19 Era in Uasin Gishu County, Kenya.	Kosgei A., Kipkoech L. & Limo A. (2023). The Availability of Infrastructure to Support Digital Learning in Public Universities During the Post COVID 19 Era in Uasin Gishu County, Kenya. Journal of Research in Education and Technology, 1(1) 47-59
17.	EMMACULATE JEPKOSGEI MAINA	MEd	Dynamics of Pastoral Conflicts on the Education Management in Primary Schools in Kerio Valley Region of Marakwet East Sub-County Elgeyo Marakwet County.	Maina E J., Limo A & Keter J. (2023). Effects of socio-political and economic marginalization on education management in Kerio valley region of Marakwet East sub-county Elgeyo-Marakwet County. Journal of Research in Education and technology, 2023.
18.	TECLA NGOSOSEI	MEd	Influence of Teachers' Interactive Strategies on Students' Discipline in Secondary Schools in Urban Areas in Uasin Gishu County, Kenya.''	Ngososei Tecla, Alice Limo, Lydia Kipkoech (2023). Determining the Influence of Communication Interactive Strategies on Students' Discipline in Secondary Schools in Urban Areas in Uasin Gishu County, Kenya. J Adv EducPhilos, 7(10): 438-446.
19.	DIANA WAKASA BARASA	PhD	''Collaborative Peer Supervision in Enhancing English Language Teacher Effectiveness in Public Secondary Schools in Kakamega County, Kenya,''	1. Barasa Diana Wakasa, Prof. Paul Onsare Onchera, Florence mokeira Okari (2022). The Supervision of English Teachers in Public Schools in Kenya: A Critical Role of Heads of English Department. Journal of Education and Practice, 6(5), 1-20. ISSN 2520-467X (Online) 2. Barasa Diana Wakasa, Prof. Paul Onsare Onchera, Florence mokeira Okari (2022). Perceptions of Teachers of English on the Effectiveness of Collaborative Peer Supervision in the Teaching of English Language in Public Secondary Schools in

				Kenya. Ameircan Journal of Humanities and Social Sciences Research (AJHSSR, 6(8), 38-51. e-ISSN 2378-703X (Open Access)
20.	JUDITH JEMUTAI TANUI	MEd	''A Survey on Factors Influencing Teacher Motivation Towards Implementation of Programme of Pastoral Instruction.''	Tanui, J. J., Andambi, R., & Natade, J. L. (2021). Teacher Attitude towards the Implementation of Programme of Pastoral Instruction. International Journal of Academic Research in Business and Social Sciences, 11(5), 1-12.
21.	RUTTO DICKSON KIMELI	PhD	''The extent to which Critical Thinking Skills are Taught in Physics Lessons in Secondary Schools of Trans Nzoia County, Kenya.''	1. Ruto, D. K., Waswa, P. & Wanami, S. (2023). The place of critical thinking in physics instruction. Journal of Research Innovation and Implications in Education, 7(3), 310 – 318. https://doi.org/10.59765/garh3732. 2. Ruto, D. K., Wanami, S. & Waswa, P. (2023). Critical Thinking Skills: The Extent to which they are Taught in Physics Lessons in Secondary Schools of Trans Nzoia County
22.	TURYATEMBA BAINGANA EDDY		''The status of implementation of the real-life project-based learning for competence development of tvet trainees in Uganda.''	1. Turyatemba, E. B., Kiplagat, H. & Wanami, S. (2023). The Role of TVET Managers in the Implementation of Real-Life Project-Based Learning for Competence Development of TVET Trainees in Uganda. African Journal of Education, Science and Technology, 7(3), 390-400 2. Turyatemba, E, Kiplagat, H. & S. Wanami (2022). Capabilities of TVET Trainers Regarding the Implementation of Real-Life Project-Based Learning for Competence Development in Uganda. IOSR Journal of Research & Method in Education (IOSR-JRME) e-ISSN: 2320–7388, p- ISSN: 2320-737x, 12(5) Ser. II (Sep. – Oct. 2022), 52-61 www.iosrjournals.org

23.	DORCAS KULU MU	MEd	Effects of Computer Simulation on Instructional Process in Physics in Selected Secondary Schools in Kangundo Sub-County.''	Kulu, D. M., Waswa, P., & Kitainge, K. (2023). Effects of Computer Simulation on Learners' Participation in Physics in Selected Secondary Schools in Kangundo Sub-County. Journal of Advances in Education and Philosophy, 7(8): 302-309
24.	MUKIRE NASIMIYU JOSEPHINE	MEd	''Socio-cultural Practices and Learners' Enrolment Rates in Home Science: A Case of Secondary School in Pokot Central Sub-County, Kenya.''	Mukire, N.J, Sempele, C. & Aming'a, R. (2023). Determining the Extent to which Initiation Rites Affect Learner's Enrolment Rate in Home Science in Secondary Schools of in Pokot Central Sub-County, Kenya. International Journal of Education Humanities and Social Science, 6(4). ISSN 2582. https://doi.org/10.54922/IJEHSS.2023.0548
25.	LUCY WANJIRA MWANGI	PhD	Relationship Between Self-Concept And Academic Performance of Secondary School Students in Selected School in Nyeri County, Kenya.	1. Mwangi,L, Kisilu,K & Nyabuto, E (2023). Relationship between Self-Esteem and Student Academic Performance in Public Secondary Schools in Nyeri County, Kenya. Elixir Psychology 176(2023). Global Scientific Journal, 11(3),1-18.ISSN 2320-9186 2. Mwangi,L, Mukolwe,N & Maithiya,P (2020). Relationship between Selected Home Environment and Academic Achievement Motivation among Pupils with Hearing Impairment. IJERN 8(6). ISSN:2411:5681
26.	MAUREEN GESARE GWARO	MEd	Integration of ICT in Teaching and Learning Home Science in Secondary Schools; A Case of Kiambu County.	Gesare, M., Aming'a, R., & Ouma, P. (2023). The Influence of Teacher Competency on ICT Integration in Learning of Home Science in High Schools in Kiambu County, Kenya. International Journal of Economics, Commerce & Management (IJECM). United Kingdom. ISSN 2348 0386. 11(5).

27.	NYAKONGO MOKAYA CLINTON	MEd	Effectiveness of the Implementation of Competency –Based Education and Training in National Polytechnics in Nyanza Region, Kenya.	Nyakongo, C. M., Kiplagat, H. & Musembi, F. (2022). Instructional Methods Used in Competency-Based Education and Training in National Polytechnics in Kenyas Nyanza Region. International Journal of Physical and Social Sciences, 12(10), 8-13.
28.	RUTH MELLY	MEd	''The Role of Testing Speaking Skills through Writing on Learners' Speaking Competence in Selected Secondary Schools in Kesses Sub-County Uasin Gishu County, Kenya.''	Melly, R., Okari, F., & Oseko, A. (2023, April 7). Testing Speaking Skills Through Writing and Learners' Speaking Competence in Selected Secondary Schools in Wareng' Sub- County Uasin Gishu County, Kenya. African Journal of Education, Science and Technology, 7(3), 421-427. https://doi.org/https://doi.org/10.2022/ajest.v7i3.861
29.	KETER PHILEMON KIBET	PhD	''The effects of Mind-Mapping in the Mathematics Instruction on Learner Achievement, Motivation and Attitude in Selected Secondary Schools in Nandi County, Kenya.''	1. Kibet, K. P., Simiyu, J., & Mubichakani, J. (2021). Effect of Mind Mapping Teaching Strategy on Mathematics Achievement among Secondary School Students in Nandi County, Kenya, 5(4), 164 – 172). https://jriiejournal.com/wp-content/ uploads/ 2021/12/JRIIE-5-4-015.pdf 2. Keter, P. K., Simiyu, J., & Mubichakani, J. (2021). Effect of Mind Mapping on Gender Difference in Mathematics Achievement among Students in Public Secondary Schools in Nandi County, Kenya, 5(4), 207–216). http://41.89.164.27:8080/xmlui/ bitstream/handle/123456789/1943/ Phlemon%20 Kibet. pdf? sequence=1
30.	GRACE CHELIMO BARNO	PhD	''Value Addition to the Holistic Development of Students in Different Categories of Public Secondary Schools in Kenya.''	1.Barno, G. C., Kosgei, Z., & Kitainge K., (2023). Value Addition on Learners' Talents by Public National, Extra County, County and Sub-County Secondary Schools in Nandi County. International Journal of Research and

				Innovation in Social Sciences (IJRISS). ISSN NO.2454 6184/DOI:10.47771/IJRISS/, VII(III) 2.Barno, G. C., Kosgei, Z., & Kitainge, K. (2022). Relationship between Secondary School Categorization and Value-Added Progress in Public Secondary Schools in Nandi County, Kenya. International Journal of Research and Innovation in Social Sciences (IJRISS). ISSN NO.2454- 6186/DOI:10.47772/IJRISS/ VII(III)
31.	ABIGAEL CHELAGAT MOKAYA	PhD	''Determinants of Career Choice in Home Science Education Programme offered in Kenya Universities.''	1. Chelagat, A., Wanami, S., & Sempele, C., (2023). Personal Interest as A Determinant of Career Choice in Home Science Education Programme Offered in Kenyan Universities. African Journal of Education, Science and Technology, 7(3), 411-420. 2. Chelagat, A., Wanami, S., & Sempele, C., (2022**).** Influence of Guidance and Counselling on Choice of Careers in Home Science Education Programme in Kenyan Universities. Journal of Education, Society and Behavioural Science, 35(6): 66-74, 2022; Article no.JESBS.87972 ISSN: 2456-981X
32.	OJWANG' CONSOLATA	PhD	''The Influence of Functional Writing Skills on Student's Performance in Kiswahili in Secondary Schools in Kenya. A Case of Elgeyo-Marakwet County.''	1. Ojwang, C., Oduori, R.W., Murunga, F. (2023). Analysis of the effectiveness of Teaching Strategies of Functional Writing on Students' Performance in Kiswahili in Kenya. A Case of Elgeyo-Marakwet County. American Journal of Humanities and Social Sciences Research, 6(5), 81-92. 2. Ojwang, C., Oduori, R.W., Murunga, F. (2023). The effect of Style and Structure of Functional Writing on Students' Performance in Kiswahili in Kenya. A

				Case of Elgeyo-Marakwet County. American Journal of Humanities and Social Sciences Research (AJHSSR) e-ISSN : 2378-703X, 06(05), 101-112
33.	BONIFACE OMARIBA	MEd	''Influence of the Mode of Training on the Level of Satisfaction of Marine Engineering TVET Programme Graduates from the Coastal Region of Kenya.''	**Omariba, B, Simiyu, J. & Dimo, H. (2023). Influence of The Mode of Training on The Level of Satisfaction of Marine Engineering TVET Graduates from the Coastal Region of Kenya. Journal of Technology & Socio-Economic Development. xmlui.dri2xhtml.METS-1.0.item-type**
34.	CHEPKORIR SALOME	PhD	''An Investigation into the Use of Computer Based Laboratory Simulation in Promoting Development of Inquiry Skills in Electro-Chemistry in Secondary Schools Chemistry Instruction in Bomet County.''	1. Chepkorir, S., Kafu, P. A., & Kituyi, L. (2023). Efficacy of teaching chemistry with computer-based laboratory simulations (CBLs) as opposed to traditional methods in acquisition of scientific inquiry skills in Bomet County. African Journal of Education, Science and Technology, 7(3), 521-533. 2. Chepkorir, S., Kafu, P., & Lusweti, K. (2022). Effect of Computer-Based Laboratory Simulations (CBLS) in Acquisition of Scientific Inquiry Skills in Electro_ Chemistry in Secondary Schools in Bomet County. African Journal of Education, Science and Technology, 7(2), 296-308.
35.	EDNAH JESANG TUWEI	MEd	Influence of School Calendar Disruption on Adoption of Digital Learning of English Language in Kapseret Sub-County, Kenya.	Tuwei J. Ednah, Okari M. Florence & Omuse Emoit (2023). Influence of School Closure on the Adoption of Digital Learning of English Language in Kapseret Sub-County, Kenya. African Journal of Education, Science and Technology, 7(3)

36.	STEPHEN MUGAMBI M. IRANDU	MEd	''Factors Affecting Female Learners Enrolment in Technology Course at Karumo Technical Institute, Meru County, Kenya,''	Irandu S. Kerre B, & Kanyeki, F. (2023-06): Factors affecting female learner's enrolment in technical courses, at Karumo technical training Institute, Meru- Kenya. International Journal of Engineering, Science and Mathematics, 12(5). ISSN: 2320-0294 Impact Factor: 6.765 http://41.89.164.27:8080/xmlui/handle/123456789/1958
37.	FRANK KIPKOECH	MEd	''Factors Affecting the Implementation of Online Teaching and Learning in Technical Institution: A Study of selected Technical Training Institutes in Nandi County, Kenya.''	Kipkoech, F., Kerre, B. & Kanyeki G. (2023): Trainee's Challenges in Accessing Online Training on Technical Courses in Selected Institutions in Nandi County, Kenya. KJ-TVET, 6, tveta.go.ke
38.	EDNAH JEPKOECH SANG	MEd	Effects School Water Sanitatio and Hygiene Practices on Students' Performance in Public Secondary Schools: A Case of Muhoroni Sub-County Kenya.	Sang, E. J., Aming'a, R. & Omuse, E. (2023). Effects of Availability and Access to Safe Drinking Water on Students' Academic Performance in Secondary Schools in Muhoroni Sub-County, Kenya. Journal of Research Innovation and Implications in Education, 7(2), 317 – 325. https://doi.org/10.59765/xc94jbj s
39.	CAROLINE WAMBUI MWANGI	MEd	Influence of Devolution Support to Early Childhood Development Education on Retention of Pupils in Public Pre-Primary Schools in Wareng-Sub County, Kenya.''	Mwangi, C. W., Koross R., & Cheruiyot B. (2021). Pre-School Teacher Support and Retention of Pupils in Public ECDE Centres Kenya. East African Journal of Education Studies, 4(1), 107-118. https://doi.org/10.37284/eajes.4.1.507.
40.	TARUS JEPKIRUI	MEd	''Agricultural Training against Competencies Needed in Agricultural Organizations: an	Tarus, J., Ouma, P. & Waswa, P. (2022). An Investigation of Agricultural Training Competencies Needed In

			Analysis of selected Technical and Vocational Colleges in North Rift Region.''	Vocational Colleges in North Rift Region, Kenya. International Journal of Scientific and Research Publications, 12(9)(IJSRP) (ISSN: 2250-3153), DOI: http://dx.doi.org/10.29322/IJSRP.12.09.2022.p12923
41.	BENSON CHEGE NJUGUNA	PhD	''Effect of School of Management of the Implementation of TPAD Policy in Public Secondary Schools in Kenya: A Case of Trans Nzoia County.''	1. Njuguna, B., Kipkoech, L. & Wanami, S. (2022). Effects of Management of ICT Infrastructural Resources on the Implementation of TPAD Policy in Public Secondary Schools in Trans Nzoia County, Kenya, 9. DO - 10.46827/ejes.v9i1.4135 European Journal of Education Studies 2. Njuguna, Benson, Kipkoech, Lydia, Wanami, Simon (2021). Effects of Management Curriculum on the Implementation of TPAD Policy in Public Secondary Schools in Trans Nzoia County. DO-10.9734/jesbs/2021/v34i1230393. Journal of Education, Society and Behavioural Science
42.	LYDIA OSIDE AMGECHI	MEd	Influence of Social Media use on Self-Concept and Social Behaviour of Adolescents in Secondary Schools in Uasin Gishu County, Kenya.	Amgechi, L., Oseko, A., & Muyaka, J. (2022). Influence of Social Media Use on the Self-Concept and Social Behaviour of Adolescents in Secondary Schools in Uasin Gishu County, Kenya. African Journal of Education, Science and Technology, 7(2)
43.	MIYAWA CALEB JOTHAM	MEd	''Effect of Teacher Competences on Students' Academic Performance in Diploma of the Set Courses: A Case of National Polytechnics in Western Kenya.''	Miyawa, C.J., Ferej, A.K., & Muyaka, J.M. (2023). Effect of Trainer Pedagogical Competences ON Students' Academic Performance in Diploma SET Courses: A Case of National Polytechnics in Western Kenya, Asian Journal of Education and Social Studies, 48(1), 15-27, 2023; Article no.AJESS.103190 ISSN: 2581-6268

44.	CAROLINE NASIMIYU WANGILA	PhD	''An Investigation of Psychological and Behavioral Interventions among Adolescent Students' Growth in Public Secondary Schools in Trans-Nzoia County, Kenya.''	1. Wangila, C., Simiyu, J. & Oseko A. (2023). Effects of Psychological Interventions on Growth of Adolescent Students in Public Secondary Schools in Trans-Nzoia County. African Journal of Education, Science and Technology, 7(3),753-765. 2. Wangila, C., & Oseko A. (2023). Review on Psychological Disorder among Adolescent Students and Proposed Intervention Strategies in Kenya. African Journal of Education, Science and Technology, 7(3), 258-265.
45	SHEILA CHERUIYOT JERUTO	MED	The influence of availability of biology laboratory resource on students' academic achievements in biology in public secondary schools in Ainabkoi Sub- County	Cheruiyot, S. J., Samikwo, D. C., Wabuke, J. M. (2021). The influence of availability of biology laboratory resource on students' academic achievements in biology in public secondary schools in Ainabkoi Sub- County**.** Journal of Education, 3(1) ISSN 1569-9986 www.targetjournals.com.
46.	WERE CALVIN MISEDA	PhD	An Evaluation of The Quality of Electrical Installation Competency-Based Education and Training Curriculum Implementation in Kenya	1. Miseda, C. W, Wanami S. & Kisilu K. S. (2021). Investigation of Participation of Industry in a Quality Electrical Installation CBET Curricula Development, Delivery and Evaluation. The Kenya Journal of Technical and Vocational Education and Training. Vol. 4. Nairobi -Kenya. 2. Miseda, C., Kitainge, P.K & Wanami S, (2021). The Effects of Instructional Design Processes on the Quality of Implementing Electrical Installation CBET System in Kenya. Africa Journal of Technical and Vocational Education and Training, 6(1), 35-45. 3. Miseda, C. W, Wanami S. & (2022). Quality of Competency-Based Education and Training during Covid-19 Lockdown in Kenya: A Discussion of Open Distance and e-Learning Instructional Design. The Kenya Journal of Technical and Vocational

				Education and Training. Vol. 5. Nairobi - Kenya. 4. Miseda, C., Ferej A. & Wanami S, (2018). Issues Affecting the Greening of TVET Programs for Sustainable Development in Kenya: A Case of TVET Institutions in Nairobi County. Africa Journal of Technical and Vocational Education and Training, 3(1).
47.	OKEMWA' STELLA KWAMBOKA	PhD	The Influence of Electronics Laboratory Practices on Skill Acquisition by Technician in Nairobi County, Kenya	1. Stella, O. K., Ahmed, F., & Simon, W. (2022). TVET Institutions and Industry Collaborative Practices on Electronics Laboratory Training for Skill Acquisition among Technician Trainees in Kenya. Journal of Scientific Research and Reports, 28(9), 1-https://doi.org/10.9734/jsrr/2022/v28i930542 2. Okemwa K. Stella; Ferej Ahmed; Wanami Simon; Kitainge K. M. (2023). Strategies used by Trainers to Enhance Trainees' Skill Acquisition in Electronic Laboratory Instruction.", International Journal of Innovative Science and Research Technology (IJISRT), www.ijisrt.com. ISSN - 2456-2165, 8(2): - 109-119. https://doi.org/10.5281/zenodo.7645283
48.	JELAGAT ISABELLA	MED	Factors Affecting Safety Skills Development Among Electrical Trainees in Vocational Training Centers In Uasin gishu County, Kenya	Jelagat, I., Wanami, S., & Kiplagat, H. (2021). Level of Knowledge and Awareness on Occupational Safety and Health Act 2007 among Electrical Installation Trainees in Vocational Training Centres in Uasin Gishu County, Kenya. Global Scientific Journals, 9(8), 1-12. ISSN 2320-9186
49.	MIGIRO WYCLIFFFE LUMUMBA	MEd	The Effect of Selected Teaching Methods on Acquisition of Technical Skills By Mechanical Engineering Technical Trainees:	1. *Migiro Wycliffe Lumumba, Kitainge Kisilu and Dimo Herbert Department of Technology Education, School of Education, University of Eldoret, P.O. Box 1125, Eldoret, Kenya ''The Effect of Work-Based Learning on the Acquisition of Technical Skills amongst Mechanical

			A Case of National Polytechnics In The Western Region of Kenya	Engineering Students in National Polytechnics in Western Kenya Region'' *Corresponding author's email address: wycliffelumumba16@gmail.com
50.	MODI JOSEPH OKEBE	MEd	Assessment of Arson in Kenya Secondary School: Case Study of Homa Bay County	Modi J. Dr. H. Dimo & Dr. P. Okemwa (2020). An Investigation into Arson in Secondary Schools in Kenya: A Case Study of Homa Bay County. International Journal of Research, Ideas and Innovations in Technology, 7(1). https://www.ijarit.com

SCHOOL OF ENVIRONMENTAL SCIENCES & NATURAL RESOURCE MANAGEMENT

S/NO	NAME	THESIS TITLE	PUBLICATIONs TITLE
1.	GLADYS CHELAGAT BIWOTT	Assesing the Potential of Stormwater in Augmenting Domestic Water Supplies in Kapseret Sub-County, Uasin-Gishu County, Kenya	i)Rural Water Supply in the Era of Climate Change in Kenya; the Case of Kapseret Sub County, Uasin Gishu County ii) Dam Sites Identification using Multi-Criteria Analysis and Spatial Weighted Overlay. The Case of Kapseret Sub-County, Kenya
2.	ODARO DANIEL OPIYO	Intergrated Environmental Planning of Wetland Ecosystem for Sustainability: The case of Okana in the Lower Nyando River Basin, Kenya	i) The Role Of Wetlands In Enhancing Household Income In Okana In The Lower Nyando River Basin, Kisumu County, Kenya ii) Analysis of Land Use Land Cover Changes of Okana Wetland Ecosystems in Lower Nyando River Basin, Kisumu County, Kenya
3.	MISOI SILAH KIPLIMO	A contigent choice modelling valuation of Forest Products: The case of Kipkunur Forest Consumers, Elgeyo Marakwet County, Kenya	i) Benefits Flow and Utilization of Kipkunur Forest Products by Upstream and Downstream Users, Elgeyo Marakwet County, Kenya ii)Assessing willingness to accept compensation and willingness to pay for Kipkunur Forest Ecosystem Conservation in Elgeyo Marakwet County, Kenya

4.	MARY JEMAIYO KIPLAGAT	Influence of Large Mammalian herbivores Dung input on Nutrient release, algal Biomass Growth and Ecosystem Metabolism in Aquatic Ecosystem (a mesocosm approach)	Hippopotamus are Distinct from Domestic Livestock in their Resource Subsidies to and effects on Aquatic Ecosystems
5.	OGECHI BENNETON ONDENGI	Influence of Anthropogenic activities on Nyangongo wetland wetland in Nyaribari Chache Sub-County, Kisii County, Kenya	Influence of Anthropogenic Activities on Nyangongo Wetland Ecosystem in Nyaribari Chache Sub-County, Kisii County, Kenya
6.	NYAMBURA JANEROSE WAMBUI	Efficacy of Treating Wastewater from Wastepaper Recycling Mill using a blend of Moringa Oleifera Lam and Synthetic Coagulants	Efficacy of Treating Wastewater from Wastepaper Recycling Mill by Blending Moringa Oleifera with Synthetic Coagulants
7.	ISABOKE JOB	Availability and Mobility of Essential Elements along the Slopes of Oroba Valley, Winam Gulf Catchment, Kenya	The Nutritional Quality of Forage Grass Changes Due to Changing Soil Chemistry Resulting from Different Land-Use Management in the Oroba Valley, Kenya
8.	OKADEMI NANCY	Effectiveness of Filters in Removal o f Flouride and E. coli in Water by Incoporating Bampoo Activated Charcoal, Diatomite, Bone Char and Steel Wool	Defluorination Effectiveness of Modified Biosand Filters
SCHOOL OF ENGINEERING			

1.	Kibor David Tirop	Performance Evaluation Of A Prototype Variable Pitch Irish Potato Grader.	-

2.3 Directorate of Industrial Linkages, Partnerships and Collaborations

The primary mandate of the Directorate of Industrial Linkages, Partnerships, and Collaborations (DILPC) is to foster mutually beneficial relationships between the University of Eldoret and external stakeholders, including industries, organizations, governmental bodies, and academic institutions. These relationships are forged through the signing of MOUs, each of which is guided by i) **Promoting Research and Innovation ii) Enhancing Student Opportunities; iii) Faculty Engagement; iv) Sharing of Resources.** These MOUs are pivotal in establishing and strengthening collaborative partnerships that enrich our academic and research environment, broaden our horizons, and contribute to the holistic development of our institution.

Since the last graduation, the Directorate successfully negotiated and signed MOUs with a diverse range of partners. These include local and international industries, academic institutions, research organizations, and government agencies such as (i) Hanze University of Applied Sciences, the Netherlands (ii) European Business University, Luxembourg (iii) University of Liberia, Liberia (iv) County Government of Nandi and (v)Unga Group PLC. The University maintains a very active collaboration with industries including CKL Africa Ltd the leading supplier of high-quality poultry, animal health and crop production inputs in Kenya, East and Central Africa and Syngenta one of the world's leading agriculture companies who have been participating very actively in the annual Agribusiness Trade Fairs.

Plate 5: Vice-chancellor Prof. Thomas Kimeli Cheruiyot exchanges the MOU document with University of Liberia President Prof. Dr. Julius Julukon Sarwolo Nelson, Jr.

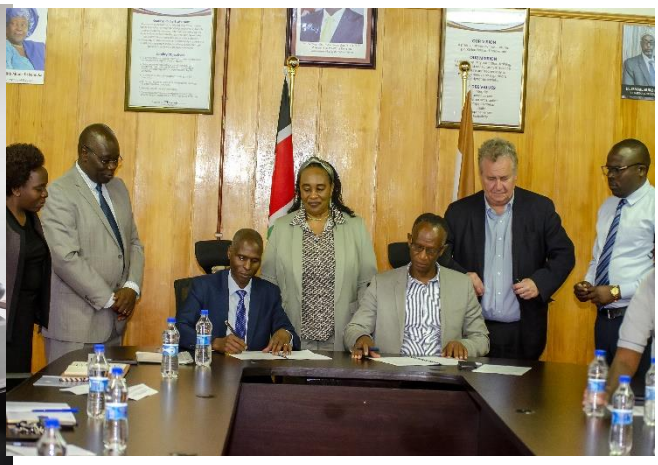

Plate 6a: Ag. VC signing MOU with Hanze University of Applied Sciences, The Netherlands and b) EBU University, Luxembourg in presence of Belgium Ambassador.

Plate 6c: Group Managing Director – UNGA Group PLC exchanges the MOU with DVC Planning, Research and Extension.

Collaborative research initiatives have yielded remarkable results, with publications, patents, and innovations emerging from these partnerships. Our faculty and students have actively participated in these endeavours, contributing to academic excellence. Our students have benefited from internship and exchange programs facilitated by these MOUs, gaining hands-on experience and exposure to real-world challenges. This has enhanced their employability and career prospects. The sharing of resources and expertise has enriched our learning environment, providing students and faculty with access to cutting-edge technologies and knowledge resources. Table 5 Gives a summary of institutions which the University currently has forged collaborations of mutual interest with:

Table 5: Summary of Institutions the University has active MOU's with to date

S/NO	CATEGORY OF INSTITUTIONS	NUMBER OF MOU'S
1.	County Governments	4
2.	Government Agencies	1
3.	Research Institutions	9

4.	Local/Kenyan Universities	3
5.	International Universities	12
6.	Industry	8
7.	Community/Civil Society Organizations	4
8.	Financial Institutions	8
9.	Colleges/School	1
	TOTAL	**45**

As we move forward, the Directorate remains committed to its mandate of forging and nurturing collaborative relationships. We will continue to seek new partnerships, explore innovative ways to collaborate, and expand the scope of our MOUs to encompass emerging fields and industries. We are also dedicated to ensuring that the benefits of these collaborations are effectively communicated to all stakeholders. Regular updates and reports will be shared to keep the university community and our partners informed about the progress and impact of these agreements.

The directorate is resolute in its pursuit of excellence through collaborations. Our MOUs represent the cornerstone of our commitment to academic growth, research excellence, and student empowerment. We look forward to the continued support and engagement of all stakeholders as we embark on this enriching journey of collaboration and knowledge sharing.

UNIVERSITY OUTREACH ACTIVITIES

1.0. Background

The University through the Outreach and International Students Centre (OISC) links with the Community, Industry and various stakeholders' in ventures of community interest. The Centre's activities are executed through (i) Outreach and external liaison, (ii) Training and capacity building (iii) Incubation of novel technologies and business ideas (iv) Income Generation and (v) International students' welfare. Since its inception in September 2017, the Centre has reached out to over 50,000 farmers directly and indirectly and engaged over 500 different community groups including women and youth groups either in training, demonstrations or field days. From November 2022 to date, the centre has organized and participated in five field days on good agricultural practices; these being held on farmers' fields, have trained over 600 farmers in various topics including soil testing and fertilizer use, mushroom production and Agribusiness. The Centre plays a key role in contributing towards the attainment of food and nutritional security in the country, one of the key pillars for economic transformation.

1.1. Outreach and External liaison

The Centre is involved in outreach and liaison by engaging the community through radio programmes, community services, agribusiness trade fair, trainings, capacity building and implementing the various MOUs signed by the University and different Government and Non-governmental organizations. On 17th March 2023, the University engaged stakeholders through a radio and TV talk show through KASS FM on Competency Based Curriculum (CBC) to answer questions on the government role in the new curriculum. The latest farmers field days were implemented on 28th February 2023 at Kapkei Sub location, Tembelio ward, Uasin Gishu County. The field day focused on Soil Conservation, The partners presented included; Uasin Gishu County Government, Kenya Seed Ltd, Western Seed, Real IPM and Agventures.

Plate 7: UOE staff demonstrating conservation / minimum tillage to farmers

The University hosted its' 16th Agribusiness Trade Fair on **Thursday 14th, Friday 15th and Saturday 16th, September 2023** at the University Pavilion Grounds. The theme for this year's Agribusiness Trade Fair was: "*Promoting Climate Smart Agri preneurship and Value Addition to Spur Industrialization for Sustainable Development*".

The trade fair, one of the University's outreach event was officially opened by the Cabinet Secretary, Ministry of Trade, Industry and Investment. In his remarks, he urged famers to adopt modern technologies and innovations developed by university researchers to improve on farm productivity. The event brought together all the key players in the agribusiness sector, farmers and interested partners from the neighboring counties to transfer new technologies and agribusiness innovations as a means of contributing to the food security in the country.

During the event the University mobilized a total of 13,716 farmers from Uasin Gishu, Nandi, Elgeyo Marakwet, Baringo, West Pokot, Trans Nzoia, Bungoma, Kakamega among other counties.


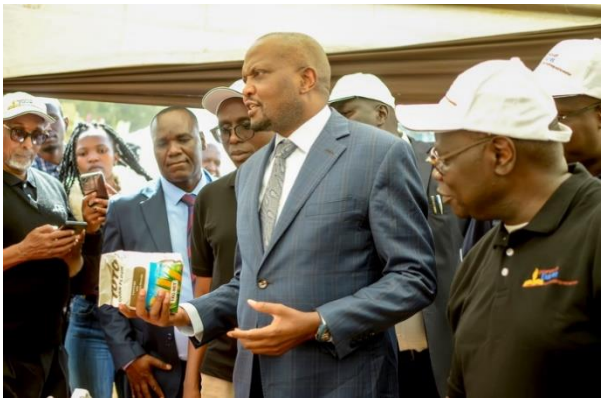

Plate ***Plate 8: Chief guest and other guests being entertained by UoE dancers (Left) and chief guest and other guests in one of the exhibitors stand (Right) during the event***

1.3. Training and Capacity Building

Training and capacity building activities were either carried out at the University (On station) or in the field (Off station) in consultation with the relevant stakeholders involved in the particular training. In carrying out this function, the Centre utilizes the University faculty in the relevant areas, industry players, the County and National Governments to benefit the community. In the year 2023, the Centre managed to carry out the following trainings;

Dates	Training Topic	Venue	No. of participants
6th to 10th March 2023	Total Diet Formulation Software – Rumen8	University of Eldoret – School of Business	40 Farmers and Post Graduate students
31st March 2023	Climate Smart Agriculture	Sinoko Baptism Church, Motosiet Ward, Trans Nzoia	59 farmers
25th May 2023	Major Pest and Disease in Crops	Meibeki Chiefs' Office, Karuna-Meibeki Ward, Uasin Gishu	72 Farmers
31st May 2023	Dairy Production	St. Pauls' ACK Nariri, Megun Ward, Uasin Gishu	84 Farmers
23rd June 2023	KEBS Standardization	University of Eldoret, School of Business	90 KCIC Incubatees
10th to 14th July 2023	Orientation & Onboarding of new incubate	University of Eldoret, School of Business	80 New KCIC Incubatees
28th July 2023	Improved indigenous Chicken rearing	Outreach Centre	23 Farmers
11th to 14th September 2023	Training of Tractor Operators	Outreach Centre	80 Farmers

Plate 9: Farmers' Training / capacity Building Sessions

1.4. Incubation of Novel Technologies and Business ideas

The Centre is home for incubation of technologies and business ideas from the University as well as the community, the Centre links innovators to experts in the University to be assisted in refining their ideas and make them commercially viable. In the year 2023, the Centre participated in two incubation programmes; Empowering Novel Agribusiness Led Employment (ENABLE) youth and Venture for Change (V4C) Programmes.

ENABLE Youth Kenya programme is a four year Programme implemented by the Ministry of Agriculture and co-funded by the African Development Bank (AfDB). University of Eldoret (UoE) is one of the Youth Agribusiness Incubation Centre (YABIC) for implementing the Programme. The YABICS provide facilities for training under identified value chains that are specific to the institution. The value chains identified for UoE YABIC are Animal/Dairy Production, Fisheries and Mushroom Production. This Programme is open for Diploma and Degree graduates from any field.

In the year 2023, the Centre incubated eighty one (81) youths in the 3 value chains and 62 of the Incubatees have successful been approved for funding. Through the ENABLE youth program, the Centre acquired a new mushroom unit that consist of;

A mushroom production room, Training room, Packaging room, office and washrooms. This new facility will improve and provide the much-needed space for mushroom training. The program has also supported the University with a number of equipment in all the value chains.

Plate 10: a) The new Mushrom Production Unit b) Straw Preparation for Mushroom Production at the Outreach Centre

2.0. VENTURE FOR CHANGE (V4C) CONCEPT EXPERIENCE

The Venture for Change (V4C) under the Making More Health (MMH) initiative is a program for students of different Universities in Kenya to conceive, develop and implement innovative ideas to foster hygiene, food safety and heathy in slums and rural areas. Boehringer Ingelheim international sponsors the program.

The third cycle of Venture for Change (V4C) was hosted by Moi University, School of Public Health. V4C is a social entrepreneurship program sponsored by the German pharmaceutical company the Boehringer Ingelheim and Making More Health (MMH). Every edition has had different themes all aimed at solving a pressing societal need. The program aims at spurring social entrepreneurship among university students in Kenya. The V4C program at the University of Eldoret is domiciled at the Outreach Centre as it fulfills one of the mandates of the centre; incubation of novel ideas and technologies. University of Eldoret first participated in 2021 where the theme was centred on solving the problem of food insecurity in rural areas of Kenya. In 2022, the students were tasked with innovating to help alleviate the waste produced in rapidly growing urban centres.

In the 2023 edition, University of Eldoret students competed against other students from Moi University, Kibabii University, and University of Kabianga. This year's program was themed, "***Improving the livelihood of the people living in low income urban settlements***." Innovations presented therefore had to be geared towards improving the living standards of the people living in Langas, Eldoret.

Participants in the V4C 2023 Boot Camp and Idea Competition - participants drawn from the four participating Universities: Moi University, Kibabii University, University of Kabianga and University of Eldoret

Recruitment and Orientation of Venture For Change (V4c) – July 2023.

The University of Eldoret, Outreach and International Students' Centre (OISC) in collaboration with Making More Health and Boehringer Ingelheim – The Sponsors of the Programme hosted an online orientation meeting on 5th July, 2023, to introduce the shortlisted University of Eldoret students to the upcoming Venture for Change (V4C). The meeting aimed to familiarize the selected participants with the program's objectives, expectations, and training modules. Hosted by Mr. Kipkogei Chemitei and assisted by Ms. Cynthia Chebii, the orientation meeting served as a significant milestone in preparing the students for their involvement in the program.

Out of the 15 shortlisted students, nine managed to attend the online orientation meeting. The participants displayed enthusiasm and eagerness to embark on the V4C program journey. The meeting covered several essential topics to ensure the students were well informed and prepared for their engagement in the V4C program. The topics covered were;-

- **Program Overview:** Mr. Kipkogei Chemitei provided an overview of the Venture for Change program, emphasizing its focus on social entrepreneurship and its goal to improve the lives of slum dwellers. He highlighted the significance of the students' roles as young innovators in tackling real-world challenges.

- **Expectations and Commitments:** Ms. Cynthia Chebii outlined the expectations and commitments required from the participants throughout the program. This

included active participation, dedication, and open-mindedness in embracing new ideas and approaches.

- **Training Modules:** The students were introduced to the training modules they would undergo in the coming weeks. These modules would equip them with the necessary skills and knowledge to develop impactful and sustainable solutions for slum communities.
- **Community Engagement:** The importance of community engagement and understanding the challenges faced by slum dwellers was emphasized. The students were encouraged to approach their work with empathy and cultural sensitivity.
- **Collaboration and Support:** Mr. Kipkogei Chemitei emphasized the significance of collaboration among the participants and with their mentors. The students were assured of continuous support throughout their journey in the V4C program.

The online orientation meeting successfully acquainted the nine shortlisted University of Eldoret students with the Venture for Change program.

The Incubation Journey: Training Modules and Field Visits

On Wednesday, 12th July 2023, the Venture for Change (V4C) program officially kicked off Module 1 at Gracescent Guest House in Eldoret. All the selected students from participating Universities, including Moi University, University of Eldoret, Kibabii University, and University of Kabianga, attended the event. The program aims to harness the students' potential as social entrepreneurs to bring positive change to slum communities - Langas area in Eldoret serving as the focal point.

Presentations by Mr. Cleophas Chesoli from Ampath and SOLASA.

Mr. Cleophas Chesoli from the Academic Model Providing Access to Healthcare (Ampath) and Hilke Rooskamp from Boehringer Ingelheim extended warm welcome remarks to the students. They expressed their appreciation for the students' participation in the program and highlighted the immense potential of the V4C program in empowering the youth to create sustainable solutions for social challenges. There was also an address by SOLASA, a women's group operating in the Langas slum.

Presentations by Hilke Rooskamp and Prof. Henry Bwisa.

The highlight of the day was the keynote speech delivered by Prof. Henry Bwisa, an esteemed academic from Jomo Kenyatta University of Agriculture & Technology (JKUAT). Prof. Bwisa is a renowned expert in social entrepreneurship and brought his wealth of knowledge to the forefront. In his address, he emphasized the significance of social entrepreneurship in addressing pressing societal issues and fostering inclusive growth.

Module 1 of the V4C program was designed to provide the students with a comprehensive understanding of social entrepreneurship as a powerful tool for social change. Prof. Bwisa's keynote speech set the tone for the module, inspiring the students to think creatively and critically in their approach to tackling the challenges faced by slum dwellers.

Right: University of Eldoret students and mentors during module 1 kickoff. Left: Students following presentations during the kickoff meeting**.**

The second module took place on the 27th July 2023 in the Langas area. This module provided the students with a practical experience as they engaged directly with the communities and gain firsthand insights into the challenges faced by slum dwellers. After this session, the students continued with the remaining modules before developing their prototypes and participating in the boot camp to compete with the students from the other Universities.

Boot Camp and Idea competition

The Venture for Change 2023 edition came to a close with student Idea competition on the 6th and 7th November 2023 held at Moi University. It was yet another success for the third year running for the University of Eldoret as one of the student teams from the institution were the second runners up winning a prize of 1000 euros. The 2023 edition had one more university participating, the University of Kabianga, making a total of 4 universities. The two-day event brought together 12 student teams from the four participating universities; the highest number of competing teams thus far.

Teams from UoE, their mentors and program organizers during the 2023 Boot Camp

University of Eldoret was represented by three student teams; Team Nova, Les Optimistes, and Beyond Innovation. The best team from the University of Eldoret, the *les optimistes*, emerged as second runners up winning themselves a prize of 1000 euros. Their innovation, the OptiGrow system, combines vertical farming with the use of Black-soldier-fly derived frass as a nutrient source to plant potatoes from cuttings. OptiGrow system alleviates two common problems in the slums, food insecurity and accumulating organic waste. It provides an opportunity to the slum dwellers to cultivate their own food in the small spaces using cheap fertilizer. Organic waste will be the major feedstock in the production of the frass and therefore helping in the cleaning of slums. Further, the use of potato cuttings reduces the growth period of potatoes and hence lowering the input cost required during the entire plant lifecycle. The prize money will help the team implement their innovation.

Team Nova made plastic tiles from plastic waste, also solving two problems; accumulation of inorganic waste and poor housing. Team Beyond Innovation converted plastic waste to ethanol. Creation of fuel from plastic waste also aims to solve the problem of accumulating plastic waste and high energy cost.

Team Les Optimistes from UoE: 3rd position in V4C 2023 edition

The UOE Vice Chancellor Impressed by V4C Participants

On Wednesday 24th November 2023, V4C 2023 teams from UOE had a chance to showcase their innovations to the Vice Chancellor, Prof. Thomas K. Cheruiyot at the Outreach Centre. The event was organized by the OISC and the 2023 V4C mentors. The DVC PRE) and Director, Research and Innovation were also in attendance. The VC was impressed by the work done by the students and the mentors, promising that the University would award the winning team. Further, he promised support for the other teams (Team Nova and Team Beyond Innovation) to implement their ideas. Therefore, through the Outreach Centre, all the three innovations from V4C 2023 will be implemented.

While congratulating the students, the Vice Chancellor challenged the Outreach Centre and the IPMO to ensure that the innovations are patented. The VC also noted that the University shall continue supporting the Outreach Centre as the place to incubate innovations emanating from the university. The VC also acknowledged the team of mentors who nurtured the students. He encouraged them to seek for more similar projects which would make the innovations from UOE even bigger and better. This will better serve the university to truly manifest its motto; flame of knowledge and innovation.


Top Left: A group photo after the presentations at OISC. Top Right: The VC and V4C 2023 mentors.


Left: The VC poses with OISC staff. Right: The VC addresses the attendees