Education Research in African Contexts

Traditions and New Beginnings for Knowledge and Impact

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CHAPTER 4

Exploring faculty and student perspectives regarding training and research interventions on climate change and sustainability at Makerere University in Uganda

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Introduction

Climate change concerns continue to exert significant impacts across various sectors globally (IPCC, 2022), posing challenges to the attainment of the UN Sustainable Development Goals (SDGs), particularly in developing countries (Akinbami & Akinbami, 2017). These challenges extend beyond environmental concerns, affecting leaders and stakeholders worldwide (Morgan et al., 2017). Given the multifaceted nature of climate change, addressing it necessitates innovative strategies tailored to specific contexts and collaborative efforts among stakeholders (Calzadilla et al., 2013). Human behaviour plays a central role in responding to climate change, underscoring the importance of fostering knowledge, skills, and attitude changes (Celik, 2020). Recognising education as a key response to climate change, efforts have been made to integrate climate change education at all levels (Duenas & Ochoa, 2016).

The UN Framework Convention on Climate Change (UNFCCC) Article 6(a)(i) mandates parties to initiate and promote education and public awareness interventions on climate change, emphasising training, research, and community sensitization at all levels (UN, 1992). This obligation was reaffirmed by the Paris Agreement in 2015, wherein parties committed to promoting education responses to climate change, ensuring quality training, public awareness, and participation (UN, 2015). Consequently, education systems are positioned to support national and local efforts to mitigate and adapt to climate change (UNESCO, 2015).

Numerous scholars advocate for mainstreaming climate change issues into education systems, encompassing both formal and informal curricula (O'Keeffe, 2016; Ssekamatte et al., 2021; Locke et al., 2013; Tosam & Mbih, 2014; Uitto & Saloranta, 2017). Higher education institutions play a critical role in climate change mitigation and adaptation, conducting scientific research and engaging policymakers and communities based on evidence (Abazeed, 2018; Akinbami & Akinbami, 2017; Alghamdi, 2018). Through training functions, universities can integrate climate change aspects into academic programmes, raising awareness

and producing specialised professionals (Bentz, 2020; Boateng & Boateng, 2015). Additionally, universities, through community engagement, can support evidence-based solutions and interventions by collaborating with decision-makers across sectors (Buckland et al., 2018).

Despite the potential, literature suggests that many universities, especially in developing countries, have not fully integrated climate change into academic programmes and research agendas (Boyde & Hume, 2015; Buckland et al., 2018; Calzadilla et al., 2018). Limited research on climate change and inadequately trained staff further constrain universities' capacity to address climate change (Cordero et al., 2008; Fahey et al., 2014). Therefore, this study aims to explore faculty and student perspectives on training and research interventions on climate change and sustainability at Makerere University in Uganda. The research questions guiding this study are:

What are the perspectives and views of faculty and students regarding training interventions on climate change at Makerere University in Uganda?

How do faculty and students perceive research interventions on climate change and sustainability at Makerere University?

This chapter seeks to provide insights into training and research initiatives supporting climate change mitigation, adaptation, and sustainability, drawing from the experiences of the relevant faculty and student bodies at Makerere University. It begins with a contextual background, followed by a methodology overview, key findings, conclusions, and recommendations.

Contextual background

This study was conducted in Uganda at Makerere University, Kampala (MAK). Makerere University is the oldest and biggest public university in Uganda. The university has its main campus on Makerere Hill in Kampala, Uganda, and other campuses across the country. The university runs undergraduate and postgraduate programmes delivered across the various colleges and schools at the main campus, upcountry branches as well as affiliated institutions across the country. At the time the study was conducted the university had 275 academic programmes (16 ordinary diploma, 134 bachelor's degree, 14 postgraduate diploma, 103 master's degree and 8 PhD degree programmes); and 39,546 students (36,947 in undergraduate programmes and 2,599 in postgraduate programmes) were enrolled at the main campus. Makerere University Business School had an enrolment of 10,494 students at postgraduate and undergraduate levels. The total enrolment for the university was 50,040 students at the time of the study (MAK, 2017).

The College of Agriculture and Environmental Sciences (CAES), the academic unit of interest in this study, runs various training and research programmes at undergraduate and postgraduate levels in the areas of agriculture and environment.

The college houses the School of Agricultural Sciences; School of Forestry, Environmental and Geographical Sciences, and the School of Food Technology, Nutrition, and Bioengineering. The researchers purposively sampled the two schools (School of Agricultural Sciences and the School of Forestry, Environmental and Geographical Sciences) because they run courses and programmes related to climate change and sustainability at both undergraduate and postgraduate levels. The college runs 18 graduate programmes and employs 410 administrative and faculty staff.

The college is engaged in various research areas including those on climate change and sustainability and these include:

- Agricultural value chains;
- food product development and value addition;
- crop improvement;
- forestry and biodiversity;
- waste management and pollution assessment;
- natural resource management and climate change; and
- hazard and disaster science.

The university has been ranked 5th best on the African continent according to the 2020 World University Rankings by Times Higher Education and the 8th best on the continent according to the 2023 Sub-Saharan Africa University Rankings.

Approach and methods

From a social constructivist perspective, the researchers adopted a qualitative research approach and a holistic descriptive case study research design (Yin, 2016). After acquiring ethical clearance from the Uganda National Council for Science and Technology (UNCST), the researchers generated data from faculty and students using semi-structured interviews and focus group discussions (FGDs). The study participants were purposively selected from academic units that offer programmes on climate change and sustainability within the college of agriculture and environmental sciences. The nine (9) interviews with faculty were conducted in their offices lasting between 40–60 minutes while the two (2) focus group discussions with undergraduate and postgraduate students were conducted in a safe and convenient room at the university campus. Data were generated from 25 participants including 9 lecturers, 8 undergraduate students and 8 postgraduate students on climate change and sustainability related programmes. Data from lecturers were generated using semi-structured in-depth interviews, while data from students were generated using FGDs.

The interviews with the faculty focused on the existing training and research engagements and programmes on climate change and sustainability and how they are involved in the design and delivery of these programmes. An interview guide

with open-ended questions guided the interviews and capturing of the data was done using a voice recorder to allow transcription and further analysis. The focus group discussions with students were centred on the various courses and programmes they were involved in related to climate change and sustainability, and how they found them relevant to their study needs. The conversations explored students' experiences in these programmes and how these have enabled them to effectively learn issues of climate change and sustainability. A focus group discussion guide was used to direct the course of the conversation and a voice recorder was used to capture the discussion after seeking consent of the participants.

The data analysis commenced with the transcription of recorded interviews (Kowal & O'Connell, 2014). Subsequently, the transcripts were meticulously reviewed to ensure accuracy and fidelity. Following this, a thematic analysis approach, as outlined by Braun and Clarke (2006), was employed with the assistance of MAXQDA software. Initial coding was conducted to generate codes, which were then organized into categories to facilitate data comprehension (Saldana, 2009). These categories, emerging from the data itself, were scrutinised to identify patterns, culminating in the identification of overarching themes for coherent data interpretation. This systematic process facilitated the condensation of voluminous data into analytical units, aiding in the extraction of meaningful insights from the perspectives of faculty and students (Willig, 2013).

The identified themes were meticulously documented and substantiated with pertinent quotations from the study participants. To ensure the integrity and rigour of the entire process the researchers attempted to maintain credibility and quality at every stage, beginning with thorough fieldwork planning and ethical review of data generation tools. This commitment to quality was sustained throughout the data analysis phase and the composition of the findings (Patton, 2015).

Key findings

The main themes that were identified are presented in Table 1.

Table 1: *Themes and Categories of Training and Research Interventions on Climate Change and Sustainability at Makerere University*

Themes	Categories
Theme 1: Training interventions on climate change and sustainability	• Short courses • Long courses • Undergraduate programmes • Postgraduate programmes
Theme 2: Research interventions on climate change and sustainability	• Climate change science research • Climate change mitigation research • Climate change adaptation research • Climate change policy research

Theme 1: Training interventions on climate change and sustainability

Universities the world over engage in short-term and long-term training. Teaching and training are key functions of any university. It was reported that the university offers various courses and programmes on climate change and sustainability. These are categorised into short courses, long courses, undergraduate and postgraduate programmes. The findings on each are presented below.

Short courses on climate change and sustainability

These courses are delivered targeting specific audiences to create awareness and provide basic knowledge and skills on climate change and sustainability. They are usually delivered for 1-2 weeks depending on the target participants. The Makerere University Centre for Climate Change and Innovation (MUCCRI) in collaboration with various departments within the selected schools run these courses targeting policymakers, farmer groups, practitioners from the NGO sector and students who are interested in learning basic aspects of climate change and sustainability. Findings revealed that many of these short courses are demand-driven and therefore they are designed to meet the needs of the target audiences. The intention of these courses has been sensitizing policymakers, practitioners, students, and government technocrats on climate change and sustainability and introducing them to mitigation and adaptation interventions they can adopt across their sectors and kinds of work in which they are engaged. The idea behind such trainings is to empower the participants and call for climate action. The short courses also targeted academia and administrators from other universities who need such knowledge and skills.

Long courses on climate change and sustainability

The university also offered long-term training courses that are taught within selected undergraduate and postgraduate programmes within the college of agriculture and environmental sciences as well as other colleges. A review of documents and interaction with faculty and students revealed that many of the undergraduate and postgraduate programmes included semester-long courses on these aspects. Such programmes included; BSc Forestry, BSc Agriculture, MA in Geography and MSc Environmental Management. Study participants indicated that these courses introduce students to climate, weather, and atmospheric processes; climate change science; energy, environment, and climate change as well as climate change and forestry. The semester courses are integrated in the programmes and are examinable at the end of the semester. The MUCCRI was also working on a university-wide course on climate change and sustainability that would run across all university programmes ensuring that all students that enrol for any university programme acquire knowledge, skills, and attitudes on these aspects. This is a good idea because it promotes climate action at all levels across various disciplines and sectors. It

would create a critical mass of climate change and sustainability actors and therefore contribute to the promotion of sustainability and implementation of SDGs at various levels. One of the participants said:

> *"We had a project that was looking at mainstreaming climate change in all college programmes. So we did that, we looked at the different college programmes, and we developed 2 course units which are common, which are taught across the college, addressing basic issues of climate change, climate and weather, and all those things."*

The participant called for curriculum review of all programmes to mainstream aspects of climate change and sustainability across disciplines as well as retooling faculty on these programmes to deliver on these aspects.

Undergraduate programmes related to climate change and sustainability

The findings revealed various undergraduate programmes that are offered at the case university focusing on climate change and sustainability. These are 3-year programmes that culminate in the awarding of a bachelor's degree. The programmes have a course work component where students cover a series of courses on a semester basis. The students also have an attachment for fieldwork experience and a research project that translates into a thesis submitted as a requirement for the award of the degree. A review of grey literature and interactions with faculty and students revealed that the college and selected schools run several undergraduate courses focusing on climate change and sustainability. These included: the BSc in Geography, the BSc in Meteorology and the BSc in Forestry. These programmes are offered mostly to students who have recently completed secondary school and a few who enrol with prior training at diploma level. The programmes focus on equipping the students with a significant amount of knowledge, skills, and attitudes to enable them to offer professional expertise as climatologists, climate mitigation and adaptation professionals, environmental specialists, and technical officers in the areas of climate change and sustainability across various sectors.

Postgraduate programmes on climate change and sustainability

This category of training interventions includes programmes offered to students at postgraduate levels. Findings revealed that the university offered the postgraduate diploma in Meteorology, MA in Geography, MSc in Land Use and Regional Development and the PhD in Geographical Sciences. The postgraduate diploma was a 1-year programme while the Master of Science degree programmes were 2 years containing course work and research components. The PhD programme was a 3–5-year programme with both course work and research components. While interacting with study participants, they reported various programmes that were already developed and undergoing accreditation processes. These were an MSc in Disaster Risk Management, an MSc in Climate Change and Sustainability, and

an MSc in Meteorology. At the time of the study, these had been approved by the respective departments and schools within the college and were awaiting approval by the senate and accreditation by the National Council for Higher Education (NCHE). A participant reported that:

> *"There is a PhD programme being worked on in climate risk management, and in the department of geography there are several courses on climate change."*

The case university was seen as moving in the right direction in terms of developing postgraduate programmes in the area of climate change and sustainability. This is because having several and diverse programmes on these aspects builds a critical mass of professionals that are able to support various sectors in addressing issues of climate change and sustainability. This is critical for the achievement of SDGs and contributes to mitigation and adaptation efforts. The PhD programme has the potential of growing a pool of academics who would strengthen training and research in these areas at this case university and other universities.

Theme 2: Research interventions on climate change and sustainability

This theme presents the findings from the study on research interventions related to climate change and sustainability. Undertaking research is yet another key function of any university. Makerere University is a research university and has been highly ranked over the years within the African continent and at global level. At the time of the study, the university research agenda included research on climate change and sustainability. This was a strategic area and therefore fully supported by the university leadership and management. Findings reveal that the faculty and students undertake several research projects on climate change and sustainability. The research projects are mainly categorised into climate change science, climate change mitigation, climate change adaptation and climate change policy research areas. Each of these is explored below.

Climate change science research

Findings revealed that the faculty and students at the case university have several research projects that are focused on climate science. The participants reported that they conduct research to understand processes and impacts of climate change on various sectors as well as ecosystems. They reported doing studies on weather-related predictions and modelling for various sectors within the country. One of them said:

> *"[A] big chunk of what we have to do, and science means we have to conduct research in these fields to understand the processes, to down scale or understand climate change at the lowest level possible. We have to look at impact across different sectors, but also look at maybe innovations. … [W]e have been doing weather-related prediction studies across Uganda."*

They reported undertaking research on the various local innovations aimed at advancing the understanding of climate science, with a focus on generating information to guide mitigation and adaptation efforts at multiple levels. The weather predictions and climate information generated are used by local farmer groups, researchers in academic institutions and policymakers in government ministries, departments, and agencies. It was revealed that the faculty and students did contribute to monthly weather bulletins especially in the dry pastoral regionals like Karamoja and were exploring doing studies on indigenous knowledge and how it can inform weather forecasting in various regions. The monthly forecasts are very key for farmers because it helps them make evidence-based decisions on when to plant and possible irrigation in case of a change in rain patterns. It was reported that the university has a weather station and a meteorological unit with the required facilities and equipment. The station and unit have been key in generating weather and climate information and are now working with the Uganda National Meteorological Authority (UNMA) to support in packaging and disseminating this information for users. This is expected to support adaptation efforts at individual and community levels.

Climate change mitigation research

It emerged that the faculty and students do engage in research focused on climate change mitigation. Study participants noted that only a few studies focus on measuring the contributions of various sectors and human activities to the country's greenhouse gas emissions. Some studies focused on exploring behavioural and technological strategies that can be adopted in mitigation efforts. Research studies under this category explored how human behaviour and mindset contribute to sustainability and environmental protection. They also explored the local technologies that can be advanced to mitigate climate change in agriculture and other production systems. However, some of the participants reported that climate change mitigation research is not funded well like adaptation research. One of them noted:

> *"Hmm, mitigation is always a challenge and it is not just on our own, I think it is also related to the global setting that in Africa here, even the funding for mitigation is quite less compared to the funding for adaptation."*

According to her, most of the available funding is for adaptation and therefore less research is done on mitigation. She noted that in Africa, mitigation research funding is so limited which explains the limited studies on mitigation. This challenge has greatly affected student researchers in universities who cannot afford equipment and other facilities they require to conduct high quality research on climate change mitigation and sustainability.

Climate change adaptation research

This kind of research relates to studies undertaken by the faculty and students on various aspects of adaptation to climate change especially in the local communities in Uganda, like the pastoral communities and those in semi-arid areas like Karamoja at Makerere University. It was reported that most of the adaptation research conducted focused on agriculture (crop and animal livestock), farming in dry areas in Uganda. Many of the projects focused on climate resilience in the cattle corridor, mainly Karamoja areas, where climate change has severely impacted pastoral farming. Study participants reported that the research studies in this area were mainly focusing on supporting livestock farmers to find effective ways of adapting to the effects of climate change amidst scarcity of water and pasture during dry spells.

The research interventions on perceptions and adaptations were mainly to support communities to be resilient but also to find alternative ways of dealing with effects of climate change in their areas. It also emerged that the faculty and students were also engaged in research that is focused on developing resilient and climate smart crop varieties for farmers especially in dry areas but also in mountainous and highland regions that experience landslides. Many of these studies have been very useful for such communities, as evidenced by high adoption levels. Studies related to safety in areas characterised by landslides have been conducted and disseminated widely. Many policymakers and NGOs in those areas have adopted some of the recommendations and innovative strategies from the studies conducted by the faculty and students at the university.

Climate change policy research

It emerged that the faculty and students are engaged in several research projects on climate policy related issues. The research studies are focused on informing policymakers on various issues that relate and have serious implications on climate change and sustainability within the country and community contexts. Most of the research on climate change that faculty and students have conducted resulted in developing policy briefs. One of the participants reported:

> *"[W]hat I know is that there are hundreds of policy briefs. This is one of the common things that people are doing from their research pieces. All the research pieces I have mentioned; … one research project comes out with more than one policy brief. So, there are quite a number of policy briefs that have been written targeting different sectors, ranging from road sector, those linked to Kampala [Capital] City Council especially linked to climate change policy, strategy, all these have been informed by our research."*

The policy briefs developed from the research findings are used to engage policymakers in making them aware of the climate change situation but also motivating them to think about the possible mitigation or adaptation interventions and the related policy options. Many of these policy briefs from Makerere University

have been handy in informing policy and other relevant decisions by government related to climate change across various sectors.

Discussion and conclusion

The findings from this study shed light on the range of training interventions and research initiatives related to climate change and sustainability at Makerere University. Through its various educational programmes, it appears that Makerere University plays an appropriate role in equipping students and practitioners with the necessary knowledge and skills to address climate change challenges.

Training interventions at Makerere University encompass a spectrum of short-term and long-term courses tailored to different audiences. Short courses target specific groups, such as policymakers, farmer groups, and practitioners, aiming to raise awareness and provide foundational knowledge on climate change and sustainability. These courses are demand-driven and designed to meet the needs of diverse stakeholders, empowering participants to take climate action within their respective sectors. Conversely, long-term courses embedded within undergraduate and postgraduate programmes offer more comprehensive training, integrating climate change and sustainability themes into academic curricula. The university's efforts to develop a university-wide course on climate change and sustainability reflect a proactive approach to mainstreaming these topics across disciplines, fostering a multidisciplinary approach to addressing climate challenges.

In addition to training, Makerere University is actively engaged in research initiatives focused on climate change and sustainability. The university's research agenda encompasses various aspects, including climate change science, mitigation, adaptation, and policy research. Faculty and students undertake studies to deepen understanding of climate processes, assess impacts on different sectors, and develop innovative solutions for mitigation and adaptation. Notably, research outputs, such as policy briefs, play a role in informing policymakers and shaping climate-related policies and strategies at both local and national levels.

However, challenges exist, particularly regarding funding for research on climate change mitigation. Limited funding in this area inhibits the exploration of behavioural and technological strategies for mitigation, potentially hindering progress towards sustainability goals. Moreover, while Makerere University demonstrates commitment to addressing climate change through its training and research initiatives, there appears to be a need for greater investment in infrastructure and resources to support high-quality research, especially in areas such as climate resilience and adaptation. Additionally, there is a need for ongoing collaboration between academia, government, and civil society to translate research findings into actionable policies and interventions that promote sustainability and resilience in the face of climate change.

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