

CONTINUED PROFESSIONAL DEVELOPMENT AMONG SECONDARY
AGRICULTURAL EDUCATION TEACHERS IN UGANDA,
A CASE STUDY.

by

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CHAPTER ONE

INTRODUCTION

Background and Setting

Uganda's education system is structured around three major educational levels, the primary school level (primary one to primary seven), secondary school level (senior one to senior six), and higher institutions of learning such as vocational schools, colleges, and universities (Ministry of Education & Sports [MoES], n.d.; Mubangizi, 2020). In addition to these three core levels, children are enrolled in a non-mandatory pre-primary school level for three years or less. Past literature summarizes this system in a 7-6-3 education formation for a child without pre-primary school education (Obiero, 2020) and 3-7-6-3 formation for a child with nursery school education (Mubangizi, 2020). Usually, it takes at least 16 years for one to complete the primary to university/college education cycle in Uganda, either through attending private schools, public schools or with a mix of both. However, the majority of educated Ugandans are primary and secondary school graduates (MoES, n.d.) since less than 20% of an enrolled cohort at primary school level completes or graduates from the university/college.

For instance, in 2017, the national secondary school completion rate was only 6%, with an even lower rate of 2.6% for students in rural areas (Uganda Bureau of Statistics [UBOS], 2017). Unfortunately, these primary and secondary school dropouts have little or no practical/employable skills or competences needed in the world of work (MoES, n.d.; Chemonges, 2020; Teachers Initiative in Sub-Saharan Africa [TISSA], 2013). Economists in Uganda highlight this problem as one of the major causes of high rates of unemployment and

the main contributor to a cycle where youth and their families are consistently forced to live below the poverty line (UBOS, 2017; World Bank Group, 2007).

To combat this, the government of Uganda through the Ministry of Education and Sports (MoES) has implemented ambitious policies and programs. Notably, such programs include Universal Primary Education (UPE), Universal Post-Primary Education and Training (UPPET) policy also known as the Universal Secondary Education (USE), and the Higher Education Students' Financing Board (HESFB). These policies were geared toward providing a free education to every child, increasing accessibility to basic education through construction of primary and secondary schools at every subcounty, and providing a student loan program for higher education for students from poor family backgrounds (MoES, n.d.; Mubangizi, 2020; Obiero, 2020). As a result, the government believed it would remove elitism and make education more inclusive and affordable for every Ugandan. However, these policy changes and programs have not yielded many tangible results apart from slightly increasing the number of primary and secondary school graduates (TISSA, 2013, p. 16). Today, the education system is criticized for failing to adequately prepare learners with skills needed to be employable or with skills to create their own employment. The system is also criticized for provision of a poor-quality education, having poor school infrastructure, low quality teachers, high rates of student attrition, and for contributing to the high levels of unemployment in the country (Nakabugo et al., 2014; TISSA, 2013)

In response, MoES and the National Curriculum Development Center (NCDC) introduced a competence-based curriculum loosely referred to as the new lower secondary school curriculum in January 2020 (NCDC, 2019; Chemonges, 2020; Nakabugo et al., 2014).

According to the NCDC 2019 press release, the new curriculum is aimed at:

Promotion of effective learning and acquisition of skills, reduction of subject and content overload, addressing the needs of all students and laying a foundation for improved pedagogy and assessment procedures, addressing the social and economic needs of the country, provision of flexibility to absorb emerging fields of knowledge in the areas of Science and Technology, addressing the 21st century skills required in the world of work, and lastly, addressing issues of wastage with regard to utilization of resources (teachers, school facilities/space, and instructional materials) so as to ensure efficiency (NCDC, 2019, p. 2).

Currently, many Ugandans believe that the new lower secondary school curriculum is the magic bullet to all education challenges at the secondary school level. To date, the competence-based curriculum has been praised for subject and content reduction and for emphasizing a practical-based education. However, there are concerns and questions about the skillset of secondary school teachers in Uganda. Previous research indicates that teachers have inadequate teaching or pedagogical skills (Okiror et al., 2017; Nakabugo et al., 2014; TISSA, 2013), and if the new curriculum is implemented without retraining and continuously training teachers, there are fears that the education sector, especially secondary education will obtain the same poor education outcomes (Chemonges, 2020). This study focuses on changing this narrative and intends to determine current level of pedagogical skill and subject content knowledge, perceived importance of Continuous Professional Development (CPD), and professional needs among agricultural educators. It ultimately seeks to draw recommendations for improvement of CPD programs in Uganda.

Problem Statement

At the start of 2020, the government of Uganda through its Ministry of Education and Sports (MoES) and the National Curriculum Development Centre (NCDC) rolled out a new

competence-based curriculum for lower secondary schools (Chemonges, 2020; NCDC, 2019). The new curriculum has 21 subjects on its subject menu, all designed to provide a practical and meaningful education to students. Implementation of this competence-based curriculum mainly targets providing learners with the much needed 21st century practical skills or those skills needed in the world of work (Chemonges, 2020; NCDC, 2019). This is indeed the right step in the right direction by MoES and its regional and international stakeholders. For too long, Ugandans have lamented about the lack of employable skills and the poor quality of graduates in relation to work deliverables, intrapersonal and interpersonal skills. Many blame this on the theoretical nature of Uganda's secondary education system, which has failed to effectively facilitate a smooth "School to Work Transition" (Mubangizi, 2020, p. 4). It is evident that teachers at this level of education don't have the pre-requisite pedagogical skills to teach a competence-based curriculum due to their prior pre-service teacher training (Chemonges, 2020; TISSA 2013). Past research about teacher issues in Uganda indicates that many secondary school teachers receive poor pre-service teacher training at teacher preparation colleges and receive little to no in-service training during their teaching careers (Nakabugo et al., 2014; TISSA 2013; Mulkeen et al., 2007), and this affects their quality of teaching which in turn affects students' academic outcomes. The low teacher standards and teaching competences is attributed to "lack of teacher-education specific national minimum standards and competence framework" that would harmonize and ensure quality teacher education and training in Uganda (Ministry of Education & Sports MoES, 2019b).

To achieve the objectives of the new lower secondary school curriculum and to enhance socioeconomic transformation in Uganda, in-service teachers across subjects need to

participate in continuous professional development. Osamwonyi (2016) and Bredeson (2000) agree that CPD fosters professional development of teachers, promotes continuous improvement of teaching staff, eliminates differences within the background preparation of teachers, keeps the teaching profession abreast of new knowledge and enables them to become creative. Unfortunately, continuous professional development in Uganda is not institutionalized and remains a personal initiative for teachers if desired. At present, only motivated teachers utilize workshops, seminars, distance-learning or evening and weekend classes to grow their professional teaching skills (TISSA, 2013). In addition to personal initiative, school leaders or principals design and implement ad hoc in-service trainings in form of broad-based workshops and seminars for their teachers mainly at the beginning of the school year or at the beginning of each academic term. Unfortunately, this is not the case in all secondary schools across Uganda. Many schools, especially rural secondary schools with more than 75% of Uganda's secondary school agricultural education programs, have inadequate CPD programs or don't have any planned CPD programs (MoES, 2014). This is because many school leaders don't have any arrangement for in-service training for their teaching staff or have no resources dedicated to teachers' professional development. Researchers attribute this to "ill-preparation" of school leaders and believe that many school leaders are incapable of meeting the contemporary demands of their ever-changing nature of jobs, resulting in failure to create favorable environments for teacher development in their schools (DeJaeghere et al., 2009; and Mulkeen et al., 2007, Nakabugo et al., 2014;). With the implementation of the new curriculum and the evident lack of essential pedagogical skills to teach a competence-based curriculum, this research will explore the strategies in place to offer CPD to Ugandan

secondary agricultural education teachers.

Purpose

The purpose of study was to identify the existing professional needs among Ugandan secondary agricultural education teachers. This was investigated using the following research objectives:

1. Profile the educational background of Ugandan secondary agricultural education teachers.
2. Identify the kind of continuous professional development activities that Ugandan secondary agricultural education teachers participate in.
3. Assess the perceptions of Ugandan secondary agricultural education teachers towards the available CPD programs.
4. Establish the level of subject content knowledge among majority of Ugandan secondary agricultural education teachers.
5. Determine if pedagogical gaps exist among Ugandan secondary agricultural education teachers.

Significance

This study will inform education policy makers, teacher educators, school leaders and other stakeholders about contemporary professional needs in relation to pedagogical skills and content proficiency that exist among secondary agricultural education teachers in Uganda. Additionally, the researcher believes that recommendations from this study will help inform the implementation of successful CPD programs for all subject teachers in Uganda.

Limitations and Delimitations

This study had several limitations. Key among these include inadequate literature on CPD among secondary school teachers in Uganda (Malunda, 2019; Nakabugo et al., 2014; TISSA, 2013). Much of the available CPD research was related to teachers at primary school level. The other limitation was that the new curriculum had only been implemented for three years. It was difficult to evaluate strategies related to professional development among teachers implemented by MoES and NCDC.

One of the delimitations of this study was choosing Secondary agricultural education teachers as the primary study group. Secondary agricultural education teachers have been known to have very limited pedagogical skills, limited interest in attaining professional development, and many of them are graduates of two-year diploma programs at National Teacher Colleges NTC, which colleges are inadequately funded (Okiror et al., 2017; Nakabugo et al., 2014; TISSA, 2013).

As for assumptions, the researcher had concerns that individual secondary agricultural education teachers would not be willing to participate in this study. According to Okiror et al., 2017, many secondary agricultural education teachers are not open to peer evaluation and the researcher was concerned that teachers might take this study as part of their evaluation. Additionally, the idea that educators would respond honestly and accurately to both survey and interview questions was a key assumption.

Operational Definitions

1. Continuous Professional Development (professional learning/In-service teacher training) refers to a planned, continuous, and lifelong process whereby teachers develop their personal and professional qualities, and to improve their knowledge, skills, and practice, leading to their empowerment, the improvement of their agency and the development of their organization and their pupils (Padwad & Dixit, 2011).
2. Education policy maker is a person with power to influence or determine education policies and practices at an international, national, regional, or local level (Viennet & Pont, 2017).
3. Diploma holder (Grade V) in Ugandan teacher education refers to teacher who completes two years of teacher education at a National Teacher's College (MoES, 2011; TISSA, 2013).
4. Agricultural Education refers to a “program of instruction in and about agriculture and related subjects” (Mukembo, 2017, p.18; Talbert et al., 2007, p.4).
5. Secondary education refers to the four to six years of formal education completed by students transitioning from primary school level (MoES, 2011; Mukembo, 2017; Namukasa et al., 2012).
6. Ordinary level (O-level) is defined as the first four years (senior one, senior two, senior three, and senior four) of lower secondary school where students are required to complete national examinations in different subjects and obtain the Uganda Certificate of Education (UCE) before they proceed to upper secondary or high school (Mukembo, 2017; Namukasa et al., 2012).

7. Secondary agricultural education teacher refers to the person teaching agricultural education at secondary school level often trained at National Teacher Colleges for two years or at university for three years (MoES, 2016; Mukembo, 2017).
8. A secondary school student is primarily a person enrolled in a secondary school (senior one to senior six) who is learning with goals of acquiring knowledge, developing professions, and achieving employment in a desired field (MoES, 2011; TISSA, 2013).
9. New lower secondary curriculum refers to the newly rolled out competence-based curriculum in Uganda whose implementation started in February 2020 and covers the ordinary level of education with four classes (NCDC, 2020)
10. Competence-based curriculum (CBC) refers to the intended and systematic learning experiences through which students acquire and/or develop their knowledge, skills, and attitudes that are components of the learner's competencies" (Shkak and Hassan, 2020, p.2).
11. School holiday in Uganda refers the academic breaks between the first, second, and third terms of the Ugandan school academic year (MoES, 2022).

Chapter Summary

Over time, the government of Uganda has introduced several policies in the education system aimed at improving accessibility of its citizenry to education and improving the quality of education available in Uganda at all levels. Like other nations, the Ugandan government recognizes the contributions of quality education towards transformation of her society and national development in general (MoES, 2019b, 2018, 2016; Mulkeen et al., 2007).

Unfortunately, policies like UPE and UPPET have not lived up to the expectations of MoES

officials, local and international employers, and the general public (Mubangizi, 2020; TISSA, 2013). Today, most Ugandan graduates have low employable skills, a factor that is blamed for high levels of unemployment among youth.

Recognizing the persistent challenges, MoES and NCDC revised the lower secondary curriculum with support from the World Bank and in early 2020, implementation of the new lower secondary curriculum began. Education analysts in Uganda and the general public believe that this competence-based curriculum is a positive strategy towards providing high quality education to all young Ugandans. However, without adequate skills, training, and retooling of in-service teachers, this curriculum is bound to produce the same poor results in relation to achievement of learner outcomes and production of graduates with adequate knowledge, skills, values, and competences needed in the world of work as the previous educational policies (Chemonges, 2020; MoES, n.d.).

Forecasting this, this study seeks to identify and profile the existing professional gaps and needs among secondary teachers of agriculture education in Uganda. Recommendations from this study will be used to inform policy makers, school leaders and other stakeholders about designing, developing, and delivering quality CPD training to Ugandan agriculture education teachers and other teachers involved in the implementation of this curriculum.

CHAPTER TWO

REVIEW OF LITERATURE

Secondary School Teacher Training in Uganda

Across the globe, teachers are considered by governments and stakeholders in education as the engine and centerpiece of an education system (Castellano & Datnow, 2000). Education officials, politicians, and policy makers understand that teachers determine and define what should be taught, how it should be taught and how learning should be assessed (Basheka et al., 2017). Because of their central role and importance in education, governments and partner stakeholders are investing huge resources in pre-service and in-service training of their teaching workforce (Sims et al., 2022). Each country has agencies or organizations responsible for pre-service and in-service teacher training, and these set the agenda for teacher training, identify gaps in teacher programs and devise solutions, and allocate resources to teacher training colleges/universities. In Uganda, such teacher training mandates have majorly been coordinated by Kyambogo University through the National Teacher Colleges (NTCs) for secondary school teachers and Primary Teacher Colleges (PTCs) for primary school teachers (Ministry of Education & Sports [MoES], 2019b). To achieve this, Kyambogo University under the Teacher/Tutor, Instructor Education and Training (TIET) department of the Ministry of Education and Sports, was mandated to set course entry requirements, admit pre-service teacher students, develop course curriculum, set examinations, certify graduates, supervise colleges, and train college instructors. For this reason, Kyambogo University supervised and managed teacher training programs in one university (Kyambogo University), five National Teacher Colleges and

46 Primary Teacher Colleges that spanned across Uganda. This responsibility will soon be assumed by the newly established Uganda National Institute for Teacher Education (UNITE) (MoES, 2019b).

Traditionally, a pre-service teacher trainee studies for two or three years and graduates as a Grade III, Grade IV (diploma), or bachelor's degree holder after completing their coursework and mandatory school practice that is always done twice during semester breaks. In the past, evidence suggests that this structure produced "somewhat" good quality teachers for all levels of education in Uganda. However, with the liberalization of education in Uganda, over 25 public and private universities currently offer education degrees to pre-service teachers, a development that has led to increased number of trained teachers in Uganda but has compromised the quality of teacher education received at these universities due to the absence of a Quality Assurance Framework in teacher education (MoES, 2019b).

Lack of a harmonized teacher education framework has led to major competency gaps among secondary school teachers, which include lack of skills in use of educational technologies, low pedagogical skills, low content and subject knowledge, and little to no counseling and career guidance skills (Malunda, 2019; MoES, 2019b, 2018, 2016; Nakabugo et al., 2014, TISSA, 2013). Additionally, past research indicates that more than 16% of 13,000 secondary teachers were underqualified or untrained teachers by 2010. This is more evident among private secondary schools where 75% of teaching staff only possess an A-level certificate of education and therefore are not qualified and trained teachers (TISSA, 2013). Consequently, underqualification and poor-quality training of teachers has adversely affected the quality of secondary school education in Uganda. Today, after six years of secondary

school education, students graduate with low academic outcomes, many cannot read and write good English, many have little or no skills required in the world of work, and they can't apply the learned knowledge to create their own employment (Mubangizi, 2020; Mukembo, 2017).

In 2013, a TISSA report highlighted key issues in Teacher education in Uganda and suggested recommendations that need to be done to address them. These issues included high numbers of underqualified teachers, absence of in-service teacher training, poor funding of teacher education colleges and universities, and low pedagogical skills among teacher trainers (TISSA, 2013). To address these critical issues at secondary school education, the Ministry of Education and Sports (MoES) and its partner agencies have developed several policy frameworks including the Harmonized Framework for Initial Teacher Training 2016, Competency Profile for a Secondary School Teacher 2016, Continuous Professional Development Framework 2017, National Teacher Policy 2018, the Competency Profile for Teacher Educators in Higher Institutions 2019. According to the National Teacher Policy (NTP), the main objective of these policies is “professionalizing and standardizing the teaching profession in order to improve the development and management of teachers in the education sector” (MoES, 2018, p. 4). Education analysts mention that these frameworks, if implemented well, will revolutionize teacher education and development, address teacher competences and their professional development issues but are skeptical about the government's resolve to fund their implementation (Arinaitwe et al., 2019).

Until now, none of these policy frameworks is operational due to the delayed institutionalization of the National Teacher Policy which is the “Umbrella” framework for all developed teacher related policies. This unfortunate situation leaves school administrators,

leaders of communities of practice (professional bodies), and non-government organizations as the main providers of in-service teacher training opportunities, also known as Continuous Professional Development (CPD). Sadly, many school leaders don't have CPD programs designed for teachers in their schools and those that do, have ad-hoc and broad-based CPD programs in form of workshops and seminars mainly organized at the beginning of the school year or at the beginning of each academic term (TISSA, 2013). Many secondary agricultural teachers are not members of any professional organization neither do they have access to CPD programs offered by non-government organizations whose work seems to be regionally based. Owing to these circumstances, CPD remains a seemingly personal initiative where only motivated teachers utilize workshops, seminars, distance-learning or, evening and weekend classes to grow their professional teaching skills (TISSA, 2013). This approach, creates a population of teachers with varying professional competences, risks the provision of quality education to all Ugandans, and threatens the successful implementation of the new curriculum. Therefore, understanding of available in-service teacher training opportunities in Uganda is a vital and important aspect of this study.

Secondary School Education in Uganda

According to Wakoli (2014), educating a nation remains the single most important strategy for developing a society throughout the developing world. As such, a country's education system plays an important role in contributing to her social, economic, and cultural development (World Bank, 2002). Because of the centrality of education to achieving national development, the government of Uganda published a White Paper on education in 1992 and the Education Sector Strategic Plan (ESSP) in 2014. Through MoES, the government uses both

documents to develop strategic policies for Uganda's education system. Undoubtedly, in 1997, Uganda started implementing the Universal Primary Education (UPE) policy which is today credited for increasing access to primary education and improving literacy levels among Ugandans. In the 2017 MoES Education Abstract report, more than 8.8 million pupils were enrolled in over 20,000 primary schools across Uganda. This is a better position considering that slightly over three million pupils were enrolled in primary schools in Uganda by 1997 (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2022). However, the picture is blurrier when one focuses on secondary school education in Uganda. After students graduate primary school, many children dropout of the education system. According to TISSA (2013), 61% of children enrolled in a particular cohort complete the primary school cycle. Of these graduates, only 49% enroll at lower secondary school level with only 30% completing this level of education. This high rate of attrition is blamed on limited access to secondary schools and high inefficiencies in Uganda's education system. Lack of access to secondary education is attributed to a persistent low budget allocated to this level of education (MoES, 2019a). Considering the 2017/18 Uganda national budget, secondary education received only 5.2% of the education budget. This budget allocation is far below the 33% average spending on secondary education as a percentage of the total budget allocated for education among Sub-Saharan countries (Zubairi & Rose, 2019). As noted by Mulkeen et al. (2007), this is a true reflection of lack of priority and attention toward this level of education by the government of Uganda and her stakeholders.

Fortunately, due to resounding calls from United Nations, World Bank, and other development partners, governments and donors in Sub-Saharan African countries are

increasingly paying attention to secondary education. Policies are being established to create more widely accessible, more relevant, and higher quality secondary education (Mulkeen et al., 2007). For instance, in 2007, the government of Uganda introduced Universal Secondary Education (USE) through the Universal Post-Primary Education and Training (UPPET) policy to increase access to quality education among Ugandans (MoES, 2019b; World Bank, 2018; Nakabugo et al., 2014). This initiative has been followed with several strategic programs like the Public-Private Partnership initiative between the government of Uganda and private secondary school owners, construction of seed secondary schools at sub-county level, revision of the lower secondary school curriculum, recruitment of more secondary teachers, making of science subjects compulsory, and the deliberate increase of the education budget allocated to secondary education over the last six financial years (UNICEF, 2022). These combined efforts have led to increased student enrolment at secondary education by an annual average of 6%, and by 2017, over 1.3 million students were enrolled in more than 3,000 secondary schools across Uganda (UBOS, 2017; MoES, 2017a).

Despite several interventions, this six-year education level system with four years of ordinary level (O-level) and two years of advanced level (A-level) structure is challenged by quality issues and implementation of an outdated curriculum. Moreover, population increases and increased primary school attendance rates are posing an enormous demand for access to a better-quality education and an education that responds to changing needs of the workplace. As a result, there's an increasing demand for high-quality secondary teachers in Uganda.

Unfortunately, many teachers do not have adequate proficiency in their teaching subject, and this is adversely impacting student's learning outcomes (World Bank, 2018). As evidenced in the

Education Abstract Report 2017, over 50% students that tested for the Uganda Certificate of Education (UCE), which is a national examination for transiting to the Upper secondary level (high school), failed their examinations and repeated senior four (S4) class the following academic year. Such statistics, and as noted by Mulkeen et al. (2007) and Nakabugo et al., (2014), show the need for continued professional development of Ugandan teachers to meet the everchanging teaching needs. Addressing this will help Uganda achieve her goal of providing an inclusive and equitable quality education, but most importantly, the country will be on the right path towards achieving the set target indicators for the United Nations (UN) Sustainable Development Goal (SDG) Four on Quality Education.

History of Agriculture Education in Uganda

Agriculture education in Uganda was started in the late 19th century by Christian missionaries. To this end, Alexander Mackay is credited for creating the pioneer informal classes in his workshop in Mengo, a Kampala suburb in 1882 (Okiror et al., 2017; Ker, 1973). At that time, Mackay and his like-minded missionaries thought that “a well-rounded education in an agricultural country like Uganda must include some practical subjects like agriculture” (Ker, 1973, p. 4). With over 90% of her population directly involved and depending on smallholder farming, agricultural education was considered key by some missionaries in-charge of education in Uganda, a British protectorate then. As a result, Mackay obtained buy-in from several heads of schools who started school-based agricultural education programs across Uganda amidst harsh and negative reactions from local parents, especially chiefs and officials of the British administration. These privileged parents didn’t want their boys to learn driving of bullocks. Instead, they wanted them to learn only academic subjects (Ker, 1973).

Under those circumstances, the Phelps-Stokes commission of 1924 was established to study Uganda's education system and this recommended offering of agricultural education and other technical subjects at secondary school level. Many of such commissions, including the Education Policy Review Commission of 1989, have consistently emphasized vocational/practical agricultural education at this level (Ker, 1973; Mayanja, 2000; Okiror et al., 2017). Although not a compulsory subject, today many schools offer agriculture education across the country. For instance, in 2022, 198,055 out of 345,444 (57.3%) students registered for the agriculture education national examination at the Uganda Certificate of Education (UCE) level (Uganda National Examinations Board [UNEB], 2022). However, this increase in the number of UCE agriculture education candidates is not parallel to the quality of education offered at this level. Most UCE agriculture education candidates scored the minimum grade or score attainable at this level of education. UNEB officials indicated that candidates in science subjects, including agriculture, showed weaknesses in handling practical tests, making, and recording of observations, drawing conclusions, and had poor mathematical skills and poor interpretation of test results (UNEB, 2022). Past studies indicate that this is due to use of lecture method of teaching, which hinders active and experiential learning in classrooms, and therefore failure of students to obtain the expected academic and practical skills and application of learned information to the real-world (Bligh, 2000; Cannon, 2019; Nilson, 2010). Evidently, Okiror et al. (2017) observed that Ugandan agriculture education teachers have not been able to engage students well enough for skills acquisition, and this is reflected in the recently released UCE 2022 results.

In brief, many factors affect the academic performance of Ugandan secondary school students. Teacher pedagogical skillset and their subject content proficiency are ranked high among the key challenges at this education level (Cannon, 2019; Okiror et al., 2017; Nakabugo et al., 2014; TISSA, 2013). With the new competence-based curriculum in its third year of implementation, identifying and understanding professional gaps and needs, and other key hindrances in their career development is paramount and essential if this new curriculum is to achieve its objectives and cause significant national development in Uganda.

New Lower Secondary School Curriculum

There has been tremendous increase in secondary school enrollment in Uganda since the implementation of the Universal Post-Primary Education and Training (UPPET) policy and the Universal Secondary School (USE) framework. Because of this, MoES reports indicate that over 1.3 million students are enrolled in more than 3,000 secondary schools (MoES, 2017a). However, education stakeholders, development partners and Ugandans are worried about the quality of secondary school education in Uganda. The 2017 Education Abstract indicates that only 20% students were proficient in biology, 41% proficient in mathematics, and 49% proficient in English Language, with over 50% students seating the Uganda Certificate of Education (UCE) failing to transition to High School and therefore repeating the last class of lower secondary school (MoES, 2017a). In addition to low levels of proficiency and high numbers of repeaters, the majority of students fail to utilize the learned knowledge and skills at their workplace or fail to create their own employment due to traditional teaching methods and lack of experiential learning opportunities at school (Nakabugo et al., 2014; World Bank, 2018). This situation has hampered Uganda's progress to a middle-income economy, created a lot of

unemployment among educated youth, and kept many Ugandans living in abject poverty (Mukembo, 2017; UBOS, 2017).

To avert this situation, the government of Uganda introduced the new lower secondary school curriculum framework at the beginning of 2020 (National Curriculum Development Centre [NCDC], 2019; Chemonges, 2020). Mubangizi, (2020, p.4) quotes that the Competence-based Curriculum (CBC) developed by NCDC is based on the 1992 Education White Paper that recommended:

A radical shift within the secondary education sub-sector from a curriculum that was initially designed for an elite minority, especially children of Ugandan elites bound for positions within the public service, to a curriculum that allows every learner to develop understandings and skills according to their ability.

The new curriculum focuses on offering a comprehensive education that meets the needs of the 21st century workplace ecosystem, the academic aspirations of a growing and broad student population, the three learning domains, and the education of citizens that can maximally utilize Uganda's resources to transform their communities and country at large (NCDC, 2019). As a result, the number of subjects and subject content has been reduced, instruction will be learner-centered, teaching will focus on competence rather than learning objectives, and assessment will focus on both formative and summative assessment as opposed to only summative assessment in the old curriculum (NCDC, 2019; Chemonges, 2020; Mubangizi, 2020).

These changes, mainly in classroom instruction, project-based learning, and assessment, demand a highly skilled teacher workforce and an institutionalized level of continued professional development for all teachers if Uganda is to achieve the set objectives of the new lower secondary school curriculum. Indeed, past research indicates that teachers in developing

countries are important in the implementation of educational changes and improvement programs at all levels of education (DeJaeghere et al., 2009; Mulkeen et al., 2007; Nakabugo et al., 2014). This is because teachers are the heartbeat of any education system. Their buy-in makes a program change successful and the reverse is true. That said, Ugandan secondary school teachers, especially science teachers, have inadequate pedagogical skills and low subject content proficiency, and this is reflected in the continued failing of science subjects (Nakabugo et al., 2014).

The situation is dire when considering agriculture education teachers. Many of them had their pre-service teacher education at the inadequately funded National Teacher College (TISSA, 2013). According to the MoES 2019 Education and Sports Sector Annual Performance Report, the 2018/2019 national budget allocated 5.5 billion to teacher education in the recurrent non-wage expenditure vote out of the 187.9 billion allocated to the ministry. Further analysis of the same indicates that fifty-two Teacher Instructor Education and Training (TIET) institutions, including five NTCs with over 20,000 student teachers, received only 2.4 billion, a lower budget allocation compared to over 51 billion allocated to Kyambogo university or 178 billion allocated to Makerere University (MoES, 2019c). The low capitation funding at NTC leads to production of agricultural educators with limited pedagogical skills, low subject content proficiency, and with no ability to create, manage and supervise the much-needed school-based agricultural projects for their students' experiential learning.

With such poor pre-service teacher training, well planned and implemented CPD programs become the surest way of providing in-service agricultural educators with vital skills required for delivering quality agricultural education in the new lower secondary school

curriculum. As Cannon et al. (2012) mentions, providing timely professional learning opportunities for educators helps them to expand their knowledge, improve their pedagogical and program management skills. However, without institutionalized CPD programs in Uganda, knowing the contemporary professional needs of agricultural educators requires a scientific study. With this study, the researcher will explore the pedagogical gaps and needs among teachers of agricultural education and investigate CPD programs being utilized to address these pedagogical gaps and needs at the school level and nationally.

Theoretical Framework

This study was guided by two theoretical frameworks, the Adult Learning Theory by Knowles (1980) and Roger's Diffusion of Innovation Theory (2003). As Njenga (2022) explains, teacher CPD is a complex learning activity influenced by a complex set of interacting personal, institutional, and contextual factors. Thus, using a twofold theoretical framework is an appropriate strategy "for understanding the multiple aims, diverse content and learning methods that characterize teacher CPD" (Njenga, 2022, p. 7). The Adult Learning Theory views teacher CPD as a self-directed and goal-oriented activity, while the diffusion of innovation theory situates teacher CPD in Uganda as an innovation or new educational practice that requires agricultural educators to adopt the new CPD ideas through the innovation-decision process (Njenga, 2022; Rogers, 2003). As highlighted in the Knowles (1980) Adult Learning Theory, an adult learner finds specific situations or needs with respect to their teaching profession that calls for adjustment or change, and these needs act as motivators of their adult education or adoption of professional development (Cannon et al., 2012; Knowles, 1980). With this notion, adult learners are expected to have a higher level of

motivation to learn as a means of addressing their perceived professional need (Cannon et al., 2012). Such perceived professional needs have been highlighted in previous studies in Uganda to include instructional strategies, subject content knowledge, classroom management, project-based learning, student motivation, counseling, and career guidance among others (Malunda, 2019; MoES, 2016; Nakabugo et al., 2014).

However, regardless of the availability of cascade CPD opportunities in the country, many teachers are not utilizing them for professional development. For example, a 2014 MoES situational analysis report indicated that 25% of secondary school science teachers had not participated in CPD within three years. The percentage might be higher for agriculture teachers since agriculture education, despite being an applied science, is not included among the Secondary Science and Mathematics (SESEMAT) program (Okiror et al., 2017). This statistic manifests teachers as adult learners with independence, self-direction, and goal-oriented learning whose decisions to participate (or not participate) in CPD activities can be explained using Rogers Diffusion of Innovations Theory (2003).

According to this theory, the adoption of ideas or innovations, such as participation in CPD programs, in any population or social system like education usually begins with a very small number of innovators (La Morte, 2022; Rogers, 2003). This small population is closely followed by early adopters, followed by earlier majority and later majority, and lastly followed by the laggards. The contemporary situation of CPD attainment among agricultural educators clearly fits in the five categories proposed by the Diffusion of Innovation Theory. The researcher intends to utilize the available innovators and earlier majority (16% of the population as highlighted by Rogers) to implement a successful CPD program among

agricultural educators. This is because peer-to-peer interactions and communities of practices are vital in knowledge transfer and in this case important in influencing other teachers to take part in CPD programs. Therefore, using the Knowles (1980) Adult Learning Theory and Rogers Diffusion of Innovation Theory (2003) provided the researcher with the tools that indicate how, why, how fast CPD programs in Uganda achieve or fail to achieve the intended goals (La Morte, 2022).

Chapter Summary

To date, a lot has been achieved in the Ugandan education system. A review of literature indicates the increased enrollment at all levels of education in Uganda. For instance, before the introduction of UPE in 1997, there was approximately three million pupils at primary school, and two decades later, the country had more than eight million pupils enrolled at this level (MoES, 2017a; UNESCO, 2022). The same trajectory is observable at the secondary school level where the introduction of UPPET/USE has led to a tremendous increment in the number of students at both O-level and A-level. By 2017, over 1.3 million students were enrolled at this level of education (MoES, 2017a; UBOS 2017).

Although accessibility to education has greatly increased, much is needed to provide a quality, meaningful, and impactful education to Ugandans. As observed, over 50% students testing for UCE, a national examination required to transition to high school, fail to obtain the minimum grade required and hence repeat the senior four class or fall off the education cycle before completing it (World Bank, 2018; MoES 2017a). With little to no skills and competences attained throughout their education cycle, graduates or dropouts of this education system can neither get meaningful employment nor create their own employment (ILO, 2017; TISSA, 2013).

This has forced many to live in abject poverty for a lifetime. Many observers of the Ugandan education system, attribute this to poor funding of the education system, low quality of teachers, absence of uniform pre-service teacher training curriculum, and lack of CPD framework for in-service teachers.

With the introduction of a competence-based curriculum, it is paramount that professional gaps and needs of Ugandan in-service teachers including teachers of agriculture education are profiled. Conducting timely scientific studies will provide outcomes and recommendations that could be utilized by MoES, NCDC, School Leaders and other stakeholders to successfully implement the new lower secondary school curriculum and in turn improve the achievement of learner outcomes across the country. Because of this need, this study was conducted to profile the professional gaps and needs among Ugandan secondary teachers of agriculture education. Recommendations from this study, could be used to address the identified professional gaps and needs, challenges in accessing CPD training, and for improving on the quality of available CPD programs in Uganda.

CHAPTER THREE

RESEARCH METHODOLOGY

Research Design

A concurrent mixed methods case study research was utilized in this research study. According to Creswell (2009), using the concurrent mixed methods design helps the researcher to have a comprehensive analysis of the research problem through collection of both qualitative and quantitative data simultaneously. Consequently, the researcher combined quantitative and qualitative data collection techniques to collect both data sets one after the other (Creswell, 2012). During data collection, the researcher collected quantitative data first and later had selected respondents answer three interview questions. This study involved 71 respondents achieving 31 more participants when compared with the 40 initially intended participants. However, only 52 finished responses out of the 71 recorded responses were used in the data analysis process since 19 responses were incomplete.

Secondary agricultural education teachers involved in this study taught at either ordinary or advanced level or at both levels of secondary education in schools located in urban, peri-urban, and rural areas of Uganda representing all the four main regions of the country (Central, Eastern, Western and Northern regions). According to MoES 2017a, Ordinary level (O' level) is the lower secondary school section with four classes, that is, senior one to senior four while Advanced level (A' level) is the high school section with two classes, senior five and senior six. In Uganda, the Ministry of Lands, Housing and Urban Development (MLHUD, 2017), defines urban as "a place with a concentration of people in a

given geographical area with a minimum density of 1,000 people per Square Kilometer engaged in more than 60% of non-agriculture activities”, and rural areas are defined as places with low populations per Square Kilometer where agriculture is the primary industry. Additionally, United Nations Educational, Scientific and Cultural Organization (UNESCO, 2014), defines Peri-urban areas as “zones of transition from rural to urban land uses located between the outer limits of urban and regional centers and the rural environment”.

To carry out the purpose of this study, a modified Judd-Murray Agricultural Literacy Instrument grade 9-12 (JMALI) developed in 2019 (Judd-Murray, 2019) combined with a Professional Development questionnaire, and three open interview questions were administered to participants via an online Qualtrics survey platform. The modified Judd-Murray Agricultural Literacy Instrument (JMALI) had 15 items with six exposure level questions, five factual literacy questions and four proficient level questions, that evaluated the teacher’s level of subject content knowledge. Additionally, the Professional Development questionnaire evaluated the teacher’s perceived importance of Continuous Professional Development, their perceived level of pedagogical/teaching skills, and their perceived level of subject content knowledge. Before distributing the survey, the researcher’s graduate committee and Dr. Rose Judd- Murray assisted in developing and refining the modified Judd-Murray Agricultural Literacy Instrument to fit the Ugandan agricultural context. This process ensured that the instrument used in this research was reliable and credible.

During data collection, the survey was physically delivered to respondents at two teacher training workshops in Uganda and via a shareable Qualtrics link to those not in attendance. After answering the survey, the researcher interviewed 15 purposively selected participants based upon

the survey results. The participants included five interviewees from the diploma, degree, and Masters' category of teacher qualification. Interviews were held virtually over the phone using the WhatsApp platform. During these interviews, participants responded to three interview questions. The data collection process occurred over the course of two months, from June 01, 2023 to Aug 20, 2023.

Using this collective case study approach to study the phenomena of continued professional development among Ugandan secondary school agricultural education teachers helped the researcher collect data from teachers with varied demographics or backgrounds (Creswell 2019, 2012; Creswell & Creswell 2018). Doing so assisted the researcher in comprehensively understanding the concept of continued professional development in Uganda using the teacher's own lenses.

Research Objectives

The purpose of this study was to identify the existing professional needs among secondary school teachers of agricultural education in Uganda. Producing a comprehensive profile for secondary school teachers of Agriculture education in Uganda can inform education policy makers, teacher educators, school leaders and other stakeholders about contemporary professional needs in relation to pedagogical skills and content proficiency that exist among secondary agricultural education teachers in Uganda. Recommendations from this study can help inform the implementation of successful Continuous Professional Development programs for all subject teachers in Uganda. As such, five specific research objectives guided this study:

1. Profile the educational background of Ugandan secondary agricultural education teachers.

2. Identify the kind of continuous professional development activities that Ugandan secondary agricultural education teachers participate in.
3. Assess the perceptions of Ugandan secondary agricultural education teachers towards the available CPD programs.
4. Establish the level of subject content knowledge among majority of Ugandan secondary agricultural education teachers.
5. Determine if pedagogical gaps exist among Ugandan secondary agricultural education teachers.

Institutional Review board

This study was carried out following the ethical procedures established by the Uganda National Council for Science and Technology (UNCST) and the Montana State University Institutional Review Board (MSU-IRB) office. As such, this study followed research ethics in Uganda and those laid out by MSU-IRB. The researcher worked with Gulu University Research Ethics Committee (GUREC) to obtain ethical approval for carrying out research on human subjects in Uganda.

In this process, the researcher submitted the research proposal, Informed consent form (see appendix C), research study plan, COVID-19 risk management plan, data collection tools (see appendix D) among other documents to both institutions. On April 25th, 2023, the study was approved by the MSU-IRB under protocol number 2023-769-Exempt (see appendix A) and approved by GUREC on June 22nd, 2023, under protocol number GUREC-2023-590 (see appendix B).

Participants

This study used purposive sampling, a non-probability sampling technique to select secondary school agricultural education teacher participants. These participants were selected from the agricultural teachers that are part of the Agriculture Educators WhatsApp group which is a professional learning community (PLC) for secondary agricultural education teachers and other agricultural educators in Uganda. All secondary teachers in this community were contacted via email and WhatsApp and requested to privately respond to the researcher expressing their willingness to participate in this study (see appendix E). Over 70 teachers expressed their interest in participating in this study. The researcher met majority of the participants at two different NCDC teacher training workshops at Ndejje Senior Secondary School in Luweero and Mityana Secondary School in Mityana. This approach made data collection easier, convenient, and cheaper as most of the respondents used the researcher's tablet and mobile internet to respond to the Qualtrics survey. Other participants away from the two venues received a shareable Qualtrics survey link from the researcher which they filled and submitted online. To motivate participants towards completion of this detailed survey, an Internet Data gift of UGX 10,000 was given to each respondent for their submitted response by cash or via mobile money transactions for those participants away from the two locations. In the end, 52 finished responses were received from the 71 participants, achieving a 73.24% response rate.

Data Collection

In this concurrent mixed methods study, the researcher collected quantitative data first using a Qualtrics survey and qualitative data was collected at the end of the study during

individual interviews. Quantitative data was collected using a survey with four sections that included, **Section I-** a modified Judd-Murray Agricultural Literacy Instrument (JMALI) that captured data on teacher's subject content proficiency, **Section II-** Pedagogical Competency that captured data on teacher's pedagogical skills, **Section III-** Professional Development Needs Assessment that captured data on the perceived importance of CPD and the perceived level of pedagogical skills and current gaps among agricultural educators in Uganda, and **Section IV-** Personal Biodata that captured data on teacher's educational background (see appendix D). A 5-point Likert Scale was used to measure the required statistics and obtain the quantitative data needed using scales such as far below average, somewhat average, average, somewhat above average and far above average and other defined responses (Wade, 2006).

For qualitative data, selected teachers responded to three questions during a semi-structured interview section conducted via WhatsApp social media platform. The questions helped collect data on challenges/barriers affecting CPD programs, participant's opinion on CPD program improvement, suggestions for new CPD program areas, suggestions for personal teacher professional growth, and suggestions on what MoES/Universities/Schools can do to provide CPD training for in-service teachers. Using open-ended interviews helped the researcher discover more information on CPD programs through the participants' narratives and shared views on the topic (Obiero, 2020; Alshenqeeti, 2014). The researcher recorded teacher responses in a word document for data analysis.

Data Analysis

Collected quantitative data was analyzed using the online Qualtrics program and Microsoft Excel software to derive descriptive statistics calculating percentages, means, standard

deviations, and inferential analyses of participants' responses to the survey. For qualitative data, content and thematic analysis of recorded interview responses was done to create themes on CPD programs in Uganda. This helped the researcher identify emerging patterns from participants' responses and thereby grouping them into words, concepts, and themes (Columbia Public Health n.d.).

Additionally, quantitative data and qualitative data were separately analyzed and later integrated to develop a complete view of the collected datasets following the *QUAN* → *qual* paradigm design (Morse, 2010). Microsoft Excel and Qualtrics were used to complete quantitative data analysis in this study, and NVivo was used to analyze qualitative data for emerging themes from interview responses. Descriptive statistics of each participant were summarized, including gender, highest level of education, years of teaching (career stage), school location by area, and school location by region. In total, 71 teachers participated in this study. However, only 52 finished responses were used in the data analysis process. Table 1 summarizes the collected demographic data from the 52 participants. To facilitate quantitative data analysis, 52 respondents were categorized according to their years of teaching, and their level of education. According to their years of teaching, five categories were represented: less than one year (n = 1), 1-2 years (n = 6), 3-5 years (n = 16), 6-10 years (n = 15), and more than 10 years (n = 14). According to level of education, participants were categorized as; diploma holders (n = 20), bachelor's degree (n = 25), master's degree (n = 7) and Ph.D. (n = 0).

Furthermore, survey data from teachers' perceptions on available CPD trainings, teachers' interest in attending listed CPD trainings, teachers' perceived level of subject content knowledge, and their scores on the JMALI instrument were used to determine

statistical differences between teachers with different highest level of education and with their varying years of teaching experiences. Performing these analyses assisted in drawing conclusions about the survey findings. As such, several one factor analysis of variance (ANOVA) analyses were performed to establish statistical differences between these variables. Where statistical differences were found, a Post Hoc analysis was conducted to evaluate significant differences between groups for several variables (Gravetter et al., 2021; Ravid, 2011). Lastly, one Pearson analysis was performed to assess the relationship between teachers' JMALI scores and teachers' scores on perceived level of subject content knowledge.

For qualitative data analysis, the researcher used a 6 stepwise process commonly used in qualitative research (Kiger & Varpio, 2020) and NVivo 12 to identify emerging themes in the recorded responses. First, recorded data from private WhatsApp chats with selected interviewees was copied and used to develop a Microsoft Word file for data analysis. After this process, NVivo qualitative software was used to identify emerging themes for each research question. Then, the researcher analyzed the same dataset to identify common themes and developed codes, basing initial open coding with no priori codes. According to Charmaz (2006), coding in qualitative data helps categorize segments of data with short names that simultaneously summarize and account for each piece of data. As such, open coding was used to summarize this data and identify areas of interest from interview responses that stood out to the researcher. Later, axial coding was done to further summarize identified open codes into axial codes relevant to the research questions (Charmaz, 2006; Kiger & Varpio, 2020). This coding process was separately done by the researcher and two other members of their graduate research committee to enhance credibility of the qualitative data analysis process (Lincoln & Guba, 1982). Lastly, using

the *QUAN* → *qual* paradigm design (Morse, 2010), quantitative and qualitative data analyses were integrated to analyze how the findings in qualitative dataset supported findings in quantitative dataset.

Trustworthiness

To ensure credibility, validity, reliability, dependability, transferability, and conformability in this mixed methods case study, several measures or strategies were undertaken by the researcher to ensure trustworthiness. Validity for both qualitative and quantitative datasets were ensured by the researcher's seven years' experience in teaching agricultural education and organizing professional development programs for agricultural teachers in Uganda. Additionally, the survey tool and open-ended interview questions were reviewed by the researcher's graduate committee and Dr. Rose Judd- Murray, the author of the JMALI tool. As Zohrabi (2013) mentions, reviewing of the research instrument helped the researcher to develop an instrument that measured the intended study elements. Validity was ensured and strengthened through collection of qualitative and quantitative data. Evidently, collecting both sets of data from multiple sources helped the researcher triangulate it and overcome personal biases among participants and the researcher (Creswell, 2013).

To ensure credibility and reliability, the researcher elaborated the details of the research study to each participant before data collection, doing this, ensured that the collected data from all participants is consistent, dependable, and replicable (Creswell, 2013; Zohrabi, 2013). Additionally, the researcher explained in detail about the study participants in the research participants' section, mentioning how they were identified, and the sampling technique used to select them. Lastly, dependability and confirmability were ensured through producing an audit

trail which is a stepwise process for conducting research (Guba & Lincoln, 1982; Korstjens & Moser, 2018).

Chapter Summary

While undertaking this study, a concurrent mixed methods research design was used. This design enabled the researcher to conduct a comprehensive study of a complex problem in a short time using both quantitative and qualitative protocols (Creswell 2009, 2012). Using the mixed methods design gave the researcher unique benefits of developing a deeper understanding of the studied phenomena and the opportunity to overcome the weaknesses of using a singular design to collect data i.e., using either quantitative or qualitative design only (Creswell & Creswell, 2018; Leedy & Ormrod 2019).

In this study, quantitative data was collected first, and qualitative data collected later after looking at gathered quantitative data. The quantitative survey instrument was developed by the researcher and reviewed by the researcher's graduate committee and Dr. Rose Judd- Murray. The survey instrument included four subsections measuring teacher's subject content proficiency, their pedagogical/technical competences, their perceived quality of CPD programs in Uganda, and profiling their personal biodata. For qualitative data collection, the researcher used a three-question item to conduct semi-structured interviews with purposively selected participants using WhatsApp communication platform. Responses were recorded by the researcher using their field notes file.

Data analysis for both datasets was conducted separately. Quantitative data analysis was done using Qualtrics online platform and Microsoft Excel. ANOVA, Post Hoc, and Correlation analyses were conducted to generate relationships. While analyzing qualitative data, the

researcher used a 6 stepwise process commonly used in qualitative research (Kiger & Varpio, 2020) and NVivo 12 to identify emerging themes in the recorded responses. In the end, both dataset analyses were combined, using the qualitative dataset to support results obtained from the quantitative data analysis.

CHAPTER FOUR

RESULTS

Introduction

The purpose of this study was to identify existing professional needs among secondary agricultural education teachers in Uganda. This was investigated using five research objectives:

1. Profile the educational background of Ugandan secondary agricultural education teachers.
2. Identify the kind of continuous professional development activities that Ugandan secondary agricultural education teachers participate in.
3. Assess the perceptions of Ugandan secondary agricultural education teachers towards the available CPD programs.
4. Establish the level of subject content knowledge among majority of Ugandan secondary agricultural education teachers.
5. Determine if pedagogical gaps exist among Ugandan secondary agricultural education teachers.

To achieve these objectives, a mixed methods research design collecting both quantitative and qualitative datasets was conducted. The quantitative data survey had four subsections measuring teacher's subject content proficiency, pedagogical/technical competences, perceived quality of CPD programs in Uganda, and personal biodata. The qualitative data collection tool had three questions that were answered by purposively selected participants using the WhatsApp communication platform.

Objective One

In this study, Objective One sought to explore the educational background of Ugandan secondary agriculture education teachers. Participants responded to questions related to gender, highest level of education (and if it is in agriculture education), years of teaching, school location by area (urban, rural, or peri-urban), and school location by region (see appendix F). Table 1 summarizes respondents' demographic data analyzed using the $n = 52$ finished responses.

Table 1
Summary of Participant Demographics ($n = 52$)

Category	n	%
Gender		
Male	46.0	88.0
Female	6.0	12.0
Teacher's highest level of Education		
Diploma	20.0	38.0
Bachelor's degree	25.0	48.0
Master's degree	7.0	13.0
Ph.D.	0.0	0.0
Highest level of Education in Agriculture Education		
Yes	42.0	81.0
No	7.0	13.0
Not sure	3.0	6.0
Teacher's highest level of Education in Agricultural Education ($n = 38$)		
Diploma	13.0	34.0
Bachelor's degree	21.0	55.0
Master's degree	4.0	11.0
Years of teaching		
less than 1 year	1.0	1.0
1 to 2 years	6.0	12.0
3 to 5 years	16.0	31.0
6 to 10 years	15.0	29.0
More than 10 years	14.0	27.0
School Location by Area		
Urban	12.0	23.0
Peri-urban	23.0	44.0
Rural	17.0	33.0
School Location by Region		
Central region	36.0	69.0
Eastern region	5.0	10.0
Northern region	9.0	17.0
Western region	2.0	4.0

Results indicate that majority of Ugandan secondary agriculture education teachers are male ($n = 46$) with either a diploma, a bachelor’s degree, or a master’s degree in agricultural education. These participants taught in agricultural education programs located in urban areas ($n = 12$), peri-urban ($n = 23$) and rural ($n = 17$). Most teachers with a diploma taught agricultural education at O-level ($n = 19$), and in rural schools ($n = 9$). Additionally, there are three times as many diploma teachers at the O-level than at the A-level ($n = 5$). Teachers with a bachelor's degree majorly taught agricultural education at A-level ($n = 20$) and in peri-urban schools ($n = 13$). All participants with a master’s degree taught agricultural education at A-level, none taught in a rural school, and there are two times as many master’s degree teachers in urban areas as in peri-urban. Lastly, half the number of female participants held a bachelor’s degree in agricultural education and taught in rural schools ($n = 3$). See figures 1, 2 and 3.

Figure 1
 Percentage of participants by their highest level of education teaching at the lower secondary level (O-level), and at the higher secondary level (A-level)

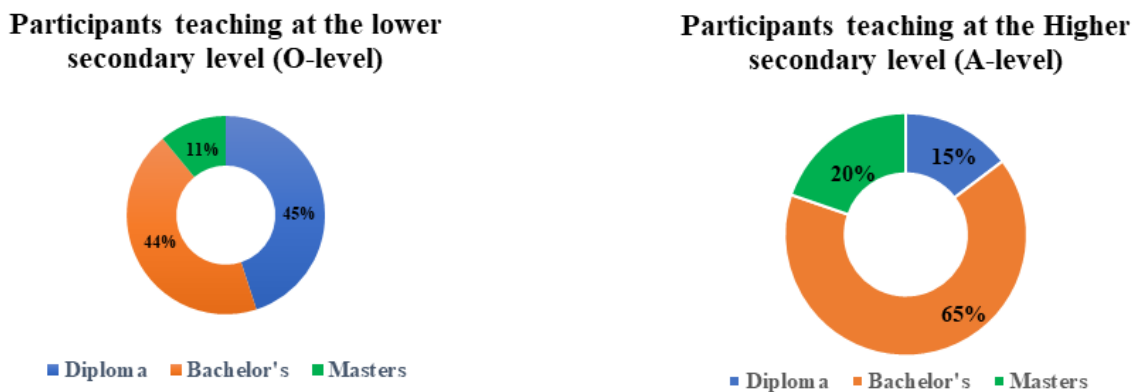


Figure 2
 Percentage of participants by their highest level of education teaching in Urban, Peri-urban, and Rural areas

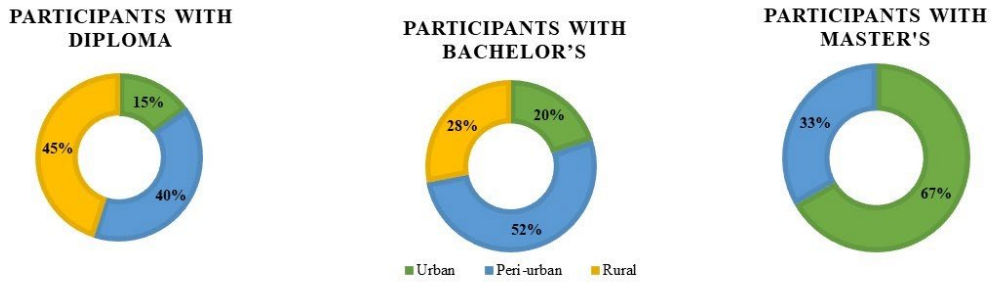
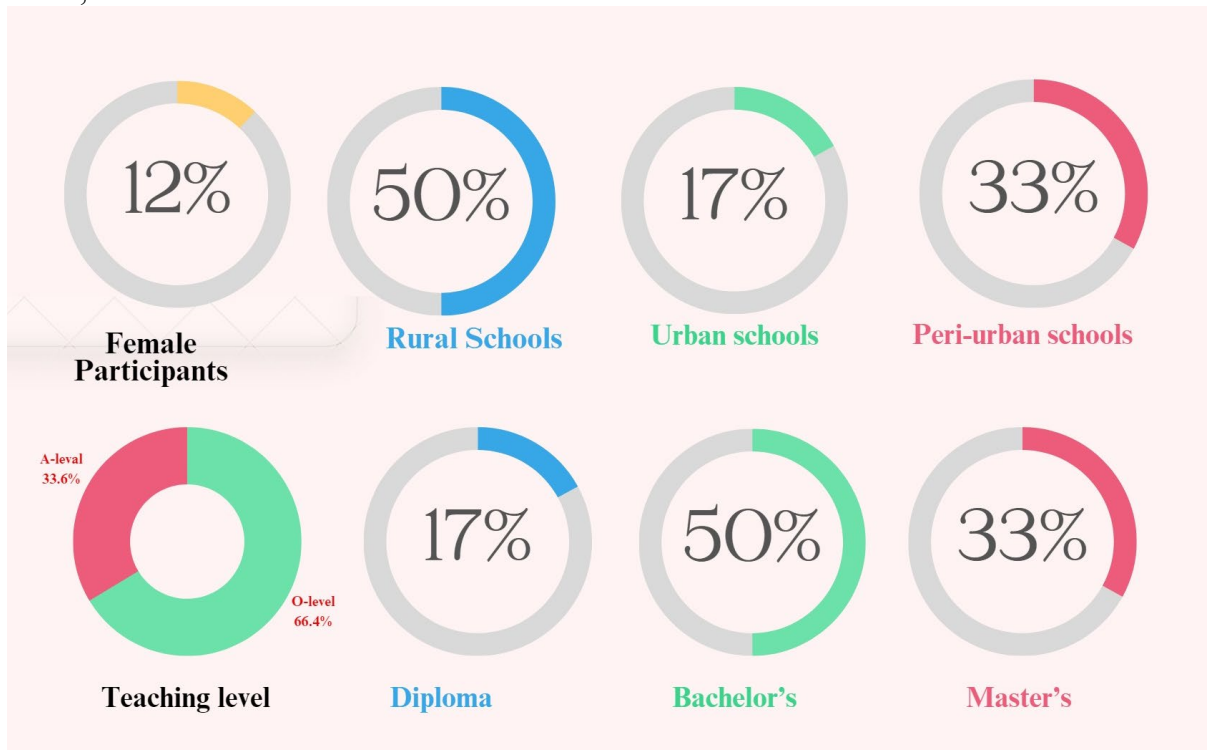


Figure 3
 Percentage of female participants by their highest level of education teaching in Urban, Peri-urban, and Rural areas



Objective Two

Research Objective Two sought to identify the type of continuous professional development activities that Ugandan secondary agriculture education teachers participated in or attended. The researcher presented 17 key areas from which participants mentioned attending and indicated their continued interest of attaining continuous professional development in such areas. A Likert scale with five possible answers was provided in the survey. Response choices were not interested (1), slightly interested (2), moderately interested (3), very interested (4) and extremely interested (5). This objective also collected data on whether schools provided continuous professional development to their teachers and the number of continuous professional development events a respondent had participated in this academic year. As such $n = 51$ teachers indicated that they had participated in continuous professional development while $n = 1$ teacher had not participated in any training this academic year. Additionally, $n = 1$ teacher indicated that on average they attend 0 CPD training in an academic year, $n = 29$ teachers indicated attending at least one or two trainings, $n = 18$ teachers indicated attending three or four trainings, and $n = 4$ teachers attended more than five CPD trainings a year (see Figure 4). Lastly, $n = 38$ teachers indicated that their schools offered some kind of CPD training, $n = 10$ teachers indicated their schools offer no CPD, and $n = 4$ teachers were not sure (see Figure 5). Table 2 summarizes teachers' mean interest in the listed 17 CPD activities against their level of highest education.

Figure 4
The average CPD trainings participants attended in an academic year

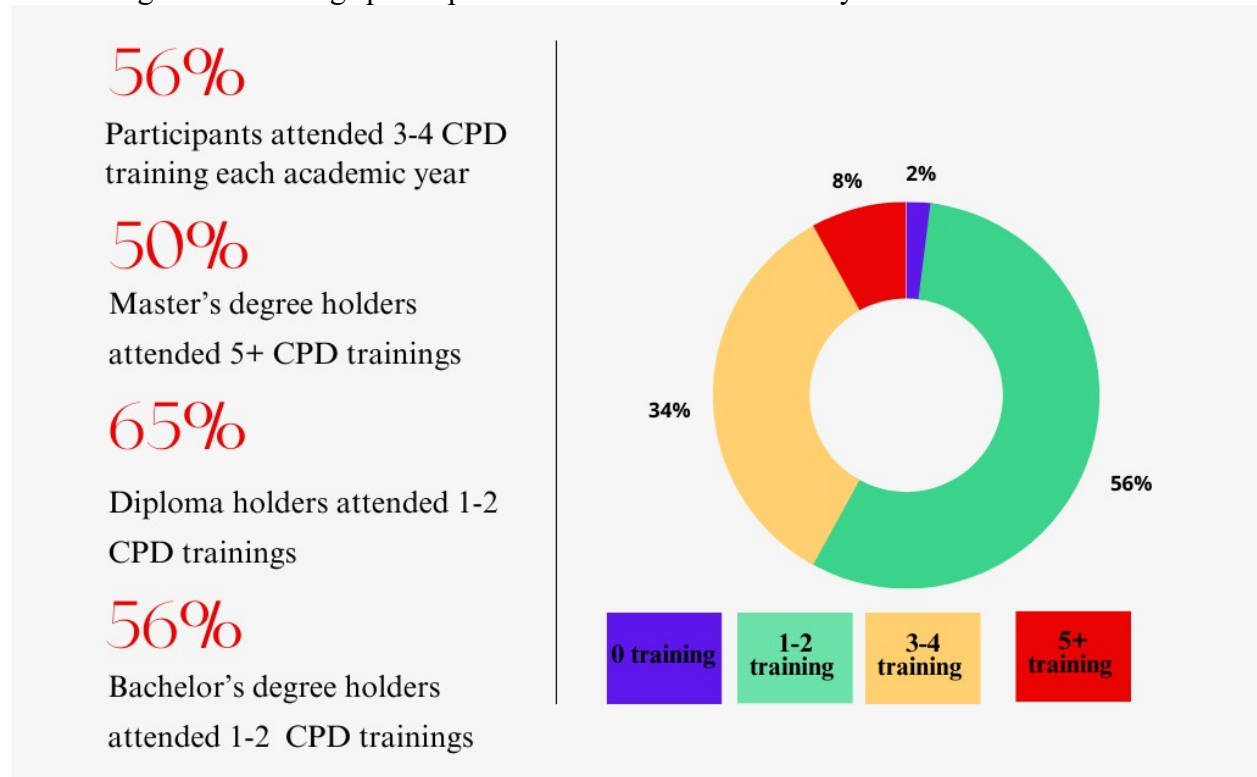


Figure 5
Schools offering CPD training to their teachers

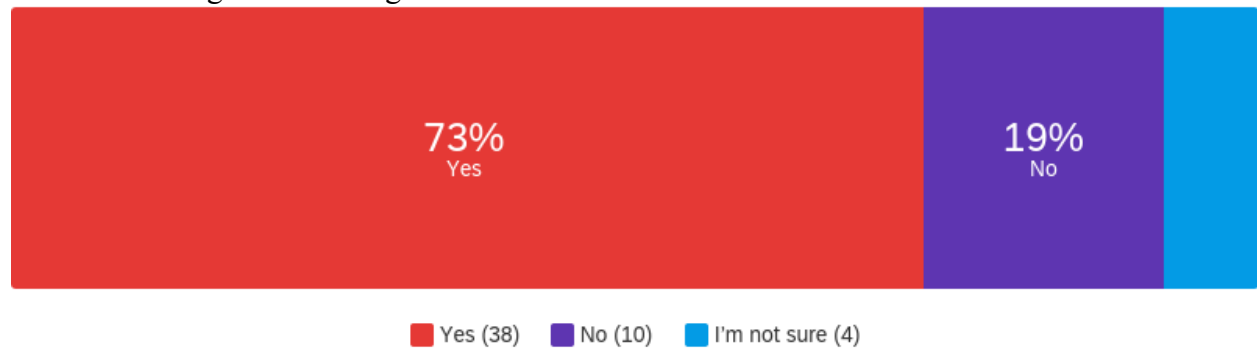


Table 2
Summary of Teachers' Interest in identified CPD areas by level of highest education

Area of CPD training Interest	Mean Scores				
	<i>M</i> (<i>n</i> =52)	<i>SD</i> (<i>n</i> =52)	Dip (<i>n</i> =20)	Deg (<i>n</i> =25)	Mas (<i>n</i> =7)
New lower Secondary curriculum	4.31	0.77	4.35	4.24	4.43
21 st Century Skills	4.31	0.67	4.20	4.36	4.43
Competence-based Learning	4.37	0.71	4.30	4.32	4.71
Best teaching Practices	4.33	0.70	4.25	4.40	4.29
Development of Activities of Integration and their rubrics	4.23	0.87	4.35	4.12	4.29
Student Experiential learning opportunities	4.25	0.68	4.20	4.24	4.43
Classroom Management	4.33	0.70	4.05	4.56	4.29
Collaborative Teaching	4.27	0.76	4.00	4.36	4.71
Curriculum Mapping	4.00	0.98	3.70	4.08	4.57
Project Development	4.37	0.65	4.20	4.52	4.29
Establishment of Agriculture Club like YoFFA in your school	4.23	0.87	4.10	4.24	4.57
Formative and Summative Assessment	4.21	0.93	4.00	4.40	4.14
Student leadership Development	4.17	0.89	4.00	4.20	4.57
Personal Management (time, stress, Work life balance, career development, etc.)	4.37	0.79	4.25	4.56	4.00
Educational Technology and Integrated Instruction	4.35	0.78	4.05	4.56	4.43
Subject Content Areas (Animal science, Agronomy, Tools, etc.)	4.38	0.88	4.20	4.52	4.43
DIT courses, assessment, and certification for senior three students	4.21	0.99	4.05	4.28	4.43

Note. Interest Scale: 1 = not interested, 2 = slightly interested, 3 = moderately interested, 4 = very interested, and 5 = extremely interested. Dip = Diploma, Deg = Degree, and Mas = Masters. SD = Standard Deviation.

Mean ranks of all secondary agricultural teachers' interest in the 17 listed CPD training areas ranged from 4.00 (curriculum mapping) to 4.38 (subject content areas). The lowest standard deviations (0.65) occurred within the project development area and highest standard deviations (0.99) occurred in the DIT courses, assessment and certification for senior three students area. Teachers with a master's degree had the highest mean interest in attending CPD on competence-based learning, and collaborative teaching ($M = 4.71$; $SD = 0.76$) and their

lowest mean on personal management ($M = 4.00$; $SD = 1.31$). Teachers with a bachelor's degree had the highest mean interest in attending CPD on three listed activities namely, educational technology and integrated instruction ($M = 4.56$; $SD = 0.64$), personal management ($M = 4.56$; $SD = 0.57$), and classroom management ($M = 4.56$; $SD = 0.50$). Their lowest mean was in curriculum mapping ($M = 4.08$; $SD = 0.98$). Teachers with a diploma had the highest mean interest in attending CPD on development of activities of integration and their rubrics ($M = 4.35$; $SD = 0.73$) and attending training on the new lower secondary curriculum ($M = 4.35$; $SD = 0.85$). Their lowest mean interest in attending CPD was in curriculum mapping ($M = 3.70$; $SD = 1.00$) among the listed 17 CPD training areas.

To understand the mean interest of attending the listed CPD training areas between teachers with different levels of education, a one-factor ANOVA test was performed. Results showed a statistically significant difference on mean interest at $p < .05$ level for the three education levels [$F(2,48) = 12.86$, $p < .001$]. ANOVA results are summarized in Table 3. Consequently, a Tukey HSD/Kramer post-hoc test was performed to evaluate which education groups contained significant differences between their mean scores (see Table 4). Results show significant differences between teachers with a diploma compared with teachers with a bachelor's degree, and teachers with a diploma compared with teachers with a master's degree. However, there was no significant difference between teachers with a bachelor's degree when compared with teachers with a master's degree.

Table 3
One-factor ANOVA Analysis of teacher's mean interests on listed CPD trainings by level of education

Sources	df	SS	MS	F	P value
Between groups	2	0.736	0.368	12.860	<.001
Within groups	48	1.373	0.029		
Total	50	2.109	0.042		

Table 4
Post Hoc Analysis of teacher's mean interests on listed CPD trainings by level of education

Group	Mean	n	SS	df	q-crit
Diploma	4.132	17	0.430		
Bachelor's degree	4.351	17	0.386		
Master's degree	4.412	17	0.558		
		51	1.373	48	3.420

Note. n represents the listed areas of interest in CPD training in Uganda.

Objective Three

Objective Three aimed to analyze the perceptions of Ugandan secondary agricultural education teachers towards the available Continuing Professional Development (CPD) programs. The respondents answered a set of five questions related to the quality of CPD programs and the ability of teachers to apply the acquired knowledge in their classrooms and professional careers. A Likert scale with five response options ranging from strongly disagree (1) to strongly agree (5) was utilized. To determine any statistical differences between groups, ANOVA analysis and subsequent post hoc analysis were performed on the group mean scores in relation to the participants' highest level of education. ANOVA analysis results indicated a significant difference at $p < .05$ in mean scores among the three educational levels [$F(2,12) = 22.30, p < .001$], as presented in Table 5. Furthermore, the post hoc analysis revealed a statistically significant difference among mean scores between teachers with a bachelor's degree and those with a master's degree. However, no significant differences were found between teachers with a

diploma and those with a bachelor's degree, as well as between teachers with a master's degree and those with a diploma, as shown in Table 6.

Table 5

One-factor ANOVA Analysis of teacher's mean scores on CPD quality against level of education

Sources	df	SS	MS	F	P value
Between groups	2	0.880	0.440	22.301	<.001
Within groups	12	0.237	0.020		
Total	14	1.117	0.080		

Table 6

Post Hoc Analysis of teacher's mean scores on CPD quality against level of education

Group	Mean	n	SS	df	q-crit
Diploma	4.402	5	0.108		
Bachelor's degree	4.140	5	0.042		
Master's degree	4.732	5	0.086		
		15	0.236	12	3.773

Note. n represents the number of questions on CPD program quality in Uganda.

Teacher participants indicated mean ranks for the quality of available CPD training ranging from 4.25 (attended trainings were of high quality and met my expectations) to 4.38 (attended trainings helped me to help my students in the classroom better). The lowest standard deviations (1.10) occurred within attended trainings were of high quality and met my expectations, and highest standard deviations (1.33) occurred in the training content is relevant to my teaching roles perspective (see Table 7). Teachers with a master's degree had the highest mean for the quality of available CPD training on the attended trainings helped me to help my students in the classroom better ($M = 4.83$; $SD = 0.37$) and their lowest mean on the attended trainings have helped me prepare for career advancement ($M = 4.50$; $SD = 1.12$). Teachers with a bachelor's had their highest mean on the training content is relevant to my teaching roles (M

= 4.21; $SD = 1.35$) and their lowest mean on the attended trainings have helped me do my teaching job better ($M = 3.96$; $SD = 1.46$). Teachers with a diploma had their highest mean on the attended trainings have helped me do my teaching job better ($M = 4.56$; $SD = 1.01$) and their lowest mean on attended trainings were of high quality and met my expectations ($M = 4.20$; $SD = 1.02$). Similar variations in rankings on the quality of available CPD trainings exist among teachers in urban, peri-urban, and rural schools.

Table 7

Summary of teachers' perceived quality of available CPD trainings.

Question	Mean	SD
The attended trainings were of high quality and met my expectations.	4.25	1.10
Training content is relevant to my teaching roles.	4.28	1.33
The attended trainings have helped me do my teaching job better.	4.29	1.26
The attended trainings helped me to help my students in the classroom better.	4.38	1.18
The attended trainings have helped me prepare for career advancement.	4.35	1.19

Note. SD = Standard Deviation.

Additionally, teacher participants indicated mean ranks for their preference on the delivery format for CPD ranging from least 3.33 (lecture training) to highest 4.38 (in-person and hands-on participation). The lowest standard deviations (0.84) occurred within in-person and hands-on participation format, and highest standard deviations (1.31) occurred in the lecture training as a delivery format for CPD for all participants (see Table 8). Further analysis based on teacher's highest level of education, showed similar preference ranking for lecture training as the least preferred format among all participants but with varying mean values and standard deviations for the three groups. Additionally, participants with a bachelor's degree ($M = 4.40$, $SD = 0.60$) and those with a master's degree ($M = 4.86$, $SD = 0.35$) had in-person and hands-on

participation as their preferred delivery format for CPD training. However, there was distinct high preference for CPD training being delivered in series of topic related workshops ($M = 4.40$, $SD = 0.66$) among participants with a diploma. Similarly, comparison according to participant's school location by area indicated high ranking of in-person and hands-on participation as a preferred format for urban ($M = 4.58$, $SD = 0.65$) and peri-urban teacher participants ($M = 4.43$, $SD = 0.77$), and high ranking of training offered away from school with other teachers of agriculture education format for rural participants ($M = 4.47$, $SD = 0.70$). Lastly, all three participant groups (urban, peri-urban, rural) ranked lecture training as the least preferred format but with varying mean values and standard deviations.

Table 8
Preference of delivery format for the professional development training (n=52)

Format of CPD training	Rate of Preference				
	1	2	3	4	5
In-class Observations	1	3	8	22	18
Virtual based trainings (Zoom, Teams, and Webinars)	2	5	12	16	17
In-person and Hands-on participation	0	3	3	17	29
Lecture trainings	4	13	11	10	14
Series of topic related workshops	0	3	7	23	19
Offered at school with teachers of other subjects	3	4	9	22	14
Offered away from school with other teachers of Agriculture	2	0	4	21	25

Note. n represents total responses, 1 = do not prefer, 2 = prefer slightly, 3 = prefer a moderate amount, 4 = prefer a lot, and 5 = prefer a great deal

Mean ranks for teachers' preference for timing of CPD training ranged from lowest 2.65 (embedded in the academic term) to highest 4.23 (before the first day of the academic term) for all participants. The lowest standard deviations (1.15) occurred within before the first day of the academic term, and highest standard deviations (1.44) occurred in the embedded in the academic term timing (see Table 9). Regardless of teacher's highest level of education, before the first day

of the academic term timing of CPD training was the highly ranked preference with varying mean ranks among the three groups of high education. Additionally, diploma ($M = 2.85, SD = 1.35$) and master’s degree ($M = 3.57, SD = 0.90$) participants ranked over the weekend timing the least while bachelor’s degree participants ranked embedded in the academic term timing the least ($M = 2.24, SD = 1.34$).

Table 9
Preference for timing of professional development trainings (n=52)

Timing of CPD training	Rate of Preference				
	1	2	3	4	5
Before the first day of each academic term	3	3	3	13	30
Over the weekend	9	10	9	16	8
During term holidays	3	2	7	12	28
Embedded in the academic term	16	10	10	08	8

Note. n = total responses, 1 = do not prefer, 2 = prefer slightly, 3 = prefer a moderate amount, 4 = prefer a lot, and 5 = prefer a great deal

Objective Four

Objective Four sought to profile the level of subject content knowledge or proficiency among Ugandan secondary agricultural education teachers. Respondents answered a 15-item JMALI instrument with and were ranked as proficient if they scored 12 or more points, as factually literate if they scored 8 to 11 points, and as developing level if they scored 7 or less points. Results indicated that 67% of the participants were at the developing level ($n = 35$), 31% were at the factual literate level ($n = 16$) while 2% were at the proficient level ($n = 1$). In relation to teacher’s highest level of education, 75% of teachers with a diploma were at the developing level ($n = 15$), 25% of them at the factual literate level ($n = 5$) while none of them was at a proficient level. A focus on teachers with a bachelor’s degree indicated that 68% of them ($n = 17$) were at the developing level, 28% at the factual literate level ($n = 7$) and 4% at

the proficient level ($n = 1$). Regarding teachers with a master's degree, 43% of them were at the developing level ($n = 3$), 57% were at the factual literate level ($n = 4$) and none was proficient. A summary of this analysis is presented in Table 10.

Table 10
Level of Subject Content Knowledge among secondary teachers of agriculture

Proficiency level	Highest level of education		
	Diploma	Bachelor's	Master's
Developing level (7 or less points)	15	17	3
Factual literate (8-11 points)	5	7	4
Proficient (12 or more points)	0	1	0
Total	20	25	7

Additionally, a Pearson correlation analysis was performed to evaluate the relationship between obtained JMALI scores and scores obtained on teachers' perceived level of subject content proficiency. There was a positive moderate relationship between the two variables among teachers with a degree, $r(23) = 0.532, p = .006$, and a negative moderate relationship between the two variables among teachers with a master's degree, $r(5) = -0.645, p = .0117$ as summarized in Table 11.

Table 11
Summary of Pearson Correlation between JMALI score and perceived level of subject content knowledge

Category	Correlation Value	<i>P</i> value
Overall	0.389	.004
Diploma	0.291	.214
Bachelor's	0.532	.006
Master's	-0.645	.117

Lastly, analysis of participants' scores on the three question levels (exposure, literacy, and proficiency) was done. All participants at the three levels of high education scored highly

on exposure questions and lower on both literacy and proficiency questions. For example, diploma holders scored 62.5% on exposure questions, 26% on literacy questions, and 22.5% on proficiency questions. A similar trend is true among bachelor's and master's degree holders. Overall, teachers with a bachelor's degree scored relatively higher than diploma and master's degree participants (see Table 12).

Table 12
Summary of participants' scores on the three question levels

Question level	Highest level of Education		
	Diploma	Bachelor's	Master's
Exposure	62.5%	62.6%	59.5%
Literacy	26.0%	43.2%	42.8%
Proficiency	22.5%	27.0%	39.3%

Objective Five

Objective Five sought to identify existing pedagogical gaps among Ugandan secondary agricultural education teachers. Participants answered 42 items subdivided into three key areas: technical competency (15 questions), teaching-learning competences (15 questions) and program management competences (12 questions). A Likert scale with five possible scores was provided with indicators of far below average (1), somewhat below average (2), average (3), somewhat above average (4), and far above average (5). A one-factor ANOVA analysis was performed to evaluate the relationship between mean scores on perceived technical competences and career stage of teachers. There was no significant relationship at $p < .05$ between perceived technical competences and the career stage of teachers [$F(3,164) = 0.075$, $p = .999$] as summarized in Table 12. Another ANOVA analysis was performed to evaluate the relationship between mean scores on perceived technical competences and highest level of

teachers' education. There was no significant relationship at $p < .05$ between perceived technical competences and highest level of teachers' education [$F(2,123) = 0.004, p = .996$] as summarized in Table 13.

Table 13
One-factor ANOVA of teacher's technical competence perceptions against their career stage

<i>Sources</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>P value</i>
Between groups	3	5.722	1.907	.007	.999
Within groups	164	41820.237	255.001		
Total	167	41825.837	250.454		

Table 14
One-factor ANOVA of teacher's technical competence perceptions against their highest level of education

<i>Sources</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>P value</i>
Between groups	2	2.085	1.043	.004	.996
Within groups	123	31420.103	255.448		
Total	125	31422.188	251.378		

Two Post Hoc analyses were performed to identify differences between groups for the two conditions. There was no significant difference between mean scores of teachers for the two variables (see Tables 14 and 15).

Table 15
Post Hoc Analysis of teacher's technical competence perceptions against their career stage

<i>Group</i>	<i>Mean</i>	<i>n</i>	<i>SS</i>	<i>df</i>	<i>q-crit</i>
0-2 years (n = 7)	25.401	42	10361.14		
3-5 years (n = 16)	25.496	42	10463.10		
6-10 years (n = 15)	25.826	42	10408.52		
10+ years (n = 14)	25.797	42	10587.35		
		168	41820.11	164	3.671

Table 16

Post Hoc Analysis of teacher's technical competence perceptions against their highest level of education

<i>Group</i>	<i>Mean</i>	<i>n</i>	<i>SS</i>	<i>df</i>	<i>q-crit</i>
Diploma (n = 20)	25.550	42	10446.0		
Bachelor's (n = 25)	25.659	42	10467.0		
Master's (n = 7)	25.860	42	10507.1		
		126	31420.1	123	3.355

Mean ranks for teachers' perceived competence on 15 listed technical teaching areas ranged from lowest rating 46.12 (teaching concepts and skills in animal and plant biotechnology & biosafety) to highest rating 47.46 (teaching concepts and skills in crop production i.e., cereals, root crops, legumes) for all participants. The lowest standard deviations (0.77) occurred within the teaching concepts and skills in crop production i.e., cereals, root crops, legumes while the highest standard deviations (1.27) occurred in teaching concepts and skills in horticultural sciences. Participants with a diploma and those with a bachelor's degree showed similar high mean ranking for teaching concepts and skills in crop production i.e., cereals, root crops, legumes ($M = 47.50, SD = 0.81$) and ($M = 47.40, SD = 0.80$) respectively. Both groups similarly indicated their lowest mean ranking on teaching concepts and skills in animal and plant biotechnology & biosafety. On the other hand, participants with a master's degree indicated their highest mean ranking on teaching concepts and skills in animal sciences ($M = 47.71, SD = 0.45$) and their lowest mean ranking on teaching concepts and skills in farm tools, equipment and implements ($M = 46.43, SD = 0.73$). Notably, participants in peri-urban and rural schools showed a high mean ranking for teaching concepts and skills in crop production i.e., cereals, root crops, legumes but with varying mean values and standard deviations. However, urban participants indicated a high mean ranking ($M = 47.42, SD = 0.86$) for teaching concepts about

Uganda's land tenure system. Table 16 shows a summary of teachers' perceived level of technical teaching areas.

Table 17
Teacher's perceived competence on technical teaching areas (n=52)

Competence	M	SD
Teaching concepts and skills in horticultural sciences	46.60	1.27
Teaching concepts and skills in soil science	46.90	1.02
Teaching concepts and skills in farm tools, equipment and implements	47.15	0.97
Teaching concepts and skills in horticultural sciences	46.60	1.10
Teaching concepts and skills in crop production i.e., cereals, root crops, legumes	47.46	0.77
Teaching concepts and skills in animal sciences (poultry, rabbits, pigs, goat, cattle)	47.13	0.94
Teaching concepts and skills in perennial crops production (coffee, banana, cocoa)	46.60	1.15
Teaching concepts and skills in animal feed conservation	46.87	1.02
Teaching concepts and skills in agribusiness, financial services, and commercial agriculture	46.83	0.91
Teaching concepts and skills in farm buildings and structures	47.06	0.93
Teaching concepts and skills in value addition or food processing	46.54	1.01
Teaching concepts and skills in animal and plant biotechnology & biosafety	46.12	1.17
Teaching concepts and skills in cooperatives & marketing of agricultural products	46.81	1.00
Teaching about agriculture's relationship with the environment	46.88	0.97
Teaching concepts about Uganda's land tenure system	46.94	1.03

Mean ranks for teachers' perceived teaching competence on the 15 listed areas ranged from least 13.27 (using multimedia equipment in teaching) to highest 14.44 (motivating students to learn) for all participants. The lowest standard deviations (0.71) occurred within the developing relationships with fellow teachers and administrators area while the highest standard deviations (1.30) occurred in teaching using computers area. Participants with a diploma and showed high mean ranking in managing student behavior problems ($M = 14.35$, $SD = 0.57$) and low mean rankings in teaching using computers ($M = 12.85$, $SD = 1.35$). Additionally,

bachelor's degree and master's degree holders showed high mean ranking in motivating students to learn i.e., ($M = 14.56$, $SD = 0.80$) and ($M = 14.57$, $SD = 0.49$) respectively. However, bachelor's degree holders attained low mean rankings in teaching disabled students ($M = 13.32$, $SD = 1.32$) while master's degree holders attained low mean scores on using multimedia equipment in teaching ($M = 13.14$, $SD = 0.99$). Table 17 shows a summary of teacher perceived level of teaching competence.

Table 18
Teacher perceived level of teaching competence (n=52)

Competence	M	SD
Motivating students to learn	14.44	0.79
Teaching students to think critically and creatively	14.17	0.80
Managing student behavior problems	14.38	0.90
Teaching disabled students	13.31	1.25
Teaching students problem-solving and decision-making skills	14.02	0.84
Organizing and supervising teaching activities in & outside the classroom setting	14.27	0.86
Developing appropriate student learning activities	14.10	0.93
Teaching using computers	13.38	1.30
Using multimedia equipment in teaching	13.27	1.23
Developing activity of integration assignments/projects	13.94	0.97
Assessing and evaluating student performance using the new assessment grid	13.94	0.95
Planning and conducting student field trips	14.06	0.99
Conducting needs assessment to determine the courses/topics to teach	13.79	1.01
Integrating life skills into the agriculture curriculum	14.02	0.99
Developing relationships with fellow teachers and administrators	14.40	0.71

Teachers ranked their perceived program management competences on the listed 12 competence areas. Mean ranks ranged from least 12.88 (developing a parent's agriculture club support team) to highest 14.25 (providing guidance to students interested in post-secondary education in the agricultural sciences field) for all participants. Similarly, the lowest standard deviations (0.85) occurred within providing guidance to students interested in post-secondary

education in the agricultural sciences field and the highest standard deviations (1.40) occurred in developing a parent's agriculture club support team. Participants with a diploma showed high mean ranking in determining the content that should be taught in a specific course/topic ($M = 14.20$, $SD = 0.87$) while both bachelor's degree and master's degree participants showed high mean ranking in providing guidance to students interested in post-secondary education in the agricultural sciences field i.e., ($M = 14.36$, $SD = 0.74$) and ($M = 14.43$, $SD = 0.49$) respectively. By level of education, all participants attained low mean rankings in developing a parent's agriculture club support team ($M = 12.88$, $SD = 1.40$). Table 18 shows a summary of teacher perceived level of program management competence.

Table 19
Teacher's perceived program management competences (n=52)

Competence	M	SD
Developing supervised agricultural education opportunities for students	13.71	0.91
Developing an active agriculture education club	13.65	1.30
Teaching record keeping skills	14.25	0.90
Developing a variety of curriculum-based school-to-work activities	13.85	0.95
Providing career exploration opportunities in the agriculture sector	14.13	0.92
Teaching about public issues related to agriculture	13.96	1.02
Organizing school exhibitions for student projects	13.71	1.29
Supervising student projects	14.12	1.01
Organizing fundraising activities for the school agriculture program	13.13	1.24
Determining the content that should be taught in a specific course/topic	14.04	1.09
Developing a parent's agriculture club support team	12.88	1.40
Providing guidance to students interested in post-secondary education in the agricultural sciences field.	14.25	0.85

Analysis of Teacher Interviews

Qualitative data was collected to identify challenges or barriers affecting teacher's accessibility to CPD programs, to profile teacher's perceptions on available CPD programs,

and to identify suggestions for improvement of CPD programs in relation to quality and accessibility. Fifteen selected teachers with five individuals representing each of the identified highest level of teacher education participated in the semi-structured virtual interviews.

Selected respondents answered three questions.

1. Is professional development important to you as a teacher and why?
2. What challenges do you have accessing professional development in Uganda?
3. What can be done to make professional development worthwhile?

Collected qualitative data was used to triangulate the results from the quantitative dataset, but most importantly, it was used by the researcher to comprehensively understand the phenomena being studied (Creswell, 2012).

Recorded responses from each participant were copied into Microsoft Word and later transferred into NVivo for thematic analysis. Consequently, collected qualitative data was analyzed and emerging themes recorded. In this section, 11 broad themes, 73 subthemes and several direct quotes for each question are presented. Direct quotes from participants are provided to enhance the understanding of responses for each question. Past research suggests that providing direct quotes helps a researcher in describing the identified themes and subthemes (Mukembo, 2017; Lester, 1999). To protect the respondent's identities, all names and other identifying characteristics were removed from the data transcript.

For question one, all respondents regardless of their highest level of education mentioned that continuous professional development was personally important to them giving reasons that are summarized in three broad themes and 20 subthemes. The identified themes

included skills development (pedagogical and professional skills), self-development (personal growth), and transferable benefits.

Skills Development

This theme consisted of two subcategories, pedagogical and professional skills development. Additionally, ten subthemes that were consistent across the three groups of participants were identified. These subthemes include effective learner engagement, effective teaching process (pedagogy), staying professionally abreast, classroom management, curriculum interpretation, lesson plan development, conflict resolution, motivation for service, problem solving skills, and fosters research. One of the participants mentioned that “professional development is important for a teacher because it can improve their teaching and learning skills. The teacher or educator will be able to engage learners effectively to make them have deeper and enduring learning”.

Another participant echoed:

Professional development is very important to me as a teacher as it helps me learn and develop new skills since new innovations, discoveries and knowledge are always coming up. For instance, the new curriculum requires refresher courses that lead to professional growth.

From all responses, participants placed strong emphasis on acquisition of pedagogical and professional skills when they attend professional development activities.

Self-Development

Participants agreed that professional development is vital for one’s career growth. Respondents mentioned that attending short-term and (or) long-term professional development activities can lead to teacher’s promotion at school highlighting that one can be

promoted from being a subject teacher to a class teacher, director of studies (DoS), deputy headteacher or a headteacher in their school or in another school. Subthemes include career growth, competence, confidence, credibility, commitment, and life-long learning. One respondent mentioned:

CPD is important especially in teaching because it gives one confidence, and the ability to handle and solve various challenges in teaching like effective content delivery and interpretation. It also helps in conflict resolution at the workplace. The fact that we are handling humans, it's inevitable for humanity to have conflicting ideologies. Therefore, as a professional, one is able to handle such conflicts between fellow workers or students before they can escalate into big problems.

And another teacher noted that “it's important, it helps me improve on my confidence, adds on my credibility by learning new skills”.

Transferable Benefits

All participants felt they acquired new and vital information when they attended professional development activities. They mentioned acquiring information related to educational technology, employment, promotion, and networking opportunities. A respondent mentioned:

It refreshes someone's mind. Knowledge is ever changing so one needs to get updated with new knowledge. Of course, if carried outside your place of work, it helps one network with others in the same field. Helps one get opportunities of promotion and also increase chances of employment.

For question two, respondents outlined challenges hindering them from accessing professional development activities. Respondents mentioned personal challenges, and structural challenges at the school administrative level and some that are at a national level. The identified challenges were organized in four themes and 26 subthemes. The themes

include accessibility, administrative and financial constraints, personal and technological constraints, and time constraints.

Accessibility

Participants outlined absence of a national CPD program or mandatory requirement of CPD training as one of the leading constraints to obtaining CPD. Other factors outlined include lack of continuity, long distances from training centers/institutions, inadequate skilled human resource to conduct CPD training, few accredited and recognized CPD institutions and programs, lack of online CPD programs, and teachers' failure to obtain information about the available CPD programs. One participant mentioned that "most of these professional development workshops are based in cities and towns leaving out us teachers in the rural areas, and coupled with financial and poor transportation, we fail to travel to those cities or towns for the workshop".

Administrative and Financial Constraints

Across the groups, participants highlighted challenges that were concentrated into the administrative and financial constraint's theme. These challenges include, low teacher pay, absence of funding for CPD activities from schools and the government, higher costs of advanced education, lack of financial support from school leaders, failure to obtain paid leave days for teachers seeking long-term CPD, and lack of scholarship opportunities for teachers. A respondent noted that "challenges of accessing professional development lie in high costs. It's not generally cheap to access it. Besides, working schedules may not welcome certain professional developments as both compete for the little available time". Another participant echoed that "the major challenges we have in Uganda in accessing professional development is

lack of institutional support especially in private schools for teachers to acquire professional development. For instance, supporting teacher with transport to attend workshops and seminars”.

Technological Constraints

Participants spoke of a number of personal and technological challenges that make it hard to obtain CPD. These challenges range from personal skills, teachers’ negative attitude towards CPD and financial inability. For this, respondents mentioned lack of smartphones and laptops or computers, not having clear goals on CPD among teachers, high internet costs, unreliable internet service especially in rural areas, inability to effectively use the World Wide Web and social media, computer illiteracy, and poor teacher attitude towards CPD activities as the leading constraints to attainment of professional development among their peers. A participant narrated that “some teachers do not have smartphones and yet now days a lot of information is passed on through social media, and this is worse for the colleagues in rural schools with network unreliability”. And another participant noted “some professional development workshops need us to pay for them, which is a challenge to many of us”.

Time Constraints

Participants outlined several time factors that hindered them from attending CPD programs in Uganda. They mentioned the long distance between them and educational centers or venues where training is often organized as the leading time constraint. Respondents further echoed CPD not being allocated official time in their school timetables and conflicting schedules between CPD activities and school programs as the other time constraints towards attaining professional activities. A participant noted that “long distances to reach educational centers and the limited number of professional development educators is a big constraint”.

Another participant highlighted that “training courses for teachers are not common in Uganda”. Many teachers agreed that the outlined constraints hinder them from attaining professional development in Uganda.

For question three, respondents highlighted strategies at individual, school, and national level that can be implemented to make acquisition of professional development among Ugandan secondary agricultural education teachers a success. Respondents mentioned that institutionalization and operationalization of CPD programs or activities by the Ministry of Education and Sports (MoES) will be the major influence towards having teachers attend CPD programs or events. They also believe that having school leaders support CPD programs, coupled with teachers developing their own personal interests in attending these programs, will help make CPD activities worthwhile throughout the country. The identified solutions towards implementing success CPD program in Uganda were organized in three themes including, institutionalization of CPD programs, administrative support, and personal initiatives.

Institutionalization of CPD programs

Most respondents emphasized that institutionalization of CPD programs in Uganda by MoES will be the major driver towards making teacher professional development a reality. One of the participants echoed that “participation of teachers in CPD activities needs to be made a requirement for teachers to take professional learning seriously”. Another participant spoke about the need to have “well programmed CPD activities as opposed to ones which come as a surprise”. Furthermore, participants reported that information about training activities is circulated and received by teachers a few days before the actual event takes place.

With this, respondents said that requesting for permission and for financial support from their school administration in a few days, especially during the school term, is almost impossible. Because of the highlighted challenges, respondents proposed the following solutions, blocking off a specific time for CPD programs during the school calendar year, having mandatory CPD requirements for the teachers, sensitization of teachers about the benefits of CPD and their available training opportunities, decentralization of CPD programs, introduction of in-service teacher training courses, introduction of online training programs, training of teachers based on need, making CPD programs free and lowering the cost of CPD programs, scheduling of CPD programs during the holiday (school breaks), government of Uganda and development agencies provide financial support for CPD activities, utilization of media to provide CPD programs, conducting of practical trainings instead of abstract training, and provision of scholarship opportunities for short-term and long-term CPD programs. A respondent had this to say about institutionalization of CPD programs:

Making well programmed CPD training as opposed to activities which come as a surprise is important. This will enable those (teachers) willing to better themselves to make all necessary adjustments such that they can attend. They will be able to ask for permission in time from their employers. Additionally, lowering the cost of professional development training is paramount. Better timing especially in holidays. It's able to capture reasonably an excellent percentage of the targeted teachers.

Another respondent emphasized the need to decentralize CPD to reach schools in the rural settings too. Many participants agree that today, most programs are organized in urban centers or major towns which makes teacher attendance quite expensive, especially if not supported by their school leaders.

Attitude of Importance for Teachers and School Leaders

Another key solution highlighted by respondents was administrative support. Teachers mentioned that they recognize the importance of, and need to attend, teacher training programs but little can be done without support from their schools. Many alluded that teachers today receive a “very small salary”, and some only receive a “small teaching allowance” (early career teachers), and that this makes it financially difficult to attend these trainings which are often organized in faraway towns or cities. They echoed that a teacher needs to find money for transport costs and for participation and lodging fees, which makes the training expensive to them. Respondents agree that having financial support from school administration would help facilitate their participation. The other key solution pointed out was communicating about training opportunities through school leaders and administrators. Participants agreed that doing this would help the “non dotcom” teachers, or those not on social media platforms, to access the shared information. Direct communication with school leaders would also help teachers get financial support and permission to attend teacher training programs from their school administrators. One participant noted that “information about these workshops should be communicated to school administrators so that the so-called ‘non-dotcom’ teachers can as well access the information and prepare for the workshops”.

Additionally, participants suggested various administrative measures to address the challenges identified. These measures included subsidizing the cost of personal computers or implementing a school-based hire purchase mechanism to improve access to personal computer. Participants also emphasized the importance of school leaders mandating attendance of continuing professional development (CPD) trainings for teachers, offering better remuneration to enhance motivation, promoting teachers based on professional merit, enforcing teacher

employment policies, implementing monitoring and evaluation tools at the school level, addressing corruption among school officials and Ministry of Education and Sports (MoES) officials, implementing motivational schemes, and organizing teacher training workshops at the school level. These suggestions reflect the participants' perspectives on possible solutions to improve the education system. A participant emphasized the point of teacher sensitization and mandatory attendance of CPD training saying:

Some teachers need to be made to know deeply the value of professional development for their teaching work so that they can take CPD more seriously whenever they learn about it. Today, some teachers just ignore these professional development workshops even if they are nearby and free, thinking that they don't need the training.

Personal Initiatives

All interviewed participants referenced the importance of making positive personal initiatives towards acquiring professional development for oneself. Teachers mentioned initiatives such as personal savings towards professional growth, embracing digital literacy, aiming to attain advanced education, and utilization of the world wide web and social media (internet) for professional development. Respondents agreed that teachers implementing their own strategy(ies) for their own professional growth is very key. Two respondents echoed that “teachers should block off specific time for personal continued professional development, and that teachers should endeavor to go for upgrading courses to acquire new skills and knowledge in teaching effectively in line with the current requirements”.

Teachers agreed that today, many teachers have not “prioritized lifelong and continuous learning as a part of their teaching profession” and suggested the need to “have mentoring and coaching arrangements of newly qualified teachers conducted by senior teachers to nurture them professionally.”

Chapter Summary

This chapter presented the quantitative and qualitative datasets addressing the study's research objectives. The quantitative survey collected data on teacher's subject content proficiency, their perceived pedagogical/technical competences, their perceived quality of CPD programs in Uganda, and profiled their personal biodata. The interview section collected qualitative data on selected teachers' viewpoints about the importance of professional development, the challenges teachers face when trying to access professional development in Uganda and lastly, their proposals for making professional development worthwhile.

All participants were current Ugandan secondary agriculture education teachers in rural (33%), peri-urban (44%), and urban (23%) settings. Fifty-two useable responses out of 71 attempts were used. A profile of a secondary agriculture teacher was developed. The average years of teaching experience for participants was 3.7 years, 81% of participants had their highest earned degree in agricultural education, and the majority of agriculture teachers were male (88.5%) teaching almost all the agriculture education areas of study. Soil science was taught by 18% of participants, farm tools and equipment by 17% of participants, crop science by 16% of participants, animal science by 16% of participants, agricultural economics by 15% of participants, and 2% of participants taught non-related agricultural content.

Additionally, 17 key areas of CPD activities were identified and ranked according to teachers' perceived interest of attending these trainings. Training in subject content areas was ranked highest ($M = 4.38$), closely followed by training in project development, competency-based learning, and personal management ($M = 4.37$). Furthermore, all participants agreed that the available CPD training courses are of high quality and met their expectations ($M =$

4.25) and lastly, most of the agriculture teachers involved were at a developing level (67.3%) regarding subject content proficiency.

With qualitative data, responses from interviews were analyzed to identify emerging themes. Themes and teacher responses were outlined for each question. Three themes were developed for questions one and three, while four themes were developed for question two. Identified themes for question one included skills development, self-development, and transferable benefits. For question two, identified themes included accessibility, administrative and financial constraints, technological constraints, and time constraints. Lastly, for question three, the identified themes included institutionalization of CPD, attitude of importance for teachers and school leaders, and personal initiatives. These themes were enhanced with unidentifiable direct quotes from interviewees.

CHAPTER FIVE

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

Purpose

The purpose of this mixed methods study was to identify existing professional needs among secondary agricultural education teachers in Uganda. This was investigated using five research objectives:

1. Profile the educational background of Ugandan secondary agricultural education teachers.
2. Identify the kind of continuous professional development activities that Ugandan secondary agricultural education teachers participate in.
3. Assess the perceptions of Ugandan secondary agricultural education teachers towards the available CPD programs.
4. Establish the level of subject content knowledge among majority of Ugandan secondary agricultural education teachers.
5. Determine if pedagogical gaps exist among Ugandan secondary agricultural education teachers.

With the completion of quantitative and qualitative data analysis, this chapter integrates all the collected data to reach conclusions about the study's objectives and provide future research recommendations along with practical considerations for continued professional development among Ugandan secondary agriculture education teachers. As such, this chapter is

divided into two key sections with several subsections. Section I: Conclusions, implications and recommendations for each research objective, and Section II: discussion of key findings.

As noted by Lincoln and Guba (1985), the findings from this study are not generalizable beyond the involved participants, but they could be transferable to other secondary agriculture education teachers with similar experiences.

Conclusions, Implications and Recommendations

Objective One

Fifty-two Ugandan secondary agricultural education teachers participated in this study with majority being male teachers and having their highest degree in agriculture education. Data was collected from agriculture education teachers representing a wide range of teaching experience, educational backgrounds, and from the five geographical regions of Uganda. The average respondent was a male teacher with a bachelor's degree in agricultural education, 3.7 years of teaching experience, and teaching at either O-level or A-level in rural, peri-urban, and urban schools in Central Uganda. Evidently, diploma holder participants majorly taught at O-level and in rural schools while teachers with a bachelor's degree mainly taught at A-level and majorly in peri-urban schools, and master's degree holders mainly taught at A-level and none of them taught in a rural school. Lastly, half of the female participants had a bachelor's degree and taught in rural schools.

Objective Two

Data on teachers' participation in CPD trainings and provision of CPD by schools, and teachers interests in attending listed CPD activities was collected. Majority of teachers indicated participating in at least one CPD training in an academic year mainly offered by their schools. On average, participants ranked attending CPD training on subject content areas such as crop science, animal science, farm tools etc. the highest followed by training on competence-based learning, project development and personal management. In the same regard, all participants ranked CPD training on curriculum mapping the least followed by training on student leadership development, formative and summative assessment training, and DIT courses, assessment, and certification training. Unquestionably, teachers with different levels of highest education had varying preferences for attending the listed 17 CPD training areas. For example, teachers with master's degree ranked training on Collaborative teaching the highest and personal management the lowest. Teachers with a bachelor's degree ranked training on personal management and educational technology the highest. Training on curriculum mapping was ranked the lowest by teachers with a bachelor's degree. Similarly, teachers with a diploma ranked training on the new lower secondary curriculum and development of activities of integration and their rubrics the highest. These teachers ranked training on curriculum mapping the lowest. These differences in preference for the listed CPD training areas indicate that teachers with different levels of education have different CPD needs. Consequently, when organizing training workshops or activities, organizers need to conduct needs assessments for their target agricultural education teachers as a way of identifying their actual CPD needs instead of offering generalized training.

Additionally, performance of one-factor ANOVA analysis, and a Post Hoc analysis showed significant difference in interest towards attending CPD trainings between teachers with different levels of higher education. Teachers with a master's degree expressed a higher interest in attending CPD trainings followed by teachers with a bachelor's degree and lastly those with a diploma. With these differences in the level of interest in attending CPD activities or programs, it is understandable that during interviews, participants proposed the institutionalization and operationalization of professional development, sensitization of teachers about CPD activities or programs at school and national level and making CPD acquisition by teachers mandatory when asked about what needs to be done to make continued professional development in Uganda worthwhile.

Teachers' thoughts on institutionalization and operationalization of CPD programs in Uganda align well with MoES' prospects about teacher professional development. According to MoES (2017b), the ministry of education and sports published the Continuous Professional Development (CPD) Framework and Costed Implementation Plan document aimed at providing "a clear structure for organizing and managing CPD within the country so that it contributes more effectively to improvements in teaching and leadership quality." Though not currently operational, this framework lays out strategies for in-service teacher training including conducting of short-term trainings like workshops, seminars, conferences, and short-term courses geared towards addressing identified teacher needs.

Recommendations for Objective Two

Operationalization of the CPD Framework and the National Teacher Policy

There is an urgent need to operationalize the Curriculum Professional Development framework and the National Teacher Policy in Uganda. With this, the Ministry of Education and Sports will achieve its documented aims of having:

A clear structure for organizing and managing CPD within the country so that it contributes more effectively to improvements in teaching and leadership quality; and professionalizing of the teaching profession to levels comparable with other professions like medical, engineering, legal, and accounting among others” (MoES, 2018, 2017b).

Objective Three

Objective Three sought to identify teachers’ perceptions on the quality of CPD programs in Uganda. Results from the survey indicated that all participants thought that available CPD programs are of high quality. Evidently during quantitative data collection, teachers with a bachelor’s degree highlighted that available CPD programs are of low quality while those with a master’s degree and diploma viewed the available CPD programs as of high quality. ANOVA and Post Hoc analyses indicated statistically significant differences on mean scores obtained by the three groups of education. Surprisingly, during teacher interviews, teachers regardless of their level of education seemed to agree that available CPD programs are of “poor quality”. Most teachers mentioned quality of CPD as one of the hindrances towards acquiring or attending professional training in Uganda. These teachers mentioned that CPD training should be based on teachers’ needs which is not the status. Today, many schools have ad hoc and broad-based CPD programs in form of workshops and seminars, mainly organized at the beginning of the school year or at the beginning of each academic term (TISSA, 2013). Teachers also expressed concerns on the limited number of

professional development service providers, having inefficient CPD programs, and the absence of training workshops where teachers are trained and introduced to professional ethics, necessary for their teaching profession.

This far, it can be concluded that majority of Ugandan secondary agricultural education teachers preferred in-person and hands-on CPD training offered before the first day of each academic term or offered during the term holidays (school breaks). Like Knowles (1980) notes, adult learning such as teacher CPD is a self-directed and goal-oriented activity influenced by unique characteristics, for example teacher's age, experiences, roles, and responsibilities. With these characteristics coupled with future adult roles, adult learners including teachers develop an independent self-concept that directs their own learning and therefore participate in learning that is meaningful, worthwhile and aligns well with or is related to their current and future roles before they commit time and other resources to it (Njenga, 2022; Lawler, 2003;). As such, it is important that organizers of CPD trainings schedule such CPD activities while putting into consideration teachers' preferences on time availability and format of delivery. This is because, teachers as adult learners are motivated to participate in CPD by its timing, content, and learning methods, and "learn best when their learning is active, interactive, and relates to their social roles" (Njenga, 2022; Knowles, 1980).

Recommendations for Objective Three

Delivery and Timing of Professional Development Trainings

Results indicated that teachers prefer attending in-person and hands-on based workshops and seminars with other teachers of agriculture conducted on a series of agricultural topics away

from their school. Teachers also indicated that CPD training should preferably be organized during the school term holiday or before the first day of each academic term. Based on this conclusion, we recommend that organizers of CPD training take into consideration teachers' preferences as a way of promoting uptake and attendance of organized CPD training activities across the country. As noted by Knowles (1980), adult learners including in-service teachers view continuous professional development activities as self-directed and goal-oriented activities. Therefore, it is crucial that organizers of CPD training understand teachers' preferences regarding when, how and where the training should be conducted. Past research indicates that this is important in diffusing teacher CPD in Uganda which is currently an innovation or a new educational practice (Njenga, 2022; Rogers, 2003).

Objective Four

This objective profiled the perceived level of subject content knowledge among secondary teachers of agriculture education. A modified JMALI instrument was administered to achieve this objective. It was found that most participants were at the developing level, some were at the factual literate level and only one was proficient. The only proficient teacher had a bachelor's degree as their highest level of higher education. A Pearson correlation analysis was performed to evaluate the relationship between obtained JMALI scores and scores obtained on teachers' perceived level of subject content proficiency. There was a positive moderate relationship between the two variables among teachers with a degree and a negative moderate relationship between the two variables among teachers with a master's degree.

With this finding, it can be concluded that participants had lower scores on the JMALI instrument and higher scores on their perceived level of subject knowledge. However, teachers with a master's degree had a higher rating (scores) of themselves on their perceived level of subject content knowledge but obtained very low scores on the JMALI instrument, which measured their actual subject content knowledge proficiency compared to teachers with a diploma and a bachelor's degree. This discrepancy among scores on perceived knowledge and scores on modified JMALI instrument, though not conclusive due to the low population of participants with a master's degree, can be explained by Wabule (2016). In her study, she noted that CPD programs in Uganda tend to satisfy individual career needs of teachers rather than the need for acquiring skills and knowledge for improving the quality of education. Because of this, teachers of different subjects in Uganda, including agriculture education teachers, attain professional development in advanced education outside the education field with a primary focus on increasing their opportunities for promotion, getting a higher pay, or getting a job outside education. Wabule (2016) further noted that this occurrence is one of the setbacks affecting CPD programs in Uganda. Most participants in this study with a master's degree pursued a degree outside agriculture education or general education.

On the other hand, secondary agriculture education teachers might not be blamed for taking advanced education outside their discipline. A close look at websites of three major universities in Uganda (Kyambogo University, Makerere University, Uganda Christian University) showed that only one master's degree program was available and no doctorate program in agriculture education. The Master of Science in Agriculture Education and Extension (GAEE) course at Kyambogo University is the only program for advanced education in

agriculture education. However, one might question whether it is geared towards advanced skilling of teachers of agriculture if they looked closely at their undergraduate degree requirement for admission. A close look at the Kyambogo University website, revealed that applicant needs to have a second-class degree in Bachelor of Agriculture, Bachelor of Vocational Studies in Agriculture with Education, Bachelor of Environmental Science, Bachelor of Agricultural Land Use Management, or any other related field from a recognized institution to be admitted (Kyambogo University, 2023). With this degree requirement, it might not be shocking that the majority of GAEE graduates are employed outside teaching secondary agriculture education or work part time in the education sector as teachers.

Lastly, the persistent low pay among teachers might be the reason why teachers acquire CPD outside education. During teacher interviews, many participants mentioned low pay or poor earnings as their major challenge towards accessing CPD especially in advanced education. In the 2021/2022 fiscal year, the highly paid government employed science teacher received a monthly salary of UGX 1,210, 213 or USD 327, and this amount is much lower for the privately employed teachers (Ministry of Public Service, 2021). Truly, as rational actors and as observed by Njenga (2022), teachers invest in CPD while considering the expected benefits and costs of their choices. Consequently, low teacher remuneration, lack of administrative support, and higher costs of advanced education may force those that sacrifice to attain continuous professional development to acquire advanced degrees outside the teaching profession so they can expand their horizon and be employed by the higher paying government and non-government organizations or agencies.

Recommendations for Objective Four

Formation of a National Association for Ugandan Agricultural Education Teachers

There is an urgent need for secondary teachers of agriculture education to organize themselves into a national and strong teacher association. This association will be among other things, the national database for secondary teachers of agriculture education in Uganda, the mobilization and sensitization tool for agriculture teachers, the leader in assessment of teacher needs and organizer of necessary CPD trainings, and an advocacy organization for agricultural education. During teacher interviews, participants highlighted poor teacher remuneration, lack of administrative support, financial constraints, accessibility constraints, absence of a national CPD program, and poor teacher attitude toward CPD as the main challenges hindering their participation in CPD programs. Addressing these challenges requires a multifaceted strategic framework and the researcher believes that agricultural education teacher membership in a national organization might help solve half the challenges Ugandan secondary agricultural education teachers face today in their pursuit of CPD acquisition. This is because, world over, teacher professional organizations are recognized for their role in developing teachers' individual skills, knowledge, and expertise, and for being communities of practice and identity where individual teacher accomplishments are celebrated (Elsheikh & Effiong, 2018). Such organizations accomplish these goals through organizing low-cost annual conferences, workshops, and seminars infused with formal and informal learning opportunities. In addition, national teacher organizations offer educators a range of affordable or complimentary teaching resources, along with their efforts to secure financial support from stakeholders to facilitate teacher training programs. Moreover, these organizations contribute to the

advancement of teacher capabilities by providing scholarships that enable educators to participate in continuing professional development (CPD) programs and coordinate teacher competitions that acknowledge exemplary educators through diverse commendations and incentives. These initiatives collectively convey that the establishment of a national teacher organization represents a significant stride towards effectively addressing the challenges encountered by agricultural teachers in their quest for CPD training. However, as observed by Okiror et al., (2017), there has been many short-lived efforts of starting an association of agriculture teachers in Uganda but failed due to difficulties in mobilizing financial resources. To overcome this, the researcher suggests that teachers of agriculture education organize themselves into a national organization that is subscription-based with members paying monthly or termly or annual subscription fees as a way of fueling the operations of their organization. Indeed, many such organizations exist across the world with great examples including the National Association of Agriculture Educators (NAAE) and the American Association of Agriculture Educators (AAAE), both in the United States. These organizations “advocate for agricultural education, provide professional development for agricultural educators, and work to recruit and retain agricultural educators in the profession” (NAAE, 2023).

Objective Five

Objective Five aimed to identify pedagogical gaps among Ugandan secondary agricultural education teachers. The study utilized a questionnaire with 42 items divided into technical competences, teaching-learning competences, and program management competences. Results showed that participants rated teaching concepts and skills in crop production the highest among technical competences, while teaching concepts and biotechnology and biosafety

received the lowest rating. In teaching-learning competences, motivating students to learn was rated highest, while using multimedia equipment in teaching received the lowest rating. Among program management competences, teaching record keeping skills were rated highest, while developing a parents' agriculture club support team was rated the lowest. The study further analyzed CPD needs based on teachers' level of education, school location, and career stage. Differences were noted between the groups, with teachers holding a diploma or bachelor's degree expressing a higher need for CPD in teaching biotechnology and biosafety, and those with a master's degree expressing a higher need in farm tools and equipment. Analyses of perceived teacher competences and education level, as well as career stage, revealed no statistically significant differences. For instance, teachers with a diploma perceived themselves the same way teachers with a master's degree did and vice versa. Additionally, teachers with one year of teaching experience perceived themselves as good as those with more than 10 years of teaching experience. This occurrence might be explained by TISSA (2013)'s earlier observation of having generalized CPD training programs at school level and Wabule (2016)'s viewpoint that teachers always seek satisfaction of individual career needs rather than the need for acquiring skills and knowledge for improving the quality of their profession. This indicates that teachers across different educational levels and years of experience have similar perceptions of their technical competences. It can be concluded that the identified areas of low-rated competences highlight the teachers' needs for continuing professional development (CPD) training. Consequently, the researcher recommends that organized CPD programs should be tailored to teachers' identified needs. If done, this will impact teachers' professional abilities to

teach the new lower secondary curriculum and will improve the quality of Ugandan secondary agricultural education.

Recommendations for Objective Five

Quality of Professional Development Trainings

Currently, agriculture education teachers participate in several CPD training courses organized by various stakeholders across the country. However, participants in this study expressed the urgency to provide CPD training based on teachers' needs and making the trainings practical-based and infused with hands-on activities for teachers of agriculture. Conducting practical and experiential-based CPD trainings for agriculture teachers in this study's 17 identified CPD areas will help Ugandan agriculture teachers become adequately competent to teach the new competence-based agriculture curriculum.

Conducting CPD training on Subject Content Areas in the Agricultural Syllabus

Although NCDC is currently undertaking teacher training in pedagogical competences necessary for teaching the new curriculum, there is a need to train teachers on subject content knowledge, skills, and competences. A closer look at the new syllabus for agriculture education at lower secondary school shows that teachers are required to teach agriculture content areas/topics in which they might never had any prior training at college or university. Notable topics include aquaponics, hydroponics, financial services and money, value addition on agricultural products, biotechnology and biosafety in agriculture, and cooperatives and self-help groups (NCDC, 2019b). Unquestionably, teachers ranked highly attending content related CPD training in plant and animal biotechnology and safety, value addition, horticultural sciences,

production of perennial crops, and cooperatives and marketing of agricultural products. As such, it is important to provide secondary agriculture education teachers with the required subject content knowledge, skills, and competences in several areas. When done, this will be the surest way of making agriculture teachers competent and able to provide a quality agriculture education to their learners that is vital in the transformation of Uganda's socio-economic status.

Discussion

Findings from this study reveal that Ugandan secondary agricultural education teachers participate in CPD programs organized either by their schools or other stakeholders in the education sector. However, there is a contradiction in the teachers' perception of the quality of these CPD programs. While survey teacher responses indicate high-quality programs, interviews suggest the opposite. This inconsistency may be attributed to the absence of an operational CPD framework specifically designed for secondary school teachers, including those in agriculture education. Although the Ministry of Education and Sports in Uganda has published the Continuous Professional Development Framework and other key CPD policies and frameworks, such as the Harmonized Framework for Initial Teacher Training 2016, Competency Profile for a Secondary School Teacher 2016, National Teacher Policy 2018, and Competency Profile for Teacher Educators in Higher Institutions 2019, the delayed implementation of these policies restricts teachers' access to and engagement in continuous professional development. Consequently, professional growth opportunities will be limited to a few schools offering generalized CPD or to motivated teachers pursuing higher education. Additionally, CPD will remain privileged for well-connected teachers with access to ad hoc and generalized programs offered by organizations such as MoES, NCDC, teacher organizations, and NGOs.

Unfortunately, this situation poses a significant obstacle to the successful implementation of the new competence-based lower secondary school curriculum.

This curriculum emphasizes the need for teachers to possess technical competences and skills in various subject content areas such as animal sciences, crop sciences, farm tools and equipment, and farm structures as outlined in the new agriculture syllabus. Unlike in the old curriculum where teachers mostly used the “talk and chalk” method during the teaching-learning process, the new curriculum requires them to provide experiential learning opportunities to their students. This mandates teachers to teach by doing as students learn by doing too. For instance, instead of talking about and giving notes on production of broilers or vegetable growing which is/was the norm in the old curriculum, teachers are required to use active learning methods to provide knowledge, skills, and experiences to their learners. However, this study found that most secondary agricultural education teachers (67%) were at the developing level of subject content knowledge. Although actual applied technical competences were not measured in this study, at this developing level, an individual is aware of agricultural concepts but may not be able to apply their knowledge. Evidently, past research indicates that Ugandan secondary agricultural education teachers lack practical skills required to effectively teach practical-based content (Okiror et al, 2017). This means that teachers may have theoretical knowledge but struggle to apply it practically. To achieve the goals of the new curriculum, it is essential for teachers to acquire applied skills and technical competences, which can be accomplished through participation in high-quality and regular CPD programs. Therefore, the operationalization of the CPD framework and the National Teacher Policy is crucial and requires immediate attention.

The operationalization of a CPD framework has various benefits, including attracting government funding and support from donor agencies in education. It will also help in clarifying the roles of different stakeholders involved, such as school leaders, individual teachers, and teacher organizations like professional learning communities (PLCs). During interviews, teachers echoed that operationalizing the CPD framework, along with the National Teacher Policy, would enhance the value of CPD programs. This includes improved program planning and implementation, increased teacher attendance at training sessions, making CPD a mandatory requirement for continued employment, aligning training programs with specific teacher needs, receiving administrative support from school leaders, and ensuring decentralized, cost-effective, and accessible CPD opportunities for teachers regardless of their school location.

Recommendations for Future Research

The study's findings revealed that all participating teachers perceived the available CPD programs as being of high quality based on the survey results. Furthermore, in interviews, educators emphasized the positive impact of participating in these programs on their teaching careers. However, the same interviews also uncovered challenges faced by teachers in accessing CPD training, including the high cost, perceived low quality, inefficiency, lack of quality trainers, discontinuity, host centers being predominantly in urban locations, and poor planning and scheduling. This finding is contradictory, paradoxical, and inconclusive. Therefore, this revelation necessitates additional scholarly inquiry into the impact of Continued Professional Development (CPD) acquisition on the pedagogical proficiency and technical competencies of Ugandan secondary agricultural education teachers. In this short or longitudinal term comparative study involving two groups of teachers, one group frequently attending CPD

training and the other rarely participating in CPD training could provide valuable insights. Such insights could be specific benefits to teachers, effect on their teaching practices and student outcomes, and other specific areas of pedagogical skills and technical competences that are most affected by CPD acquisition. By identifying these areas, educational institutions and policymakers can tailor CPD programs to address the specific needs of teachers, ultimately enhancing the quality of education.

Additionally, the results from this study indicated that there were no statistically significant differences among the three distinct teacher groups based on their highest level of education, in terms of their perceived subject content knowledge and scores achieved on the JMALI instrument. Similarly, when comparing teachers according to their career stage, no significant differences were found. To gain more conclusive insights, it is recommended that further research be conducted utilizing an assessment tool specifically designed based on the new secondary school agriculture syllabus to evaluate specific subject content knowledge. This investigation should involve a substantial sample of secondary agricultural education teachers from all five geographical regions of Uganda. Such an endeavor would provide critical information and insights to CPD stakeholders, including the Ministry of Education and Sports (MoES), regarding the specific gaps that necessitate urgent attention to enhance learning outcomes for students pursuing agricultural education at the secondary school level.

Lastly, this study's findings revealed that there was no statistically significant difference in the perceived technical competences among teachers at different career stages (years of teaching) and with varying levels of highest education. This finding presents two possible interpretations. Firstly, it suggests that teachers in Uganda may possess comprehensive training,

although this notion contradicts several studies and publications (TISSA, 2013; MoES, 2019, 2018, 2017b, 2016). Secondly, it proposes that teachers, regardless of their experience, exhibit no significant disparities in their professional skills such as teaching, assessment, or learner motivation, a viewpoint that has been challenged through various avenues, including the analysis of student academic achievements in national examinations at ordinary and advanced levels (UNEB, 2022; UBOS, 2017). Considering this finding, a rigorous scientific study is recommended, focusing on specific technical competences as outlined by the new secondary school agriculture syllabus. This investigation should examine teachers' proficiency in performing specific tasks, such as operating agricultural machinery, cultivating specific crops, managing livestock, utilizing educational technology tools, adding value to dairy-based products, and constructing poultry housing structures.

Recommendations for Stakeholders

Enactment of Teachers Act

A lot of restructuring is currently happening at the ministry of education and sports in relation to operation of National Teachers Colleges in Uganda and Initial Teacher Education (ITE). Officials at MoES and its strategic donors/partners found it fit to restructure teacher training colleges into the Uganda National Teachers Institute (UNITE). According to MoES (2018), “The Uganda National Institute for Teacher Education (UNITE) shall be established as an Autonomous Organization to coordinate and provide all levels of teacher education ranging from Initial Teacher Training to Graduate Training and CPDs”. As such, UNITE was established with a major aim of helping teachers with lower qualifications (certificate and diplomas) in primary and secondary education attain degrees in teaching (MoES, 2018). However, due to the

delayed operationalization of the National Teacher Policy, commencement of in-service teacher training for Grade III and Grade IV teachers has been affected (The Independent, 2023). Results in this study indicated that Grade IV teachers (diploma holders) were mostly at the developing level and obtained low JMALI scores regarding subject content proficiency when compared to teachers with a bachelor's and master's degree. With this revelation, the researcher recommends that the government and parliament of Uganda quickens enactment of the Teachers Act in Uganda to facilitate operationalization of the National Teacher Policy and funding of its planned activities towards continuous professional development. As suggested by MoES, this will provide a clear structure for organizing and managing CPD within the country so that it contributes more effectively to improvements in teaching and leadership quality.

Update of Initial Teacher Training Curricula

According to MoES (2016), curriculum changes at the lower education levels, assessment practices and Continuous Professional Development (CPD) are not informing teacher training practices and vice versa. Since 2020, MoES through the National Curriculum Development Center (NCD) has been implementing the new lower secondary curriculum with the pioneer students completing the ordinary level in 2024. Although NCDC has conducted CPD trainings for in-service teachers since January 2020, there is an urgent need to revise and update the teacher training curricula at colleges and universities so that pre-service teachers are trained in the intricacies of the new competence-based curriculum. With this new curriculum, an agricultural educator is required to be a facilitator, a veterinary technician, a masonry, a carpenter, a writer, a youth trainer, community organizer and a program manager. Fortunately, results in this study indicated that teachers have 17 areas of CPD training interests or needs.

These results can be used by agricultural education teacher educators to update their contemporary pre-service teacher training curriculum. Doing this will enable teacher graduates to have the required knowledge, skills, values, and competences to teach this curriculum.

The process of revising pre-service teacher curricula could be spearheaded by the Teacher Instructor Education and Training (TIET) of MoES, the National Council for Higher Education (NCHE), and Kyambogo University. Additionally, teacher training colleges and universities need to establish partnerships with schools, organizations, and industry. These partnerships will provide pre-service teachers with real-world experiences necessary for teaching a competence-based curriculum.

Programming of CPD Activities at a National Level

During teacher interviews, participants indicated lack of program continuity, poor timing, and long distances as barriers to accessing available CPD programs. To overcome these barriers, there is a need by the Teacher Instructor Education and Training (TIET) of MoES to identify teacher training opportunities in Uganda provided by several stakeholders and have these included in the national secondary schools' academic calendar produced by the ministry of education and sports. Having this done, will give teachers and school leaders an opportunity to know in advance about these CPD programs and prepare accordingly. Additionally, TIET needs to identify teacher associations with teacher training initiatives to enhance their capacity to provide quality in-service teacher professional development. Capacity development of teacher associations can be done by development partners involved in education too.

School-Based CPD Activities

Past research indicates that providing school based CPD training in the form of workshops and seminars on specified topics led to professional improvement among teachers (Okiror et al., 2017). As such, it is important that school leaders allocate funds to facilitate provision of CPD training to their teachers. Budget allocations will ensure provision of regular and relevant CPD training opportunities offered in a variety of formats: in-person workshops, online courses, virtual webinars, and collaborative learning experiences with other teachers across the globe. It is also important that school leaders empower their directors of studies (DoS) or deputies in charge of academics to conduct in-class teacher observations, conduct surveys and assess teacher needs, and recommend needs-based professional development for their teachers. Regarding teachers, school leaders need to encourage them to join professional learning communities or teacher associations, participate in collaborative learning, peer evaluation, joint lesson planning and teaching, and collaborative projects. This will foster a culture of sharing resources and learning best teaching practices among teachers within and across schools. In addition, school leaders need to provide incentives and recognition to celebrate teachers' professional growth and achievements, they also need to provide a platform for mentorship and coaching of less experienced teachers and need to invest in resources and infrastructure such as learning materials and educational technology. Lastly, it is vital that school leaders provide paid leave to teachers seeking further education.

Chapter Summary

This chapter presented findings, implications and recommendations addressing the study's research objectives. The use of a mixed methods approach allowed a comprehensive

study of a rather complex topic of continuous professional development in Uganda. Below is a summary of key conclusions, implications, and recommendations.

First, it was concluded that agriculture education at secondary school level is offered by rural, peri-urban, and urban schools. Most agriculture teachers are male with either a bachelor's degree or diploma in agriculture education and had 3.7 years of teaching experience. These teachers participate in at least 2.5 CPD trainings in an academic year offered at school or away from school. Regarding subject content knowledge, most teachers were at the developing level with only one proficient participant identified.

With many participants at the developing level when assessed on the modified JMALI instrument, it is imperative that in-service teachers participate in as many of the 17 CPD activities as possible. Participating in further CPD training will provide teachers with the necessary skills and competences to competently teach the new lower secondary agriculture curriculum. However, for this to be realized, the researcher recommends that the National Teacher Policy (2018) and the Curriculum Professional Development framework are operationalized and funded by the Ugandan government. Additionally, colleges and universities need to update their pre-service teacher training curricula, schools need to mobilize resources to provide school-based CPD trainings to their teachers, and arguably more importantly, teachers need to form a subscription-based association to drive professional development among its members. A combination of these recommendations will lead to professional improvement among teachers of agriculture and in turn lead to achievement of high academic outcomes among learners regardless of their school locality in Uganda.

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APPENDICES

Appendix A

MSU-IRB Approval

Appendix A. MSU-IRB Approval

Protocol Detail Report

Printed By: Kibirige, Brian
4/25/2023 11:04:34 AM

Report Comments

Protocol Information

Version # 1

Reference Number:	769
Protocol Number:	2023-769-EXEMPT
Protocol Title:	Continued Professional Development among Secondary School Teachers of Agricultural Education in Uganda, a case study.
Protocol Type:	Original
Principal Investigator:	Kibirige, Brian
Approval Date:	4/25/2023
Submittal Date:	4/19/2023
Effective Date:	4/25/2023
Author:	Kibirige, Brian
Renewal Date:	4/25/2028
Status:	Approved
Next Review Date:	4/25/2028
Inactive Date:	
Expiration Date:	4/25/2028

Protocol Information	1
Definition of Human Subjects Research	1.1
Only human subjects research studies require IRB review. If you have questions about whether your work qualifies as human subjects research, contact the IRB Office at 406-994-4706 or irb@montana.edu for determination assistance.	
Human Subjects Research Qualification	1.2
Does the intent and scope of your proposed study meet the definition of human subjects research?	
<input checked="" type="checkbox"/> Yes	
<input type="checkbox"/> No	
<input type="checkbox"/> Unsure - determination assistance requested	
Yes	1.2.1
No	1.2.2
Unsure - determination assistance requested	1.2.3
Exempt Review	1.3

Use this form for research studies that will be reviewed at the *Exempt* level in accordance with 45 CFR 690.104(d).

>Some topics or methods are typically NOT eligible for Exempt Review - See Review Level Determination.

>Do not use this form for research that falls into an Expedited or Full Committee Review (FCR) category. See Types of Review.

>For students: Only certain in-class projects require IRB review. See Student Research and Class Projects.

Appendix B

GUREC Approval

Appendix B. GUREC Approval



22/06/2023

To: Brian Kibirige

Montana State University
 4065953245

Type: Initial Review

Re: GUREC-2023-590: Continued Professional Development among Secondary School Teachers of Agricultural Education in Uganda, a case study.

I am pleased to inform you that at the 99th convened meeting on 04/05/2023, the Gulu University REC meeting voted to approve the above referenced application.
 Approval of the research is for the period of 22/06/2023 to 22/06/2024.

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of 22/06/2024 in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Gulu University REC:

Appendix C

Informed Consent

Appendix C. Informed Consent

INFORMED CONSENT DOCUMENT (Version 2.0)**Title of the study: Continued Professional Development among Secondary School Teachers of Agricultural Education in Uganda, a case study.****Investigator(s):** Brian Kibirige**Graduate Committee**

1. Dr. Dustin Perry
2. Dr. Carl Igo
3. Dr. Tena Versland

Institution: Montana State University**Introduction**

The purpose of this study is to identify the existing professional needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda. The research population is secondary agricultural education teachers in Uganda and the sample population will include 40 Ugandan teachers purposively selected. Participants will take *30 minutes* answer four sections in this survey tool. The sections include the modified Judd-Murray Agricultural Literacy Instrument (JMALI) for content proficiency, the pedagogical section, the demographic section, and the professional development needs assessment form, and lastly respond to a one-on-one open interview. To do so, the researcher will visit each participant at their school and have them fill the survey and respond to the open interview questions. The researcher will use Qualtrics and Excel to analyze the collected data. All these activities will occur in Uganda in the 2023 summer (June-July). Participation in this research is voluntary.

A brief description of the sponsors of the research project

This study will be done to fulfil the academic requirements for the award of a master's degree in Agricultural Education at Montana State University. Because of this, this research is sponsored by Mr. Brian Kibirige, a graduate student at Montana State University.

Purpose:

The purpose of this study is to identify existing professional needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda. This study is being led by Brian Kibirige, Graduate Student in the Department of

Agricultural and Technology Education at Montana State University. The Faculty Advisors for this study are Dr. Carl Igo, Professor in the Department of Agricultural and Technology Education, Dr. Dustin Perry, Professor in the Department of Agricultural and Technology Education and Dr. Tena Versland, Professor in the department of Education at Montana State University. Information obtained from this study will be beneficial in informing education policymakers, teacher educators, school leaders and the other stakeholders in education about the existing professional needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda. Lastly, recommendations from this study might be used to implement a successful Continuous Professional Development program for teachers of agricultural education and other subject teachers in Uganda.

Procedures:

The research population is secondary agricultural education teachers in Uganda and the sample population will include 40 Ugandan teachers purposively selected. Participants will answer a survey with four sections, the modified Judd-Murray Agricultural Literacy Instrument (JMALI) for content proficiency, the pedagogical section, the demographic section, and the professional development needs assessment form, and lastly respond to a one-on-one open interview. In June and July 2023, the researcher will visit each participant at their school and have them fill the survey and respond to the open interview questions. This meeting will take less than *30 minutes*. The survey will be online, and participants will respond to it using the researcher's computer or their personal gadgets.

Risks/discomforts:

There are no foreseen risks or costs associated with your participation in this study. The only risk or discomfort will be the inconvenience in terms of time spent during the interview. Participation is voluntary, and **participation or non-participation will not affect your teaching job**. If you agree to participate, you will be asked to complete this informed consent and asked to answer the online survey and respond to the one-on-one open interview session with the researcher.

Benefits:

Results from this study will be used to inform education policymakers, teacher educators, school leaders and the other stakeholders in education about the existing professional needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda. Furthermore, recommendations from this study might be used to implement a successful Continuous Professional Development program for teachers of agricultural education and other subject teachers in Uganda. Lastly, on completion of this study, the researcher intends to share study findings with all participants and other agriculture teachers in various agriculture education communities of practice.

Confidentiality:

In this study, no personal identifiable data shall be collected. Any collected data in this study will remain anonymous and confidential. Information obtained will only be accessible by the research team. Online copies of the data will be hosted on a secure Qualtrics platform and Excel program protected by password and any hard copy files obtained will be kept under lock and key. Confidential information will only be accessed by the principal investigator.

Statement of voluntariness:

Participation is voluntary, and **participation or non-participation will not affect your teaching job**. You do not have to participate in this study if you are not interested. You will not lose any benefit in case of no participation.

You can choose not to answer any questions you do not want to answer and/or you can stop participating in this research at any time without any penalty or consequence. If you agree to participate, you will complete a survey to explore the existing professional needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda. All responses will be anonymous and confidential.

Questions:

If you have any questions related to the study as a research participant, you can contact the principal investigator, Brian Kibirige on telephone number 0789-608268 or via email on bkryan090@gmail.com or brian.kibirige@montana.edu

If you have any issues pertaining to your rights as a human subject involved in this study, please contact the Chairperson, Gulu University Research Ethics Committee, Dr. Gerald Obai Tel: No., 0772305621; email: lekobai@yahoo.com or lekobai@gmail.com ; or contact Uganda National Council for Science and Technology, on plot 6 Kimera road, Ntinda, Kampala on Tel 0414705500.

Statement of consent

.....has described to me the entire research process, the risks and benefits involved, and my rights as a human participant in this study. I understand that my decision to participate in this study will not affect me in any way. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

Participant's Name

Participant's SignatureDate

Researcher's Name.....

Researcher's SignatureDate.....

Appendix D

Data Collection Tool

Continued Professional Development among Secondary School Teachers of Agricultural Education in Uganda, a case study.

Survey Instrument Part I (Modified JMALI) – Content Proficiency

- Determine if the statement is true or false: *Sustainable agriculture is the practice of producing food, fiber, and fuel in a way that is profitable to the producer, supports quality of life, and protects natural resources.* 1.12.E₁
 - The statement is true
 - The statement is false

- Drag and drop the natural resource into the box with the corresponding sustainability practice.

1.12.L₂

- Water
- Soil
- Air

Selecting drought-tolerant crop species

Using a methane digester

Reduce tillage

- Select all examples of sustainable agricultural practices. 1.12.P₂
 - Unregulated water use
 - Intensive grazing along stream banks
 - Continuous planting of the same crop
 - Eliminate or reduce soil tillage
- Determine if the statement is true or false: *The inspection of meat and poultry for wholesomeness, is mandatory in Uganda.* 2.12.E₂
 - The statement is true
 - The statement is false

- Match the name of the production system with its appropriate description. 2.12.L₂

Production System

Local food system

Description

Consumers share the benefits and risks of food production by purchasing shares of a farm operation.

Community-supported agriculture	The prevailing agricultural production system uses technological innovation for maximum efficiency.
Organic food system	Food produced, processed, and distributed in a limited geographic area often connects farms and consumers at the point of sale.
Conventional food system	Production promotes biodiversity, food is grown and processed using little or no synthetic fertilizers or pesticides.

6. Farmers and traders must abide by animal welfare laws in Uganda. Select all the laws that must be observed by livestock farmers and traders in Uganda. *2.12.P2*
- Animal diseases Act
 - Prevention of animal cruelty act
 - Control of Bee Diseases Act
 - Agricultural Chemicals Act
7. Interpret the information given on this food label. Match the correct answer with the correct description. *3.12.E1*



<i>Items</i>	<i>Description</i>
120	Grams of protein in 1 serving
2%	Percent of the daily requirement of Calcium per serving
6	Number of calories per serving
33	Number of servings in this package

8. **Select all** processed foods. *3.12.L₂*
- Chocolate
 - Banana
 - Groundnut powder
 - Maize Flour
 - Yogurt
9. **Select all** the marketing terms used to influence consumer choices. *3.12.P₂*
- Antibiotics-free
 - Non-vaccinated
 - Cage-free
 - Non-GMO
10. Determine if the statement is true or false: *An adequate global food supply depends on the continued development and appropriate use of science, technology, and engineering.* *4.12.E₂*
- The statement is true
 - The statement is false
11. **Select all** the following technologies that are frequently used in agricultural production systems. *4.12.L₂*
- Unmanned aerial systems (drones)
 - Robotics
 - Global positioning systems
 - Cloning
12. Which of the following practices benefits from using precision agriculture? *4.12.P₂*
- Wildlife levels
 - Determining topsoil depth
 - Variable-rate pesticide application
 - Animal stocking rates
13. Determine if the statement is true or false: *The geographic location of your food source plays a part in determining the price of the food.* *5.12.E₂*
- The statement is true
 - The statement is false
14. **Select all** factors that affect a country's production and distribution of food. *5.12.L₂*

- Economics
- Geography
- Population size

15. **Select all** the following jobs related to agriculture. *E.12.P₂*

- Bioengineer
- Biologist
- Mechanic
- Teacher
- Nutritionist

Survey Instrument Part II: Pedagogical Competency**Please rate your perceived level of competence in the listed pedagogical areas**

	Far below average	Somewhat below average	Average	Somewhat Above average	Far Above average
Technical Competency					
1. Teaching concepts and skills in horticultural sciences					
2. Teaching concepts and skills in soil science					
3. Teaching concepts and skills in farm tools, equipment and implements					
4. Teaching concepts and skills in horticultural sciences					
5. Teaching concepts and skills in crop production i.e. cereals, root crops, legumes					
6. Teaching concepts and skills in animal sciences (poultry, rabbits, pigs, goat, cattle)					
7. Teaching concepts and skills in perennial crops production					
8. Teaching concepts and skills in animal feed conservation					
9. Teaching concepts and skills in agribusiness, financial services, and commercial agriculture					
10. Teaching concepts and skills in farm buildings and structures					
11. Teaching concepts and skills in value addition or food processing					
12. Teaching concepts and skills in animal and plant biotechnology & biosafety					
13. Teaching concepts and skills in cooperatives & marketing of agricultural products					
14. Teaching about agriculture's relationship with the environment					
15. Teaching concepts about Uganda's land tenure system					
Teaching-Learning competences					
16. Motivating students to learn					
17. Teaching students to think					

critically and creatively				
18. Managing student behavior problems				
19. Teaching disabled students				
20. Teaching students problem-solving and decision-making skills				
21. Organizing and supervising teaching activities in & outside the classroom setting				
22. Developing appropriate student learning activities				
23. Teaching using computers				
24. Using multimedia equipment in teaching				
25. Developing activity of integration worksheets				
26. Assessing and evaluating student performance using the new assessment grid				
27. Planning and conducting student field trips				
28. Conducting needs assessment to determine the courses to teach				
29. Integrating life skills into the agriculture curriculum				
30. Developing relationships with fellow teachers and administrators				
Program Management competences				
31. Developing supervised agricultural education opportunities for students				
32. Developing an active agriculture education club				
33. Teaching record keeping skills				
34. Developing a variety of curriculum-based school-to-work activities				
35. Providing career exploration opportunities in the agriculture sector				
36. Teaching about public issues related to agriculture				
37. Organizing school exhibitions for student projects				

38. Supervising student projects				
39. Organizing fundraising activities for the school agriculture program				
40. Determining the content that should be taught in a specific course/topic				
41. Developing a parents' agriculture club support team				
42. Providing guidance to students interested in post-secondary education in the agricultural sciences field.				

Survey Instrument Part III- Professional Development Needs Assessment

1. On average, how many professional development trainings do you attend in an academic year?
 - none
 - 1 or 2
 - 3 or 4
 - 5 or more

2. How many professional development trainings have you attended this academic year?
 - none
 - 1 or 2
 - 3 or 4
 - 5 or more

3. Does your school offer any professional development trainings?
 - Yes
 - Not
 - I'm not sure

4. Have you participated in any professional development trainings offered by the National Curriculum Development Centre (NCDC) after the introduction of the new lower secondary school curriculum?
 - Yes
 - Not
 - I'm not sure

Please rate how much you agree with the following statements regarding the professional development trainings you attended this year.

	Strongly disagree	Somewhat Disagree	Neither disagree nor agree	Somewhat agree	Strongly Agree
1. The attended trainings were of high quality and met my expectations					
2. Training content is relevant to my teaching roles					
3. The attended trainings have helped do my teaching job better					
4. The attended trainings have helped better help my students in the classroom					
5. The attended trainings have helped me prepare for career advancement					

Please rate your level of knowledge concerning the listed professional development topics.

	Far below average	Somewhat below average	Average	Somewhat Above average	Far Above average
1. New lower secondary curriculum					
2. 21 st century skills					
3. Competence-based learning					
4. Best teaching practices					
5. Development of Activity of Integration and their rubrics					
6. Student experiential learning opportunities					
7. Classroom management					
8. Collaborative teaching					
9. Curriculum mapping					
10. Project development					
11. Establishment of agriculture club like YoFFA in your school					
12. Formative and Summative assessment					
13. Student leadership development					
14. Personal management (time, stress, work-life balance, career development etc)					
15. Educational technology and integrated instruction					
16. Subject content areas (like animal science, agronomy, tools etc)					
17. DIT courses, assessment, and certification					

Please rate your level of Interest concerning the listed professional development topics.

	Not interested	Slightly interested	Moderately interested	Very interested	Extremely interested
1. New lower secondary curriculum					
2. 21 st century skills					
3. Competence-based learning					
4. Best teaching practices					
5. Development of Activity of Integration and their rubrics					
6. Student experiential learning opportunities					
7. Classroom management					
8. Collaborative teaching					
9. Curriculum mapping					
10. Project development					
11. Establishment of agriculture club like YoFFA in your school					
12. Formative and Summative assessment					
13. Student leadership development					
14. Personal management (time, stress, work-life balance, career development etc)					
15. Educational technology and integrated instruction					
16. Subject content areas (like animal science, agronomy, tools etc)					
17. DIT courses, assessment, and certification					

Please rate your preference in terms of delivery format for the professional development trainings.

	Do not Prefer	Prefer slightly	Prefer Moderate Amount	Prefer a lot	Prefer a great deal
1. In-class observations					
2. Virtual based trainings (Zoom, Teams, Webinar)					
3. In-person and hands-on participation					
4. Lecture trainings					
5. Series of topic related workshops					
6. Offered at school with teachers of other subjects					
7. Offered away from school with other teachers of agriculture					

Please rate your preference for when the professional development training should be done.

	Do not Prefer	Prefer slightly	Prefer Moderate Amount	Prefer a lot	Prefer a great deal
1. Before the first day of each academic term					
2. Over the weekend					
3. During term holidays					
4. Embedded in the academic term					

Survey Instrument Part III – Personal biodata

1. Please indicate your sex/gender.

- Female
 Male

2. Please select the appropriate geographical location of your school.

- Urban
 Peri-urban
 Rural

3. Please select all appropriate class levels that you teach.

- s1 s4
 s2 s5
 s3 s6

4. Please select all subject areas that you teach.

- Crop science
 Soil science
 Animal science
 Agricultural Economics
 Farm Equipment & Machinery
 Farm tools & structures
 Other (please specify)

5. What is the highest degree you have earned?

- Diploma
 Bachelors
 Masters
 PhD

6. Is your earned highest degree in agricultural education?

- Yes
 No
 Not sure

7. Is agricultural education your only teaching subject?

- Yes
 No

8. Which other subject do you teach?

9. How many years have you been teaching?

- less than 1 year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

Part IV: Interview questions

1. Is professional development important to you as a teacher?
2. What challenges do you have accessing professional development?
3. What can be done to make professional development worthwhile?

Appendix E

Participant Email

Appendix E. Participant Email

Email to participants

Re: Request to participant in my study

Dear Ag educator,

My name is Brian Kibirige, a graduate student at Montana State University. I am conducting my master's thesis research study on Continued Professional Development among secondary agricultural education teachers in Uganda. This research study has been reviewed and approved by the Montana State University Institutional Review Board for Protection of Human Subjects under IRB #2023-769 and by the Gulu University Research Ethics Committee (GUREC) GUREC-2023-590.

The purpose of this study is to profile existing professional gaps and needs in relation to pedagogical skills and content proficiency among secondary agricultural education teachers in Uganda.

The study will take 30minutes of your time. Your participation will be much appreciated. This study has no known risks involved and your participation is voluntary.

If you are interested in participating, please privately respond to this email and I will follow up for more details.

Yours,

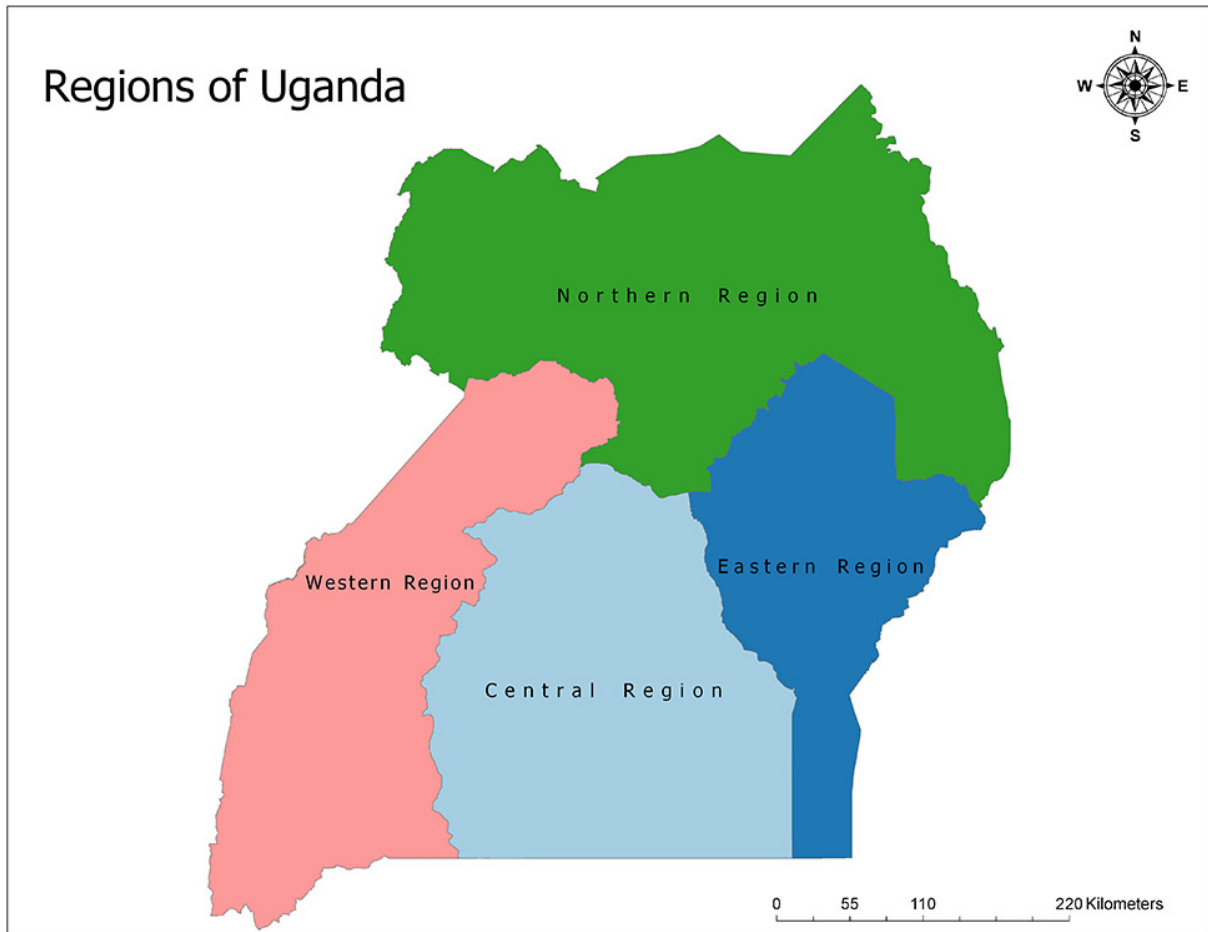
Brian Kibirige
Graduate Student
Montana State University

Thank you.

Appendix F:

Map of Ugandan Geographical Regions

Appendix F. Map of Ugandan Geographical Regions



Source: Mappr. (n.d.). *Where is Uganda? Four Regions of Uganda*. Retrieved October 4, 2023, from <https://www.mappr.co/location/uganda/>.