EXPLORING THE TEACHING AND LEARNING ROLES OF AGRICULTURAL EXTENSION WORKERS

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DECLARATION

I declare that this research report is my own unaided work. It is being submitted for the Degree of Master of Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree, part degree or examination at this or any other university.

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LIST OF ACRONYMS

DoA	Department of Agriculture
DAFF	Department of Agriculture, Forestry and Fisheries
DARD	Department of Agriculture and Rural Development
FAO	Food and Agricultural Organisation
GDP	Gross Domestic Product
GCRF	Global Challenges Research Forum
ILO	International Labour Office
ISCO	International Standardisation of Classification of Occupations
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NAADS	National Agricultural Advisory Services
NQF	National Qualifications Framework
ORP	Occupational Role Profile
RAELL	Re-imagining Agricultural Extension Through a Learning Lens
SA	South Africa
Stats SA	Statistics South Africa
UG	Uganda
UBOS	Uganda Bureau Of Statistics
UNDP	United Nations Development Programme
UPDF	Uganda People's Defence Forces

ABSTRACT

Agricultural extension has been identified as a key occupation in many African countries. This is because extension workers play a critical role in linking farmers and other actors within the agricultural sector to policy and practice. As a result, teaching and learning are their most important roles. Agricultural extension systems and the work done by agricultural extension workers are faced with a number of challenges, including inadequate funding, a limited number of extension workers, climate change, and general changes in the agricultural system, to name a few. These changes call for extension workers to constantly change and adapt to the changes happening in their world of work in order to best assist farmers in addressing their challenges.

Despite a large amount of research being conducted in different areas of agricultural extension, such as the training needs and requirements of extension workers, challenges facing agricultural extension, reforms in extension systems, and gender inequalities in extension, little work has focused on how their teaching and learning roles are changing. This study thus takes an in-depth look at the teaching and learning roles of agricultural extension workers. The study starts by conceptualising the agricultural extension occupation using the five dimensions of an occupation proposed by Shalem and Allais (2018) to unpack the different factors within each occupation and how these can impact the teaching and learning roles of agricultural extension workers. The results of the study provide an understanding of why occupations are social and political activities that are affected by a number of factors and are always undergoing changes. Studying changes in occupations is critical, as it enables us to understand changes in the world of work and how workers in the workplace adapt to work-related changes.

Key words: Agricultural extension workers, teaching and learning roles, occupations, extension system.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction and background of the problem

An increasing number of scholars have long been interested in researching agricultural extension, as evidenced by research such as the training needs and requirements of extension workers, challenges facing agricultural extension, reforms in extension systems, gender inequalities in extension, and changing roles of agricultural extension in communities (Alotaibi et al., 2019; Al-Zahrani et al., 2018; Ashraf & Yousaf Hassan, 2021; Gumucio et al., 2020; Meera et al., 2012; Mudege et al., 2016).

Despite the relatively large amount of research that has been done in the area of agricultural extension systems throughout Africa, as shown above, the advisory services rendered by agricultural extension workers continue to remain ineffective, weak, and unsustainable in countries like Uganda (K. Davis, 2008; Maake & Antwi, 2022; Oladele, 2011). And although other factors such as poor policies, inadequate funding, and a low number of qualified extension workers have contributed to the weakness of extension systems, the biggest contributing factor remains the failure of extension workers to perform their roles efficiently since they are the primary agents of knowledge transfer in the extension system (Msuya et al., 2017).

This research postulates that a contributing factor to the ineffectiveness of extension workers' roles could be due to their teaching and learning roles and how these roles are changing. This study aims to contribute to understanding what the teaching and learning roles of extension workers are, how these roles are changing and what some of the main underlying causes are.

1.2 Problem statement

Research shows that there are changes occurring in agricultural extension systems and their roles around the world, with the role of extension shifting and becoming more knowledge-based, emphasising knowledge transfer and sharing through facilitation and teaching by extension workers (Msuya, 2021). As the role of the agricultural extension sector is changing, this will also have an impact on the roles of extension workers. Furthermore, the Academy of Science of South Africa (2017, p. 64) goes on to say that agricultural extension workers play a key role in technology

transfer and adoption among farmers by promoting learning, knowledge sharing, and co-creation. Msuya et al. (2017) argue that agricultural extension does not only play an important role in bringing new knowledge to the farming community but that agricultural extension and the roles played by extension officers as knowledge facilitators cut across other sectors within an economy, with the potential to also promote economic growth in these sectors. As a result, they advocate for a better understanding of the changes in extension workers' roles, as this will allow for more effective ways of training extension workers within academic institutions. Swanson (2006) adds that with the ever-increasing global challenges facing the agricultural sector, farmers will have to pick up new skill sets and technologies to adapt to the pressures within agriculture, and therefore extension workers, as knowledge facilitators, will have to be up to date with emerging knowledge and technologies.

Furthermore, Pesanayi (2009) claims that challenges brought about by climate change in the agricultural sector call for both farmers and extension officers to prepare to learn and re-learn sustainable practices. Therefore, emerging new roles and changes in the roles of extension workers may require them to have new skills to address these challenges and use more advanced practices to perform their teaching and learning roles effectively. It is from this point of view that I have found it critical to explore the teaching and learning work roles of extension workers and how they are shifting in these times, as this could improve the effectiveness of the extension system.

1.3 Purpose statement

Agricultural extension is both a teaching and learning occupation and a crucial occupation in the agricultural value chain because it promotes food security in Africa through knowledge transfer and the adoption of technologies and practices by communities. As a sector undergoing change, agricultural extension becomes an important occupation as it connects two changing points, which are: changes in the world of farmers and changes in the broader knowledge or innovation world, which are a critical mediation point. Hence, studying the nature of the occupation, how it is changing and adapting, and how these changes impact, in particular, the teaching and learning roles, will be very important to the complete agricultural system. It will also give us an idea of how an occupation changes over time and what outside factors have an effect on those changes. A key point to note and have at the back of the mind is that the main focus of this study is exploring

the teaching and learning roles of agricultural extension workers but the conceptualisation of the nature of the occupation provides a critical lens that allows the researcher to better understand the teaching and learning roles.

1.4 Research questions

1.4.1 Main questions

1. What is the nature of agricultural extension as an occupation in the South African and Ugandan contexts?
2. What teaching and learning work roles do agricultural extension workers play in the occupation?

1.4.2 Sub-questions

1. How have these teaching and learning roles changed over time in the two country contexts?
2. What factors have contributed to these changes?

1.5 Structure of the report

Chapter one introduces the research and describes the background of the problem; it describes the different studies conducted in agricultural extension and how, despite this, the system continues to be ineffective, hence calling for a closer examination of the agricultural extension occupation as well as the changes in the teaching and learning roles of the occupation. The chapter further examines the importance of the research study and the aim of the study.

Chapter two covers the relevant literature critical for the study. The chapter starts by providing an understanding of the term "occupation" in general by bodies such as the International Labour Office. This is followed by a section describing the agricultural extension occupation and its meaning in the two country contexts of Uganda and South Africa. The third section discusses the history of agricultural extension in Uganda and South Africa and shows that histories such as colonialisation and the apartheid era in South Africa greatly impacted how the agricultural extension occupation and the teaching and learning roles of the workers within the occupation evolved. This section is then followed by another that describes the different roles played by

agricultural extension workers in Africa as a continent and then in Uganda and South Africa. The next two sections after this present the knowledge transfer roles of extension workers and the challenges extension workers face in executing their roles. Literature shows that there are multiple problems ranging from financial constraints to inadequate knowledge among extension workers to a one-size-fits-all approach in trying to address farmers' problems. Following this are two other sections, one looking at how the agricultural extension occupation is changing and the other explaining why it is important to study changes within occupations and occupational change. This is because studying how occupations change offers critical vantage points for understanding how work changes and how workers in the workplace are also changing. The last section of the literature explains the conceptual framework of the research study. Here, two concepts are presented that are important in the study. The first is the concept of occupation, which is conceptualised using the five dimensions of an occupation that are discussed by Shalem and Allais(2018b). The second is the knowledge transfer model by Shaxson et al.(2012), which discusses the various knowledge transfer roles that practitioners like agricultural extension workers play in their work.

Chapter three is the methodology of the study. The section describes the research design adopted for the study, the various participants involved in the study, the various forms of data used, the data analysis method, and the ethical considerations undertaken during the study.

Chapter four presents the findings from the study. The first section of this chapter discusses the nature of the agricultural extension occupation using the five dimensions. Under each dimension, various themes are discussed. The normative dimension discusses the formal codes of ethics and values that extension workers follow in their occupation. Social and cultural norms and beliefs are also discussed in the first dimension. This is followed by a discussion of various themes related to the remaining four dimensions. Next, the teaching and learning roles of extension workers are discussed. It is noted that while it was difficult to make a distinct difference between the teaching and learning roles due to their being interlinked, where possible, each role was discussed separately. The third section of chapter four discusses the changes happening in the teaching and learning roles of the agricultural extension occupation. It was found that there are different changes happening in the two roles, particularly with regards to methods of teaching and sources of learning. The last part of chapter four explains the causal factors leading to the changes in the

teaching and learning roles of extension workers. The factors are divided into facilitating and constraining factors, and technological advancement was one of the biggest supporting factors.

1.6 Conclusion

Agricultural extension is a critical occupation in many African countries. Agricultural extension workers play important teaching and learning roles as knowledge experts, which impact the growth of the agricultural sector and the success of any rural development projects. These teaching and learning roles played by extension workers are changing with time due to a range of factors, such as technological change. It is hence important to first understand the nature of the agricultural extension occupation before looking at the teaching and learning roles, how they are changing, and factors contributing to the changes. That is the aim of this research study, as discussed in this chapter.

The next chapter is the literature review, which critically examines key literature on the study. Literature conceptualising an occupation and the agricultural extension occupation will be discussed, along with a conceptual framework that will help in understanding the agricultural extension occupation in detail.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter engages with critical literature with regards to agricultural extension. The review covers topics such as understanding occupations, conceptualising agricultural extension occupation, the history of agricultural extension, the teaching and learning roles of extension officers, challenges facing the extension system, and the importance of studying how occupations change. A critical review of the literature will foreground the study by identifying the most relevant literature for better understanding the nature of the agricultural occupation, unpacking the teaching and learning roles of extension workers and analysing how these roles are changing. Through the literature review, the research problem is made more relevant based on previous research, and a conceptual framework for the study is developed.

2.2 Conceptualizing occupations

Occupations are understood differently around the world but may have similar meanings. International organisations like the International Labour Office (ILO) try to provide an international understanding of occupations for countries, but each country also has its own definitions of occupation.

Literature indicates that the term “occupations” is not homogeneous, and thus there is no universal definition of an occupation. I will therefore provide diverse meanings to the term, from an international perspective to country-specific understandings. The International Labour Office (ILO) (2012) developed the International Standardisation of Classification of Occupations (ISCO) framework in which they define an occupation as a group of jobs whose main tasks and responsibilities are very similar. A person's main job can be used to classify them into an occupation. This definition places emphasis on an occupation consisting of similar jobs, with jobs, according to them, consisting of groups of tasks and responsibilities that an individual carries out.

Standing (2010) defines an occupation as an ever-changing set of duties based on accumulated knowledge and traditions. He goes on to say that an occupation entails a variety of types of knowledge that go beyond the traditional definition of competence. According to him, occupation has key features such as non-homogeneity, where differentiation can occur by task, position, type

of work, and amount of salary paid. Standing shifts his focus on knowledge and competence when defining occupations, arguing that occupations are always changing and so is the knowledge used. His emphasis on knowledge rather than just jobs and tasks within an occupation could provide a strong framework for studying occupational change using empirical investigations.

Shalem and Allais (2018), in a working paper looking at linking knowledge, education, and work, provide a range of definitions for the term "occupation." However, Shalem and Allais (2018) link occupation and knowledge. According to them, there needs to be a reimagining of the knowledge and learning within occupations, particularly due to the precarious nature of jobs in today's world. In their analysis of the term, they provide five dimensions of occupations, the normative, knowledge, formal recognition of occupations, authority and, the political and economic context dimensions.

Gamble (2022) describes an occupation as "a term of promise and ambiguity". According to her, globally, occupations are experiencing great levels of precarity caused by a number of factors such as academic qualifications, market instability, and rapid levels of technological advancement and digitalisation. Gamble (2022) adds that in occupational labour markets, occupational qualifications rely heavily on specialised knowledge because such labour markets are driven by formal qualifications, which creates very strong links between such occupations and their formal qualifications. It is therefore important to examine agricultural extension as an occupation and its relationship with knowledge and qualifications. The next section thus focuses on this.

2.3 Agricultural extension-the occupation

There are variations in how organisations and occupational systems within countries define agricultural extension, with the definitions each having a different focus. While others focus on knowledge and technology transfer, others claim extension involves informal methods of teaching farmers.

The Food and Agricultural Organisation (2019) defines agricultural extension as an informal way to teach people in rural areas how to solve their problems with knowledge and information. The United Nations Development Programme (1991) claims that agricultural extension focuses on

developing human resources, getting information to farmers, and giving rural households access to new technologies.

Since the study is looking at two case studies, how agricultural extension is understood in these countries will also be given. The Ministry of Agriculture, Animal Industry, and Fisheries (2017) in Uganda defines extension as the various interventions by state and non-state organizations that make it easier for farmers, value chain participants, and organizations to access information and technologies in order to improve their technical capacity in agriculture and family. On the other hand, the Department of Agriculture (2005) in South Africa defines extension as a methodical approach to assisting farmers or communities in acquiring pertinent and practical information and skills in agriculture or related fields in order to boost agricultural production, competitiveness, and sustainability. The fields of consultation, instruction, and capacity development are where it tackles pressing areas of concern, while limited technology transfer modifies farming techniques without taking into account broader societal perspectives.

From the definitions above, important points are identified. Firstly, extension involves teaching farmers using informal methods. Secondly, it is a process of transferring knowledge, information, and technologies, and lastly, extension involves a number of actors, such as government agencies, non-state organisations, individuals, and families. This is supported by Cobbett (1985), who says that the key points in extension are that it is an educational process that entails teaching and learning and that it involves the family. I therefore argue that agricultural extension is an occupation involving the use of different interventions to pass on information and knowledge to farmers with the support of different actors. Having defined extension, I will now move on to discuss the history of the occupation in South Africa and Uganda. This will provide perspectives on the evolution of the agricultural extension occupation in the two countries' contexts.

2.4 History of Agricultural extension

In this section, I argue that the histories and social structures of South Africa and Uganda influenced the development of agricultural extension systems, the pedagogical roles of extension workers, as well as the types of knowledge they acquired.

2.4.1 History of Agricultural extension in South Africa

South Africa's extension system history is quite distinct from that of Uganda, having been heavily influenced and driven by racial discrimination against blacks. However, South Africa faced more critical occurrences and events that impacted the extension system, such as apartheid, rinderpest epidemics in the 1980s, wars, and the expansion of the mining industry (S. Terblanche, 2013). Before 1994, extension services for the Africans were developed by them on the land that had been reserved for them by the Native Land Act of 1913 by the Union Government (S. Terblanche, 2013). This dispossession of land from blacks was disproportional, as only 13 percent of the total land was reserved for blacks and 87 percent was given to the minority white communities (Mushangai, 2020). The main aims of dispossessing blacks of their land were to force them to abandon peasant agriculture and provide cheap labour in the mines belonging to the whites (Pons-Vignon, 2014). The Native Land Act of 1913 and the 1936 Native Trust and Land Care Act ensured a more equal distribution of Bantustans across South Africa to provide adequate labour for the mining industry, leading to the complete annihilation of small-scale black farming communities (Mushangai, 2020; Pons-Vignon, 2014). As a result of this, the Africans were struggling in their settlement areas, which were characterized by poor living conditions, leading to the outbreak of two Anglo-Boer wars. In an effort to end the conflicts between farmers and foresters, the government established committees to develop programmes aimed at water and forestry resource management, and this marked the formal emergence of extension in South Africa (Kock, 2006). However, at this time, it can be argued that Africans had little participation in agriculture, with no active extension agents supporting their practices. This was because the war also had devastating impacts on black farming communities. Besides black Africans being directly used by both the Boers and the whites to work as carriers and messenger, Africans were also recruited from their farming communities to work on white farms and provide veterinary services to ensure both sides of the war had adequate food supplies. This left black African farming communities with no adequate labour to continue their own farming activities.

After the end of the second Anglo-Boer war in 1902, the then Governor of Cape Town and administrator, Alfred Milner, focused on agricultural development under a reconstruction programme, but the challenge was the lack of adequately skilled agricultural extension workers during that period. South Africa was thus compelled to import its extension workers from Europe,

marking the start of the work of qualified extension workers in the country (Van Vuren, 1952, as cited in Ramsarup et al., 2021).

It is critical to note that the step taken to import extension workers from Europe did not work well, as the knowledge they possessed did not match the contexts and needs of the farmers in South Africa, and this forced the government to support the education of these extension workers abroad (Liebenberg, 2015). This improved the knowledge base of the extension workers. In 1925, the department of extension was created under the Ministry of Agriculture. By that time, this department comprised of only six extension workers providing services in the four provinces, and the department used an approach called cooperative demonstrations to link farmers to technical extension workers (Kock, 2013 as cited in Ramsarup et al., 2021). It is easy to note the limited number of knowledgeable and well-skilled extension officers in South Africa at this time. From the moment formal agricultural extension workers were introduced in South Africa, their roles went beyond agricultural development and productivity but spread to other critical areas such as community health, children's education, and conserving the environment, among others, and this called for extension workers to have a wider knowledge base (Ramsarup et al., 2021).

2.4.2 History of Agricultural extension in Uganda

Agricultural extension in Uganda has undergone a number of transformations from the colonial period up until now. In colonial times, local chiefs and some experienced community members were the main agents of agricultural extension (Mukembo & Edwards, 2015; Semana, 1999). During this period, agricultural extension was focused on fulfilling the needs of the colonial government, whose main interests were cash crops like coffee for their industries back home (Bukenya, 2010; Semana, 1999). The chiefs and the other personnel assisting them were selected by the colonial leaders. Farmers and extension agents were coerced, exploited, and oppressed to meet the demands of the colonialists' industries at the time, negatively affecting the relationships between extension agents and the people in their communities (Mukembo & Edwards, 2015; Ojambo, 2012).

From 1956 to 1963, the local chiefs became less relevant in the extension system as the role was moved to progressive farmers who served as model farmers tasked with teaching local communities' agricultural practices on their farms, which were rendered as demonstration farms

or sites. The progressive farmers were selected using a number of characteristics, such as owning a large piece of land and being relatively successful in farming (Semana, 1999). Following their selection, these farmers were provided with financial and input support to facilitate community learning at their well-functioning demonstration farms (Kidd et al., 2001; Semana, 1999). Oumo and Cho (2014) argue that this approach proved to be very effective in situations where well-trained agricultural extension workers were limited in number.

During the period of the 1960s to early 1970s, the extension system in Uganda went through another transformation and was placed in the hands of international organisations like USAID, which provided direct support to the farmers with the aim of improving their livelihoods, but this was short-lived as towards the late 1970s the country experienced political instability (Mukembo & Edwards, 2015; Semana, 1999). The political turmoil had devastating effects on the extension system making it extremely inefficient as extension workers resorted to selling inputs to farmers, and this followed through to the early 1990s, which marked a period of recovery for the extension system.

In the 1990s and 2000s, the extension system underwent great reforms. For example, between 1992 and 1997, reforms in the agricultural extension system in Uganda included privatizing it and creating a decentralized system (Semana, 1999). The transformation also involved the implementation of a number of government programs, such as the National Agricultural Advisory Services (NAADS), that was aimed at improving extension services by giving farmers the resources to work directly with both government and private extension workers (Lumu & Kiwuuwa, 2014; Mukembo & Edwards, 2015). However, such government programmes faced numerous challenges, such as limited resources, corruption among coordinators, and insufficient personnel. To curb some of the shortfalls, a number of interventions were put in place. The deployment of the Uganda People's Defence Forces (UPDF) to monitor and control the NAADS programme is one example (Mukembo & Edwards, 2015; Uganda Media Centre, 2014).

Throughout the history of agricultural extension in Uganda, different approaches were used to pass information to farmers. In the 1960s, top-down approaches were used, and this included new knowledge, practices, and information being passed directly from research centres to farmers without involving them in the co-creation of knowledge (Mukembo & Edwards, 2015). By the 1990s, a knowledge-innovation system was introduced to facilitate a “two-way” movement of

information between farmers, research organisations, and agricultural extension agents, acting as a link between these two groups of people. The integration of private sector actors in the provision of agricultural extension services shifted the system in Uganda from a singular system where the government is the sole provider of extension services to a pluralistic system. However, the pluralistic system of agricultural extension was also heavily criticised by the public for being poorly coordinated by the government (Mukembo & Edwards, 2015; Rivera & Qamar, 2003).

Despite the long history and transformation of the extension system in Uganda, the system is still very ineffective and faces many challenges. Oumo and Cho (2014) claim that for effectiveness to be achieved in the future of agricultural extension in the country, the government needs to be willing to rethink the roles of its various institutions and extension workers to ensure an abundance of resources as well as the necessary expertise in the field of agricultural extension.

2.5 The roles of Agricultural extension officers

The roles of extension officers vary among countries and contexts; some focus more on knowledge and technological transfer and adoption while others play roles like research and development, health, and education in institutions, to name a few. Also, in each country, within the roles played, there are different focus areas for the extension workers. The changes in the teaching and learning roles of extension officers may occur along with the main roles played in each country.

2.5.1 Roles of extension workers in African countries

Many of the developing countries, more so those on the African continent, consist of many rural areas where social issues such as high rates of poverty, unsustainable agriculture, and poor services like health and education are prevalent (Kiplangat, 2001). Literature shows that agricultural extension is critical to the economic development of most African countries because of their heavy reliance on agricultural development (Kongolo, 2012; Ukaga, 2005). Msuya et al. (2017) claim that agriculture is the mainstream source of income for a number of African countries, with the sector contributing greatly to the Gross Domestic Product (GDP) and earnings from exports of these countries. For example, in Uganda, agriculture contributes about 37 percent of GDP and 19 percent of exports, while in South Africa it contributes only 3 percent to the GDP. It should be noted that while in South Africa agriculture is not the main contributor to the GDP, the sector is a

main source of livelihoods for the vast majority of small-scale farmers in the country, and these are the most vulnerable group of farmers who would benefit the most from agricultural extension.

A study in Tanzania by Mkuki and Msuya (2020) identified seven categories of roles for extension workers: educational, intermediation, advisory, technical, facilitation, organisational, and administrative. According to research, 90% of agricultural extension workers identified education roles as being the most important, particularly for small-scale farmers. The educational roles of extension workers included teaching farmers how to use water and soil appropriately, training farmers on proper agronomic practices, educating farmers on the proper use of pesticides and fertilizers, among others. This supports the work by Nwaogu and Akinbile (2018) in Nigeria, who found that extension workers perceive their education and teaching roles as critical in agricultural extension systems.

While according to Msuya et al. (2017), the primary function of extension workers is to carry out these extension roles, which include increasing agricultural production, enhancing rural livelihoods, fostering connections between researchers and farmers, assisting in the reduction of rural poverty, organizing youth for agricultural and rural development, and promoting climate change education. In addition, a study by Oladele (2008) identified the roles of extension workers to include encouraging the adoption of new technologies, boosting farmers' profits, and raising productivity.

On the other hand, Davis et al. (2010) assert that the roles of extension workers are moving beyond technology transfer and training to facilitation and learning roles. Whereas Msuya (2021) explains that the roles of extension workers in Tanzania have greatly increased from more traditional roles of passing on information to farmers to more teaching roles like educating farmers on developing practices and technologies, which makes them teachers. Thus, their role in knowledge transfer has grown in significance.

2.5.2 Roles of Agricultural extension and extension officers in South Africa

We saw in the previous section, which covered the history of agricultural extension in South Africa, that agricultural extension was characterised by racial segregation between the white and black races throughout the country. And before 1994, South Africa had two distinct extension

systems in colonial times, a system for minority white farmers and a system for black farmers which faced a number of challenges, including limited yet unproductive land, inadequate extension service personnel (Worth, 2012). The two systems were combined after 1994 into a dual system of agricultural extension under the Department of Agriculture and Rural Development (DARD). Different authors give different views of the roles of agricultural extension and extension workers in South Africa, with some roles being more similar than others.

One of the common roles played by extension workers is enabling farmers to make well-informed decisions by building their capacity through training, which increases farmer productivity and thereby contributes to food security (Academy of Science of South Africa, 2017; K. E. Davis, 2008; Maoba, 2016; Raidimi & Kabiti, 2019; Zantsi, 2019). With increased productivity, rural communities increase their incomes and thereby improve their livelihoods (Hart & Aliber, 2012). Zwane et al. (2014) argue that food insecurity is one of South Africa's biggest challenges, and agricultural extension is important in promoting food security through ensuring rural development as well as providing sustainable employment to vulnerable groups of small-scale farmers in rural locations. Another similar role extension workers play is linking various actors in the agricultural system. Extension workers act as a bridge between farmers, researchers, and educational institutions, thereby enabling farmers to access resources and information (Akpalu, 2013; Bembridge, 1987; Ncube, 2017; Raidimi & Kabiti, 2019). The resources include finances and markets whereas the information accessed by farmers can include changes in weather, soil, pest and disease outbreaks, and best agricultural practices (Akpalu, 2013; Sibisi, 2015). Technological transfer is one of the biggest roles of extension workers. As technological breakthroughs occur through innovations, extension workers are the frontline of the extension system and will be the first to receive any new technologies developed for agricultural growth; they will pass these technologies to farmers and ensure they are adopted within the targeted communities (Maoba, 2016; Mpiima et al., 2019; Mukembo & Edwards, 2015). Some authors describe extension workers' problem-solving roles, which include teaching farmers to become problem solvers in order to help them find solutions to some of the problems they face. For example, according to Terblanche (2008), the philosophy of extension is; "to help people to help themselves". Maoba (2016), Akpalu (2013), and Zwane et al. (2014) support this claim by saying that agricultural

extension workers have to instil problem-solving abilities in farmers such that they can come up with prudent solutions to their farming challenges.

Other authors, however, give distinct roles that extension workers and the extension system need to play. According to a study conducted by Zantsi (2019), extension workers in South Africa play a critical role in land policies. He explains how extension workers are supporting emerging farmers, especially small-scale farmers, to successfully transition to commercial farmers. Zantsi (2019) adds that emerging farmers are farmers who have acquired land through land reform policy, and extension workers provide specialised services in farm management, entrepreneurship, marketing, and running a formal business. This was mandated by the National Development Plan (2011), which called upon extension workers to develop emerging small-scale farmers in South Africa. However, Zwane et al. (2014) and Lukhalo (2017) argue that extension workers could not effectively support these farmers as they were confronted with setbacks like limited numbers, inadequate skills, and a lack of coordination of extension workers by the government departments. Abdu-Raheem (2014) also gives another distinct role for extension workers, and that is their role in encouraging biodiversity conservation in South Africa. This was a study in KwaZulu Natal province, and it found that, as much as the job descriptions of extension workers mention sustainable farming as one of their roles, these workers are not making any substantial contribution to ensuring that farmers' practices do not lead to environmental degradation and loss of biodiversity. Conversely, the study showed that the top-down approach of the extension system in South Africa fosters conventional farming methods that heavily rely on non-ecologically friendly agro-chemicals and disregards the usage of locally available traditional knowledge (Abdu-Raheem, 2014, p. 1026).

From the above roles, it can be noted that the roles of agricultural extension and extension workers in South Africa are different. This difference in roles and areas of focus is influenced by factors such as the agro-ecological zones in which the workers are located, the types of farmers, and the types of government programmes being implemented in a community. Taking the example of the Eastern Cape, which is a semi-arid area with severe water challenges, extension workers will focus more on promoting water conservation, irrigation farming, and sustainable usage of water (Pesanayi & Weaver, 2016). However, the Academy of Science of South Africa (2017) claims that

for extension workers to be able to perform any of their roles effectively, they need to have certain levels of expert knowledge that they will teach farmers.

2.5.3 Roles of agricultural extension and extension workers in Uganda

Of the two country case studies, Uganda depends most on agriculture, as over 90% of its population is engaged in agriculture, and 95% of these are small-scale farmers located in rural areas (Uganda Bureau of Statistics (UBOS), 2017, p. 188). And this is not a new development, as Mettrick (1967) shows that even in the 1960s, 90% of Uganda's population depended on agriculture, and the sector contributed 60% to the country's gross domestic product and this has not changed much today. This makes the work of extension workers very important for not only the economic development of the country but also the growth and development of the people.

Just like in the previous country, there are some roles played by extension workers in Uganda that cut across South Africa. These roles include increasing agricultural production, enhancing rural livelihoods, fostering connections between researchers and farmers, facilitating the reduction of rural poverty, ensuring food security, mobilizing youth for agricultural and rural development, and promoting climate change education, technological adoption, and the increasing income of farmers (Msuya et al., 2017; Oladele, 2011; Pan et al., 2018).

Uganda has one of the highest malnutrition rates in the world, with over 29% of the 2.2 million children being stunted, and this has resulted in agriculture being one of the ways through which the issue can be addressed (Uganda Bureau of Statistics (UBOS), 2017). Agricultural extension workers can support the building of the capacity of farmers to produce more nutritious food, thereby ensuring food security as well as increased income (Shimali et al., 2021). Furthermore, they Shimali et al., (2021) state that extension workers should be well-versed in food safety, post-harvest handling, and nutrition, and they recommend that training institutions provide more extension worker training in these areas.

2.5.4 The teaching and learning roles of agricultural extension workers

While it is important to note that the main aim of this study is to explore the teaching and learning roles of agricultural extension workers in two country contexts-Uganda and South Africa, it is useful to first understand the roles of extension workers in general, and this has been provided in

sections 2.5.1 to 2.5.3 of the literature review. This sub-section will explicitly look at the teaching and learning roles of extension workers. As a starting point, the previous three sub-sections discussed some of the teaching and learning roles of agricultural extension workers in Africa, Uganda and South Africa. The most prominent teaching role of extension workers is their educational role. As educators, extension workers teach and train farmers a range of farming systems and emerging technologies (Msuya, 2021; Davis et al., 2010; Mkuki & Msuya 2020).

Literature shows that current agricultural systems are faced with a multitude of problems that are brought about by climate change. As such, there is a need to focus on how learning occurs among key stakeholders in the agricultural sector including extension workers, scientists, farmers among others to better solve challenges related to sustainability in agriculture(Pesanayi, 2009). The current sustainability related challenges call the stakeholders to learn, unlearn and re-learn practices, to better promote recommended practices and expel bad agricultural practices (Pesanayi, 2009). Extension workers as knowledge experts play a critical role in this learning process as they act both as teachers and learners in the process.

According to Knowles et al., (2011), extension workers should go beyond having the right knowledge, to having facilitation skills to promote adult learning because they are dealing with farmers who are adults and need to be taught using the principles of adult learning. Therefore, it calls for agricultural extension workers to understand and engage with the three dimensions of learning which are; formal learning, informal learning and non-formal learning and these dimensions form the foundations of what knowledge is, the role of the learner, the role of the facilitator and the changes in someone who has undergone learning. Rogers (2014) explains formal, informal and non-formal learning explicitly. He defines formal learning as the learning that occurs in institutionalised settings and results into the award of certificates, diplomas and degrees. Therefore, extension workers and other professionals like scientists in the agricultural sector undergo formal training in educational institutions. Nonformal learning on the other hand ins more learner-centred, flexible and use participatory approaches while engaging with learners and is known as key when training farmers. Ainsworth and Eaton (2010) add that this form of learning is intentional and may be organised loosely but highly adaptable. Extension workers hence largely use nonformal approaches to teach farmers and these involves the use of demonstration sites and farmer field schools (Kaziboni, 2018). Lastly, informal learning usually

occurs unintentionally, is never organised and is said to be experiential and spontaneous (Ainsworth & Eaton, 2010).

As highlighted earlier, farmers are adult learners and extension workers should be guided by the principles of adult learning below as explained by Fell (1986, 1996) specifically for the agricultural field after building on the work of Knowles (1990) whose work focused more in the field of education. Therefore, the eight principles of adult learning in agriculture are:

i. Expand on prior local experience and make use of group or individual knowledge
ii. Provide a welcoming and supportive atmosphere for learning.
iii. Make sure the learning exercise is relevant to the issues facing the client group and fits their needs.
iv. Involve the audience in planning their own learning experience.
v. People must actively participate in stimulating, engaging activities.
vi. Allow time for people to reflect on what they are learning, take difficult subjects slowly and always be open to questioning.
vii. Reassure individuals and groups by stating that they are correct and that they are moving closer to their learning objectives.
viii. Learning must involve effective two-way communication (Fell, 2005).

Fell (2005) claims that principles of adult learning are pivotal to the improvement and delivery of effective and good extension activities, and learning experiences of farmers and extension workers. This is further supported by the work of Paulo Freire in the field of democracy, extension and education. Paulo Freire states that extension workers should not just act as knowledge experts who aim at 'extending' information to farmers who are viewed as having no knowledge. He argues that extension workers need to recognise that farmers too possess immense amounts of experiential knowledge and the learning process should involve a two-way dialogue between farmers and extension workers (Freire, 1973). He adds that in extension, high levels of hierarchy will impede learning processes and this explains why a lot of the innovations in agricultural extension fail to be adopted by farmers.

2.6 Challenges facing the teaching and learning roles of extension workers, and agricultural extension systems in Africa

Literature indicates a number of factors that constrain the learning and teaching roles of extension officers and the agricultural extension systems in Africa. According to Greenberg (2010), the limited numbers and low expertise among extension workers pose a big challenge to the use of ICT methods of teaching in agricultural extension services. Furthermore, Mushangai (2020) writes that there are few interactions between research organisations and small-scale farmers, and there are few ICT technologies designed to suit small-scale farmers.

Some authors also argue that despite the immense technological advancement happening in the agricultural extension space, access to technologies like smartphones is still a problem for both farmers and extension workers' teaching and learning roles (Mpiima et al., 2019). They add that poor network coverage in some geographical locations, particularly rural areas, impedes the teaching and learning roles of extension workers. This could support Ajala et al.'s (2013) and Maoba's (2016) statements that extension workers are invisible in their communities, their roles are less effective and inefficient, and they use ineffective approaches as well.

One of the most prominent and biggest failures attributed to the agricultural extension system is the inadequate levels and types of knowledge among extension workers. Take, for example, Aphunu and Otoikhian;s (2021) explains that extension workers need training to gain more knowledge on adult learning principles to improve how effectively they perform their roles. Readiness to learn, experience, motivation, and experience are some of the key adult learning principles that can enable agricultural extension workers to be better teachers among farmers but also better learners themselves. Chikaire et al. (2011) argue that the roles of extension workers need to move beyond their traditional role of passing on technology to farmers, as this has proven ineffective in providing for the changing needs of agriculture. This could be attributed to some of the technologies, information, and knowledge transferred and taught to farmers not being suitable for all farmers (Akpalu, 2013). According to Raidimi and Kabiti (2019, p. 52), "extension service delivery must shift from its current top-down approach to a knowledge sharing and facilitated learning approach."

Agricultural extension workers use different approaches when performing their teaching roles. These include a group development area approach, model farmers, transfer of technology, farm visits and training, media, use of technological devices like smartphone applications, demonstration sites, and farmer field schools (Buyinza et al., 2015; Hanyani-Mlambo, 2002; Mpiima et al., 2019). Each of these approaches offers potential benefits and disadvantages as well. For example, Maulu et al. (2021) claims that transfer of technology approach follows a top-down model of transfer of knowledge and this affected adoption of technologies by farmers. A study conducted in South Africa by Akpalu (2013) found that agricultural extension workers ignored diversity in the use of these approaches, and this contributed to the ineffectiveness of their role in teaching farmers.

Other challenges include dependence on donor funding, a limited number of extension workers, budget constraints, weak partnerships between extension workers and research institutions, education institutions, and other actors, a one-size-fits-all approach, corruption, inadequate materials for teaching inadequate transportation facilities, poor pay of extension workers (Antwi-Agyei and Stringer, 2021; Abdulshakur et al., 2020; Davis & Terblanche, 2016; Munyua et al., 2002; Raidimi & Kabiti, 2019; Semana, 1999). The identified challenges and more can make the execution of the teaching and learning roles of extension workers difficult, thereby forcing changes in how extension workers go about performing these roles. The next section thus focuses on how the agricultural sector is changing as an occupation.

2.7 How the agricultural extension occupation is changing

According to Msuya (2021), agriculture is undergoing transformation globally, and therefore the roles of extension workers need to change along with the changes in the agricultural sector. The transformation in the agricultural sector is a result of climate change, changes in innovation systems, technological changes, policy changes, and value-chain development. Technological developments and usage in agriculture will force extension officers to learn new knowledge and skills so as to be in a position to teach farmers such technologies (Msuya, 2021). Swanson (2006) supports Msuya (2021)'s argument by stating that agricultural extension needs to shift in its role by putting emphasis on producing high-value crops, livestock, and products and also look at the emerging roles of extension workers.

Msuya (2021) adds that as the roles of extension workers change towards them becoming facilitators and learners, academic training institutions are conscious of the new responsibilities and constantly change the way they train extension workers in order to make extension services more effective. Rodriguez, Erbaugh, Mattee, Msuya, Masambuka, and Cochran (2019) found that extension workers in Tanzania lacked the adequate skills and knowledge to perform emerging roles like facilitation, problem-solving, and partnership. This shows that as the roles of extension workers change, there is an urgent need for academic institutions to also change the ways in which extension workers are taught so that they are equipped with the needed skills to perform in their changing roles. Oumo and Cho (2014) further claim that most extension systems around the world are changing, and extension is noted to include more than just transferring technology-it also includes facilitation and learning. This is because the traditional approach that put emphasis on transferring technologies to farmers failed to effectively reach farmers and have AN impact in target communities (Raidimi & Kabiti, 2019, p. 52).

Ban and Samanta (2006, p.5) further conducted a study on the changing roles of agricultural extension in Asia and found that the changing roles of agricultural extension were due to factors like increased agricultural productivity, increasing income gaps, globalisation of trade in agricultural products, the need to increase farmers' income, and increasing populations. This could be a contributing factor to the ways in which the roles of agricultural extension officers are changing, as they are critical role players in the agricultural extension system. Climate change has had diverse impacts on agriculture and continues to negatively affect agriculture around the world (Alotaibi et al., 2019). According to Antwi-Agyei and Stringer (2021), for extension workers to be able to effectively enable farmers to adapt to the effects of climate change, the extension workers need to have adequate knowledge of climate change, its impacts, and emerging technologies aimed at combating the effects of climate change on agriculture. This could enhance how extension workers teach farmers about climate adaptation approaches in agricultural and rural development. This study, which was conducted in five countries in West Africa, also found that the most common sources of climate change information and knowledge were phones and televisions. The study therefore identified challenges such as inadequate materials, funds, and poor transportation facilities as constraining the ability of extension workers to effectively acquire the right knowledge to teach farmers to overcome the impacts of climate change.

So far, the parts of this literature review have looked at the conceptualisation of an occupation in general, the definition of agricultural extension occupation, the history of agricultural extension in South Africa and Uganda, the functions of extension workers in agriculture in the three countries, the ways in which they support knowledge transmission, and the changes that have an impact on their work. The sections that follow spotlight the ways in which occupations are studied and how the study of occupations is and will continue to change as greening occurs.

2.8 Studying occupations and occupational change

There are a number of reasons for the need to study occupations. First, occupations are key to our survival, and this is supported by Wilcock (1993, p. 18), who writes that people are occupational in nature so as to survive by providing for their needs and thus enabling them to carry out their own tasks for a purpose, consider consequences, make advance plans, reflect, and mentally change future behaviour due to the results of current outcomes. She continues by saying that an occupation offers a means for societal advancement and social connection. Occupational activities enable individuals to show who they are or what they hope to be. Therefore, occupations serve three key purposes in ensuring human survival: meeting urgent physical necessities like housing; gaining skills, social structures, and technology to ensure protection from predators; and using one's own abilities to further oneself (Wilcock, 1993, p. 20). But Wright (1980, p. 177) also explains that sociologists operationalize social classes in terms of occupational typologies. For example, professional and technical occupations occupy the upper-middle class, while manual occupations make up the working class. He therefore argues that classes are determined by the occupations of people in society.

Literature also looks into why occupations have to change over time. Ramsarup (2019) says that changes in the environment can be either challenges or opportunities that call for new skills and ways of doing things than what were not used before. This can cause jobs to change. This means that extension workers need to know how their learning and teaching roles are changing so they can help the agricultural sector deal with new problems.

Becher (1996, p. 54) also claims that workers in most professional fields, particularly those with learning and teaching roles, will continue to grow and develop new knowledge throughout their

working lives, and that higher education institutions and organisations need to study and be part of the change process. Whereas Ramsarup (2019) further claims that studying changes in occupations offers critical vantage points that can help us understand changes in work spaces, she also recognises the limited research conducted in the field of occupations under change, which greatly impacts transitions towards greener and more just occupations.

2.9 Knowledge transfer roles in Agricultural extension

Abdulshakur et al. (2020) argue that learning situations and sources have an impact on how well extension workers deliver services and the adoption of technologies and practices by farmers. This could be because the extension workers learn new knowledge that could impact how well they can pass it on to farmers. They, Abdulshakur et al., (2020) argue that appropriate situations must be created in order for extension workers to learn properly. Ban and Samanta (2006, p. 8) further explain that the sources of information for extension workers are also changing. In the past, they used to largely rely on government research institutes, but this is changing. According to them (2006), these days, extension workers learn a lot from successful farmers and fellow extension workers. This is supported by Hall, Raina, Naik, Clark, and Prasad (2005), who say that successful extension agents often learn from their own experiences and the experiences of other successful extension workers.

A South African-based study by Ngaka & Zwane (2017) showed that extension learning networks and personal learning networks were extremely helpful in the learning of extension workers because extension learning networks supported the sharing of information between extension officers and farmers, while personal learning networks, on the other hand, allowed extension workers as teachers to connect and engage with researchers, advisors, and farmers. Ngaka and Zwane (2017) therefore recommend encouraging extension officers to be more participative in learning networks as they increase information sharing and interaction between professionals in the extension field.

2.10 Conceptual framework for this study

From the literature discussed above, two concepts are critical for this study. These are the concepts of occupation and the knowledge transfer model. Under the concept of occupation, I will use the

five dimensions of an occupation developed by Shalem and Allais (2018) to provide an understanding of the nature agricultural extension occupation and provide a lens to examine how the occupation is changing. This will help me to examine the nature of the agricultural extension occupation by looking at the various factors influencing the occupation under each dimension. Due to the scope of this master's research report, I then did a deep dive into one dimension, which is central to the teaching and learning roles. There to help me to unpack the knowledge transfer roles of extension workers, the Shaxson et al. (2012) knowledge transfer model will be used to understand the teaching and learning roles extension workers play in the communities.

Shalem and Allais (2018) provide five dimensions through which the idea of occupations can be considered. The first is the **normative dimension**, which locates an occupation as a social activity in which workers have norms, views, and values that they follow, and these can be written or not. The second is the **knowledge dimension** which claims that workers in different occupations require both formal and everyday knowledge to be able to make right and informed decisions within these occupations (Shalem & Allais, 2018, p. 7). The third dimension of autonomy discusses two types of authorities that influence work within occupations. In authority looks at how people at higher positions within the occupations follow the established procedures to control the work of their subordinates within an occupation (Shalem & Allais, 2018, p. 12). On the other hand, an authority is where a person within an occupation is given the right to share their opinions based on their knowledge levels and not their hierarchical positions (Shalem & Allais, 2018). In other words, a person in a lower position within an occupation is able to freely share their knowledge with those in a higher position than them. The fourth dimension looks at the formal recognition of occupations within the labour market. It gives insights into how qualifications give power to occupations within the labour market and how occupations are organised into occupational councils or bodies, with stronger occupations being more organised and having more monopoly in the labour market (Shalem & Allais, 2018, p. 16). According to them (Shalem & Allais, 2018), "*they (occupations) have come to be seen as an indicator of the skills people have gained through education, which make them more productive, and hence as an indicator of an individual's economic value in the labour market."* This therefore also means that individuals with higher qualifications are seen to have more knowledge and hence occupy higher positions within their occupations. The last dimension looks at the political and economic contexts at macro levels

that influence how occupations function. It includes bureaucracy, policies, and penalties that impact occupations (Shalem & Allais, 2018). These policies are in different sectors like environmental, financial, educational or legal.

The second concept is the notion of knowledge transfer, developed by Shaxson, Bielak, Ahmed, Brien, Conant, Fisher, and Phipps (2012) as a framework that looks at how organisations and individuals can successfully use their roles to create knowledge and lead to change by asking the following key questions: "what is needed?, what is missing?, who has it?, what form is it in?, and how accessible and timely is it?". This framework of knowledge transfer will be adapted for this research to understand if there are any knowledge-sharing activities extension officers play in their learning and teaching roles. According to Shaxson et al. (2012, p. 2), the roles played by practitioners such as extension officers are knowledge-sharing activities that can be considered knowledge transfer, knowledge management, knowledge translation, knowledge exchange, knowledge brokerage, and knowledge mobilisation. Shaxson et al. (2012) offer useful conceptual tools to examine the knowledge transfer of these workers.

2.11 Conclusion

The literature reviewed covered a number of critical issues. It started by looking broadly at the meaning of occupations, using different authors and international bodies. The first definition of the term occupation is by the International Labour Office, that defines occupations as groups of jobs comprising similar jobs. This was followed by section two which narrowed down on providing an understanding of agricultural extension as an occupation. The literature in this section describes agricultural extension as an occupation that aims at supporting farmers and rural communities improve their agricultural practices through knowledge and information sharing.

The third section of the literature review discussed the historical development of agricultural extension in South Africa and Uganda. The literature showed that the current inefficient and ineffective extension systems in these countries were heavily influenced by the history and colonialism of these countries. For example, in South Africa, the system was developed based on the racial segregation of blacks and whites. Blacks were heavily excluded from the formal extension system, leading to extension workers in these communities lacking the relevant

knowledge to support the growth of farmers. Up to today, black small-scale farmers form the largest section of the agricultural sector continuing to received limited extension services from few extension workers who furthermore lack the relevant knowledge to support farmers.

The fourth section explained the various roles of extension workers in the three case studies. Throughout the three countries, extension workers serve a number of similar roles, and these included; teaching new technologies and knowledge on practices to farmers and teaching farmers better approaches to managing limited natural resources like water. However, literature also showed that most extension workers had limited knowledge to perform their roles effectively, and others had knowledge that was not necessarily contextually useful to the farmers.

The next section of the literature covered the knowledge-transfer roles of extension workers. Here, it was found that extension workers played a big role in transferring various forms of knowledge from various sources to the farmers. The section showed that the types of knowledge and sources of knowledge used by extension workers are changing, thereby impacting their knowledge transfer roles.

The sixth section explained some of the challenges facing the teaching and learning roles of extension workers. Inadequate resources, limited expertise knowledge, technological challenges such as access to technologies and a poor network, and the use of poor teaching and learning approaches were among the challenges. These challenges affect how well extension workers play their teaching and learning roles.

In the next section, the literature review looked at the changes happening in the agricultural extension occupation and the drivers of these changes. It was found that the knowledge roles of extension workers are shifting from transfer to more of a participatory and facilitative role as technology advances. Extension workers are moving towards becoming facilitators and learners in agricultural extension as opposed to being links to farmers.

The next section looked at why there is a need to study occupations and how they are changing. Here, Ramsarup (2019) argues that studying changes in occupations offers critical vantage points that can help us understand changes in work spaces; she also recognises the limited research

conducted in the field of occupations under change, which greatly impacts transitions towards greener and just occupations.

In the last section of the literature, two concepts were identified as being critical and useful in understanding the study. These were the concept of knowledge transfer and the concept of occupations. The first concept of knowledge transfers offers a useful framework that will enable the researcher to identify the various knowledge transfer roles played by extension workers during the analysis of data. The second concept of occupations is useful in understanding the tasks and responsibilities of extension workers and also in providing an understanding of how extension workers understand their own occupation.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter discusses the methodology used in the study. It describes the research design used in the study, the case studies included in the study, the participants, the data sets used, and the data analysis. Finally, the chapter covers the limitations of the research design used and the ethical considerations taken for the study.

3.2 Research design

For the study, secondary data from the Re-imagining Agricultural Extension Through a Learning Lens (RAELL) project was used. According to Pederson et al. (2020) the use of secondary data can contribute to significant knowledge contributions and serve as a foundation for future research, especially if large amounts of data were collected in the past. The RAELL project was a project funded by the Global Challenges Research Forum (GCRF) through the University of Nottingham in the United Kingdom. The project used a qualitative approach to conduct research in three case countries: South Africa, Zimbabwe, and Uganda. In the respective countries, the research was led by the University of Witwatersrand, the University of Zimbabwe, and Gulu University in Uganda. The short duration of the project (6 months) restricted cross-case analysis, and this study therefore contributed to a broader contextual understanding of how the teaching and learning roles of extension workers were changing across the countries of South Africa and Uganda.

A qualitative design was used in the REALL project because it provided an insider's perspective on understanding agricultural extension through a learning lens, which was the main aim of the project. Furthermore, Mutimba (2014, p. 16) argues that for a long time in Africa, critiques of the ineffectiveness of extension workers' roles and the failure of the extension system in general have come from people who are not practitioners in the extension field, and thus the qualitative approach allowed us to get in-depth perspectives from extension workers themselves and other extension system actors on the teaching and learning roles of extension workers and how these were changing over time.

During Re-imagining Agricultural Extension Through a Learning Lens (RAELL) project, the supervisor of this study, Dr. Presha Ramsarup, was the project lead for the South African case

study, and the researcher of the study served as the research assistant for the Ugandan case. It is important to note that while this study focuses on agricultural extension in two countries--Uganda and South Africa--it is not a comparative study but rather a contextual study that is trying to understand the nature of an occupation, and the two sites chosen are meant to offer insights from two contexts in Africa.

3.3 Study participants

This study had a large number of participant groups as the project from which the data was drawn was looking at the extension system as a whole in South Africa and Uganda. Therefore, it involved all the possible actors in agricultural extension, from farmers who are primary producers to policy implementors. The different groups of participants who were interviewed thus included the following:

3.3.1 Agricultural extension workers

Agricultural extension workers were included as the core group of participants for the RAELL project because they are the direct receivers of knowledge and technologies, which they then teach to the farmers. Because of the pluralistic nature of agricultural extension in the case studies, the extension workers interviewed came from diverse institutions and organisations. Some came from government departments, while others came from non-governmental organisations. Extension workers were crucial in providing what agricultural extension means to them, the knowledge they possessed, the sources from which they were learning new knowledge, and the methods they used to teach the final beneficiaries of this knowledge--the farmers. The extension workers also varied in their fields of expertise, including agronomy, entomology, animal scientists and general extension workers.

3.3.2 Policy makers and heads of departments

The second group of RAELL project research participants included policymakers and the project directors. They were critical in providing insights into the development and implementation of policies that impacted the practice of agricultural extension as an occupation in the three countries. From the policy side, key policy actors interviewed were the Directorate of Extension Reform at Limpopo Province in South Africa, the head of the agronomy department in Gulu, and a professor

from the University of KwaZulu Natal who had vast experience and knowledge in agricultural extension policy in South Africa (Monk & Adrupio, 2021; Ramsarup et al., 2021).

3.3.3 Trainers of agricultural extension workers

The trainers of extension workers included lectures from higher education institutions as well as those from vocational education and training institutions. These provided information on what knowledge was provided to extension workers, how it was taught, and what was covered under the various curricula that were used to train agricultural extension workers, as all of these heavily impacted the practise of agricultural extension.

3.3.4 Farmers

All the developments in terms of policy and practice in agricultural extension are meant for farmers, who are the final recipients of the knowledge and technologies in agricultural extension. They are the people that extension workers' roles influence and impact the most. Farmers were identified as participants as they would provide information on the type of knowledge passed to them by extension workers, what methods used by extension workers to teach them, the knowledge gaps of extension workers, and the relevance of the knowledge to their agricultural practices.

3.3.5 Students

The interview guides developed by the team of researchers for the RAELL project did not include one for students as research participants. However, the Gulu team, with the support of the team from the University of Nottingham, decided to develop an interview guide for students because they were on the path of becoming extension workers. But because this initiative was developed at the end of the data collection phase, one student from Gulu University pursuing a bachelor's in agriculture was interviewed to give insights on how students are trained to become effective extension workers later in the world of work in the agricultural extension occupation.

3.4 Data sets used

This study involved the utilisation of data from interview transcripts and critical documents from the REALL project in South Africa and Uganda. The interviews from the REALL project were collected using semi-structured interviews developed by all researchers from the three case studies

as well as the principal investigator and his team from the lead institution, the University of Nottingham. A total of four semi-structured interview guides were developed by the research team, and this enabled the collection of data from various participants, including teachers and lecturers in educational institutions, policymakers, agricultural extension workers, farmers, and non-governmental organisations providing extension services in the two countries (Ramsarup et al., 2021). Data collection in the two countries involved purpose sampling, which was identified as the most effective and convenient method of sampling for the research project (Etikan et al., 2016). This involved the research team pointing out the research needs of the project and directly identifying and selecting the most suitable participants based on their expertise, knowledge, and experience in the field of agricultural extension.

The Re-imagining Agricultural Extension Through a Learning Lens (RAELL) project was conducted in three countries: Zimbabwe, Uganda, and South Africa, but for this research study, the focus was on only Uganda and South Africa. This is because, while initially the researcher set out to base her on the three countries, due to the scope of a master's study and the time constraints, the researcher focused on Uganda and South Africa since the two countries are in two distinct geographical locations in Africa. Uganda is found in East Africa, and South Africa is in the South. In addition, the researcher has a deeper understanding of the agricultural extension systems in Uganda and South Africa, having lived in one of the countries, which allows her to better interpret and analyse the data. Lastly, the researcher being a Ugandan made it more relevant for the country to be selected, as the insights from the research can be beneficial to her home country.

In the South African case, a total of 17 interviews were collected. Of these, four were from the policy side: five farmers, and one farmer focus group, five extension workers and two university lecturers. Due to restrictions related to COVID-19, all interviews in South Africa were conducted online via Zoom, with purposive sampling being employed to identify the participants who were believed to be experts in the subject matter (Ramsarup et al., 2021).

For the Ugandan case, a total of 27 interviews were conducted, with the majority being done face-to-face because of the lower restrictions related to the COVID-19 pandemic in the country. One interview with a university lecturer was conducted online using a phone call. The breakdown of the interviews was as follows; 17 farmers, 1 focus group with farmers, 10 extension officers, 3

lecturers or trainers of extension workers, 3 implementation actors in the private sector, and 1 university student (Monk & Adrupio, 2021).

Table 1: Data sets used for the study

Data category	South Africa	Uganda
Interviews	17	27
Occupational Role Profile	8	12
Documents	2	2

Source: Author's analysis (2023)

3.5 Data analysis

Data collection in this research involved the use of different techniques as there were varying sources of data to be analysed. Analysis of secondary data through document analysis involved the researcher sourcing together all the documents that were going to be analysed. These included the two case reports from the project and 8 and 12 occupational role profiles of agricultural extension workers from South Africa and Uganda, respectively, as shown in table 1 above. The researcher thoroughly read through the project's final case studies to pull out any relevant information. Furthermore, the researcher extracted themes that talked about the knowledge transfer role of extension workers.

Primary data that had been collected through interviews for the RAELL project was first fully transcribed by the researcher. Due to the extremely short duration and time limitations of the REALL project, a number of the interviews from the case study countries were not transcribed. This process provided the researcher with an opportunity to interact better with the South African case, where the researcher was not part of the data collection process. The researcher then read the primary data from interviews a number of times while identifying key broad codes. Through this thematic coding analysis procedure, the researcher then grouped the codes into main themes. The main themes were grouped according to the two main concepts that were operationalised in this study, namely occupations and knowledge transfer. For the five dimensions of the occupation concept, after coding, the codes under each dimension were then grouped to form broader themes under each dimension. And for knowledge transfer, I grouped the extension officers' work according to the main tasks and duties that they conduct in relation to their teaching and learning roles.

3.6 Ethical considerations

For this research study that used secondary data, a number of ethical issues were considered. Firstly, in all three countries, the RAELL project obtained ethical clearance to conduct the research through the respective institutions. Ethical clearance was obtained from the University of Nottingham, the University of the Witwatersrand, the University of Zimbabwe, and Gulu University. Through the ethical clearance, all the project teams in the three case studies obtained important documents such as consent forms and participant information sheets. The ethical approvals ensured anonymity and confidentiality and prevented any possible danger that participants could face by being part of the research project.

Secondly, for this master's research, the researcher obtained an ethical certificate under protocol number **2022ECE035M** that waived the application for full ethical approval since there was no interaction with human participants during the study. Lastly, the broader project team was informed and permission sought for the use of interviews gathered. A permission letter was obtained from the lead institution, the University of Nottingham that allowed the use of the data from the Re-imagining Agricultural Extension Through a Learning Lens (RAELL) project for the study at hand and all members of the RAELL team were informed of the master's study.

3.7 Conclusion

This chapter has covered the methodology of the research study. The chapter has explained that this study draws on empirical and secondary data from a qualitative research project called the Re-imagining Agricultural Extension Through a Learning Lens (RAELL) that was carried out in three case countries: South Africa, Zimbabwe, and Uganda. Because of this research design, the research was granted an ethical waiver as there were no humans involved in the study. The next chapter, four, covers presentations of the research findings.

CHAPTER FOUR: FINDINGS OF THE RESEARCH STUDY

4.1 Introduction

In this chapter, the findings of the research study are presented and discussed. The data analysed and discussed includes data collected through document analysis and interviews. The aim of the study was to explore the teaching and learning roles that extension officers played in Uganda and South Africa. The analysis starts by presenting the findings about the nature of the agricultural extension occupation based on the five dimensions discussed in the previous chapter: the normative dimension, knowledge dimension, authority dimension, formal recognition of the occupation, and political and economic contexts influencing the occupation. Next, key findings emerging from the study are discussed under three broad themes: the teaching and learning roles of extension workers, changes in the teaching and learning roles, and facilitating and constraining factors leading to the changes in the teaching and learning roles of extension workers in Uganda and South Africa. To ensure ethical protocols are followed in ensuring anonymity and confidentiality, all the direct quotations from interviews will be taken as general comments from the various groups of participants.

4.2 Nature of agricultural extension occupation in Uganda and South Africa

Based on the findings, a number of themes are presented to conceptualise the agricultural extension occupation using the Shalem and Allais'(2018) five dimensions of occupations and the emerging themes are presented in the table below.

Table 2: Themes under each of the five dimensions of the agricultural extension occupation

Dimension	Themes
Normative	Formal laws and ethics within the occupation Social and cultural norms and beliefs
Knowledge	Possession of relevant expert knowledge by agricultural extension workers Knowledge sharing and technical backstopping between extension workers and other actors in the agricultural system Qualifications are indicators of one's knowledge
Authority	Compliance as main discourse in government Constraints in decision making More an authority (knowledge co-creation) on the ground
Formal recognition of occupations	Demand for higher qualifications in the labour market Formal governing body in the occupation Knowledge value of qualifications
Political and economic contexts of the occupation	Job stability Vs renumeration Working conditions Policy regulation

Source: Author's analysis (2023)

4.2.1 Normative dimension

The findings showed that the workers within the agricultural extension occupation follow norms, values, and behaviours when performing their roles. There are formally written down guiding principles of what an extension worker is meant to act and behave when dealing with farmers. this implies that extension work is a social activity where individuals working in the occupation have to work with integrity to achieve a common goal. There were also cultural norms, beliefs, and practices that communities followed, and workers within the agricultural extension occupation were to some extent governed by these norms as well as those who fell outside of their occupation. Under this dimension, two themes are discussed:

4.2.1.1 Code of ethics and values within the extension occupation

The data revealed that extension workers had a set of guidelines and rules that they were mandated to follow as they performed their tasks, and they were taught about these norms during job

orientation. The set of guidelines reflected different aspects such as the type of farmers to visit, which language to use when interacting with farmers, and respecting the rights of farmers, among others. One senior extension worker at the district explained:

"Extension officers learn the guiding principles, norms etc during orientation and while on the job. There are some adjustments also which require for example, you work within set policies, laws, guiding principles, etc. So, this is another area of learning also and the orientation takes care of that, but not so fully, much of it, you learn also as you are now running." (Extension worker 7-UG)

And while some of these principles and norms are explained and handed over to newly recruited extension workers, they learn that for them to effectively play their role, the farmer has to be at the centre of the occupation, as one policymaker with many years of experience in agricultural extension in South Africa stated:

"That's the first thing we have to do is to recognize the nobility of every single farmer, we have to recognize that that person is a human being who has both the right and the capability to make decisions." (Policy maker 1-SA)

Starting with the farmer meant that extension workers needed to recognise, understand, and make the necessary changes in the teaching approaches, language used and enterprise focused on to ensure that they could comfortably engage with the farmer. With regards to this, the findings showed that extension workers were aware of the literacy levels of the majority of the farmers and used the commonly used local languages when dealing with them. This implies that depending on the contexts where an agricultural extension worker in the occupation is located for their work, they have to manage and adapt to such changes in language as well as teaching approaches to best assist the farmers.

One extension worker, for example, mentioned:

"So, we, in our approach, we tell them during, when you're training farmers, you should strictly speak in the language, they know best. And that is the local language." (Extension worker 6-SA)

The findings further showed that the norms and guidelines that are meant to be followed by extension workers are, in some aspects, a false representation of what is actually happening on the ground among practising extension workers. For example, data from documents revealed that the ratio of extension workers to farmers is much lower than what extension workers work with in the field, as expressed by one South African extension worker:

"For the department, because we have norms and standards advocating extension work. If we can stick to those norms and standards, in terms of the number of farmers. Because us in the communal setup, I can say we're overloaded. Because in each village, you will find almost half, or three quarter of the village is involved in agriculture. So, for you to reach all of them it's a struggle. Or maybe if we can have less quota per extension officer, because as we stand now, it is one extension officer to 500 put in the standards. And 500, we're beyond that as extension officers especially in the communal settlements." (Extension worker 7-SA).

So, much as the results show that there are guiding principles and rules that govern the work of agricultural extension workers, the next sub-theme discusses cultural norms, farmer behaviours, and perceptions towards extension workers, and how these can either facilitate or constrain the work within the occupation.

4.2.1.2 Cultural norms, beliefs and practices that impact the agricultural extension occupation

The findings from the research study showed that there are a number of cultural norms, beliefs, and practices among the communities that extension workers worked in that have an influence on their work. One of these norms and beliefs was related to gender aspects, most of which were in conflict with the principles of extension workers. One extension worker said:

"And there are some other work activities, that men think it is really meant for women not them, say for instance like you're going to weed, some of them consider that those are some works which should be done by women. And maybe when you are going to cut grasses for mulching, they leave those ones to the women. And when it comes to other crops, like tomato, they have a believed in Acholi here, they believe that when the tomatoes have reached the flowering stage, women who are seeing their period should not enter the garden." (Extension worker 6-UG)

This shows that culturally, division of labour follows gender dimensions, with certain forms of farming work being left for women, but also that beliefs still restrict when women can and cannot enter the garden. These beliefs can have adverse impacts on the work of extension workers. Still

within the gender aspects, results showed that women are restricted from owning farming land, as one female farmer explained:

"I think its culture. Its culture because yeah, culture and beliefs myth as well. Because that is a myth to say a woman cannot own a land, she is unfit that she can own land is only men that can own land." (Farmer 4-SA)

The female farmer explains that the failure of women to have access to land is one of the biggest factors facing female farmers, particularly in rural areas, and that for women to be granted access to land, it is their husbands who seek permission from the village chiefs, as she stated:

"The challenges that we are facing as women number one. Women they, especially in rural areas, we don't have access to land. That's the challenge number one. So, no access to land, because you are a woman. If you want land or piece of land, we have it must be your husband to go and ask for land maybe to the chiefs." (Farmer 4-SA)

These findings show that women are excluded culturally when it comes to farming, and this can impede one of the major principles of the occupation, which is *"We support all the farmers, but we also group them into classes like progressive farmers, smallholder farmers then those who are still coming in farming."* (Extension worker, 4-UG) These gendered forms of discrimination, particularly towards women, can greatly impact their active participation in agricultural activities and also how extension workers effectively support such farmers within their occupation.

Other than gender norms, there were also general cultural community beliefs and practices that workers within the agricultural extension occupation encountered. One of the cultural beliefs is the agricultural practices that farmers engaged in particularly use of genetically modified seeds and fertilizers. One farmer who was strongly against the use of modified seeds other than local seeds said:

"To say, we can't, this is our pride our culture, because the seeds is our culture. They had a choice to say no, would better die than giving away what we had, what we have, what our culture, our beliefs, our pride towards our dignity towards they've lost their dignity." (Farmer 6-SA)

Another farmer from a farmers focused group explained how she witnessed organic farmers refusing the advice of extension workers to use synthetic fertilisers in their gardens. The farmer stated that:

"...not me personally but a group where they refused the harsh synthetic chemicals that are being offered by the extension officers. (Farmer 1-SA)

Important to note is that despite the existence of such cultural conflicts between the community and the practices of extension workers, the community firstly recognises that extension workers are valuable in communities, as noted by a farmer who said:

"I know their value. And then fortunately for me, I've found extension officers that that are open minded." (Farmer 1-SA)

Second, the farmers in the community recognised the difficulties that extension workers faced in carrying out their duties and were sympathetic to the gaps and difficulties that they encountered when working with extension workers:

"So sometimes you cannot blame them because they know only that, that the agricultural knowledge is from the college or from the university, you see." (Farmer 4-SA)

The findings on the first dimension of agricultural extension show that the principles, cultural norms, and beliefs surrounding the work of agricultural extension workers within agricultural extension are diverse and complex. Firstly, within the broader agricultural extension sector, there are formal guiding principles and norms within the occupation that determine how extension workers act and behave while in communities, as well as personal norms and behaviours like respect for communities. The communities as well have their cultural norms and beliefs that govern their farming activities and social life in general, but there seems to be a conflict between the norms within the occupation and the cultural norms in the societies that end up constraining the work within the agricultural extension occupation, as was depicted by norms and beliefs against women owning land, entering a flowering garden while on their menstruation, and certain forms of work being designated for women. Despite this, farmers recognise the valuable work that extension

workers do in communities and are empathetic when there are gaps in the work done by the extension workers.

4.2.2 Knowledge dimension

The findings have shown that knowledge plays a big role within the agricultural extension occupation. There are types of knowledge within the occupation based on a number of factors, including one's position, years of experience, and level of qualification. Different participants presented different opinions on knowledge within the occupation and these are discussed in the three themes below:

4.2.2.1 Possession of relevant expert knowledge by agricultural extension workers.

Most practicing extension workers feel than they have all the relevant knowledge to carry out their responsibilities effectively and this was obtained through formal education, but they always forward what they can't handle to research institutions, take an example of an extension worker who alluded that:

"Being an agricultural extension worker, you get to have the skills and knowledge. So that was imparted from my course of study." (Extension worker 7-UG)

Another extension worker from South Africa gave a similar opinion citing how farmers expect them to know everything, he stated that:

"The expectation is that when the extension officer visits the farm or a farm, it is expected that the extension of that just knows everything." (Extension worker 1-SA)

These findings show two things. First, the findings show that extension workers believe that they have the relevant knowledge and that they obtained it through formal qualifications. Second, farmers too expect extension workers offering extension services to have the knowledge to offer them assistance in the different agricultural enterprises that farmers are carrying out.

4.2.2.2 Knowledge sharing and technical backstopping between extension workers and other actors in the agricultural system

When practising in the field, some extension workers acknowledge that they cannot be experts in everything and often seek further knowledge from their peers, those who are considered to be more experts than them. These experts were different categories of professionals within the extension occupation, including senior extension workers, university lecturers, and researchers at research

institutions. For example, a senior extension worker in Uganda talked of providing "technical backstopping" to junior extension workers and community-based facilitators:

"The role of a senior officer is now to supervise the field extension workers who are a little bit, junior. So, we do supervision, we do technical backstopping." (Extension worker 6-UG)

The extension worker explained technical backstopping as filling any practise gaps among young and new recruits of extension workers because his being a senior means he has more years of experience. The data also revealed that years of experience are associated with more knowledge and offer extension workers advancement within the occupation. Data from the Uganda case showed that a junior extension worker needed three years of experience to be promoted to a senior extension worker position, as explained below by one of the senior extension workers:

"Then you after gaining experience for at least about three years. You can now become a senior officer." (Extension worker 6-UG)

From the above findings, it can be seen that extension workers do not know everything and have to rely on their fellow extension workers to gain more knowledge in areas where they lack some knowledge. This, however, follows a hierarchical format where senior extension workers, who are believed to have knowledge through experience, support junior extension workers. Furthermore, practical and experience knowledge also play a big role in the agricultural extension occupation, as workers with more years of experience in the field gain access to progressing within the field through promotions but are also sought to provide knowledge support to newer extension workers.

4.2.2.3 Qualifications as indicators of knowledge levels

Furthermore, with regards to the knowledge dimension, qualifications served as an indicator of one's knowledge levels, as argued by Bills (2003, p. 444), who says that educational qualifications portray one's skills and abilities that are relevant for the job. The data showed that when hiring within the government departments in both countries, certificate graduates are not hired; the hiring begins with those that have diplomas or higher, as these were believed to have adequate practical and theoretical knowledge. One district extension worker in Uganda explained:

"For hiring somebody, I would expect somebody who has been formally trained in an accredited institution, who has been trained in agricultural extension services, either in the veterinary field or in the crop science field or in fisheries and entomology. There are institutions

which are training, specifically training, the extension workers in those fields. So, I would expect if I am to hire somebody, it would be somebody who has undergone that training at diploma level or a degree level." (Extension worker 6-UG)

This argument was supported by a university lecturer who trains extension workers. The trainer asserted that during the training of graduates or potential extension workers, they are taught broad bodies of knowledge using a general curriculum that will enable them to have all the relevant knowledge to tackle the challenges that farmers face. According to the trainer, a curriculum that allows students to specialise is limiting the level of knowledge that they can exercise within the practice. He explained by saying:

"…unlike other universities, where they have maybe specialization somebody and then they say you specialize in soil science, then they specialize in animal science I specialize in science station, they are by the end of the first year, if you are you are treated as an expression officer who is supposed to offer general agricultural advice or farmers you may not help farmers may be who you may not know how lots of knowledge in crops because you specialize in economics you may not have adequate knowledge in livestock production because you specialize may be in crop science. So, because bachelor of science in agriculture and other programs are general programs. That's why I believe that as far as we are concerned, the faculty are not constrained in finding a gap that currently is really limiting students not perform well." (Trainer 3-UG)

Despite government departments and higher education institutions agreeing that extension workers need broader levels of knowledge, the findings revealed that some of the private extension workers were only certificate holders. One poultry farmer in the private sector claimed that her farm manager was a certificate holder and that he had more relevant knowledge than most of the extension workers that she had come across. According to her, extension workers do not have the knowledge to help farmers with their problems, as she expounded:

"I mentioned here and there about how the extension officer was not able to identify sickness in a bird. Like, at some point, I had an outbreak of Cytosis, some kind of I don't recall the technical name for poultry, but it was a liver disease. Then I call the vet, I actually kept that liver and called him. And he had never seen anything like that. Like really even in school, you've never heard of it. And they said no." (Farmer 3-UG)

However, a senior extension worker in government made it clear that in government, certificate holders are not hired as extension workers, he said:

"No, we don't recruit those ones" (implying extension workers with certificates), (Extension worker 6, UG)

The findings above show that specific levels of knowledge within the occupation are not uniform in practice from certificate levels to master's, as different levels of knowledge are recognised differently within the occupation's private and public sector actors. The data showed that while a senior extension worker reported only hiring diploma and degree holders as extension workers, a farmer in the private sector was working with an extension worker with a certificate. This implies that formal knowledge is necessary for the agricultural extension occupation, and therefore, there is an increasing demand for workers with higher qualifications in the workplace. However, this demand for workers with higher formal qualifications is more prevalent in formal government departments, but in the private sector, workers with lower formal qualifications, such as certificates, who would not be hired in government jobs are still able to get employment as reported by a senior extension worker in Uganda.

4.2.3 Authority dimension

Within this dimension, the research findings revealed that there were variations in the relationship between extension workers within the occupation and other actors such as the government, farmers, researchers, and fellow extension workers. This was because at higher government departments there was a top-down approach with compliance to procedures as the main discourse, but while practising on the ground, extension workers gave more opportunities for people in communities to express their views and jointly co-create knowledge.

4.2.3.1 Top-down flow of authority in the extension system

Firstly, the research showed that the relationship between extension workers and the various departments at the governmental level was very top-down, sticking to procedures and protocols that extension workers at various positions followed. For example, a senior fisheries officer in Uganda explained the chain of command as follows:

"We have a district Production Coordinator. Who is a link between the local government and then the ministry. So, the flow of information comes from the ministry, throw the district production officer down to the extension workers. And then also from the extension workers through the district production officer to the ministry. it is a bi directional flow." (Extension worker 6-UG)

The above participant in Uganda explained that within their extension department, there was a two-way flow of information that was from top to bottom but also from bottom to top. Contrary to this, a policy implementation actor in South Africa says that, within the country, the centralised form of decision-making constrains extension workers from making certain decisions. The policymaker explained:

"So, if you want to work with forestry, there might be a forest officer near me. But he has no authority to make any decision as to go all the way to wherever their headquarters is. We have a centralized action, but centralized decision making. And that's very common in South Africa, where you have people on the ground, but they have no authority to make decisions. They, so it becomes difficult for a group to make a decision" (Policy maker 1-SA)

The findings further revealed that this top-down flow of authority, particularly from the public sector, also impedes the decisions. This was in terms of the enterprises that farmers can engage in, as one participant clearly stated:

"We have inputs that we could always have, as the district, we prioritize those commodities, these commodities when we first come and asked to present. And we submit to the ministry. And then the communities. We always tell the farmers that this is what is at the district, as far as I say we do also include up support." (Extension worker 10-UG)

From the above, it can be noted that the government's extension system is very bureaucratic, and there is a top-down flow of information and procedures. As such, extension workers follow a centralised system of decision-making with little autonomy for them with the work they do within government, and this their affects decision making.

4.2.3.2 Practising persuasion and knowledge co-creation with communities

Despite the fact that extension workers are constrained by the procedures in decision-making within their work in the government, the extension workers recognise that they can only try and

persuade farmers and communities to adopt the knowledge that they are passing on, but farmers have the agency to decide what to adopt or not, as said by an extension worker in South Africa:

"So, what we're trying to do is to build the capacity of the farmer, and whether they adopt a particular technology is not our concern. What we're concerned about is that they have rational decision-making powers around saying yes or no to a technology." (Extension worker-SA)

Extension workers on the ground in communities move beyond just following procedures and protocols established within their work; they take the initiative to freely interact with the presumably uninformed and illiterate farmers by engaging in joint discussions but also by being willing to learn from experienced farmers who are willing to share knowledge that has worked for them. With regards to this, an extension worker in Uganda was recorded saying:

"Sometimes we kind of experience sharing, we share experience because there are farmers within the community that have quite good knowledge that they can also share with their colleagues." (Extension worker 3)

The research findings above therefore showed that within the government more so, compliance to procedures and protocols is the main discourse within the occupation, and this type of bureaucratic setting limits the flow of knowledge within the occupation. But extension officers in their work with farmers try to break this discourse and practise "an authority" where they value the opinions of the farmers who have a lower knowledge level than them.

4.2.4. Formal recognition of an occupation dimension

In looking at the formal recognition of the agricultural extension occupation dimension, the data showed that generally formal qualifications are becoming more required within the occupations, with some low-level qualifications such as certificates not being recognised, and this was discussed under the knowledge dimension.

4.2.4.1 Formal governing body

In the Ugandan context, the biggest finding indicated that there was no professional governing body for agricultural extension workers to ensure all those within the occupation held the right levels of qualifications. One trainer of extension workers asserted:

"If we are to look at Uganda as a whole, there is no streamlined way of getting agricultural extension workers apart from government, yes, but if you were to look at other NGOs and so on, they recruit people who are incompetent. Okay. So, I think there must be a body in Uganda, which will be directly we use all extension workers who are qualified." (Trainer 3-UG)

As a result of the above, the job qualifications for extension workers varied within the public and private sectors, as seen under the knowledge theme where, while in the government, certificate holders are no longer being hired, in the private sector, these graduates are still having access to the labour market and holding higher positions such as farm managers.

4.2.4.2 Weaker qualifications in the labour market

Aside from the growing demand for higher education in the extension occupation, having a higher education does not guarantee access to a higher position at an entry level. On the contrary, a senior extension worker in Uganda explained that, irrespective of the level of education, when one gets a government job as an extension worker, the person will start by being a junior extension worker when entering the labour market. The person explained this by saying:

"Even if you have a master's degree, when you're first joining the service, you join as a junior officer." (Extension worker 6-UG)

This particular participant had completed a bachelor's degree and joined the government extension service as a junior extension officer before being promoted to a senior extension worker three years later. This shows that there is little recognition for the knowledge value of qualifications since all workers joining the public sector in Uganda start as junior extension workers, despite of their level of qualification. South Africa, on the other hand, has the South Africa Society for Agricultural Extension as a professional body that regulates the occupation in terms of qualifications and competences, but farmers did not seem to recognise the various levels of qualifications possessed by extension workers, claiming that all extension workers did not have the relevant knowledge to provide the required support to farmers. One farmer hence declared:

"They are failing people because they have a lack of knowledge. Yeah, they bought their diplomas or their degrees from universities from colleges, but they have degrees and diplomas, it means nothing, because they have a lack of knowledge. They know nothing, yes." (Farmer 4-SA)

The findings indicate that the agricultural extension occupation seems to be a weak occupation in the labour market within Uganda and South Africa. In Uganda, this could be attributed to the lack of a professional body governing the occupation and its workers, but even though South Africa has such a body, there are still struggles within the occupation, especially in relation to formal qualifications and their recognition within the labour market.

4.2.5. Political and economic context of the occupation

The government plays both a political and economic role through policies that influence the agricultural extension occupation. The findings revealed that economic aspects within the labour market, such as remuneration and job stability, affect the choice of an extension professional to work either in the public sector or the private sector.

4.2.5.1 Job stability in the government versus high renumeration in the private sector

For participants who had worked both in private and public extension systems, most of them claimed that the remuneration within the public sector is much lower than that of the private sector but government work offered better job stability. The stability applied majorly to job security to long-term employment and employment benefits such as pension after retirement. One participant said:

"Job security in government is good but renumeration is poor compared to the NGO world." (Extension worker 1-UG)

But extension workers did not only look at their personal benefits when it came to choosing where to work; they also looked at the impact of the work that they were doing, and here the findings showed that government work had more impacts within the community, as noted by the same extension worker:

"So and then, in terms of the work, I think, government work, to me, would give better results than NGO world because we have the time the challenge with NGO world is that there is a lot of pressure to meet timelines that gradually reduces on the efficiency and effectiveness of the individual officers, if an independent, honest and sincere evaluation is to be done, you will believe that you will get to find those facts because me I was with the NGO was I know, you'll find this this timeline ABC wants to be done things, at certain points, things are done, to exhaust the budgets to

consume the time, so that there is a picture outside there that this result has been met." (Extension worker 1-UG)

The above findings show that when it came to the sector extension workers preferred to work in, a good proportion preferred to work in government or the public sector. This was because, while public extension workers reported receiving lower remuneration compared to their experience from working in the private sector, they did report that government employment offered more long-term job security in terms of contracts and pension. Government jobs were reported to also offer long-term impacts to farmers and communities compared to private extension, where most projects are short-term with little impact on communities.

4.2.5.2 Poor extension policies and policy regulation

The findings indicated extension policies and their regulation as one of the political contexts influencing the work within the agricultural extension occupation. One of the issues noted was the poor regulation of policies developed in the space of agricultural extension and development, as noted is as one policymaker in South Africa reported:

"So, there's a lot of there's a big regulatory function, that, influence agriculture. So, what I have found in terms of the two basic policies of extension and agricultural development policy, they often don't speak to each other, or they speak too much to each other." (Policy maker 1-SA)

The participant explained that besides the poor policy regulation, there was also a challenge with policy development as most policies of extension and agricultural development are developed by short-term politicians, resulting in short-lived and constantly changing policies, as the participant further added that:

"And it is also top down with a with, with the context that policies are developed by politicians who have who have a short lifecycle, they have to get re-elected every five or six years." (Policy maker 1-SA)

So, in summary, the policymaker notes that policies in Africa are top-down and not coordinated. This results in a number of constraining and facilitating factors that affect the work of agricultural extension workers, and this is discussed further in the last chapter, which looks at the factors that are causing changes within the teaching and learning roles of agricultural extension workers.

Using the five dimensions of the concept of an occupation has given me the lens through which to understand the agricultural extension occupation and what factors influence work within the occupation based on the five dimensions. These dimensions illustrate that the agricultural extension occupation is a political and social activity, and the workers within the occupation first and foremost have a sense of identity and a common purpose that they strive to achieve. However, the work that the workers in the occupation perform and how well they perform these roles are dependent on other external forces like the cultural norms and beliefs of the people they are assisting, the type of formal training and knowledge that they possess, the professional bodies that govern the work that they do, and the degrees of autonomy that members within the occupation are able to exercise. With this in mind, I am now able to unpack the teaching and learning roles of extension workers within their occupation, and I do this in the next section.

4.3 Teaching and learning roles of extension workers

One of the objectives of the research study was to understand the teaching and learning roles that extension workers play in their occupation. From the data, findings showed that different participants had varying views of what the teaching and learning roles of extension workers entailed. And while there is no clear-cut difference between teaching and learning roles because in the process of teaching, one is also believed to be learning, where a clear role can be brought out, it will be made. The main teaching and learning roles that emerged are presented in the table below:

Table 3: Themes for the teaching and learning roles of extension workers

Roles	Themes
Teaching roles	Needs assessment Training of farmers using different approaches Knowledge transfer
Learning roles	Research and information gathering Undergoing training and academic upgrading Learning from farmers

Source: Author's analysis (2023)

4.3.1 Needs Assessment

Needs assessment was one of the main teaching roles that a number of the participants explained as being performed by agricultural extension. This teaching role was concerned with extension workers finding out what different farmers in the community required in terms of the types of inputs and solutions to some of the challenges that they were facing. One participant explained:

"We are going to talk in terms of mainstream government and projects under mainstream we do a needs assessment. Now a needs assessment tells us farmers in Paicho want maize farmers this side also maize a few of them wants this" (Extension worker 1-UG)

According to one extension officer in Uganda, the needs assessment is a two-way process where one way involves extension workers observing farmers to identify their needs, and the second involves farmers reaching out to extension workers with their needs as explained by the extension worker:

"With interaction you see that what is lacking from his farm and also by them approaching the office or yourself that this is what I want, then it is then that you try and identify, you try and find out where you can ask this person. So, it's almost a through a two-way process, where through interaction with them, through meetings, information to farmers, and agricultural shows, then you can see you can identify that there is a gap here is, this is how I would need assistance here. All for him or her approached you or the office requesting particular steps. That is how we identify farmer's needs." (Extension worker 6-UG)

However, the above argument contradicts what another extension worker in Uganda said. According to the other extension worker, farmers do not decide their needs, the needs have already been predetermined at a higher hierarchical level, such as the ministry. He was noted saying:

"Needs assessments, we do. But basing on the inputs that they have already selected, not the farmers themselves to select." (Extension worker 4-UG)

Another extension worker in South Africa noted that farmers' needs are not the same and often vary when they are conducting community needs assessments. The participant hence said:

"But the needs of the farmers vary also the time that we are living in now" (Extension worker 1-SA)

This was evidenced by farmers who identified some of the training needs that they wanted extension workers to focus on during their visits:

"Yeah, for me, if they can teach us about the varieties, which one is the good variety of crops or if they can to choose the good variety that can cope up with our land, you know, our land here is somehow not fertile, by the way. Yeah. So, if they can help us to choose good variety of seeds, it would be good and then also how to maintain that seed by the way. To add on that, if they can also teach us how to raise the crop from nursery bed by the way, yeah. And also, how to get the market also, yeah. That is the very big challenges we are facing market, yeah. Getting market is very expensive, by the way." (Farmer 4 in focus group1-UG)

In summary, the above sub-section indicated that needs assessment is one of the key teaching roles of extension workers. The findings revealed that, on the one hand, extension workers identified the needs of communities in collaboration with farmers, while on the other hand, the data showed that the needs of farmers were determined by higher authorities in the government, such as ministries, leaving farmers with little influence on identifying their own needs.

4.3.2 Training farmers using different approaches

What usually follows after identifying the needs of the farmers is that extension workers then address some of the training needs of the farmers using different training approaches or methods that extension officers learned during their formal training. In regards to this, one university trainer in South Africa explained:

"We have developed a range of extension tools that we teach students to use, which are non-traditional extension tools. And we tell them even in second year, we tell them, these are experimental tools, work with them, give us feedback, tell us how they're working, we send them into the field to test them with farmers and, and to on a small scale, but they engage with them" (Trainer 1-SA).

So, when in the field, extension workers use a range of approaches when training farmers. One of the common approaches used while training farmers is *demonstrations*, which act as learning centres for the farmers where they are located. One extension worker in Uganda said:

"We go and set up demonstration, then we release them to go and construct their ponds but we don't leave them totally, we make follow ups, whether they are doing it correctly." (Extension worker 6-UG)

To maximise the farmers' learning from the demonstrations, they are usually conducted on the farms of what extension workers refer to as "lead farmers." These are farmers who are in a suitable location where a large number of farmers can reach them, but also whose farms have adequate resources to promote learning by other farmers. A good example of this is an extension worker who described:

"Training there are several approaches one we talk of these demonstrations we have set up demonstrations. We are planning to set one for beans this June towards the end because from the local experience from our lead farmer, we have a lead farmer in that one there who is going to host for us the demo from the experience you're supposed to plan towards the end of the month the local experience so we are going to plant that is going to be a demonstration." (Extension worker 2-UG)

Other extension workers also discussed other methods that they use while training farmers:

"We mostly use focus discussion groups, we put them in groups of few people and we have the eight of the group. So that passing information can be easy. Mostly we use focus discussion groups." (Other extension implementor 1-UG)

Another extension worker reported that the training starts with classroom-based training, and if there is a need for demonstrations, they can be conducted in the field. This participant said:

"But if they are many with a similar problem, we bring them together in a classroom, train them, if it requires carrying out a demonstration, we do the demonstration for all of them." (Extension worker 5-UG)

Different approaches are used for different reasons; for example, focus group discussions were said to be the most preferred approach because it allowed extension workers to meet many farmers at once since their numbers are always too limited to effectively support individual farmer visits. But even when individual visits to farmers are made by extension workers, there is time a limitation where the extension worker can only meet the farmer for a limited period of time. This is supported by one extension worker in Uganda who claimed:

4.3.3 Knowledge transfer, translation and interpretation

The findings also showed that one of the teaching roles of agricultural extension workers has to do with knowledge transfer, which involves extension workers relaying knowledge from different sources to the farmers, as one extension worker was recorded saying:

"They are the facilitators of the transfer of knowledge to the farmer." (Extension worker 1-SA)

Still related to the knowledge transfer role, extension workers are reported to translate what is called "technical" or "complex" information on various areas, such as technologies, to farmers into simpler language, as told by an extension worker who said:

"...even if you are illiterate like people like us you have a way to translate. in our culture. you have your way of knowing things of translating things in a from too much technical to in a simple in a simpler way." (Farmer 4-SA)

Similarly, in Uganda, extension workers believe that they play a role in translating information, particularly that related to technologies that are difficult for the farmers to understand, as one explained:

"...it is extension workers who are supposed to translate the complex technologies from research to the farmer." (Extension worker 4-UG)

The findings on extension workers' teaching roles revealed that their roles evolved from identifying farmer needs to training farmers using various training approaches, during which they also broke down complex knowledge for farmers in their knowledge transfer and translation roles.

4.3.4 Research and information gathering

Aside from teaching, extension workers also play a learning role in which they become learners themselves through their work. This role is critical as it ensures that extension workers have the right knowledge and information to teach the farmers. The data showed the different learning roles that extension workers played. One of the learning roles involves searching for information. This was reported by one agricultural extension worker, who claimed:

"So, we get that information using our various platforms some of them electronic and then we give them out to the farmers." (Extension worker 4-UG)

The online sources ranged from the internet to social media platforms like WhatsApp and Twitter, where extension workers form critical learning networks to share knowledge and also get information on issues that they did not have knowledge of, such as:

"Actually, on weather, we get the ref from the National metrological centre. When we, the website is there when we click, it gives you the weather update." (Extension worker 4-UG)

The data further indicated that extension workers had close links with research institutions and hence got access to knowledge that was produced by such institutions or individuals working within them. The evidence from the data on this is as follows:

"It's both, actually, we have research stations. They're the ones who generate the new technologies. Then throw the ministry. We get to know those new technologies." (Extension worker 6)

The findings show that this is the case for both countries, different sources of learning were utilised by extension workers to expand their knowledge to best serve the communities that they work in.

4.3.5 Undergoing training and academic upgrading

Findings also revealed that extension workers took part in different types of training, whether on the job or through short training courses, to learn more about issues. One extension worker said:

"Because with the government I have had a lot of capacity building there's so many training that are organized either by ministry or the district or the department itself, that gives us opportunity to learn what we have never learned before." (Extension worker 1-UG)

The extension worker went on to add to this by saying the trainings offered capacity-building opportunities for him to learn new things, and he is quoted as saying:

"I have had a lot of capacity building, there's so many training that are organized either by ministry or the district or the department itself, that gives us opportunity to learn what we have never learned before." (Extension officer 1-UG)

As reported by another extension worker, the "dynamic" private sector also offers ample training opportunities for farmers to learn and broaden their knowledge. The extension worker said:

"I mentioned is like one commodity, you learn that the private sector actually I almost forgot. So, the private sector is very dynamic, they are looking into opportunities that make a difference. So, we came in as a project and learnt of this more broadly and the project would successful. If other external factors had not hampered us and the market abroad was compromising by the covid situation." (Extension worker 7)

Extension workers take part in a range of capacity-building trainings which are provided by both the government and the private sector.

4.3.6 Learning of traditional knowledge from farmers

To other extension workers, farmers acted as a good source of learning as they had relevant experience and were freely willing to share it with the extension workers, as seen below:

"I told them (extension workers) about the seed saving because they didn't know that. Seed saving and how to pack it and how to label it" (Farmer 1-SA)

The extension workers themselves attested to farmers having knowledge, sharing this knowledge with them, and then using this knowledge in practice or passing it on to other people in the

community. Farmers' knowledge covers a wide range of agricultural topics. For example, one extension worker learnt how to identify good local beehives from an experienced farmer; he expanded on this by stating:

"The farmers shared for me knowledge, like the type of these local beehives, that this local bee hives the mature ones at the first place, sometime when they have just cut, it is very difficult to identify that this is a mature local bee hive or this is just a young one. So, they give me advice that these mature ones are good because it will last longer and it will not, the bees will not abscond compared to the younger ones. The younger one may smell very well, very good, the smell and the aroma will be nice and attract bees within two weeks the bees will have colonized but again to start developing some white furs, some let me say some moth, some cocoons inside and in it decompose and the inside one fall down and bees will abscond you'll clean it and it will take time again to dry. So, you will have wasted a lot of time compared to fighting and matured local hive of which will just be in the centres and the bees enters." (Extension worker 3-UG)

The extension worker, however, added that he does not stop by learning and practicing the knowledge that he obtained from the farmers, he goes a step farther and conducts research to find out if the knowledge is legitimate, as seen below:

"It worked also for me and I did research about that, I found out that this iron sheet will cut the precipitate to make them scattered not to get absorbed into the, in the beehives. Yes, and it works." (Extension worker 3)

In this next example, an extension worker learnt something in crop production, as the participant alluded:

"With crop varieties I have seen, where you go to the community and the variety of choice, is new to you as information I have encountered them but they don't have very specific I can tell you now but you just learn that this is what's going on." (Extension worker 7-UG)

Some extension workers refer to what they learn from farmers as "traditional or local knowledge," as one extension worker put it:

"I had once scenario whereby a farmer shared with me one of the ways of pest control and he was using some local plant, I cannot remember the name now. So, and he was spraying with

his tomato, and it was controlling the pest, which was disturbing the plants." (Extension worker 5-UG)

The extension worker went on to add that:

"But after realizing that it worked, I had to start spreading out to others, such that if they can adopt that would be okay." (Extension worker 5-UG)

This implies that not only did the extension worker learn from the farmer, but he also shared this knowledge with other people as it had worked well, and in doing so, he became a teacher too, hence my argument that the teaching and learning roles are intertwined. Some extension workers pointed out that not all of them were accepting the adoption of the "traditional knowledge" that farmers possessed, and one extension worker expressed this by stating:

"No, because we are moving to modern, we shall build on what they have. Traditional knowledge is what they have." (Extension worker 3-UG)

The participant added that *"because we are moving to commercial farming"* (Extension worker 3-UG), indicating that in the modern farming system, there is no need to rely on any form of traditional knowledge. However, he cautioned that local farmers may misinterpret the language: *"because if we say traditional knowledge, they will still use open fire in harvesting which the product will be very bad."* (Extension worker 3-UG)

In summary, extension workers play a range of teaching and learning roles in the occupation. As teachers, they have the responsibility of finding out the needs of their farmers or the problems that the farmers are chasing, and then providing the necessary training to the farmers using several approaches to help them overcome their challenges. Extension workers, as learners, participate in a variety of trainings provided by both the private and public sectors to broaden their knowledge and skills. In the next section, I discuss any changes that have occurred or are occurring within the teaching and learning roles of extension workers in Uganda and South Africa.

4.4 Transformations within the teaching and learning roles of agricultural extension workers

The previous section looked at the teaching and learning roles played by agricultural extension workers; in this section, I present the findings from the data that show whether or not these roles

of agricultural extension workers are changing and any indicators to support what changes are occurring within the roles, if any. The findings showed that the teaching and learning roles of the extension workers have changed over time and will continue to change. These changes include; changes in the nature of technologies used for learning and teaching, the mode of transport used by extension workers, and the agricultural practices and enterprises that farmers take part in.

Firstly, the findings showed that the entire agricultural extension system is changing, which means the extension workers and the roles they play must also change. An extension worker in South Africa was reported as saying:

"There's a change in it, because now the extension officers aware of the most issues that are happening around them, they are aware of their responsibilities. They can be able to confront issues I think now, even the society as a whole now understand the relevance of the service on itself that it is required for us to withstand and confront these issues of food security." (Extension worker 1-SA)

Secondly, as noted in the previous section, extension workers are now using countless forms of technology, including the internet and social media platforms, to perform their teaching and learning roles.

Third, an extension worker explained that they now use various modes of transportation to reach out to farmers and teach them in their various locations. The extension worker explained:

"…the mode of transport used to be bicycle, but these days we have motorcycle." (Extension worker 8-UG)

And while other extension workers agreed to this, some noted that there were still challenges, mostly with logistics when using motorcycles to fulfil their roles. In this regard, an extension worker implied:

"The mode of transport used to be bicycle, but these days we have motorcycle although we have challenge of fuel and other logistics." (Extension worker 1-UG)

Another extension worker noted that now they have more actors to work with, with all these actors trying to support them in playing their teaching and learning roles, as he was quoted as saying:

"…even we do work with the politicians, because at the sub-county, they are the politician like the LC three and the councillors, they help us a lot in mobilization and getting their will." (Extension worker 1-UG)

The extension worker also mentioned the abundance of technological and research centres that help them learn new technologies and knowledge:

"I think, there is some improvement, because we already have, we have so many, the technology generating centres, we have the Ngetta Zadi for Northern Uganda, we have the NARO, we have those ones in Arua. So, and we also have the universities that are helping us in doing some research, we use not have Gulu university but these days we have. So, I think there will still be upcoming, other institution that can help us to change the sector and the extension." (Extension worker 1-UG)

The research findings also revealed changes in agricultural practises taught to farmers; for example, an extension worker explains a change in beehive placement as a consideration or inclusion move for farmers with disabilities:

"You cannot set a beehive up on the branch of a tree. And we expect a woman to climb and you expect a disabled one, you need to set at least two to three meters from the ground, at your chest." (Extension worker 3-UG)

Changes in practice are also noted in the crop sector, where one extension worker disclosed that:

"…majority of farmers are now producing improved, growing improved seeds, compared to two to 5 years" (extension worker 1-UG)

Changes in the enterprises are also followed up by extension workers, who now carry out a broader form of training of farmers to cover various aspects of agriculture, business, and beyond, as one extension worker told us:

"…train farmers in various areas ranging from production, farming as a business and other cross-cutting issues like HIV/AIDS and environment, gender related issues in the family because that one can also negatively impact on agriculture." (Extension worker 1-UG)

The findings in this section showed that the teaching role of extension workers is changing and has changed over time. Changes are in the areas of modes of transportation, the types of enterprises

that farmers are involved in, the practices that extension workers train farmers, and the training content for framers' which has become broader to cover other aspects such as gender-based violence and HIV/AIDS, which could impact the performance of the agricultural sector. According to the results, there are now a larger number of other actors who are providing assistance to extension workers in performing their roles and responsibilities, including politicians. The findings also revealed that the changes are within the entire agricultural system, not just within the teaching and learning roles of the extension workers.

4.5 Findings from analysis of occupational role profiles (ORP) of agricultural extension workers

Data was analysed and generated from a total of 20 occupational role profiles from Uganda and South Africa. These consisted of various job advertisements from a range of organisations and departments such as national government, ministries, local government, international and local organisations, and private companies. The findings generated were grouped into three major themes that are relevant to the research study.

4.5.1 Job descriptions of extension workers

From the analysis, it was found that different organisations outline different roles and responsibilities, and these depended on the position to be filled. However, government departments in both countries presented a more detailed description of what an extension worker was expected to do. Three broad roles were identified from the job descriptions: providing technical support to farmers, supporting the implementation of government programmes, and supporting sustainable agricultural development.

4.5.2 Qualification requirements of extension workers

The analysis showed that within governments, the most needed qualification for most roles within the agricultural extension sector is a bachelor's degree, with none of the job advertisements from the government requiring one to have a minimum of a certificate only. This finding is in line with the findings from the interviews in both countries. Diploma holders were sometimes required by the government to work as assistant extension workers. For senior extension workers and project team leaders, the minimum qualification was a master's degree. However, within the private

sector, there were a number of job advertisements calling for diploma holders, and, in these cases, having a bachelor's was an added advantage. According to Ramsarup et al. (2021), the qualifications needed for extension services, according to the job postings, range from a matriculation certificate plus a NQF level 6 agriculture diploma to a NQF level 7 or four-year agriculture qualification and a Bachelor of Technology or agricultural degree.

4.5.3 Relevant skills and competences of extension workers

The current extension workers are required to have a diverse group of skills and competences to enable them effectively play their roles. The table 4 below highlights the different skills and competences reflected on the job descriptions as a requirement for agricultural extension workers.

Table 4: Skills and competences of extension workers

Country	Skills	Competences
South Africa	Communication/presentation skills Computer skills Report writing skills Problem solving skills, Analytical skills Preparing lessons Strong administration and attention to detail Facilitation Adaptability in workplace Able to work effectively under pressure Work remotely due to COVID-19 Financial management People management Change management Conflict management. Customer focus and responsiveness,	Knowledge of extension methodology Knowledge of project planning and management. Extensive knowledge in Agricultural Advisory. Knowledge of Public Service Legislations, IDPS, PGDS and CAPS. Valid driver's license
Uganda	Comprehensive understanding of agricultural development involving public and private sectors. Communication and facilitation skills. Skills and experience in agribusiness development, rural livelihoods, planning, development and implementation of rural development projects. Project planning and management.	Thorough understanding of Horticultural/ Vegetable production concepts, techniques and crop seasonality. GIS knowledge. Must be passionate about farming, self-motivated, self-starter, identifying goals to be

	Computer and IT skills Community mobilization skills Reporting skills Organisational Skills Analytical skills Interpersonal skills	accomplished daily/weekly/ monthly. Must be able to ride a motorcycle and possess a valid riding permit. Knowledgeable of Horticulture production cycle and pest and disease management.

Source: Author's analysis (2023)

The above analysis shows that while some of the skills and competences of agricultural extension workers such as computer skills, communication skills, facilitation and presentation skills, there are some skills and competences that only appeared in one country. For instance, working remotely due to Covid-19 restrictions came out form job descriptions in South Africa but this was absent from the Ugandan case. This could be because of higher infection and death rates experiences during the pandemic in South Africa as compared to Uganda. Furthermore, in South Africa still, most of the extension workers called for a valid driving license, but in Uganda, extension workers were required to hold a valid riding license since the most common mode of transport for extension workers in the country is motorcycles rather than cars as it is in South Africa. The next section focuses on the factors that are leading to changes in the teaching and learning roles of agricultural extension workers.

4.6 Factors causing the changes in the teaching and learning roles of the agricultural extension workers.

The last question of this research study was to determine the factors that are leading to changes in the teaching and learning roles of agricultural extension workers. The findings indicate that there are both facilitative and challenging factors within the agricultural extension system that are leading to these changes. The facilitating factors include technological changes, and growth, institutional changes, infrastructural growth and educational changes. The challenges or constraining factors are mostly political, economic, and social.

4.6.1 Factors facilitating the changes in the teaching and learning role of extension workers

The findings identified five major facilitating factors supporting the changes in the teaching and learning roles of agricultural extension workers and these include; technological advancement, increase in research institutions, increased professional development opportunities, improved extension systems and developments in education and curriculum.

4.6.1.1 Technological advancements

The growth and changes in technologies was one of the main supporting factors that extension workers and other participants identified as being imperative to the changing teaching and learning roles of extension workers. In South Africa, one extension worker reported an increase in the level and availability of technological opportunities:

"And as we say that in in terms of technology, there is a great improvement because we have cell phones, we have laptops, we have transport, whereas back in the olden days we didn't have the luxury of those." (Extension worker 6-SA)

The availability of technological advancements gives farmers access to information, with some being more effective than others, as reported by the same extension worker:

"More effective is when searching on the internet, using your phone or your laptop followed by contacting our special is available in the department and outside" (Extension worker 6-SA)

From the above findings, technological advancement is identified as one of the major facilitating factors leading to changes in the teaching and learning roles of extension workers. Technology has opened up the information world, giving extension workers access to numerous sources of information and technological tools like phones and laptops.

4.6.1.2 Increase in research institutions and collaborations with such institutions

Another supporting factor that extension workers reported was the increase in the number of research institutes that continuously develop new knowledge and technologies for extension workers to use:

"….we have research stations. They're the ones who generate the new technologies. Then through the ministry. We get to know those new technologies" (Extension worker 6-UG)

In South Africa, a similar trend was reported in terms of a number of research institutes that are developing technologies for farmers, and more so small-scale farmers, as one policymaker said:

"So there, we have a group called the Agricultural Research Council, ARC. They have a small smallholder technology development unit. So, they've been going for quite a number of years, they are developing technologies that are more appropriate for small scale." (Policy implementer SA-1)

The collaboration with research also extends to academic institutions like universities, as reported by one extension worker in Uganda, who noted that collaboration with universities was strong, saying:

"And in their program, the university has been involved in the district, a lot, don't know that to the last aspect. So, there is a very strong partnership between the district and the university with the school, and that programs are really committed to solving problems." (Extension worker 10-UG)

An increase in the number of both research and educational institutions such as universities is the second factor supporting the changing teaching and learning roles of extension workers. These institutions play a critical role in the development of new technologies for different groups of farmers through collaboration between the institutions and other actors within the extension system, such as extension workers and farmers.

4.6.1.3 Increased professional development opportunities

Professional development opportunities were identified as another supporting factor causing changes in the teaching and learning roles of agricultural extension workers. Some extension workers received this in the form of workplace trainings, as one senior extension worker stated:

"Then after that we come and train our extension workers who are also on the ground for them to train the farmers now." (Extension worker 6-UG)

The extension worker pointed out that these trainings were run by the ministry, he alluded to as follows:

"So, the ministry now organizes trainings and we go and train specifically on some of these ones." (Extension worker 6-UG)

A similar view for trainings was also shared by another extension worker, who added that apart from the ministry, other organisations were also putting together trainings for agricultural extension workers, as reported below:

"We do get trainings. Okay, especially with organizations that need very particular output. Now, these are trainings related to what you love to undertake. With the public service. The ministry also arranges trainings. For example, when he had the threat for the desert locusts' invasion. We underwent training." (Extension worker 7-UG)

The above finding on trainings conducted by various organisations expands on collaborations between the various actors. One non-state implementation actor explained how their international development agency was working directly with the Ugandan government to implement activities, he said:

"The activities on behalf of the (development partner name) there is always a bilateral discussion that happens between the two governments that you can attach to (development partner name), it is the (development partner name) that holding discussions with the office of the Prime Minister, so, they agree on that kind of arrangement on what sector the (development partner name) can support implement activities." (Other implementation actor 3-UG)

In brief, the above findings indicate an increase in professional development opportunities like trainings as being important to the changing teaching and learning roles of extension workers. It was also found that the numerous training opportunities are due to numerous actors, including international agencies, government ministries, and other organisations that all organise and offer training to the extension workers.

4.6.1.4 Improvement in agricultural extension systems

There has also been progress in agricultural extension systems, which appear to be working better than previous systems, particularly in Uganda. One extension worker discussed the government's single spine extension system and how it works:

"But with the government here, it's honestly different because with the single spine system of extension work, because government of Uganda is using a single spine system means that everything is running which is at your jurisdiction showing your field like us, we are under crop. So, anything concerning crop whether NGOs activity, whether any other individual activities like

the farmers we have to get to know whatever is happening. As he said, we have a lot of activities we take which he has mentioned most of them" (Extension worker 4-UG)

The participants explained the advantage of the current system, saying that it has brought on board more professional extension workers than the previous systems, as he explained below:

"Actually, the current agricultural extension system which is a single spine currently being implemented. It's good, very good, compared to previously what has been going on. I can talk about NAADS and then currently now we have the operation wealth creation which was embedded into the single spine, I am saying that the single spine is good, because this is a system that has now brought agricultural extension officer on board to do the real extension work. Previously, like take a case for NAADS, you find that the district NAADS coordinator can be any community worker who has connection to the appointing authority and is doing that work. There was little professionality in it." (Extension worker 4-UG)

To another extension worker, it is the numerous programmes that the government is running under the single spine extension system that have made the system beneficial to the communities and the agricultural sector as a whole:

"When we, we have worked a number of programs that really help us to improve on these areas, like we have got programs within our district here we have got programs like agricultural cluster development project." (Extension worker 8-UG)

Aside from the government running many development projects, a cost-sharing initiative under the programmes of the single-spine agricultural extension system was reported to be working well in ensuring farmers' access to expensive agricultural inputs because the costs for the inputs are shared in a 33:67 ratio between the government and the farmer. One extension worker explained:

"We have worked a number of programs that really help us to him, to improve on these areas, like we have got programs within our district here we have got programs like agricultural cluster development project that. First of all, has helped our farmers to get good inputs, agricultural inputs, like for example they delay this aspect of provision of input, where the farmer pays only 33% of the total cost of the input, the rest the other part 67% is paid by government. You only need to register. And then you're provided with this input this input might include the seeds, fertilizers, and even templates." (Extension worker 8-UG)

Farmers were also advocating for the adoption of the cost-sharing initiative used by the government in some of its programs, claiming that it would reduce farmers' reliance on NGOs for everything. In this regard, a farmer in a focus group said:

"It should be something like maybe at least even provision of some seeds, basic seeds that are needed for a farmer but at a subsidized cost because we've seen scenarios where farmers have been given free seeds like in the NGO world some years back but you find that that thing brought in the dependency syndrome so farmers should also learn to pay at least something some bit for that. Yeah, so that would also help the government but the farmer also." (Farmer 8-FGD-UG)

Important to note from the above findings is that in Uganda, there has been an improvement in the agricultural extension system. The current single-spine extension system is reported to be working well for both farmers and extension workers. The system was reported to have a number of merits. One of the advantages of the system was that it ran a number of agricultural programmes to benefit farmers. The second reason the single-spine system worked well was the use of a cost-sharing approach towards inputs given out to farmers. This benefit was explained by farmers as well as extension workers as creating a sense of ownership among farmers for the inputs that they acquired, but it also reduced farmers from being complete dependents on the government for all their needs.

4.6.1.5 Developments in education and curriculum

The final supporting factor for the changes in the teaching and learning roles of agricultural extension workers is related to education and curriculum developments. A university trainer in Uganda explained how the curriculum is reviewed every complete cycle of a course-- that is, once a group of students using that curriculum graduate—and how this process involves all stakeholders in the community including farmers, businesses, and community, representatives, among others. He explained this as follows:

"We normally update ever after one cycle when the students that have During it from year one, when they reach for the year and graduate, then it will be even during that four year period it will continue as we are already updating our content, why, but then at the end of the first year, when the students graduate at the end of one cycle, then we come up with the advisory curriculum that is again, the second part through the processes your department, then the inputs of other stakeholders present that to the investor management processes. And again, back up to there the

management of higher education so it could be set for a program for four years. So, every four years, we have the curriculum that has been accredited." (Trainer 3-UG)

The trainer hence calls the university curriculum as "holistic," one that trains students on all aspects, including professional development and soft skills that are currently highly sought after in the labour market. The trainer therefore explained soft skills as below:

"I think the soft skills that are there, basically, we train them in communication skills. That students in this category will have a mentor. Then how for issues to do is assurance, we also train a lot of soft skills that you need, then even extension and training methods." (Trainer 3-UG)

However, a trainer at a vocational institute talked about him training students in soft skills despite the fact that their current curriculum does not include training in any of the soft skills, he attested:

"Because currently we are looking at the soft skills. Yes, how you communicate to farmers, how you relate to them. Which we are giving them is not in in the curriculum, but it's a benefit to them as people who will be dealing with the community." (Trainer 3-UG)

A final year student pursuing a bachelor of food and agribusiness at the same university as the trainer, who referred to their curriculum as being "holistic," attested to undergoing a broad form of training covering a range of topics in different areas, including extension as a standalone course unit along with other courses in areas of gender, information technology, and computer skills, among others. The student said that:

"Yeah, for anything, you learn generally. And then when you can also decide on how to apply the knowledge which you've learned." (Student 1-UG)

As empirically evidenced above, there are a number of factors that positively support the changes in the teaching and learning roles of the agricultural extension workers in Uganda and South Africa. Among the factors are technological changes that have increased access to information and knowledge, an increase in the number of and work done by research institutions, stronger collaboration between the various actors within the extension system, and positive developments in the curriculum. It is important to note that despite the evidence of progress in the extension system, there are also constraints that are limiting the teaching and learning roles of agricultural

extension workers, and some of the facilitating factors are also limiting, as discussed in the next section.

4.6.2 Factors constraining the teaching and learning roles of the extension workers

The findings also showed that there are challenges facing the extension systems that are affecting how well extension workers play their teaching and learning roles.

4.6.2.1 Poor policy implementation

One of the challenges identified was that of policy, and the first problem here is the top-down approach to agricultural extension, which limits what an extension worker can do in influencing decision-making among farmers. This was noted by a policymaker in South Africa, who said:

"But very often extension policy is how to implement government policy on agriculture. So, we often don't give space to the extension practitioner, particularly if they're in the public sector. We don't give them space to help the farmer make decisions. We tried to convince him to adopt a program, join a project, use a technology, you know, so we're not really empowering the farmer to be making decisions." (Policy implementor 1-SA)

The participant adds that policy in Africa has also been heavily influenced by colonialism and continues to be extractive in nature, as noted below:

"Unfortunately, most policies in Sub Saharan Africa that deal with agriculture development, treat the smallholder farmer the same way as the colonial governments did, alright (extractive nature). They encourage farmers to produce more efficiently and more effectively. So, we have a higher lower cost, raw material that that gets sold to somebody else who makes all the money. "(Policy implementor 1-SA)

The above findings show poor policies as a constraining factor in the changes in the teaching and learning roles of extension workers. Most of the agricultural development policies are said to be top-down, thereby impeding decision-making by extension workers. A policy maker in South Africa reports on how agricultural development policies in Africa have been influenced by colonialism, which relied heavily on extractive forms of agriculture.

4.6.2.2 Inadequate funding by government

Another limiting factor reported in both countries is the economic issue of funding, which has been noted to be inadequate. Firstly, the budget allocated to agriculture is small as reported:

"Then secondly, funding, for every year government put it very clearly the minimum percentage of the national budget that should go to agriculture for all African countries." (Extension worker 4-UG)

A policy implementer in South Africa said the same thing about the lack of money:

"But the challenge of that in South Africa, and I think in other countries, is that there's no funding for the extension" (Policy implementor 1-SA)

A Ugandan extension worker told of how government projects are funded by international bodies like the World Bank. He alluded:

"The government got funding from world bank. That's why now we have the agriculture cluster development project" (Extension worker 1-UG)

Because of the limited budget allocated to agriculture, the same extension worker above explained how this meant even lower budgets to run activities by extension workers:

"The policy aspect, if you look at the national budget, what goes to agriculture, and when you come to the districts, the allocation that goes to the production, it might sound very, very big, but when you break it down into the operations, wages and non-wages then get to see that the activities get so much little." (Extension worker 1-UG)

From the above findings, inadequate funding for agriculture and extension is an issue that is reported in both country contexts, as reported by a policymaker in South Africa and extension workers in Uganda. Besides the majority of the funding for extension and agriculture programmes coming from external funders such as the World Bank, within the Ugandan national budget, agriculture receives a small portion of the budget.

4.6.2.3 Limited number of extension workers

The limited number of qualified extension workers was another limiting factor discussed by participants in both countries. One farmer in South Africa was quoted as saying:

> *"First, it's, overload, because there's less extension officers and more farmers. Because extension officers, they are divided the or they are like, given a ward. Like in a ward, there could be maybe 10 villages, and in 10 villages, there's a lot of farmers there that they need to support."* (Farmer 1-SA)

In Uganda, one extension worker stated the standard number of extension workers as stipulated by the government:

"Government has a standard structure that in a district, there must be one extension worker for all these in a sub-county. So, in a sub in one sub-county there are four extension workers, one per sector." (Extension worker 6-UG)

The extension worker then proceeded to tell how big the current gap in the number of extension workers was in one district:

"I have only two extension workers in fisheries who are in charge of 11 sub-counties. So, I had requested for, because when I made a sub-county mission, they were only 6 sub-counties. I requested for 4 more so that all the sub-counties have the extension workers but the ministry cleared only 2." (Extension worker 6-UG)

The limited number of extension workers was also noted by a non-state extension implementation actor, who reported on the ration of extension staff to farmers and said that:

"Because you will find a sub county having more than 8000 farmers. It is being managed by one extension officer, which is very difficult to take." (Non-state extension worker 1-UG)

The above ratio is slightly less than that reported by a government extension worker in Uganda, who reported:

"Then two, farmer extension staff ratio is just unbelievable. There is a guideline that grants extension staff to take care of about 500. But we are taking care of 1:5000 plus, so that is unimaginable and unless now you're very good in planning and also you work yourself off the job description," (Extension worker 4-UG)

The numbers in the standards are the same for both countries, but they don't match up with what's out in the field, as one extension worker in South Africa said:

"Because as we stand now, it is one extension officer to 500 put in the standards. And 500, we're beyond that as extension officers especially in the communal settlements." (Extension worker 6-SA)

The limited number of extension workers is also reported as a constraining factor in the changes in the teaching and learning roles of extension workers. Such low numbers of extension workers lead to a large ratio of extension worker to farmer in both Uganda and South Africa, with the ratios on the ground exceeding those indicated in formal extension standards in government. This leads to the overworking and overloading of extension workers in both countries.

4.6.2.4 Poor coordination of actors in the extension system by the government

In the previous section, it was noted that there has been improvement in the collaboration between different actors, but participants also recorded a lack of proper coordination between the work done by the government and other non-state actors like non-governmental organisations and the private sector in general. One extension worker was reported as saying:

"We also do face challenges of coordination. Yeah, there are technologies that can, that could have been developed from the research station but they are not reaching us." (Extension worker 2-UG)

Because of the coordination gaps, another extension worker talked about how technologies are not reaching them:

"And also, we also do face challenges of coordination. Yeah, there are technologies that can, that could have been developed from the research station but they are not reaching us. So, this makes us also not aware of the new technologies that could have transferred to farmers." (Extension worker 1-UG)

The coordination challenges also resulted from research institutions working directly with farmers instead of extension workers, as alluded to by one extension worker:

"In one of the sub-counties in Awach, a variety of beans were tried. In instead of having the extension staff managing with the farmer, NARO decided to leave it with the farmer. Then farmers mixed up the varieties" (Extension worker 4-UG)

The above results show that coordination of activities within the extension systems is still a problem, even though there have been some positive changes. This leads to the failure of some new technologies developed by different institutions like research centres to reach farmers, who are the beneficiaries.

4.6.2.5 Slow response of education and curriculum towards changes within the extension system

There were also curriculum challenges reported by the research participants. For one trainer at a vocational institution, there was an issue with the curriculum taking long periods without reviews:

"The one at NTC it has taken 20 years without a review, but yet a there was a time I tried to understand somebody said what we are using it has taken 20 years and you also know agriculture is something which is based on innovation." (Trainer 1-UG)

To another participant in South Africa, universities, unlike colleges, were very rigid and not flexible to any changes, as noted below:

"Colleges are very flexible. Universities are not very flexible, even my own university was not, they're flexible, and they would not change, they will not even entertain changing the Agricultural Science program to accommodate extension. That's why we had to build an entirely new qualification and take it off campus." (Policy implementor 1-SA)

Despite positive developments in the education system being reported in the section looking at the facilitating factors for the teaching and learning roles of agricultural extension workers, in this section, the findings show that there are still problems in education and curriculum. This is due to the fact that the education response is reported as being slow to respond to the changes in the agricultural and extension systems, and that the curriculum is also not up to date and relevant to farmers. Educational institutions, particularly universities, are reported to be rigid and not easily implement changes to adapt to changes in the agricultural extension occupation.

4.6.2.6 Social and cultural constraints

Participants also reported social and cultural limitations in extension workers' teaching and learning roles. One of these was a gender aspect that was limiting in different ways. One participant reported how women are not normally expected to be involved in certain enterprises, as shown below:

"Women are not in commercial poultry production as people don't believe women can raise chicken commercially." (Farmer 3-UG)

A second gender aspect reported was in regards to land ownership, where women are not allowed to own land. A female farmer in South Africa explained:

"Because you are a woman if you want land or piece of land, we have it must be your husband to go and ask for land maybe to the chiefs." (Farmer 4-SA)

In addition to this, another extension worker reported that men were considered more superior than women:

"And somehow, I believe also men think that they are superior to women. So, if there is something that is supposed to make people come together, there should be only men who should go there not women, their participation should be not too much in the group activities." (Extension worker 5-UG)

Another social limiting factor was the mindset of the community, which was reported to not be interested in adapting new technologies. An extension worker in Uganda said:

"The major challenge we have with our communities is that it's not very simple for them to really adapt new technologies. I think could be mindset, people there to get things to remain the pattern that they have been seeing for long." (Extension worker 8-UG)

Poverty and diseases in communities were identified as making it difficult for extension workers to work with communities and this has impacts on the development of agriculture. An extension worker in Uganda is quoted saying:

"And people really make it hard sometimes, if you interface with communities, and they may be due to other issues, poverty and illness, the commercialization of agriculture is not taking root." (Extension worker 7-UG)

A range of social and cultural constraints are reported above with regards to the changing teaching and learning of extension workers. Social constraints included gender exclusion against women taking part in certain enterprises and owning land, as well as poor mindsets in communities and poverty.

4.6.2.7 Climate change and its impacts on agriculture

Climate change was yet another critical limiting factor that was leading to changes in the teaching and learning roles of extension workers. An extension worker in South Africa explained how weather changes were affecting agricultural activities such as planting and ploughing. The extension worker explained:

"The most challenge, firstly, is the weather. You know, for example, in most scenarios we plough maize in August-September, but because of climate change, we are unable to do that. We plough the names in October, actually in November, at that time was sometimes cold, and then you cannot plough the maize in cold weather. It's one of our challenges." (Extension worker 10-SA)

According to another extension worker in South Africa, climate change has brought about water scarcity, calling for better water preservation techniques and practices among farmers:

"For example, since we are under the global warming, climate change, we are faced with drought and there is a scarcity of water, so people have to do things like water harvesting. There are a few farmers that have been exposed to those techniques of doing farming and preserving water to go back to the basics to enrich and also to improve in field in what happens in water conservations. So, they are some of the farmers that have that because of the of the state of dryness that we experience and also people have to produce food for themselves and they have to devise means so the ecological way of farming come in handy in terms of them trying to preserve water. So, they have some of farmers that we can say that through intervention of extension these farmers have changed their way of doing things." (Extension worker 6-SA)

Climate change has also resulted in the failure of traditional farming practices, as one participant noted:

"Some traditional practices like calculation of the planting dates by traditional methods not working due to climate change" (Extension worker 1-SA)

Finally, climate change has also negatively impacted some of the modern technologies being developed in the farming sector. One extension worker in Uganda reported how the introduction of black soldier flies failed due to harsh climatic conditions, yet black soldier flies were an alternative insect protein for fish and poultry. The extension worker was reported as saying:

"Now, this was a project meant to, to make us produce the love of the black soldier flies in order to provide for as the feeds for fish and poultry. It was very successful, during the time when we had the project ongoing, we produce a lot of the goods. And basically, these goods, intended to, to provide a very good source of protein for these for these birds, and the fish. The challenge that we got later was the issues of climate variability. It is not basically climate variability, but

our weather, the pattern of our weather. When it comes to a dry season, what we call dry season. It's always a bit long span of time, about three, four months. So, this time does not provide a conducive environment for the survival of these, these flies." (Extension worker 8-UG)

Overall, the findings revealed both facilitating and constraining factors leading to changes in the teaching and learning roles of agricultural extension workers. The findings included five facilitating factors, which include: technological changes and advancements; an increase in research and academic institutions; increased professional development opportunities; improvements in extension systems; and education and curriculum development. However, a number of constraining factors were identified as causal factors to the changes in the teaching and learning roles of extension workers, and these are: poor policies, inadequate funding for agriculture and extension, a limited number of extension workers, poor coordination of actors in the extension system, a slow response of education and curriculum to changes in the extension system, social and cultural constraints, and climate change and its impacts on agriculture. As seen from above, some factors have been both facilitating and constraining to the changes in the teaching and learning roles of extension workers. The next section gives a final conclusion to the findings chapter.

4.7 Conclusion

In this chapter, I presented the findings of the research study. The chapter started by providing an understanding of the agricultural extension occupation using the five dimensions of an occupation as a lens. The first dimension gave the institutional principles, the code of ethics, and the cultural norms and practices that influence how extension workers behave when playing their roles. The second dimension discussed the bodies of knowledge and the different levels of knowledge within the agricultural extension occupation. The third dimension explained the practice and recognition of authority and power and how this was influencing the work of extension workers from the departmental level down to communities. The findings showed that, while at a departmental level, the flow of authority is very top-down, with extension workers at lower levels of positions having little influence on decision-making. However, in communities, extension workers tried to break this discourse by having a collaborative relationship with community members where even the illiterate farmers' opinions were valued. The fourth dimension looked at how inadequate regulation within the agricultural extension occupation is weakening the occupation within the local market.

This was because agricultural extension in Uganda does not have any governing body to ensure that qualified extension workers are working within the occupation. The fifth dimension presented the findings of the political and economic factors impacting the work of extension workers. The findings found that politically, the government structure was very bureaucratic and top-down, with both farmers and extension workers being imposed enterprises to be involved in.

The lens provided by the five dimensions in conceptualising agricultural extension made it easier to discuss extension workers' teaching and learning roles. The findings revealed that extension workers played important teaching and learning roles. They identified the needs of farmers by conducting a needs assessment within communities and then providing the necessary training using a variety of approaches. But for the extension workers to adequately play their teaching roles, they needed to learn and gather bodies of knowledge and information to relay to the farmers. In this regard, extension workers underwent various trainings provided by different actors, such as the government, research institutions, and organisations. Well-informed and experienced farmers also acted as learning sources for the extension workers although the extension workers, although extension workers considered this to be “local or traditional” knowledge that was in fact being undermined by some extension workers.

The next section discussed some of the changes in the teaching and learning roles of the extension workers. The changes ranged from extension workers having a wide range information change to changes in farming practices such as farmers venturing into more newer farming enterprises.

The last section looked at the factors influencing changes in the teaching and learning roles of agricultural extension workers. The factors presented included both facilitating factors like an increase in research institutions, stronger collaboration between actors, and improvements in technologies. The constraining factors discussed were climate change, inadequate funding, poor policies in agricultural extension, and social and cultural factors like women not owning land in both country contexts. In the next chapter, I discuss the findings and relate them back to the literature review chapter to find out whether there is a correlation or disparity between the findings and the literature discussed.

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.1 Introduction

The aim of this research study was to explore the teaching and learning roles of agricultural extension workers within the agricultural extension occupation in two different countries, Uganda and South Africa. The objectives of the study were to understand the nature of the agricultural extension occupation, identify the teaching and learning roles of extension workers, determine if these roles were changing, and identify the factors leading to the changes in the teaching and learning roles of the extension workers. This chapter focuses on the discussions of the findings presented in chapter four by linking the literature, conceptual framework, and findings sections in relation to the study's aims. The chapter ends by discussing the conclusions and recommendations for future research, as well as the limitations that were faced by the researcher while conducting this research study.

5.2 Discussing the nature of the agricultural extension occupation

The first objective of the study was to conceptualise the idea of the agricultural extension occupation. In line with this, the study findings show that agricultural extension occupation is influenced by a number of factors under the five dimensions of an occupation presented by Shalem and Allais (2018). These dimensions are the normative, knowledge, authority, formal recognition of an occupation, and political and social contexts within an occupation. The findings show that under the normative dimension, extension workers are controlled by both formal norms and standards as well as the social norms, beliefs, and practices that the communities follow. Women farmers face a lot of cultural obstacles that limit their full participation in agriculture and extension, and this is supported by Hart and Hall (2012) who claim that women continue to be excluded in agriculture. This finding also is in line with the extension services guidelines in Uganda that were produced by the Ministry of Agriculture, Animal Industry, and Fisheries (MAAIF), which outline acceptable standards of professionalism that people in the agricultural extension occupation should follow when performing their roles (Ministry of Agriculture, Animal Industry and Fisheries, 2017). According to Standing (2010), all occupations are meant to give people a sense of belonging, where people who think alike come together and strive to achieve a common goal and hence

extension workers carry a sense of belonging among themselves but also with the communities that they engage with.

Under the second dimension of knowledge, the findings also revealed that in the agricultural extension occupation, formal knowledge plays a big role and that levels of position within the occupation are dependent on different levels of knowledge and experience. Those at an entry-level position need less experience than those at senior positions. Furthermore, qualifications served as an indicator of one's level of knowledge (Bills, 2003), and the findings showed that graduates with certificates were not being hired to work in the occupation at government departments as they were believed to have inadequate theoretical and practical knowledge. The findings are also supported by authors who argue that formal knowledge is required by occupations to enable workers to make crucial professional judgements during various work situations, along with practical knowledge to facilitate the translation of formal knowledge into practical knowledge in practice (Freidson, 2001; Winch, 2010, 2022).

Moving on to the third dimension related to authority, the research findings showed that in both country contexts, the flow of authority within agricultural extension is very top-down, with extension workers and farmers following directives and procedures handed down to them from a higher level. However, at the community level, extension workers were creating a more collaborative environment where all opinions from the community were being heard and respected. A study conducted by Shalaby et al. (2011) found that extension services that have a one-directional flow of knowledge and authority where farmers are viewed as recipients of information affected the success of agricultural development programmes as well as the effectiveness of the work done by agricultural extension workers.

The findings in the formal recognition dimension revealed that in both countries, the agricultural extension occupation was becoming weaker within the labour market. In Uganda, this was because there was no formal governing body to monitor workers within the occupation. In addition, as much as higher qualifications were being demanded in the labour market, not everyone with the required qualifications had access to the jobs in the labour market. This was also the case for South Africa, although in South Africa literature showed that the country has a formal governing body for agricultural extension workers known as South Africa Society for Agricultural Extension (SASAE) that aimed at promoting high levels of professionalism among extension workers in

South Africa and further address some of the challenges facing agricultural extension in the country (K. Davis & Terblanche, 2016).

Lastly, the findings showed that in the political and economic context dimension, factors like top-down policies and poor remuneration in government were impacting the occupation. The policies developed and regulated by the government particularly have implications on the environment as seen from the interviews where the current agricultural policies in Uganda and South Africa are aimed at promoting commercial agriculture and intensive use of artificial chemicals which negatively affect environment and further threatens environmental sustainability. This is supported by Freire (1973)who argues for dialogue with farmers and not a top-down approach that considers farmers as having no knowledge in farming to better promote the adoption of new knowledge and technology by farmers. So, while Shalem and Allais (2018) note that there is a relatively symbiotic relationship between the state and occupations, the state still has higher authority that governs most aspects of the occupation including what practices to implement in a country.

Vanclay (2011) conducted a study and concluded that agriculture should not be taken as a technical activity involving a top-down transfer of information because it is not. Rather, it is governed by a set of social principles that influence how technology is transferred to farmers and how they adopt it. Overall, Vanclay and Lawrence (1995) argue that agriculture is a political and social construction that is controlled by forces that are social, cultural, and political. They therefore call for further conceptualisation of this forces by all actors within the agricultural extension system, this as it heavily influences the work that they do.

5.3 Discussion of the teaching and learning roles of agricultural extension workers

The next section of the findings looked at the teaching and learning roles of the agricultural extension workers. The research findings the teaching roles of agricultural extension workers involved needs assessment where extension workers found out what the farmers in the community needed in terms of support with inputs and information, and according to Mugwisi, Ocholla and Mostert (2012b) are the two most critical roles of extension workers. The findings, however, showed that while some extension workers said that the needs assessment process was two-way, with farmers having the opportunity to also identify their needs, other extension workers claimed

that the needs of the farmers were predetermined by the government departments that provide the inputs, trainings, and enterprises to farmers without consulting the farmers.

Another teaching role of extension workers included knowledge transfer and translation, which involved breaking down complex information into simpler forms for easy understanding by farmers. Shaxson et al. (2012) explain how the agricultural extension workers roles have changed and made them become more of knowledge translators, knowledge transfer, knowledge management, knowledge brokage and knowledge exchange.

From the findings, the last teaching role of extension workers was provision of training to farmers. The training was done using various approaches, like demonstrations, focus group discussions, and classroom-based lecturers. Of all the approaches, the use of focus group discussions was found to be the most preferred approach used by agricultural extension workers and other actors in the agricultural extension system. This could be explained by literature that says that use of adult learning principles and nonformal learning methods like focus group discussions, have proven to be more effective in extension because they note only promote two-way communication between farmers and extension workers but also builds on farmers knowledge (Fell, 2005; Malouf, 1994). Furthermore, a study in Australia claimed that most governments around the world use group discussion extension approaches because they are cost-friendly rather than because their effectiveness compared to other approaches (Vanclay & Lawrence, 1995).

On the other hand, three themes emerged from the learning roles of the extension workers. The first theme showed that the learning by extension workers involved gathering information using various sources like the internet, radio, and social media platforms like WhatsApp and Twitter. Although there were varied opinions on which sources were the best for information gathering, the use of the internet and social media platforms were reported to be the most effective. Literature from different parts of the world supports the role that internet and social media play in improving the effectiveness of the teaching and learning roles of extension workers (Barau & Afrad, 2017; Kipkurgat et al., 2016; Thakur & Chander, 2018).

The findings also showed that extension workers learnt through a number of trainings that were being provided by various actors in the extension system, including government departments, research institutions and centres, and non-state actors like international organisations. This is an important finding which relates to professional development in agricultural extension and

professional development is pivotal in ensuring that extension workers are well equipped to respond to the needs their occupation (Muwaniki & Wedekind, 2018). Farmers were also found to be a good source of learning for agricultural extension workers. As experienced farmers taught extension workers new practices or shared information related to farming. There were mixed feelings with regards to adopting the knowledge that farmers were sharing with the extension workers. This was because, while some extension workers referred to this knowledge as important and successful in addressing some of the problems that farmers were facing, other extension workers felt that this knowledge was "traditional" and had no place in modern agricultural systems. However, some of the extension workers did not simply accept knowledge from farmers; they went on to research and understand how the successful knowledge came about, and after this, they were then able to pass on the knowledge to other farmers or extension workers. A study in KwaZulu Natal province in South Africa confirmed that extension workers did not recognise traditional knowledge and practices in agriculture as the government projects focused more on conventional commercial agriculture that heavily invested in the use of synthetic agro-chemicals (Abdu-Raheem, 2014). An earlier study contradicted this and found that both agricultural extension workers and researchers were applying traditional knowledge for innovations, with 89% of extension workers using traditional knowledge and 92.9% of researchers using traditional knowledge in agricultural development and extension (Mugwisi et al., 2012a).

5.4 Discussing the changes in the teaching and learning roles of agricultural extension workers

The third objective of the research study was to explore any changes occurring in the teaching and learning roles of the agricultural extension workers. The findings revealed that there are a number of changes happening in the teaching and learning roles of extension workers. The first change is a shift in the sources from which extension workers gathered new information and knowledge to share with farmers. Some of the sources included the internet, social media, research centres, and academic institutions. A study conducted in Uganda found that integration of media sources such as the use of video-media improved the effectiveness of extension services compared to when extension workers only used face-to-face extension approaches (Karubanga et al., 2016). This is because the use of such media approaches promotes self-learning among farmers making them more aware of the developments within the agricultural systems.

The second change was in line with extension workers being more informed and knowledgeable about recent and developing issues that have implications on their work within the occupation. Extension workers can tackle a range of issues and problems facing communities such as climate change, HIV/AIDS, gender, and domestic violence, and they are helping communities to overcome these challenges. This could be due to the technological advancements and ease of access to information that ensures that extension workers are up to date with new developments in their occupation.

The findings showed changes in the nature of enterprises in which farmers are involved and use modern methods of farming, from using modern seed varieties to being gender and disability inclusive when conducting certain practices. In Uganda extension workers in entomology, for example, are placing beehives at lower heights than in the past to accommodate women and people with disabilities who are unable to climb and access beehives at the tops of trees. This finding is similar to a study in Australia that found that farmers in a community are never homogeneous and have different needs, and agricultural extension workers and other actors in agriculture should consider this when working in a diverse community with diverse farming needs (Vanclay, 2011).

5.5 Discussion of the factors leading to the changes in the teaching and learning roles of agricultural extension workers

The last aim of the study was to determine the factors that were causing changes in the teaching and learning roles of the agricultural extension workers. From the research, the first finding of the study indicated that there were both facilitating and constraining factors that were leading to changes in the teaching and learning roles of the extension workers.

On the side of facilitating factors, one of the biggest and most critical factors is the rapid world-wide technological drive that is facilitating the work of extension workers in different ways. One way is by enabling the development of varieties of crops and animals, but the information era means that extension workers are open to easily accessing any form of information that they need to assist the farmers. The information era is positioning extension workers in a place where they can facilitate the transition of farmers to such technologies, as the findings showed that most rural farmers are not well-informed of some of the technological developments and are thus not harnessing them for developing agriculture. Mpiima et al. (2019) also found that both farmers and

agricultural extension workers do not have access to some technologies, nor are they able to effectively use them.

The findings further identified the greater growth and increase in both educational institutes such as universities and other research centres in both countries, which was also a huge development for the agricultural extension workers and their work. These research centres were the leading producers of technologies pushing the agricultural sector forward, and there is also greater collaboration between these centres and the agricultural extension workers. Finally, the findings noted that there were immense professional development opportunities that agricultural extension workers had access to, and these were being provided by different actors like government departments and ministries, non-state actors, research institutions, and educational institutions. These were in the form of short courses and trainings on a number of enterprises and recent challenges that were developing within the agricultural sector; for example, the locust outbreak in Uganda led to the organisation of a number of trainings for extension workers by the government to equip them with the right skills to overcome the challenge. In South Africa, water scarcity challenges are leading to extension workers to learn and teach farmers modern water harvesting and preservation methods to ensure agricultural production continues. The National Extension and Advisory Service policy (2014) emphasised the need to continuously conduct professional development and capacity building for extension officers, and the recent increase in the level of professional development initiatives could be in response to this. Hoque and Usami (2007) found that on-the-job training enabled extension officers to acquire new skills, improve the management of daily activities, and create a workplace learning environment, thereby improving their working with groups, organising and planning demonstrations, and work planning. They therefore emphasise the need for providing on-the-job training for extension workers, especially for new workers, in order to increase their rate of successfully implementing extension services and programmes. Franz (2002) calls for organisations to promote the facilitation skills of extension officers through workshops aimed at transformative learning. And finally. Davis and Terblanche (2016) support this by emphasising the role continuous professional development plays in keeping extension workers informed of recent technological developments in the agricultural sectors.

The findings also identified different constraining factors impacting the teaching and learning roles of agricultural extension workers. One of the most significant limiting factors identified in both

countries was insufficient agricultural extension, agriculture, and rural development policy. Policy approaches are top-down, limiting flexibility within the occupation. Poor policies were blamed on histories, and colonialism, for example, apartheid in South Africa, was blamed for leading to the creation of highly exclusionary policies. The policies are also leading to the exclusion of a number of farmers, particularly small-scale and female farmers, because the majority of the technologies developed are not suitable for them. This is supported by Mukembo and Edwards (2015), who indicated that during the colonial period in Uganda, extension approaches were exploitative, forceful, oppressive, and even unlawful in nature. Another study also indicated that during the colonial and apartheid periods in South Africa, the extension system was divided into two based on racial discrimination, and the system for the blacks was poorly facilitated with poor services offered by poorly qualified extension workers (Worth, 2012). The findings revealed that policy challenges were also leading to further problems, such as inadequate funds. In both countries, agriculture received the smallest percentage of the national budget, yet it played a crucial role in supporting livelihoods of large portions of the populations. The financial issues were leading to delays in extension workers and farmers receiving inputs on time, which delayed other agricultural practices. Inadequate budgets were also found to be the reason for the low salary rates of the extension workers and the challenges in transport-related operations, where extension workers were now being provided with motorcycles as a mode of transport but there was no money to consistently supply them with fuel.

A number of participants in both countries talked of the unreasonable ratio of extension workers to farmers In Uganda, the ratio ranged from 1:5000 to 1:8000, while in South Africa, it was determined to be 1:5000. Besides the limited number of extension workers offering services to farmers, some participants spoke of extension workers lacking adequate knowledge to effectively assist farmers in the community. Despite the limited number of extension staff, it was found that there has been an increase in the number of extension workers in the past five to ten years, although the majority of the staff continue to be men. Literature shows that the government has opted for traditionally male-dominated extension systems, and there is a shortage of trained and experienced agricultural extension workers in South Africa (Department of Agriculture, Forestry, and Fisheries, DAFF, 2011).

The last findings in this section discovered that while there was improvement in the collaboration between different actors in the agricultural extension system, there was still poor coordination between these actors. As a result, extension workers in some areas are being left out by certain actors, such as research centres, that end up working directly with farmers who may not be well-informed on how to handle developed technologies. Furthermore, non-state actors, who according to stipulated standards are supposed to work with government extension workers to link them to farmers, were not doing so but rather also working directly with farmers and issuing them with new crop varieties that extension workers do not know about and therefore end up being embarrassed when farmers ask for their assistance on the new crops that farmers are growing. This finding differs from Munyua, Adams, and Thomson (2002), who claim that there is a very weak link between extension and research, which limits the flow of new information between extension officers, farmers, private partners, and other actors. The Academy of Science of South Africa (2017, p. 54) supports this by saying that there is weak coordination between different agricultural actors in the public and private sectors.

5.6 Limitations of the study

The researcher had limited control over the secondary data collected from the RAELL project. Also, not all the secondary data from documents and interviews proved relevant to the study, which had its own specific focus and objectives. Taking an example, the project was more intensified on the learning lens of agricultural extension, and as much as the learning and teaching roles of extension workers tend to go hand in hand, there was less data talking about the teaching role of the extension workers.

Second, there was a limitation in terms of insufficient interviews with students, which are critical in understanding extension workers' teaching and learning roles. The students are in a better position to provide insights into the recent changes in the knowledge that is being taught to them. This would create a stronger link between current changes in knowledge types among extension workers joining the field, and current experts in the field who have been in the field for a number of years.

5.7 Recommendations for future research

From the findings and discussions, a number of recommendations are put forward for future research on agricultural extension in both South Africa and Uganda. Firstly, agricultural extension workers play a critical role in teaching farmers the relevant information. From the findings, traditional knowledge seems to have a strong hold within the farming communities, with farmers relying heavily on it, especially those who believe in a more organic and sustainable way of farming. This calls for all extension workers to learn more about traditional knowledge and be able to apply it in practice.

Secondly, the findings also showed gaps in curricula where students who were the future extension workers were being taught commercial agriculture, yet in the communities, a larger percentage of the farmers were involved in small-scale subsistence agriculture. Therefore, there is more need to look deeper into the curriculum and align it to the knowledge needs of the farmers, as Mutimba (2014) reported that in Africa, most agricultural extension workers are trained on conventional agriculture and research methods by universities, making the occupation to always lag behind in a number of aspects, including knowledge and technology as seen in both country contexts.

Lastly, the findings showed that there are more rapid changes in the agricultural extension system in terms of the environment, the climate change crisis, and technological and extension policy and implementation that are not able to keep up with the changes. This calls for a need to revisit agricultural and extension policies in both countries and push them in a direction that will enable the occupation to remain relevant and keep up with changes in the sector.

5.8 Conclusion

The research report has explored the teaching and learning roles of agricultural extension workers in two country contexts: Uganda and South Africa. However, despite the research report focusing on two countries, it should be noted that the study was not a comparative study and the two countries were meant to provide a better understanding of the nature of the agricultural extension occupation, with the two country sites offering insights from two contexts in Africa. The report also examined the most critical teaching and learning roles of extension workers and how these roles could be harnessed to improve the effectiveness of the work done by extension workers. The study has shown that needs assessment is a key role of extension workers, but the process is one-

way, with the government deciding and predicting the needs of the farmers without involving the farmers themselves, and this left some of the farmers with irrelevant information or agricultural inputs. The report further looked at how the teaching and learning roles of extension workers have changed over time and some of the factors causing the changes in the roles. And while factors like technological advancement, education and curriculum developments, and improvement in extension systems were on the one hand identified as facilitating factors for the changes in the teaching and learning roles of extension workers, these factors still acted as limiting factors.

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ANNEXTURE A: WITS PROPOSAL APPROAL LETTER

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | FACULTY OF HUMANITIES

08 August 2022

Person Number: 2618775

Adrupio Scovia

By Email: 2618775@students.wits.ac.za

Cc: Dr. Presha Ramsarup

RESULTS FOR THE DEGREE OF MASTER OF EDUCATION PROPOSAL

I am pleased to be able to advise you that the readers of the Graduate Studies Committee have reviewed your proposal entitled *"**EXPLORING THE TEACHING AND LEARNING ROLES OF AGRICULTURAL EXTENSION WORKERS**"* and recommended the research proposal can pass subject to minor revisions to the satisfaction of the supervisor.

I confirm that **Dr. Presha Ramsarup** has been appointed as your supervisor.

Kindly liaise with your supervisor regarding the contents of the reader's report.

The reader's report has been emailed to your supervisor.

The research report is normally submitted to the Faculty Office by 15 February, if you have started the beginning of the year, and for mid-year the deadline is 31 July. All students are required to RE-REGISTER at the beginning of each year

Please note that should you miss the deadline of 15 February or 31 July you will be required to submit an application for extension of time and register for the research report extension. Any candidate who misses the deadline of 15 February will be charged fees for the research report.

Please keep us informed of any changes of address during the year.

Note: All MA and PhD candidates who intend graduating shortly must meet the ETD requirements at least 6 weeks after your supervisor has received the examiners reports. **A student must remain registered at the Faculty Office until graduation.**

Regards,

Faith Herbert

Faith Herbert
Senior Faculty Officer
Faculty of Humanities
Education Campus
Tell: 011 717 3018

ANNEXTURE B: WITS ETHICS APPROVAL LETTER

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | WSoE Wits School of Education

SCHOOL OF EDUCATION ETHICS COMMITTEE

CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER**: 2022ECE035M
PROJECT TITLE	Exploring the teaching and learning roles of Agricultural extension workers.
INVESTIGATOR	Scovia Adrupio
SCHOOL/DEPARTMENT OF INVESTIGATOR	**WSOE**
DATE CONSIDERED	22 July 2022
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	No Risk
EXPIRY DATE	Date of submission of the Research Report
ISSUE DATE OF CERTIFICATE	**CHAIRPERSON** Mbokane

Dr. Batseba Mofolo-Mbokane

cc: Dr. Presha Ramsarup

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature _____ **Date** 26/07/2022

ANNEXTURE C: RAELL INTERVIEW SCHEDULE FOR EXTENSION WORKERS

PARTICIPANT INFORMATION **RAELL Group 3: Individuals that train AEOs**	
Date of interview:	
Location of interview:	
Gender:	
Age (*ask if appropriate***):**	
Approximately how many years have you been involved in farming / AEO work?	
Participant ID:	

PART 1: INTRODUCTION AND CONTEXT

1. **Can you tell us a little about how you came to be an AEO?**
    - *Do you have a background in farming?*
    - *Where and how did you first develop an interest in farming and AEO work (e.g. college, family farm, community, by observation, enrolling on a course)?*
    - *For female AEOs: Are there any specific challenges you have faced as a female to becoming an AEO?*

2. **What was your main source of training as an AEO?**
    - *Who were the providers i.e. college or university or other?*
    - *Did the training result in certification?*
    - *If yes, what type of certificates/qualifications?*

3. **In your opinion, what is the main responsibility of an "Agricultural Extension Officer"?**

4. **Who have you worked for as an AEO (e.g. business, government, NGO)?**
    - *Did your training experiences differ between organisations?*
    - *Which was best, and why?*

PART 2: PRACTICAL LINKS WITH FARMERS

5. **What type of farmers do you support?**
    - *Probe: product, scale, and social issues such as gender, land reform etc.*

6. **How do you decide who needs your support?**

7. **How does a meeting get arranged?**
    - *Do they contact you or do you contact them, or both?*
    - *Do you work with groups or individuals?*
    - *How often do you meet with farmers?*
    - *Are there any conditions (e.g. payment)?*

8. **In your role as an AEO, what do you generally do to assist farmers?**
    - *How do you teach, e.g. do you give farmers things to read, provide demonstrations, field days, discussion groups, opportunities to ask questions?*

9. **Do you think AEOs face any challenges in trying to do their job?**
    - *Please explain?*

PART 3: EXPERIENCES OF AEO ENGAGEMENT AND KNOWLEDGE SHARING

10. **In your experience what are the main challenges farmers face?**
    - *Are you able to help farmers solve these challenges?*

11. **Where do you currently get information from to help you deal with the challenges your farmers may face?**
    - *Sources of information – individuals and organisations, other sources? (e.g. radio, mobile phone, research station – being careful not to lead the participant).*
    - *Does this include interactions between policymakers, researchers, or farmers?*
    - *In what ways do they support you in your AEO work?*
    - *Are some sources more useful than others, e.g. radio, farmers over policy advice? Probe here for knowledge, resources, better training/educational skills.*

12. **Are there examples where farming practices have changed as a result of your work as an AEO?**

13. **Are there any important issues that farmers face which AEOs don't usually help with?**
    - *Can you give examples?*
    - *Why do you think this is?*

14. **Have you experienced any challenges that you could not help with in your capacity as an AEO?**
    - *What did you do on this occasion?*
    - *Probe – did they try and learn and adapt, e.g. go and find out how they could help the farmer?*

15. **Are there examples where farmers decided not to follow the advice or information you gave?**
    - *Why do you think they did not follow your advice?*

16. **Are there examples where farmers have shared farming insights with you based on their own experiences and knowledge, or that of the community?**
    - *Can you give an example?*
    - *Have you implemented this knowledge elsewhere?*

PART 4: CONTINUING KNOWLEDGE DEVELOPMENT

17. **Have you received any further AE training and support after your initial qualification**?

    IF NO:

    - *Why do you think this is?*

    IF YES:

    - *What type of support and training?*

- *From whom?*
- *Did the training result in certification?*
- *If yes, what type of certificates?*
- ***Was this training / support useful for making practical decisions in your role as an AEO?***
- *Can you give an example?*

18. **Is there any additional training and support you feel would be helpful for your day-to-day work as an AEO?**
    - *If yes, what form of training or support?*
    - *How would this help you in your role as an AEO?*
    - *If no, why?*

19. **Has your understanding of the AEO role evolved in the last 5 – 10 years?** (*Or since you first graduated from college/your initial AEO training if sooner*)?
    - *How?*

20. **Would you have any recommendations on how the AEO role could be improved to respond to challenges AEOs and farmers may face in the future?**
    - *Do you think training on issues such as climate change, gender, traditional knowledge, or digital technologies could be important? Please explain.*

21. **Finally, is there anything else you would like to tell us about AE?**

THANK YOU FOR YOUR TIME.

ANNEXTURE D: RAELL INTERVIEW SCHEDULE FOR TRAINERS OF EXTENSION WORKERS

PARTICIPANT INFORMATION **RAELL Group 3: Individuals that train AEOs**	
Date of interview:	
Location of interview:	
Gender:	
Age (*ask if appropriate***):**	
Approximately how many years have you been involved in farming / AEO work?	
Participant ID:	

PART 1: INTRODUCTION AND CONTEXT

1. **Can you tell us a little about how you came to be involved in training AEOs?**
    - *Do you have a background in farming?*
    - *Where and how did you first develop an interest in farming and AEO work (e.g. college, family farm, community, by observation, enrolling on a course)?*
    - *For females: Are there any specific challenges you have faced as a female to becoming a trainer of AEOs?*

2. **What exactly did you study (e.g. course or programme) for you to be able to offer training to AEOs?**
    - *Who were the providers?*
    - *Did the training result in certification?*
    - *If yes, what type of certificates/qualifications?*

3. **What experience do you have that is most relevant to training AEOs?**

4. **In your opinion, what is the main responsibility of an "Agricultural Extension Officer"?**

PART 2: CURRICULUM AND AEO TRAINING NEEDS

5. **What type of programmes do you offer for AEOs?**
    - *What type of farmers are catered for in your AE curriculum/training?*
    - *Who typically enters into AEO training pathways (e.g. graduates, men)?*
    - *Does your training include ongoing professional development for AEOs? If yes, please explain?*

6. **What sort of issues or challenges do your trainees typically need to help farmers with in their role as AEOs?**

7. **What organisations and individuals are involved in developing the content of your curriculum?**
    - *Are there any other organisations or individuals involved in developing the curriculum for AEOs?*
    - *Are there interactions between policymakers and researchers in the design of the extension curriculum?*
    - *Are there interactions between farmers in the design of the extension curriculum?*
    - *Who decides what you teach?*

8. **Do you / your institution update your AEO curriculum content regularly?**
    - *If yes, how often?*
    - *Who / what helps you / your institution keep the AEO curriculum updated?*
    - *Do you have regular contact with farmers? How?*
    - *Do you maintain regular contact with AEOs? How?*

9. **How do you/your organisation typically teach AEOs/students?**
    - *Do you give them things to read?*
    - *Provide demonstrations, field days, discussion groups, community projects?*

10. **Does the curriculum and training teach AEOs how to help farmers make practical decisions?**
    - *Can you give an example?*

11. **Are there any examples where the training/curriculum does not adequately train AEOs to support farmers?**
    - *What do you do on these occasions?*
    - *Probe - did you try to learn and adapt, e.g. go and find out how you could adapt the training?*
    - *Probe - Do you include information on traditional and indigenous beliefs and methods?*

12. **What do you think are the most important parts of your training/curriculum for AEOs?**
    - *Why?*
    - *How does this help AEOs support farmers?*
    - *Are there any parts of the curriculum that you would cut?*

13. **Do you seek to identify any learning needs and challenges which AEOs and farmers might face?**
    - *If yes, sources of information – individuals and organisations, other sources (e.g. radio, mobile phone – being careful not to lead the participant)?*
    - *Are some sources more useful than others (e.g. radio, farmers over policy advice)?*

14. **Do you personally adapt the curriculum in your day-to-day teaching?**
    - *If yes, why?*
    - *What do you do to adapt it?*

15. **Are there examples where you have taught AEOs based on your own experience and insights?**

PART 3: CONTINUING KNOWLEDGE DEVELOPMENT

16. **What professional development and training do you need to ensure that you remain up to date on the needs of AEOs?**

    - *Have you got this support and professional development?*
    - *If no, why do you think this is?*

- *If yes, probe – examples, what type of support and training, qualifications etc.*

17. **Have there been significant changes in the AE curriculum in the last 5 – 10 years** (or since you started teaching if sooner)?
    - *Who made/required these changes?*
    - *How were these changes communicated to you as trainers/educators?*
    - *Are you aware of any factors that influenced these changes, please explain?*

18. **Has your understanding of the AEO role changed in the last 5 – 10 years** (or since you first graduated from university/college/your initial AEO training if sooner)?
    - *How?*

19. **Would you have any recommendations on how training for AEOs could be improved to respond to challenges AEOs and farmers may face in the future?**
    - *What are those challenges? Probe: climate change, land reform, shifting regulations, gender, traditional knowledge, digital technologies etc.*

20. **Finally, is there anything else you would like to tell us about AE?**

THANK YOU FOR YOUR TIME.

PARTICIPANT INFORMATION **RAELL Group 5: Institutions – policy and/or curriculum**	
Date of interview:	
Location of interview:	
Gender:	
Age (*ask if appropriate*):	
Approximately how many years have you been involved in farming / AEO work?	
Participant ID:	

ANNEXTURE E: RAELL INTERVIEW SCHEDULE FOR POLICYMAKERS AND CURRICULUM

PART 1: INTRODUCTION AND CONTEXT

21. **Can you tell us a little about how you came to be involved in policy and/or curriculum work in the agricultural extension system?**
    - *Do you have a background in farming?*
    - *Where and how did you first develop an interest in farming and AEO work (e.g. college, family farm, community, by observation, enrolling on a course)?*
    - *If female, probe if appropriate, whether they faced any specific challenges as a female in this field.*

22. **What was your main source of knowledge and training for your work in AE policy / curriculum for AEOs?**
    - *Who were the providers?*
    - *Did the training result in certification?*
    - *If yes, what type of certificates/qualifications?*

23. **In your opinion, what is the main responsibility of an "Agricultural Extension Officer"?**

PART 2: CURRICULUM/POLICY DEVELOPMENT AND KNOWLEDGE SHARING

24. **What type of farmers does your AE policy/curriculum work typically focus on?**

25. **In your experience what sort of issues or challenges do AEOs typically need to help farmers with in their role as AEOs?**

26. **What organisations and individuals are involved in developing curriculum / policy content?**
    - *Does [your organisation] engage with AEOs and with farmers on a regular basis?*
    - *How do these engagements get arranged? Who initiates these engagements?*
    - *How often do you meet with AEOs and farmers?*

27. **Does [your organisation] engage with any other organisations and individuals to keep its policy/curriculum work updated for AEOs?**
    - *Who?*

28. **How does your organisation learn about the usefulness of its curriculum/policy work in helping AEOs support farmers to make practical decisions?**
    - *Can you give an example?*

29. **Are you aware of any examples where your organisation's curriculum/policy work does not adequately prepare AEOs to support farmers?**
    - *What did your organisation do on this occasion?*
    - *Did it try and learn and adapt, e.g. did the organisation find out how it could adapt its curriculum/policy work?*

30. **What do you think are the most important parts of your organisation's curriculum/policy work for AEOs?**
    - *Why?*
    - *How does this help AEOs support farmers?*

PART 3: CONTINUING KNOWLEDGE DEVELOPMENT

31. **Has your understanding of the AEO role evolved in the last 5 – 10 years?**
    - *How?*
    - *What prompted this?*

32. **What, if any, have been the key changes in policy/curriculum for AEOs in the last 5 – 10 years?**
    - *How were these changes communicated to AEOs?*
    - *Are you aware of any factors that influenced these changes, please explain?*

33. **Do you personally receive any ongoing training on the role of AEOs?**

    IF NO:
    - *Why do you think this is? Do you think this would be useful?*

    IF YES:
    - *What type of support and training?*
    - *From whom?*

34. **Is there any additional training that you would like to support you in your curriculum/policy work for AEOs?**
    - *Please explain.*

35. **Would you have any recommendations for how agricultural extension policy/curriculum development work can be improved to respond to the challenges AEOs and farmers may face in the future?**
    - *What are the key challenges facing the agricultural sector? Probe – climate change, gender, traditional knowledge, digital technologies, land reform etc.*

36. **Finally, is there anything else you would like to tell us about AE?**

THANK YOU FOR YOUR TIME

ANNEXTURE F: RAELL INTERVIEW SCHEDULE FOR STUDENTS

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PARTICIPANT INFORMATION **RAELL Group 2: AEOs**	
Date of interview:	
Location of interview:	
Gender:	
Age (*ask if appropriate*)**:**	
Approximately how many years have you been involved in farming / AEO work?	
Participant ID:	

PART 1: INTRODUCTION AND CONTEXT

22. **Can you tell us a little about why you are studying Agriculture?**
    - *Do you have a background in farming?*
    - *Where and how did you first develop an interest in farming? (e.g. college, family farm, community, by observation, enrolling on a course)?*
    - *For female AEOs: Are there any specific challenges you have faced as a female to becoming an AEO?*
    - *What career are you aspiring to? (AEO?)*
    - *Why do you want to be an AEO?*

23. **Which courses have you taken related to Agriculture Extension?**
    - *Who were the providers I.e college or university or other?*
    - *Did the training result in certification?*
    - *If yes, what type of certificates/qualifications?*

PART 2: Learning experience

24. **Do you think your course/program prepares you to be an Agriculture Extension Officer?**
    - *How?*
    - *What are the most important components of your learning?*
    - *How do you feel that the program could better prepare you/ meet your needs?*

25. **Do you receive practical training and field work as a component of your learning?**
    *** please explain how this works and give an example**
    *** what did you learn/ expect to learn in your field experience?**

26. **Does your program to teach you how to learn from farmers and integrate traditional knowledge and practice with new methods (together)?**

27. **Do you receive any teaching/ facilitation skills?**
    - *How do you expect to teach, e.g. do you give farmers things to read, provide demonstrations, field days, discussion groups, opportunities to ask questions?*
    - *Please explain some teaching methods and how you acquire them?*

PART 3: Role of AEO EXPERIENCES OF AEO ENGAGEMENT AND KNOWLEDGE SHARING

28. **In your opinion, what is the main responsibility of an "Agricultural Extension Officer"?**
29. **Have you ever had contact with AEOs prior to your studies?**
    a. *If so, where? What were your impressions?*

30. **What are some expected challenges that you may face in your capacity as an AEO?**

31. **In your experience what are the main challenges farmers face?**
    - *Are you able to help farmers solve these challenges?*

32. **Where do you expect to update your learning as new technologies and challenges emerge in time?**
    - *Sources of information – individuals and organisations, other sources? (e.g. radio, mobile phone, research station – being careful not to lead the participant).*
    - *Does this include interactions between policymakers, researchers, or farmers?*
    - *In what ways do they support you in your AEO work?*
    - *Are some sources more useful than others, e.g. radio, farmers over policy advice? Probe here for knowledge, resources, better training/educational skills.*

PART 4: Additions

33. **Would you have any recommendations on how the AEO role could be improved to respond to challenges AEOs and farmers may face in the future?**
    - *Do you think training on issues such as climate, gender, traditional knowledge or digital technologies could be important? Please explain.*

34. **Finally, is there anything else you would like to tell us about becoming an AEO?**

THANK YOU FOR YOUR TIME

ANNEXTURE G: RAELL INTERVIEW SCHEDULE FOR FARMERS

PARTICIPANT INFORMATION **RAELL Group 1: Farmers**	
Date of interview:	
Location of interview:	
Gender:	
Age (*ask if appropriate*):	
Approximately how many years have you been involved in farming / AEO work?	
Participant ID:	

PART 1: INTRODUCTION AND CONTEXT

1. **Can you tell us a little about how you came to be a farmer?**
    - *Where and how did you first develop an interest in farming (e.g. college, family farm, community, by observation, enrolling on a course)?*
    - *For female farmers: Are there any specific challenges you have faced as a female to becoming a farmer?*

2. **What are some of the most pressing challenges you face in your farming activities?**

3. **Where do you get information to help you with the challenges you face as a farmer?**
    - *Sources of information – individuals and organisations, other sources (e.g. radio, mobile phone – being careful not to lead the participant)?*
    - *Are some sources more useful than others, (e.g. radio, farmers over policy advice)?*
    - *If farmers are identified as a source, please probe how this is arranged or facilitated (e.g. is this a formal/informal network)?*

4. **In your opinion, what do you think is the main responsibility of an "Agricultural Extension Officer"?**

PART 2: PRACTICAL LINKS WITH AEOS

5. **Which organisations and individuals are delivering extension services or agricultural training in your area?**
    - *Are you able to access some or all of this?*
      If yes:
    - *From which organisations and individuals?*
    - *Are some organisations / individuals better at providing support than others?*
    - *Why do you think this is the case? (Probe here for knowledge, resources, better training/educational skills.)*
      If no:

    - **Have you ever engaged with AEOs? If not, why?**

NOTE: If participants state that they ***do not*** engage with AEOs, please use the remaining questions to probe who does assist them in their work as farmers, and what do these other individuals / organisations do.
This may help us learn more about what AEOs should do.

6. **How many times have you received services from an AEO in the last 6 months?**
    - *What did the AEO do on these occasions?*

7. **How does a meeting get arranged?**
    - *Do they contact you or do you contact them, or both?*
    - *How often do you meet with AEOs?*
    - *Are there any conditions (e.g. payment)?*

8. **What do AEOs actually do to assist you?**
    - *How do they teach you?*
    - *Do they give you things to read, provide demonstrations, field days, discussion groups?*
    - *Do they give you an opportunity to ask questions during your meetings?*

PART 3: EXPERIENCES OF AEO ENGAGEMENT AND KNOWLEDGE SHARING

9. **What sort of training do you think you need as a farmer?**
    - *Do you always get this help from AEOs?*

10. **Is the training and support you receive from AEOs useful for making practical decisions?**
    - *Can you give an example where your farming practice has positively changed as a result of meeting with an AEO?*
    - *If yes, please explain*.
    - *If no, why not*?

11. **Are there examples where you decided not to follow the advice or information you received from an AEO?**
    - *Why was this?*

12. **Have you experienced any challenges that the AEO could not help you with?**
    - *What did they do on this occasion?*
    - *Did they try and learn and adapt (e.g. go and find out how they could help you)?*
    - *Are there any other important issues that AEOs don't help with?*

13. **Are there examples where you have shared your knowledge on agricultural practices with AEOs?**
    - *What experience and insights did you offer?*
    - *Did the AEO adopt / transfer your expertise elsewhere?*

14. **Do you think AEOs face any challenges in trying to do their job?**
    - *Please explain.*

PART 4: THE FUTURE OF AE

15. **Finally, would you have any recommendations to AEOs, the government (*municipality/province/district*) or other organisations delivering training to farmers on how agricultural extension can be improved to respond to challenges you may face in the future?**
    - *Do you think training on issues such as climate change, gender, traditional knowledge or digital technologies could be important? Please explain.*

16. **Finally, is there anything else you would like to tell us about AE?**

THANK YOU FOR YOUR TIME.