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Strengthening Agricultural Extension Training in Nigeria, Malawi, South Africa, Uganda, and Kenya

Partnerships for Innovative Research in Africa : Research Report

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ABBREVIATIONS AND ACRONYMS

AAP	Alliance for African Partnership
ADAP	Accelerated Development Area Project
ADP	Agricultural Development Projects
ADPEC	Agricultural Development Project Executive Council
AEDC	Agricultural Extension Development Coordinator
AEDO	Agricultural Extension Development Officer
AESON	Agricultural Extension Society of Nigeria
AFADU	Alliance for Farmer Development Uganda
AgGDP	Agricultural Gross Domestic Product
APLU	Association of Public and Land-Grant Universities
APS	Agriculture Planning Services
ARET	Agricultural Research and Extension Trust
ASDS	Agriculture Sector Development Strategy
ASTGS	Agricultural Sector Transformation and Growth Strategy
BES	Block Extension Supervisor
BFAP	Bureau for Food and Agriculture Policy
CBO	Community- Based Organizations
CIA	Central Intelligence Agency
CIG	Common Interest Group
CRISP	Centre for Research on Innovation and Science Policy
CSR	Corporate Social Responsibility
DADO	District Agricultural Development Officer
DADP	Diocesan Agricultural Development Project
DAES	Directorate of Agricultural Extension Services
DAESS	District Agriculture Extension Services System
DAFF	Department of Agriculture, Forestry and Fisheries
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEC	Development Education Centre
DES	Director of Extension Services
DFRRI	Directorate of Food, Roads and Rural Infrastructure

DLEC	Developing Local Extension Capacity
EA	Extension Agent
EASs	Extension Advisory Services
ECOP	Extension Committee on Organizational Policy
ECWA	Evangelical Church of West Africa
EO	Extension Officer
EPA	Extension Planning Area
ERP	Extension Recovery Plan
FADU	Farmers Agricultural Development Union
FAO	Food and Agriculture Organization
FASCOM	Farmers Agricultural Supply Company
FBO	Farmer- Based Organization
FGD	Focus Group Discussion
FMARD	Federal Ministry of Agriculture and Rural Development
FRT	Farm Radio Trust
GDP	Gross Domestic Product
GOK	Government of Kenya
GOM	Government of Malawi
GRP	Green Revolution Programme
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
ICTs	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Centre
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IRB	Institutional Review Board
KARI	Kenya Agricultural Research Institute
KASEP	Kenya Agriculture Sector Extension Policy
KEFAAS	Kenya Forum for Agricultural Advisory Services
LGA	Local Government Area
LUANAR	Lilongwe University of Agriculture and Natural Resources
M&E	Monitoring and Evaluation

MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MaFAAS	Malawi Forum for Agricultural Advisory Services
MOA	Ministry of Agriculture
MOAAS	Market-Oriented Agricultural Advisory Services
MSADP	Multi-State Agricultural Development Projects
MSU	Michigan State University
MSUE	Michigan State University Extension
MTRMs	Monthly Technology Review Meetings
NAADS	National Agricultural Advisory Services
NAEASS	National Agricultural Extension and Advisory Services Strategy
NAEP	National Agricultural Extension Policy
NAFPP	National Accelerated Food Production Project
NAIP	National Agriculture Investment Plan
NAIS	Nigeria Agricultural Insurance Scheme
NALEP	National Agriculture and Livestock Extension Programme
NAP	National Agriculture Policy
NARES	National Agricultural Research and Extension System
NARIs	National Agricultural Research Institutes
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
NASEP	National Agricultural Sector Extension Policy
NBS	National Bureau of Statistics
NDE	National Directorate of Employment
NEEDS	National Economic Empowerment and Development Strategy
NEP	National Extension Programme
NFDP	National Fadama Development Project
NGO	Non- Governmental Organization
NIFAAS	Nigeria Forum for Agricultural Advisory Services
NPEASs	National Policy on Extension and Advisory Services
NQF	National Qualifications Framework
NRCNA	National Research Council of the National Academies
NSAs	Non-State Actors

OECD	Organization for Economic Co-operation and Development
OFAR	On-farm Adaptive Research
OFD	On-Farm Demonstration
OFN	Operation Feed the Nation Programme
PAP	Poverty Alleviation Programme
PFAN	Practicing Farmers Association of Nigeria
PIRA	Partnerships for Innovative Research in Africa
PMU	Programme Management Unit
QTRM	Quarterly Technology Review Meeting
RBDA	River Basin Development Authority
RCVS	Royal College of Veterinary Surgeons
RDP	Rural Development Projects
SAA	Sasakawa African Association
SASAE	South African Society of Agricultural Extension
SDGs	Sustainable Development Goals
SFAA	Shifting Focal Area Approach
SHG	Self- Help Group
Sida	Swedish International Development Agency
SMS	Subject Matter Specialists
SPSS	Statistical Package for Service Solution
StatsSA	Statistics South Africa
T&V	Training and Visit System
UFAAS	Uganda Forum for Agricultural Advisory Services
UG	Under Graduate
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNN	University of Nigeria, Nsukka
USAID	United States Agency for International Development
WIA	Women in Agriculture
WOFAN	Women's Advancement Network
ZABTA	Zirobwe Agaliawamu Business Traders' Association
ZEO	Zonal Extension Officer

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EXECUTIVE SUMMARY

To strengthen the agricultural extension curriculum, the present study was undertaken in sub-Saharan Africa covering Nigeria, Malawi, South Africa, Uganda, and Kenya during 2021-2023. The population for the study was agricultural extension professionals within these five countries drawn from universities, public- sector organizations, private- sector organizations, and NGOs. Mixed- method research design, comprising quantitative and qualitative approaches, was employed to assess the process skills and competency gaps in undergraduate (UG) agricultural extension curricula with the following research questions and objectives:

Research Questions

1. Do extension programs effectively address the needs of current food and agricultural systems?
2. What are the critical job skills and core competencies required of extension workers to effectively plan, implement, and evaluate extension work in today's changing context?
3. Does the UG curriculum in extension education include education and/or training on these job skills or core competencies?
4. What are the barriers to effectively training extension workers with required core competencies, and how can these barriers be removed?

Objectives

1. Review agricultural extension curricula currently in use at AAP member universities at the UG level in Nigeria, Malawi, South Africa, Uganda, and Kenya.
2. Identify critical process skills and competencies of agricultural extension professionals, process skills gaps, and areas of potential curricular reform.
3. Recommend improvements/reforms of agricultural extension curricula to prepare the next generation of agricultural extension professionals to competently handle EASs delivery.
4. Introduce new/improved curricula among the agricultural extension faculty engaged in training and education in sub-Saharan countries.

The study assessed 11 process skills and competencies -- program planning; program implementation; communication; information and communication technologies (ICTs;, program monitoring and evaluation; personal and professional development; diversity and gender; marketing, brokering, and value chain development; extension soft skills; nutrition; and technical subject matter expertise. These were assessed on:

- **How important is this skill or competency?** Respondents rated items on 1 to 5 scale with 1 = Not Important; 2 = Somewhat Important; 3 = Moderately Important; 4 = Important; and 5 = Very Important.

- **How well does our UG extension curriculum address this competency?** Respondents were asked to rate the statements on 1 to 5 scale with 1 = Not at All Covered; 2 = Minimally Covered; 3 = Moderately Covered; 4 = Well Covered; and 5 = Very Well Covered.

The online survey questionnaire was administered to 1497 agricultural extension professionals in the five countries, and five reminders were sent to non-respondents to increase the response rate. A total of 635 respondents completed the online survey. A paired sample t-test was applied to see the difference between two means, and cross-tabulation on demographic and institutional characteristics as they relate to perception on process skills and competencies also worked out. The perception of respondents was also obtained on: additional skills and competencies that extension professionals need but are not covered above; strategies to make the agricultural extension curriculum robust and practical; appropriate ways to acquire process skills or core competencies; and major barriers to effective implementation of agricultural extension curriculum. For qualitative data, 12 FGDs were planned and conducted involving 97 participants across Nigeria, Malawi, South Africa, Uganda, and Kenya. The key FGD questions were related to perceptions of local agricultural extension contexts, critical job skills and core competencies required of extension workers, their coverage in the current UG curriculum, and the barriers to effectively training extension workers.

Key Findings from the Review of Agricultural EASs and Agricultural Extension Curriculum

- Conventional top-down, supply- and technology-driven extension EASs no longer appear to be an appropriate model to address the key challenges in EASs delivery -- reduction and untimely governmental funding, declining number of well trained public- sector extension staff, inadequate research-extension-farmer-inputs linkages, inadequate policy, legal, regulatory and institutional frameworks, inadequate targeting of diverse groups, lack of coordination/ regulation among pluralistic EASs providers, inadequate EAS infrastructure, and demand for market-driven and efficient EASs.
- The options chosen to meet the challenges in EASs delivery include privatization, multiple service providers, public-private partnerships, decentralized and/or bottom-up services, and market-driven or fee-for-service systems.
- All five AAP partner universities offering agricultural extension training have established curriculum committees to review and recommend the curriculum including learning methods and materials.
- The committees conducts the curriculum review every five years based on stakeholder feedback, changing national and global development needs, and policy changes.
- The regulatory bodies have the mandate to stipulate the broad objectives, learning

outcomes, requirements for minimum standards/hours, and the nature, organization, and general structure of the program.

- In most cases, the proper implementation of curricular recommendations is impacted by budgetary constraints, instructor preparedness, and student / faculty motivation for practical or hands-on learning. As a result, the curriculum transaction is more theoretical and inadequate on practical hands on training. Students have little opportunity to develop critical thinking and problem-solving process skills that are necessary to align training content and instruction with employment outcomes.
- A 10-week to one-year practical extension programs exists in two universities aimed to close the gap between theory and practice.

Key Findings from the Quantitative Data (Online Survey):

- A greater proportion of extension functionaries are in their young to middle age years, highly qualified, and thus are a great asset for the required reforms of agricultural EASs in sub-Saharan Africa.
- Despite the increase in women's involvement in agricultural production and value chain activities, the EASs in sub-Saharan Africa are dominated by male extension professionals.
- The paired t-test index values revealed significant differences between "how important the skill or competency' and 'how well does UG extension curriculum address the skill or competency "of all 11 process skills and core competencies and 97 subcompetencies.
- The agricultural extension professionals are fully aware of the importance of these 11 process job skills or competencies, and they perceived that present UG extension curriculum inadequately transect these skills and competencies.
- Though most of the broad process skills and competencies are included in UG agricultural extension courses, students have little opportunity to have hands-on training and build up critical thinking and problem-solving process skills to line up with EASs delivery outcomes.
- The curricula for the programs are largely aligned with the 11 competency domains, but with outstanding emphasis on technical competence rather than process skills and competencies with few exceptions like in Uganda's BARI program, 52% of the credit units are extension methods/process skills, 15% economics and agribusiness, and 33% are technical agriculture.
- Some critical professional competency domains such as soft skills, gender and diversity, nutrition and food safety, brokerage, marketing, and value chains, and personal and professional development are not well covered in most curricula. Also, some subject

matter--particularly on contemporary issues and technologies in competency domains such as ICTs among others -- is not adequately addressed.

- The level of required curriculum transaction and preservice training at the UG level is inadequate and insufficiently prepare students with the required skills and competencies to provide integrated EASs efficiently to their clients.
- The nomenclature of UG programs is diverse and varying from country to country, and university to university within a country. Although the traditional nomenclature of the departments and programs still exists in most universities, there are attempts to reform the systems and nomenclature of UG programs in some universities.
- Though some of the contents being imparted at UG level are still relevant, curriculum reforms are important to address new challenges such as climate- smart agriculture, demand-driven or market-led pluralistic EASs, contract farming and value chain EASs, agriculture start-ups and digital EASs, management of natural resources, community sustainability, facilitation for development, diversity of extension staff members and clients, changing job markets for agriculture graduates, etc.
- The methods such as preservice training, internship at various work environments, basic induction training, in-service training, and continuing education opportunities are appropriate methods and could be employed to enhance the skills and core competencies of agricultural extension professionals.
- The results on major barriers to effective implementation of extension curricula revealed major similarities in budget to support practical learning experience (e.g., field visits and demonstrations), classroom and demonstration farms or facilities, student motivation to study extension and interest in practical extension work, development of an effective extension curriculum, teacher motivation to teach required process skills and competencies, quality textbooks and/or manuals, quality faculty to teach extension courses, etc.

Key Findings from the Qualitative Data (FGDs):

- Extension professionals graduating from universities come with the technical theoretical knowledge, but they have been missing out on some critical practical competencies such as provision of holistic EASs including production techniques, processing, marketing, and business planning.
- Frontline extension professionals are demotivated by issues such as limited resources, operational funding, infrastructure, and incentives. On the other hand, farmers have little trust in them because of lack of accountability and poor attitudes.
- EASs are inadequately targeted, and the quantity and quality of advisory contacts are compromised, especially for the poorest farmers, women, and spatially remote

households.

- Gaps in critical communication skills needed by extension professionals include networking, negotiation, persuasion, facilitation, interpersonal, conflict resolution, lobbying, proposal writing, gender relations, group dynamics, and teamwork.
- Gaps in critical managerial skills needed by extension professionals include planning and organizing skills, leadership skills, monitoring, budgeting, and reporting, program evaluation and documentation, and knowledge management.
- The social and emotional skill gaps include intelligence, empathy, integrity, positive attitudes towards the job, respect for other cultures, self-directed learning, and professional ethics.
- Common skill /competency gaps in the UG agricultural extension curriculum across sub-Saharan Africa include practical and technical skills, knowledge of ICTs, soft skills (e.g., communication, facilitation, social skills), marketing and entrepreneurship skills, resource mobilization, project management, monitoring and evaluation, and problem-solving analytical skills.
- Curriculum revisions are not taking place at regular intervals and most of the universities across sub-Saharan Africa lack some basic facilities and funding to ensure quality extension training to UG students. Most of the extension professionals, therefore, lack the required skills and competencies.
- Suggested courses related to process skills include ICTs, agribusiness management, entrepreneurship, program proposal, community mobilization and local organization development, and management of change to enhance the technical competencies of the students.
- There is a dire need of curriculum revision of the agricultural extension programs offered in the sub-Saharan African universities.

Key Recommendations for Policy Decisions:

- To address the needs of demand-driven, pluralistic, decentralized, and participatory agricultural EASs, the authors identified and recommend 11 process skills and core competencies with 97 subcompetencies for their inclusion in the UG agricultural extension curriculum. The broad areas of competencies recommended are: program planning; program implementation; communication; ICTs; program monitoring and evaluation; personal and professional development; diversity and gender; marketing, brokering, and value chain development; extension soft skills; nutrition; and technical subject matter expertise.
- Systematic in-service training programs are recommended on demand-driven, decentralized, pluralistic, and participatory agricultural EASs with focus on the 11

process skills and competency gaps.

- To bridge the gender gap, encourage more women to enroll and specialize in agricultural extension at UG and postgraduate levels. In addition, recruit more women extension professionals in the public, private, and non-governmental extension organizations for teaching, research, and field positions, which will help in bridging the gender gap, planning gender-specific extension programs, and delivering EASs to meet the needs of women clients.
- The universities in sub-Saharan Africa need to specify the skills or competencies in course content with learning outcomes to be achieved, suggest pedagogy for facilitating process skills development, support practical training and fieldwork, and focus on enhancing the curriculum transaction processes.
- Capacity building of the agricultural extension faculty on the 11 process job skills or competencies and 97 subcompetencies for effective curriculum transaction is recommended.
- Modernized agricultural extension curricula could be devised through the integration of various social science courses and the terminology of course contents of UG extension curricula transformed with a focus on modernized EASs.
- To make the agricultural extension curriculum robust and practical, we recommend interventions such as ICT- oriented UG extension curriculum/pedagogy, exposing students to market opportunities and service providers to develop entrepreneurship, offering training- of- trainer workshops for extension faculty members, including the identified soft skills in the curriculum, and developing cutting-edge and practical teaching learning resources – extension textbooks, practical handbooks, training manuals, and self- learning materials.
- There are vital advantages to incorporating precisely defined competency outcomes and job roles in the UG agricultural extension curriculum at preservice and internship training levels. For effective preservice training, alignment of the UG agricultural extension curriculum with NQF is recommended as in South Africa.
- Define the minimum day-one competencies expected of graduates with learning outcomes. The 11 process competencies and 97 subcompetencies identified and assessed could be the starting point for defining learning outcomes, job roles, and NQF at preservice and internships during UG programs. These are the core competencies that every extension professional must possess, among others.
- We recommend co-learning among agricultural extension departments within AAP partner universities. Successful examples on reforms in one university can be shared with other AAP partner universities through regional workshops and learning conferences. The

learning workshops could be organized on a rotational basis, i.e., one university hosting the workshop each year. These workshops could focus on learning from the field. MSU AAP and regional extension networks could co-sponsor these workshops and/or conferences.

- For the in-service extension functionaries, the authors recommend systematic basic induction trainings, in-service trainings at various work environments, and opportunities to attend short trainings, seminars, workshops, webinars, etc., on the process skills and competency gaps.
- Further, the competencies can be contextualized through the basic induction training and further refined through staff development or in-service training and continuing education opportunities.
- The additional appropriate ways to acquire process skills or competencies recommended include staff and student exchange programs, farmers' field schools, experiential practical learning, facilitated peer-to-peer learning, and robust e-learning.
- Other recommendations are sufficient allocation of budget for extension practical learning, recruiting qualified faculty members to teach extension courses, training and motivating teachers to teach required process skills and competencies, providing good classroom and demonstration facilities, and making available quality textbooks and/or manuals to address the barriers and improve agricultural extension training in sub-Saharan Africa.
- The recommendations for the public extension systems include adopting and giving space to the pluralistic approach in EASs delivery, and developing, monitoring, and reviewing the regulatory aspects of EASs.
- The recommendations for the universities include improving synergy and collaborating more closely with all stakeholders, revising the curriculum at least every five years, and ensuring adequate funding to extension departments to facilitate proper curriculum transaction.
- Strengthening the extension professionals' preservice education and in-service training courses with critical process skills and competencies will ensure that the system serves farmers and delivers EASs effectively.
- Admitting students with genuine interest in extension field jobs; collaborating with farmers, rural communities, and commodity associations; monitoring current outreach programs and arranging for longer internships; inviting guest speakers from the field to enhance the knowledge of the students; and involving students in research projects using/establishing mini farms for hands-on education will enhance extension education.
- To promote the scholarship of extension, universities are recommended to adopt a separate track for extension/outreach faculty similar to the teaching track.
- A resource manual need to be developed to provide extension faculty members with a

guide to teaching their curriculum covering all process skills and competencies.

- Also, conduct job analyses to identify occupational standards for extension professionals and revise courses to evolve a standardized curriculum incorporating the 11 process skills and competencies and 97 subcompetencies that every extension professional must possess.
- Many universities in Africa have initiated internship or mentorship programmes. We strongly recommend making it compulsory in final year to all UG students by determining appropriate credit structure.
- Considering the study findings, similarities in agriculture systems, and a careful review of gaps in existing agricultural EASs delivery vis-à-vis UG agricultural extension curricula, we recommend adopting the following three UG courses of four semester credits each to be offered during the first three years of the curriculum in Nigeria, Malawi, South Africa, Uganda, and Kenya. These courses can be the starting point for the curriculum revision in sub-Saharan Africa with required local contextualization:
  1. Foundations of Agricultural Extension (3 Theory+1 Practical Credits).
  2. Managing Agricultural Extension Programs (2 Theory +2 Practical Credits).
  3. Agribusiness and Supply Chain Management (3 Theory +1 Practical Credits).

CHAPTER 1 - INTRODUCTION

The agricultural sector in sub-Saharan Africa is one of the major drivers of economic growth and poverty reduction, and contributes about 15.3% to the overall real GDP in the region (World Bank, 2020). The sector provides the major source of livelihood to smallholder farmers as well as micro-, small-, and medium-scale enterprises along the numerous agricultural value chains leading to a pathway of long-term food security, poverty eradication, and rural development. In spite of the significant role of agriculture in driving the economy, poverty and food insecurity are prevalent among smallholder farmers and other value chain actors, and this has been largely attributed to low agricultural productivity that keeps the agri-food sector locked in underperformance (Fawowe, 2020; Bjornlund et al., 2020). Therefore, improving agricultural productivity is the major means to alleviate poverty and curtail food insecurity in sub-Saharan Africa. Agricultural extension advisory services (EASs) play a key role in addressing complex challenges, increasing farm productivity, and linking farmers to markets. On the other hand, poor institutional capacity -- i.e., faculty vis-à-vis the agricultural extension curriculum -- has resulted in poor quality training of extension workers resulting in low quality EASs and low adoption of improved agricultural technologies among food systems actors (Babu et al., 2020).

Agricultural universities in sub-Saharan Africa face challenges from having their undergraduate (UG) training curricula modeled decades ago after Western universities with few or no changes. With changing agriculture and rural development contexts, colleges and universities in sub-Saharan Africa are recognizing the need to revise and upgrade their UG curricula in extension. This has necessitated studies to identify process skills and core competency gaps of extension professionals that limit their abilities to adapt their training to changes in food systems based on local conditions.

Periodic updating of the UG agricultural extension curriculum is necessary for agricultural training institutions to produce graduates with core process skills and competencies that will enable improved EASs, sustainable food security, improved livelihoods, and natural resources conservation. Although there have been few studies on core competencies of agricultural extension professionals in sub-Saharan Africa (Davis and Terblanche, 2016; Nwaogu and Akinbile, 2018; Olorunfemi et al., 2020), a systematic assessment of agricultural extension training within Michigan State University Alliance for African Partnership (MSU-AAP) Consortium members is lacking. This study would help AAP member universities to develop the broadly competent extension professionals needed for contemporary agricultural development with focus on Nigeria, Malawi, South Africa, Uganda, and Kenya.

1.1 NIGERIA

Nigeria is the most populous nation in Africa, with a population of 201 million (United Nations Data, 2019). Of the country's 911,000 square kilometers of land area, 78 percent is

dedicated to agriculture, and 36 percent of the labor force is engaged in agriculture (Camillone et al., 2020; FAO, 2019). This makes agriculture the largest employer of the country's labor force. Nigeria's 853- km coastline along the Gulf of Guinea, together with ample freshwater resources provided by the River Niger and Benue rivers, provides great potential for fisheries and aquaculture/mariculture (FMARD and UNDP, 2015). However, Nigeria's export economy is mainly based on petroleum (95 percent); cocoa and rubber have the next largest shares (Central Intelligence Agency [CIA], 2019). Despite its export dominance, petroleum accounted for under 9% of national Gross Domestic Product (GDP) in 2018, compared with agriculture's 21 percent (National Bureau of Statistics [NBS], 2019). In essence, agriculture plays a major role in the economy of Nigeria.

1.1.1Agriculture in Nigeria

Nigerian agriculture is broadly divided into four sectors -- crop production, fisheries, livestock, and forestry. Crop production is the largest segment, accounting for about 87.6% of the sector's total output. This is followed by livestock, fisheries, and forestry at 8.1%, 3.2%, and 1.1%, respectively (Taiwo, 2020). In crop production alone, Nigeria accounts for up to 20% of the world cassava production (and 34% of Africa's), making the country the largest producer of cassava in the world (Adedotun, 2022).

Nigerian agriculture has a high potential for employment generation, food security, and poverty reduction (Olagunje et al., 2019). It is the main source of raw materials for the agro-based industries in the country, and over 75% of the Nigerian population depends on agriculture as a source of livelihood (Suresh et al., 2020). Between January and March 2021, agriculture contributed 22.35% of the total GDP (FAO, 2021). However, domestic agriculture is currently unable to support the growing population's food needs, and $3 billion to $5 billion dollars of food is imported per year, largely comprising staples such as wheat and rice (Federal Ministry of Agriculture and Rural Development [FMARD], 2016). This is the case, even with Nigeria's awesome National Agricultural Research and Extension System (NARES), which is the largest in sub-Saharan Africa.

It is clear, therefore, that the country has not been able to harness its vast natural resources for sustainable agricultural development. This has been aptly captured in the National Food Security Program document, which is the most recent and authoritative policy statement by the federal government on the state of the nation's agriculture. Although "agriculture remains a key component of the country's economy, currently contributing about 40.0 percent of the GDP and employing about 70.0 percent of the active population, the sector has significantly underperformed its potential" (FGN,2008). This has been clearly manifested in very high food prices nationwide, food insecurity at both the household and the national levels, and widespread malnutrition, especially in children. Thus, the agricultural production and food situation in the country today is anything but non-impressive.

Despite these challenges, the Nigerian agricultural system has both potentials and opportunities. There is untapped agricultural potential: only about 40% of the roughly 84 million hectares of arable land are utilized, whereas more than half (60%) are yet to be

utilized. About 279 billion cubic meters of surface water, including three of the eight major river systems in Africa, plus ground water represent untapped irrigation potential. Manpower is also readily available, and the growing population translates into an internal market for agricultural products (Ufiobor, 2017). Realizing these potentials requires agricultural extension workers who understand the underlying issues and the opportunities to enhance the food and agricultural system. They can then source and disseminate information and technology that will enable their clientele to maximize the opportunities for a sustainable food and agricultural system.

1.1.2 The History of Agricultural Extension in Nigeria

Agricultural extension has a long history in Nigeria. During the colonial era under the British, some agricultural development initiatives were undertaken with the purpose of increasing production. The first step was the establishment of the Department of Botanical Research in 1893, with its headquarters at Olokomeji in the former Western Nigeria (Williams, 1978), now Ogun state. Its responsibilities included conducting research in both agriculture and forestry. Agricultural policy focused on the production for export of certain cash crops required in Europe (Naswem and Ejembi, 2017). In 1905, the British Cotton Growers Association acquired 10.35 square kilometers of land at the site now called Moor Plantation, Ibadan, for growing cotton to feed the British textile mills. In 1910, Moor Plantation, Ibadan, became the headquarters of the Department of Agriculture in Southern Nigeria, while the Department of Agriculture was established in the north in 1912. During this embryonic phase of extension development, the British government provided free EASs to farmers aimed at feeding their home-based industries with agricultural raw materials (Kagbu and Issa, 2017). The extension approach was majorly commodity- driven. The EASs were organized and managed through a combination of coercion, manipulation, and use of reward to motivate farmers to comply with extension service directives (Nwachukwu, 2013). Farmers were encouraged to grow certain crops -- basically oil palm, cocoa, groundnuts, and soybeans -- and were sometimes offered free seeds and EASs (Naswem and Ejembi, 2017). During this era, research information and extension of scientific information to clientele hardly existed, conflicting role arising from the adoption of incongruous strategies, and the emphasis was on cash crop development at the expense and to the neglect of food crops (Nwachukwu, 2013; Kagbu and Issa, 2017).

After the amalgamation of the North and the South, a unified Department of Agriculture was formed in Nigeria in 1921 (Nwachukwu, 2013). The major policy of the Department of Agriculture was still to increase production of export crops for the British market and provide for Britain's industrial growth. The EASs were therefore directed toward increasing efficiency in crop production and marketing. The colonial government commenced with the creation of agricultural research stations in Umudike (1923) and Moor Plantation (1924) together with the Regional Ministries of Agriculture in the North, East and West.

Following Nigerian independence in 1960, the federal government of Nigeria started to get more involved in agriculture. The increase in unemployment rate of school leavers in the country led to the introduction of farm settlements and the setting up of the school leavers'

farm projects in the East, West and Mid-West. In addition to generating employment and controlling rural-urban migration, these projects served as focus for concentrated EASs. A revitalized strategy was also established for separate special commodity EASs for export crops such as cocoa, rubber, and groundnut, leaving the general EASs for food crops and livestock at the expense of the nation (Nwachukwu, 2013).

After the civil war in 1970, the nation faced food insufficiency. The need to solve that problem led to the proliferation of agricultural interventions, programs, and research institutes with EASs components (Box 1.1).

Box 1.1: Programs and approaches to extension in Nigeria

- National Accelerated Food Production Project (NAFPP)
- Agricultural Development Projects (ADP)
- Accelerated Development Area Project (ADAP)
- Multi-State Agricultural Development Projects (MSADP)
- Operation Feed the Nation Programme (OFN)
- River Basin Development Authority (RBDA)
- Green Revolution Programme (GRP)
- Directorate of Food, Roads ,and Rural Infrastructure (DFRRI)
- National Directorate of Employment (NDE)
- Nigeria Agricultural Insurance Scheme (NAIS)
- National Fadama Development Project (NFDP)
- Poverty Alleviation Programme (PAP)
- National Economic Empowerment and Development Strategy (NEEDS)
- Developing Local Extension Capacity (DLEC)

Today, EASs is still within the purview of the Federal Government of Nigeria. It gives guidance and coordination to the states in agricultural programs and implements some agricultural projects. Each state has a network of ADPs that are responsible for providing EASs delivery in 36 states and FCT. The ADPs within each state are organized into zones, then subzones, and then blocks (approximately equal to a local government area, or LGA), and then cells (or villages) (Developing Local Extension Capacity [DLEC], 2017). In recent times, multiple private- sector, donor agencies and NGOs have also been providing EASs. With the involvement of these many actors, the focus of EASs delivery has metamorphosed from a supply- driven approach to a demand-driven, market-oriented, value chain approach.

The major stakeholders in EASs are the public sector (state ADP, National Agricultural Research System [NARS]), private sectors, NGOs, and international donor agencies. The ADPs in collaboration with the LGAs in some states are responsible for grass-roots extension delivery nationwide; the NARS is responsible primarily for technology development. Currently

the major provider of public- sector EASs is the ADPs in each of the 36 states of Nigeria. The ADP has an extension workforce of about 7,000 public agents (28 percent female) (DLEC, 2017). It is noteworthy that, over the past few decades, there have been changes in the approaches and performance of agricultural EASs in Nigeria (Lewis and Watts, 2015; Kuz et al., 2018; Nwoye and Nwalieji, 2019). These changes may be attributed to the participation of NGOs and donors in funding and provision of agricultural EASs (Sinkaiye et al., 2018).

Some private agencies have embarked on agricultural EASs directed largely toward a specific clientele group of their choice. They complement the public sector in providing extension services to farmers, for either improving farmer production or generating demand for agricultural inputs they sell. Quality inputs are in high demand, and a dearth of seed companies creates an opportunity for the private sector. The private sector increasingly views EASs as a corporate social responsibility (CSR) and as a way to increase brand loyalty with the farmers. Successes have been seen in out-grower schemes in which a processing company organizes farmers and provides inputs and training. Some of those agencies are the Nigerian Tobacco Company, oil companies such as Shell Petroleum Development Company, and religious organizations such as the Catholic and the Anglican churches. Some NGOs such as the Leventis Foundation also operate some EASs (Yahaya, 2020).

The participation of NGOs in EASs delivery in Nigeria is a major feature in recent time. These NGOs are either charity- based or private commercial organizations. The charity-based NGOs are non-profit oriented; private commercial organizations have a profit motive associated with their EASs activities. These NGOs in the agricultural and rural development sector provide a wide range of EASs and technical support services, including micro-credit financing and supply of essential inputs in several communities in the country (Malabe et al., 2019). Examples of the non-profit NGOs include: the Development Education Centre (DEC), which provides extension support for women to organize themselves into grass-roots, self-help associations in South-Eastern Nigeria; the women's Advancement Network (WOFAN) in the North-West, promoting income generation activities among rural women; the Farmer Development Union (FADU) and the faith-based Diocesan Agricultural Development Project (DADP) in South-Western Nigeria, which aims at poverty alleviation among small- scale farmers. Other NGOs playing supportive role in research and extension delivery in Nigeria include: Sasakawa Global 2000 and Women in Agriculture (WIA), Practicing Farmers Association of Nigeria (PFAN), Farmers Agricultural Development Union (FADU), Farmers Agricultural Supply Company (FASCOM), and Evangelical Church of West Africa (ECWA).

Many international organizations have also been involved in agricultural extension and rural development in Nigeria for decades. Notable among these are the World Bank, United States Agency for International Development (USAID), Technical Centre for Agricultural and Rural Cooperation (TCARC) , and Food and Agriculture Organization (FAO) of the United Nations. Some international research centers and networks have made their presence known and been supportive in Nigeria in the research and extension delivery. Some of them have established collaborative efforts with the NARIs and other relevant agencies.

Some of the international research centers are: International Institute of Tropical Agriculture (IITA), International Fertilizer Development Centre (IFDC), International Livestock Research Institute (ILRI), International Crops Research Institute for Semi-Arid Tropics, International Fund for Agricultural Development (IFAD), and United Nations Development Programme (UNDP) (Yahaya, 2020).

1.1.3 Organogram of EASs in Nigeria

The public extension organization in Nigeria became effective in 1968 under the Ministry of Agriculture (MOA). As a reform of the MOA, ADP's strategy was initiated under enclave arrangement in Funtua, Ayangba, Ekiti-Akoko, Gombe, Gusau, and Lafia in 1975. The success of this arrangement led to the expansion of the ADP strategy to all the states in Nigeria. Since 1989, public- sector extension activities in Nigeria were concentrated in the ADPs. The ADP was designed to improve the traditional systems of production and raise productivity by transfer of relevant and proven production technologies to farmers, easing constraints on inputs supplies, and provision of rural infrastructure (Obasi, 1995). In pursuance of this, the program employs the training and visit system (T&V). The T&V system provides comprehensive agricultural EASs (for crops, livestock, etc.) within a single line of command (Bindlish and Everson, 1997).

The advent of the ADPs ushered in a different approach to extension work by bringing several elements that contributed to agricultural development under one semi-autonomous administrative set-up separate from the Ministry of Agriculture. Emphasis was on reorganizing and revitalizing the extension system with a suitable linkage with research. To this end, a NARS comprising 18 national agricultural institutes, 16 faculties of agriculture, and three universities of agriculture was established for basic and applied research in the country. This was in addition to the presence of the International Institute of Tropical Agriculture (IITA) and substations of other international research institutions (Mijindadi, 1984). Later, more universities of agriculture were established.

This arrangement set the stage for the collaboration of ADPs, research institutes, and universities to diagnose prevailing farming problems, test promising technologies for research on the farmers' fields, and promote relevant ones for mass adoption. In this connection, Mijindadi (1994) observed that an agricultural research - extension - farmer- university linkage had been established in Nigeria whereby each ADP had an agreement with a research institute or university for getting assistance of scientists in monthly technology review meetings (MTRMs), quarterly technology review meetings, and design and supervision of on-farm adaptive research trials (OFAR). This two-way communication link between the agencies ensures better quality research for the development of appropriate, up-to-date technologies and extension services oriented to farmers' needs.

The ADPs in the various states of Nigeria operate similarly to agro-technology transfer organizational structures established in each state by law. Each state ADP is organized in four levels to facilitate supervision and transfer of authority: headquarters, zonal, block, and circle levels. The two broad arms of the ADP are the CORE and the SUPPORT services, or

subprograms. The core program includes engineering, extension, technical, and rural Institution services. The support programs are administration, finance, human resources, monitoring and evaluation services (Fig. 1.1).

At the headquarters, a policy-making body known as the Agricultural Development Project Executive Council (ADPEC) is under the chairmanship of the state governor. This committee formulates policies for administrative control, appointments, promotions, and general discipline, supervision, and coordination. It also controls all finances and approves the project's annual budget.

The administrative head of the ADP is the project manager (PM), who is next in the hierarchical line of authority. The PM is the head of a body known as the Programme Management Unit (PMU), which comprises all heads of subprogram as well as zonal managers. The PMU has responsibility for the execution of the policies and programs approved by the ADPEC. It also prepares work plans and budget estimates, and handles appointment, promotion, and discipline of ADP staff.

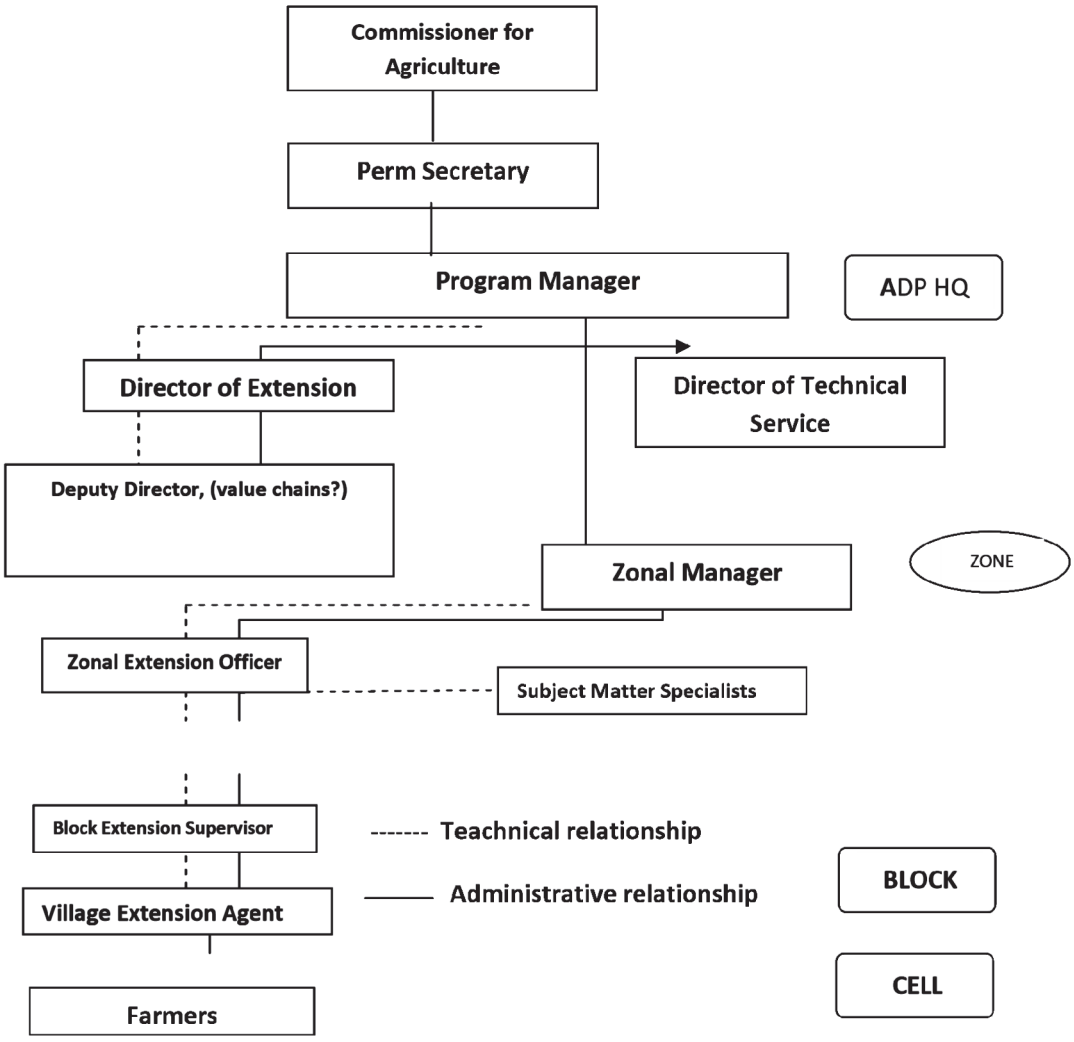

Fig. 1.1: Organogram of Agricultural Development Project (Source: FACU, 1991)

Each subprogram has clearly defined responsibilities. Program implementation, management and administration are, therefore, achieved through the activities of these subprograms and their components. A meeting point for the subprograms is possible only at special review meetings where the activities of each subprogram may be discussed. The review meetings are expected to provide opportunity for interdisciplinary exchanges and linkages. One key link for all the subprograms is the planning, monitoring, and evaluation support services. The activities of this unit cut across all the subprograms -- its staff can go straight into the affairs of any program to obtain information, even before special review meetings are announced.

The second supervisory level is at the zone, which may have from six to eight blocks. Each zone is headed by a zonal manager (ZM), who is assisted in the execution of extension programs s by zonal extension officers (ZGOs) and subject matter specialists (SMSs). The organizational chart under consideration does not, however, provide for any direct linkage of the ZM with the director of extension services (DES). It appears that the only meeting point for both officers is at the PMU level since both reports directly to the PM. There should be a lateral linkage between the ZM and the DES because both are involved in implementation of the same extension programs.

The third supervisory level is the block, which in some cases may correspond to a local government administrative territory. Blocks represent areas that are similar in farming technology used and crops and animals kept. Each block is headed by a block extension supervisor (BES). These officers, together with zonal extension officers (ZEOs), maintain lateral technical knowledge with subject matter specialists (SMSs), who may be university researchers or experts from the private sector. A block extension supervisor is in charge of six to eight circles, which make up a block.

The circle is the fourth level and is headed by an extension agent (EA), who makes direct contacts with the farmers, and men's and women's groups. The organizational structure of the ADP, therefore, seems to have satisfied the principles for optimum communication within any organization as outlined in the UNESCO Handbook for information system and services (1980) in the following ways:

a. The channels of communication are known --i.e., the lines of authority have been established with appropriate authority put upon each position.

b. The principle of forward and backward communication has been provided for.

c. Lines of communication are as short as possible to increase the speed of communication and lessen the incidence of errors in transmission of information.

d. There is completeness in the vertical line of communication to ensure that communication, such as from the PM to the EAs, passes through every line of authority, thereby avoiding incidence of conflicting communication in either direction.

e. The placement of competent, well-trained heads to man each supervisory position is provided for to ensure accurate interpretation of incoming information and dissemination of same.

f. Continuity of sanctions and roles in the system is provided for to ensure that the lines of communication are not broken.

g. All persons in the communication line occupy necessary positions of authority, ensuring that every message or communication being handed down is articulated.

1.2 MALAWI

The Republic of Malawi is a small, land-locked country surrounded by Mozambique to the south, east, and west, Tanzania to the north and east, and Zambia to the west. Malawi is among the smallest countries in Africa, with a territorial area of about 119,140 square kilometers of which forests occupy 38% of the total area. Malawi's population of 19.6 million people (in 2021) makes it one of the world's most densely populated nations.

1.2.1 Agriculture in Malawi

Agriculture is a key sector in food security, economic growth, and wealth creation in Malawi. More than 65% of the country's population is directly or indirectly employed in the agricultural sector, which also accounts for 67 percent of foreign exchange earnings and 29 percent of GDP (GoM, 2020). Agriculture occupies about 56 percent of the land area --covering 5.3 million hectares of the country's 9.4 million hectares-- and supplies at least 65 percent of the manufacturing sector's raw material requirements (Chirwa, 2008; Mbukwa, 2015).

The agricultural sector in Malawi consists of both small-scale farmers and the estate subsector. These subsectors are key farm types in the country and have been historically distinguished on the basis of legal and constitutional laws regulating land tenure, type of crops grown, and marketing arrangements. The smallholder subsector (smallholder farm type) is based on a customary land tenure system and is primarily subsistence; the estate subsector comprises 30,000 estates occupying about 1 million hectares of privately owned land under leasehold title (GoM, 2020). Estates in the country focus on high-value cash crops for export such as tea, sugar, tobacco, coffee, and macadamia nuts. On the other hand, the country has a record of over 4.2 million smallholder farmers on 3.3 million hectares under communal land tenure, with an average landholding size of 0.4 hectare. The dual nature of the agriculture sector has investment implications for different types of interventions and, most important, for agricultural EASs (GoM, 2020; GoM, 2011; Phiri et al., 2012).

The agriculture sector has a number of opportunities such as growing interest by organizations to invest in and support agriculture commercialization, abundant water resources in some parts of the country, a conducive policy environment, and a hardworking farming population. Despite its importance, the agricultural sector is facing several challenges, including low productivity due to overdependence on rain-fed farming, limited adoption of improved technologies, insufficient technology development, shrinking public- sector resources, climate change, weak EASs for the smallholder sector and lack of dedicated EASs for the commercial agriculture sector, weak farmer organizations, high transportation costs for farm inputs and outputs, inadequate and inefficient input and output markets, and limited access to agricultural credit and market information (GoM, 2020).

Initiatives to commercialize the agriculture sector have been hampered by weak private- sector participation and low investment in the sector in addition to low levels of mechanization along value chains, including production, harvesting, storage, processing, and other forms of value addition. Although various policies exist to guide the sector, implementation of the policies is largely weak with stakeholders hardly participating, linking up, and coordinating on interventions in the agriculture sector (GoM, 2010). The policies have also failed to inform the delivery of quality and relevant EASs. In addition, the policies have not triggered increased and coordinated funding of EASs. The aforementioned state of affairs emphasizes the need for EASs to ensure that farmers of all gender groups and scale access information and messages on good agriculture practices to expand the contribution of agricultural extension to agricultural development (GoM, 2020).

1.2.2 The History of Agricultural Extension in Malawi

In Malawi, agricultural extension has a long history, back to the colonial times under the British Cotton Growers Association. The objective of the association was to reach out to African farmers who were willing to grow cotton (Dequin, 1970). Instructors known as traveling agents were dispatched to teach farmers about cotton production, and compliance to the recommendations was high. Later, the concept of Master Farmers was incorporated into the mainstream of extension activities. These Master Farmers, who were relatively well off and innovative, received government support in the form of inputs and EASs that other farmers did not receive (Chanock, 1972; Masangano and Mthinda, 2012). At this time, the focus was still on commercial farmers, and the predominant extension approach was individual contact supported by mass media approaches such as radio programs, puppet shows, and farmers' magazines (Masangano, 1989).

The post-colonial era adopted the Master Farmers approach, which was referred to as *Achikumbe*. Just as in the colonial era, the *Achikumbe* or progressive farmers were given preferential support by extension workers (Masangano and Mthinda, 2012). The use of the group extension approach was recognized in the 1970s as means of spreading agricultural messages to a wider farming community including the resource- poor and women. The group approach was also scaled up in the 1980s through the Block Extension System, a modification of the World Bank's T&V system. The Block Extension System involved visits by extension workers to subsections called blocks, where extension activities were implemented through on-farm demonstrations (OFDs) on contact farmers' farms. The system was faulted for reaching fewer farmers than anticipated; being dominated by larger and resource-rich farmers; being costly because of increased operational costs; and using top-down approaches that did not take into account farmers' needs (Masangano and Mthinda, 2012).

For most of the post-colonial era (1960s to 1990s), the Ministry of Agriculture was the main provider of EASs in the country. However, the dominance of the government in the provision of EASs changed in 2000 following the adoption of the pluralistic and demand- driven extension policy (MoAI, 2000). The reformed policy recognized the role of multiple actors in providing EASs. It emphasized the vital role of farmers in demanding and influencing extension service delivery. The 2000 extension policy was followed by the District Agriculture Extension

Services System (DAESS) (GoM, 2006). The DAESS replaced the Block Extension System and provided a structure and guidelines for operationalizing the envisioned pluralistic and demand- driven extension services. Recently, Malawi adopted a new National Agriculture Extension and Advisory Services Strategy (NAEASS), which will guide the implementation of extension service delivery from 2020 to 2024. The strategy document also recognizes the need for demand-driven extension services, the role of multiple players in the delivery of quality extension services, and the need to embrace agricultural innovations systems thinking.

1.2.3 Organogram of EASs in Malawi

Pursuant to the changes that DAES underwent, the organizational framework for DAES was restructured along with the upgrading of posts to match the challenges of the new millennium. The department, headed by a director of extension services, has six subprogram (Fig. 1.2):

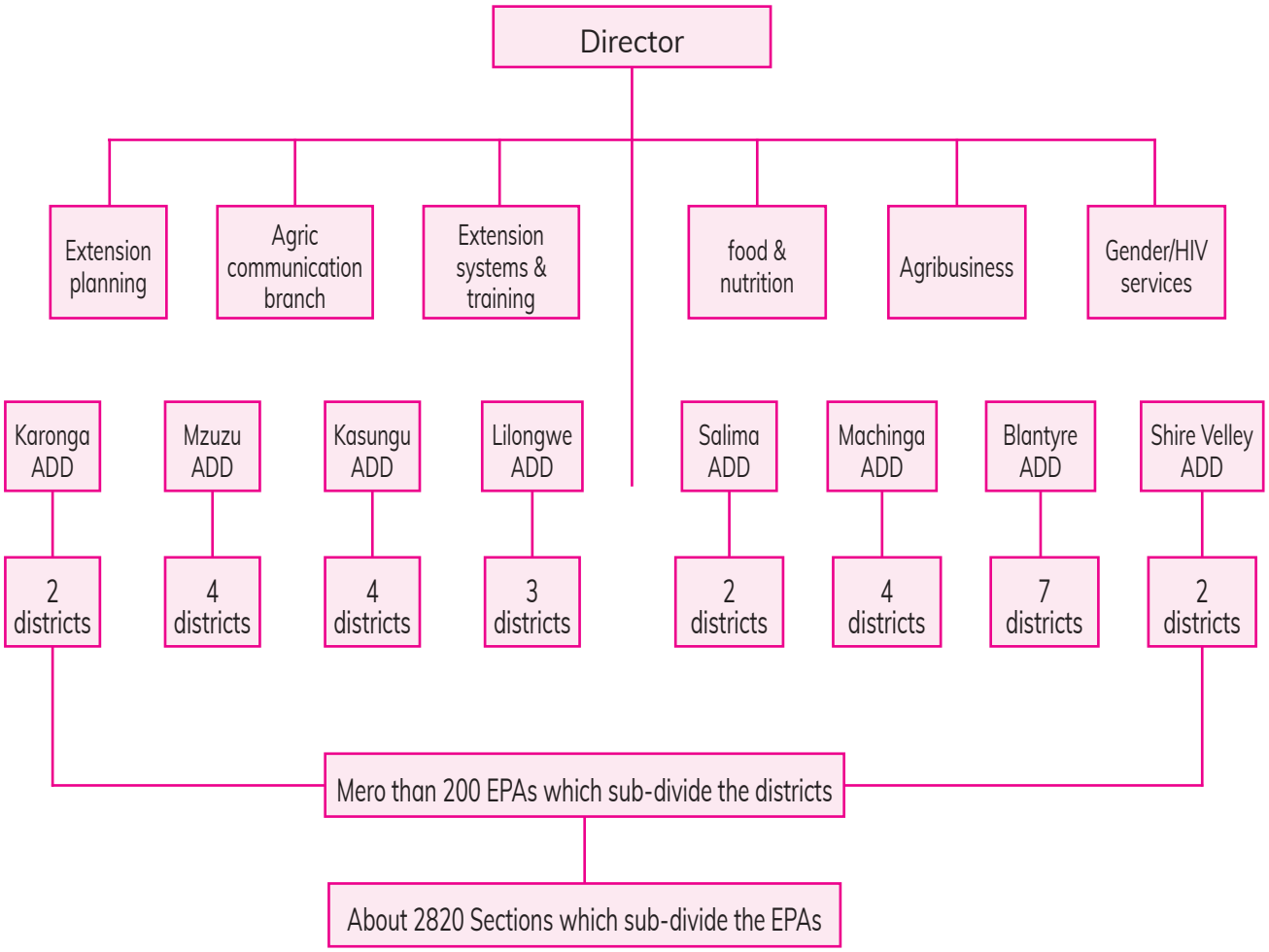

Fig. 1.2: Organogram of DAES, Malawi

i. Extension research, planning, and training:

- Policy direction in harmonized planning and implementation of programs.
- Providing guidelines for capacity building of staff and farmers.
- Overseeing management of financial and human resources.

ii. Extension methodologies and systems:
- Use innovative approaches, strategies, and methodologies to contact farmers with agricultural technologies in order to improve food security and livelihoods. These are:
- Approaches -- The model village approach, which is used as the entry point and planning and implementation base for all programs.
- Strategies for farmer mobilization -- These are farming clusters, ulimi wam'ndandanda, and lead farmers, which are strategies for mobilizing farmers to collectively engage in group activities.
- Extension methodologies -- Such as on-farm demonstrations (with packaged technologies), field days, study tours, and training for information and knowledge sharing.
- Institutionalization of the District Agricultural Extension Services System (DAESS) to improve coordination of service providers and bring service delivery closer to the farmers.
- Strengthening the research-extension-farmer linkage mechanisms in agriculture.

iii. Agricultural communication branch:
- Produces farm radio programs.
- Develops and prints agricultural extension technical messages.
- Upgrades and maintains equipment in multi-media, mobile vans, radio studio, and video-graphics and print workshop.
- Programming all media services in Agricultural Communications Branch.

iv. Agriculture gender roles extension support services:
- Supports mainstreaming of gender and HIV and AIDS in agricultural programs and the agriculture sector in general.
- Improves male and female staff and farmer capacity in mainstreaming gender and HIV and AIDS in agricultural programs and projects.
- Enhances participation of women in agriculture and food security programs and project activities.

v. Food and Nutrition:
- Promotes nutrition education with emphasis on food processing, preservation, and utilization for diversified diets at household levels.
- Strengthens coordination and collaboration with other stakeholders.
- Builds capacity for all nutrition programs.

vi. Agribusiness Development and Management:
- Promotes business development and management through establishment of farmer-based organizations (FBOs).
- Improves marketing of agricultural produce.
- Establishes farmer business school.

DAES delivers extension services to the farm level using a comprehensive organizational structure or extension delivery system which has eight Agricultural Development Divisions (ADDs) demarcated on the basis of agro-ecological characteristics. Each ADD is manned by a program manager. The ADDs have 28 districts, previously called Rural Development Projects (RDP), each headed by a district agricultural development officer (DADO). The more than 200 Extension Planning Areas (EPA) in the 28 districts are each managed by an agricultural extension development coordinator (AEDC). There are about 2880 sections, each manned by an agricultural extension development officer (AEDO), who is the frontline extension officer. The AEDO translates extension messages at the farm level (to the farmer) (Chingaipe and Msukwa, undated). Figure 1.2 depicts the DAES structure.

1.3 SOUTH AFRICA

The Republic of South Africa is the southernmost country in Africa with an area of 1,221,037 square kilometers. It is bounded to the south by a long coastline, to the north by the neighboring countries of Namibia, Botswana, and Zimbabwe, and to the east and northeast by Mozambique and Eswatini. South Africa has a mixed economy with a relatively high per capita GDP compared with other countries in sub-Saharan Africa. With population statistics indicating an increase from 45 million in 2002 to 60 million in 2021, the importance of a well-functioning agricultural sector is pivotal to food security in the country.

1.3.1 Agriculture in South Africa

Endowed with rich natural resources and a suitable climate for diverse agriculture, South Africa produces various agricultural products in the nine provinces. The agricultural sector in South Africa is of significant importance to the country's general economy and the food security of its citizens. Although its contribution to GDP is small, the sector's impact lies in the linkage to and influence on related sectors such as manufacturing and transport (Department of Agriculture, Land Reform and Rural Development, 2021).

The main contributors to the produce pool in the country in terms of sales are listed in order of importance below (Fruit South Africa, 2020; Bureau for Food and Agriculture Policy [BFAP], 2021; Department of Statistics South Africa, 2022).

1. Animal and animal products: cattle and chickens are the main contributors to the livestock sector. Chicken meat, fresh milk, and eggs contribute the most to the animal production sector.
2. Horticultural crops and products: fruit (excluding grapes) are a significant contributor, followed by vegetables. A wide variety of fruit is produced for the local and export markets. The main contributors are oranges, apples, lemons and limes, pears, soft citrus, grapefruit, and grapes. The significant vegetable sector contributors are potatoes, green mealies, sweet corn, and tomatoes.
3. Field crops: maize is the most significant contributor in this sector, followed by wheat, sugarcane, and other field crops including cotton, sunflower, sorghum, soyabeans, barley, and canola.

In a country with an official unemployment rate of 35.3% (Statistics South Africa [StatsSA], 2022) and an unofficial unemployment rate of 46.2% (Business Tech SA, 2022), food security is under threat. Many households turn to agriculture to supplement their diets. The percentages of households per province that were involved in agricultural activities are displayed in Figure 1.3.

The agricultural sector in South Africa is facing many challenges. The effects of climate change have become noticeable. Rising input costs, especially the recent drastic fuel price increase, threaten production's profitability and sustainability. The COVID-19 pandemic has caused havoc in the sector by reducing food sales, reducing or stopping activities of agro-processing plants and harbors by lockdowns, and constricting general production by restricting availability of critical mechanical parts and inputs (Meyer et al., 2021).

In light of these circumstances, the importance of knowledgeable, efficient agricultural EASs in South Africa cannot be overemphasized. Extension and advisory workers are directly linked to agricultural producers in rural areas. They are a critical link between the producers, government, the research community, and credit and input supply organizations (Roberts, 2022). Extension services are tasked with assisting communities in adapting to change, be it to new circumstances or through new technology (Davis et al., 2021). Supporting farmers to enhance production while preserving natural resources amid climate change is part of their role (Davis et al., 2020). When they operate efficiently, EASs play a vital role in poverty alleviation and rural development (Maulu et al., 2021; Hlatshwayo and Worth, 2019). The following section examines the development of agricultural EASs in South Africa from its inception to current times.

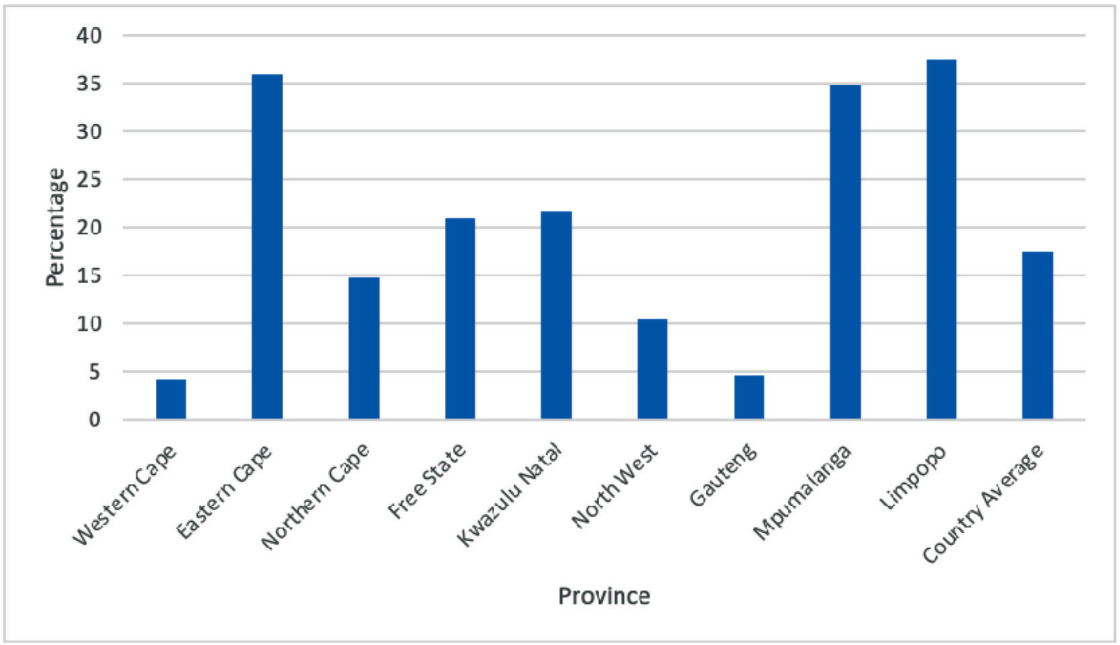

Fig. 1.3: Households involved in agricultural activities in South Africa. ***(Source: StatsSA, 2020).***

1.3.2 The History of Agricultural Extension in South Africa

The South African agricultural extension service, comprising six extensionists, was initiated in 1925 by the minister of agriculture. Given the circumstances after the Anglo-Boer War (1899-1902) and First World War (1914-1918), farmers needed assistance in acquiring knowledge and enhancing their production to ensure food security at the time (Koch and Terblanché, 2013). The role of EASs was expanded in 1933 from merely advisory to facilitating government assistance schemes (Liebenberg, 2015). The first higher institution to offer training to potential agricultural extensionists in the country was the University of Pretoria, which did so during the early 1940s. Other institutions followed, and agricultural colleges emerged across the country (Khwidzhili and Worth, 2019). With several professionals operating in the field, the South African Society of Agricultural Extension (SASAE) was formed in 1966 to support the profession.

Before 1994, legislated segregationist policies by race existed in South Africa, and EASs were also racially segregated. Extension services provided to black farmers focused on livestock as it was said that cattle, in particular, fulfill a fundamental role in the lives of black farmers. The government required extension staff employed among Indian farmers to register for a specialized three-year diploma. Extension services catered separately to the needs of the people of color and the white people of South Africa (Koch and Terblanché, 2013).

After 1994, South Africa achieved democracy, and segregated EASs were amalgamated into a single service. Extension services' focus changed primarily to smallholder and/or previously disadvantaged farmers. Nine provincial extension services were set up to replace the previous compartmentalized extension services. There was also a reorganization of government extension and increased hiring of government extensionists. In addition, there was enhanced participation of private and semi-private actors in extension. Women started playing more prominent roles in extension service delivery. Commercial agriculture became more reliant on the private sector for extension services.

With the change in government came policy changes affecting the public sector, including agricultural EASs. A brief history of the public policy documents on EASs published to date is summarized in Box 1.2.

Box 1.2: Timeline of Public Policy on EASs in South Africa

- 2005: The first norms and standards for agricultural EASs was published by the then Department of Agriculture with focus on (Department of Agriculture, 2005):

- Facilitating improved farmer access to support services (which include information, finance, inputs, technical expertise, regulatory services, and access to markets).
- Providing farmers with skills and knowledge for ensuring sustainable resource management.
- Facilitating access to and awareness of new technologies.

- Facilitating communication between farmers, farmer organizations, mentors, and advisors.

According to the document, to ensure efficiency, EASs staff must be efficient communicators, be able to manage projects independently, be able to manage the required information and knowledge, and be customer-focused. They should be skilled in problem solving and analysis, people management, and service delivery innovation. They should also promote confidence in the department through honesty and integrity.

- 2007: A report was published profiling the government-employed EASs officers of the time (Department of Agriculture, Forestry and Fisheries, 2007). In this document, the public extension staff was profiled according to province, age, race, gender, qualifications, and experience. Extension- to- farmer ratios were also profiled, and finally, a comparative analysis was done comparing the extension personnel profile to the set norms and standards of 2005.

- 2008: An Extension *Indaba* (a discussion or conference) was held to discuss the challenges faced by public- sector EASs in the country. An Extension Recovery Plan (ERP) was consequently formulated (Department of Agriculture, Forestry and Fisheries, 2008). In this document, the strategic objectives of the ERP were listed as follows:

- Ensure visibility and accountability of extension.
- Promote professionalism and improve the image of extension.
- Recruit extension personnel.
- Reskill and reorientate extension workers.
- Provide ICT infrastructure and other resources.

- 2016: The decision was made to develop a National Policy on EASs to improve effectiveness and efficiency (Department of Agriculture, Forestry and Fisheries, 2016). The significant challenges experienced in the sector were highlighted in this policy document as follows:

- The poor linkage between research, extension, and producers.
- Low extension- to- producer ratio.
- Lack of coordination from various extension support agencies.
- Lack of national policy and regulatory framework.
- Limitations in the extension education system and narrow service focus.

- 2020: The most recent document released was the Draft Review of the National Framework for the Minimum Norms and Standards for EASs in Agriculture, which should replace the first version of 2005 with an updated, relevant version (Draft 2, Version 2) (Department of Agriculture, Land Reform and Rural Development [DALRRD], 2020). The guiding principles for EASs listed in the document are:

- Poverty eradication.
- Equity.
- Prioritizing production and income opportunities.
- Promoting sustainability.
- Providing pluralistic and integrated extension and advisory services.
- Trustworthiness, integrity, and efficiency.
- A strong link between research, extension, and producers.
- Demand-driven.
- Relevant.
- Human and social capital development.
- Participatory.
- Cooperative governance.
- Accountability.
- High-quality advisory service.
- Batho-Pele (people first).

The problem of limited efficiency in the public agricultural EASs is mentioned, which will be discussed in the section on challenges in agricultural extension.

1.3.3 Organogram of EASs in South Africa

DALRRD is responsible for public-sector agricultural extension in South Africa. However, the country has a three-tiered system of government, in which national, provincial, and local levels of government have legislative and executive authority.

- DALRRD's Vision: *A united and transformed agricultural, forestry, and fisheries sector that ensures food security for all and economic prosperity.*
- DALRRD's Mission: *Advancing food security, job creation, economic growth, and transformation of the sector through innovative, inclusive, and sustainable policies, legislation, and programs.*
- DARRLD's Strategic Outcome-Oriented Goals:
    - Effective and efficient strategic leadership, governance, and administration.
    - Enhance production, employment, and economic growth in the sector.
    - Enabling environment for food security and sector transformation.
    - Sustainable use of natural resources in the sector.

Public Extension Services: The EASs fall under the Chief Directorate of National Extension Support Services (Figure 1.4). According to the National Policy on Extension and Advisory

Services (DAFF, 2016), the coordinating responsibilities of the sector are structured according to national, provincial, and district levels. Each level has representatives from DALLRD, the private sector, research and academics, and producer organizations. There are currently 2,704 public officers (Table 1.1) and roughly 1,500 private / non-governmental officers distributed throughout the nine South African provinces (Fig 1.5).

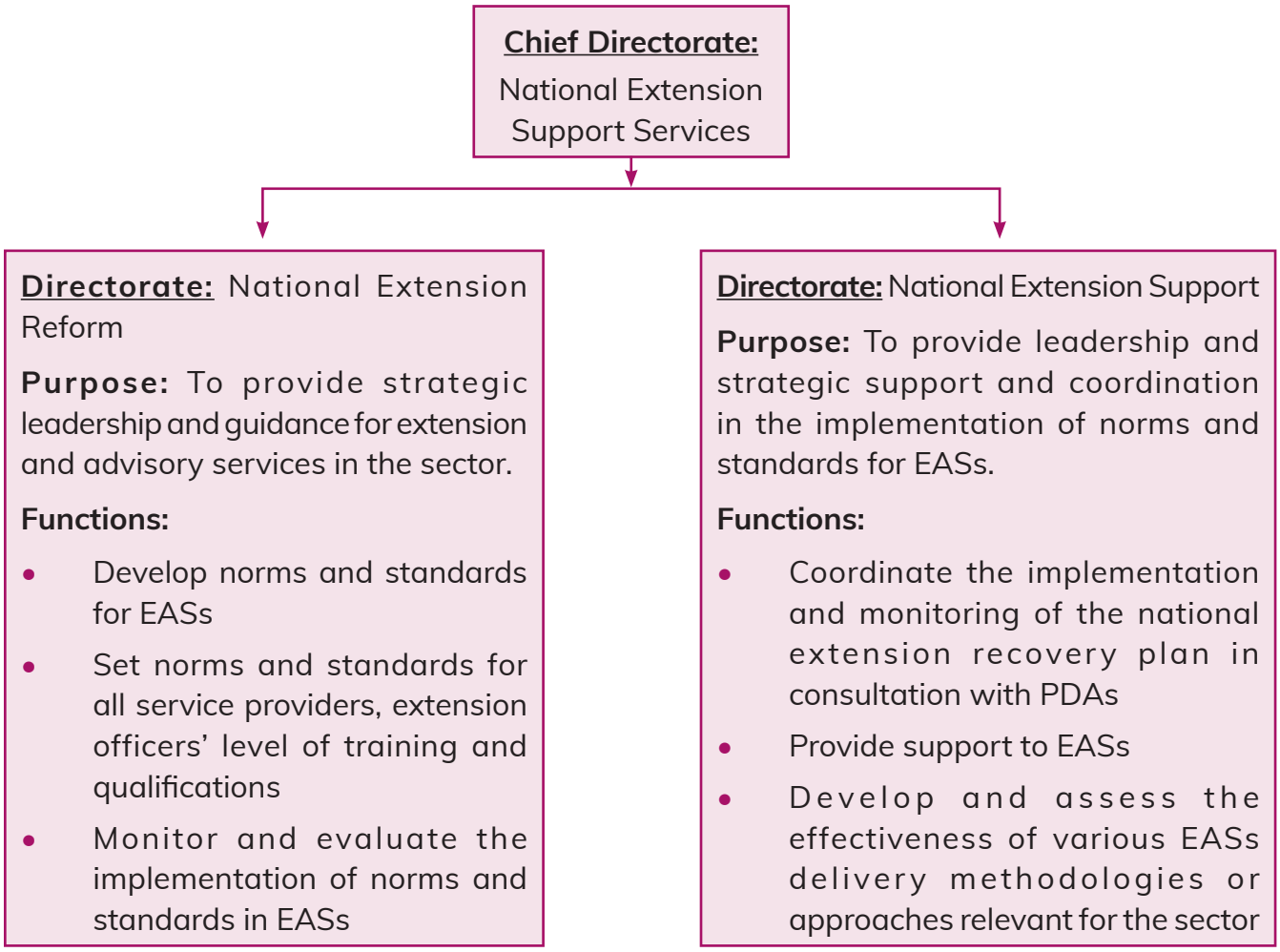

Fig. 1.4: Organogram of agricultural extension and advisory services in South Africa

(Source: Authors' compilation of information available from the Department of Agriculture, Land Reform and Rural Development website (https://www.dalrrd.gov.za/About-Us/Structure-and-Functions)

Table 1.1: Public extension officers in South Africa and ratio to farmers.

Province	Number of extension officials		Total # extension workers	Estimated # farmers [GHS 2019, StatsSA] {Thousands}	Extension-to- farmer ratio (current)
	Managers	Extension practitioners			
EC	42	488	530	518	1 061
FS	11	116	127	145	1 250

GP	5	133	138	219	1 647
KZN	33	752	785	544	723
LP	49	445	494	619	1 391
MP	25	172	197	374	2 174
NC	9	49	58	38	776
NW	30	275	305	114	415
WC	8	62	70	53	855
TOTAL	**212**	**2 492**	**2 704**	**2 624**	**1 053**

Source: DALRRD, 2021

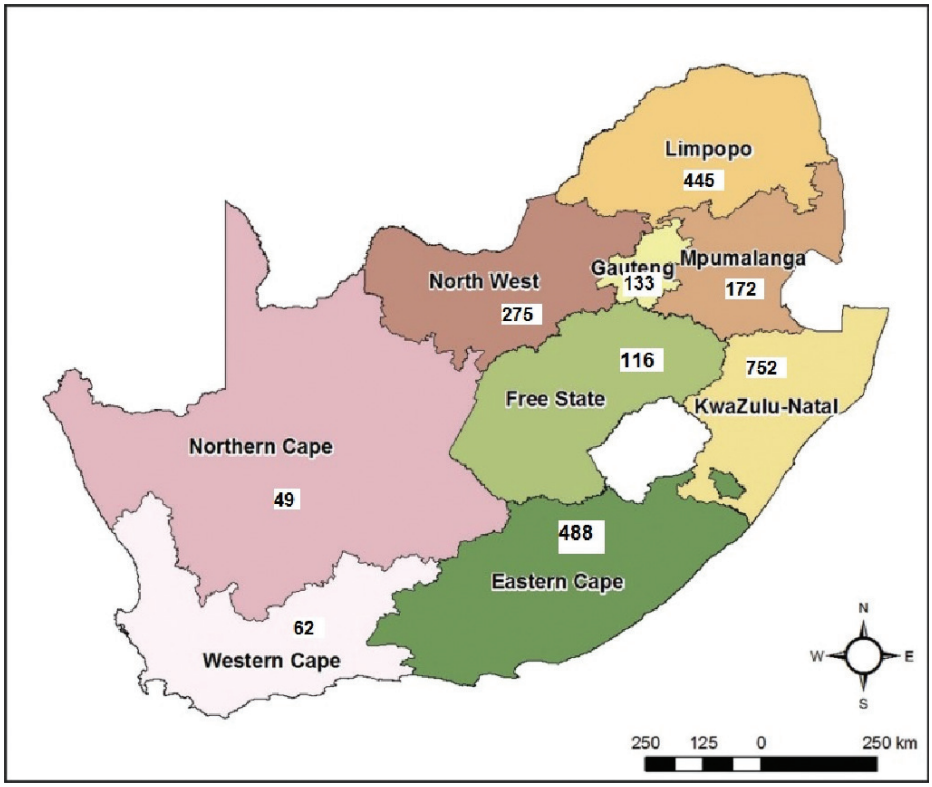

Fig. 1.5: Distribution of public extension officers by province (Source: DALRRD, 2021)

Private extension services: The following institutions typically provide private extension services in South Africa:

- Agricultural cooperatives offer training and demonstration days.
- Seed companies provide demonstration days and do farm visits for personalized advice.
- Livestock stud associations provide training and information days/courses to educate on livestock health, feeding, and management.
- Feed companies provide expert advice on the feeding requirements of livestock.
- Pesticide companies provide advice on pest and disease control of horticultural and field crops.

1.4 UGANDA

The Republic of Uganda is a landlocked country across the equator in eastern Africa bordering Lake Victoria in the southeast, South Sudan in the north, the Democratic Republic of the Congo in the west, Kenya the east, and Rwanda and Tanzania in the south. With an area of 241,551 square kilometers, Uganda has a population of 45.74 million, and about 70% of Uganda's working population is employed in agriculture. Eighty percent of Uganda's land is arable, but only 35% is being cultivated (ITA, 2022).

1.4.1 Agriculture in Uganda

During 2021-22, agriculture accounted for about 24.1% of the GDP and 33% of export earnings. Uganda produces a wide range of agricultural products, including coffee, tea, sugar, livestock, fish, edible oils, cotton, tobacco, plantains, corn, beans, cassava, sweet potatoes, millet, sorghum, and groundnuts. The Ugandan government has identified agriculture as a key economic sector contributing to the transition to a middle-income status, emphasizing the importance of value addition and commercialization (NPA, 2020). The vision of Uganda's Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is "a competitive, profitable and sustainable agricultural sector", and its mission is "to transform subsistence farming to commercial agriculture". To realize these aspirations, the country will need to overcome a range of challenges to agriculture productivity growth.

1.4.2 The History of Agricultural Extension in Uganda

Over the past three decades, Uganda's agricultural extension system has undergone major reforms. In 1990, the three ministries responsible for agriculture (Ministry of Agriculture, Ministry of Animal Industry. and Ministry of Fisheries) were merged to create the present-day MAAIF. The merger was intended to address challenges of uncoordinated and parallel approaches to EASs and duplication. It was also meant to professionalize EASs through learning and teaching as well as increase efficiency and effectiveness of public extension programs.

The period from 1992 to 1997 ushered in further radical reforms including decentralization and liberalization. Decentralization transferred powers, functions, and responsibilities for planning and implementation of agricultural EASs from the MAAIF to district local governments. The MAAIF was left with the roles of planning and policy formulation, regulatory functions, technical backstopping and training, setting standards for and monitoring performance of the agricultural sector, and managing funds of selected projects. Extension workers at the district level were put under the direction of the local district governments (Friis-Hansen and Kisauzim, 2004; Mangheni, 1999; Bashaasha et al., 2011). In 1998, the MAAIF's directorate of extension was abolished, central staffing was reduced by some 80 percent, and the major responsibility for supporting field-level extension was transferred to the National Agricultural Research Organization (NARO). Parallel to the changes in public extension service, liberalization of service delivery opened space for a proliferation of private companies and NGOs offering EASs to farmers (Friis-Hansen and Kisauzi, 2004).

The most radical reform occurred under the National Agricultural Advisory Services (NAADS) program from 2001 to 2014. In 2001, Uganda, through an act of parliament (NAADS Act: Government of Uganda, 2001), reformed its public extension system, paving the way for a decentralized, farmer-owned, demand-driven contract system. National management was transferred from the MAAIF to a lean, semi-autonomous agency, the NAADS, headed by an executive director with policy guidance by a board of directors. The MAAIF retained the functions of policy formulation, disease and pest control, regulation, and quality assurance. At the district and subcounty level, the program was managed by coordinators. Farmers were mobilized into groups at the village level, which aggregated to higher level fora at parish, subcounty, district, and national levels. The farmer fora were empowered to select enterprises for service provision, procure inputs, carry out monitoring and evaluation, and participate in recruitment and supervision of service providers. Extension services were delivered to farmers by private staff on short-term contracts, initially of three to six months, later increased to one year. The reform was implemented under the broader macro-economic policy frameworks of liberalization, privatization, democratization, and decentralization, which allowed civil society and the private sector to complement government efforts in agricultural service delivery. The reform adopted a market-oriented agricultural advisory services (MOAAS) approach aimed at transforming agriculture from subsistence to commercial. The Neuchatel Initiative's Common Framework on MOAAS defines MOAAS as "knowledge services which assist small to medium scale farmers and other actors in agricultural value chains to increase their access to markets and secure benefits from commercialization" (Chipeta et al., 2008). Interventions included (World Bank, 2010):

- Farmer institutional development.
- Advisory and information services to farmers.
- Agribusiness development and market linkages.
- Local service provider institutional capacity development.
- Planning, monitoring/quality assurance and evaluation.

The NAADs program faced a range of challenges, including inadequate capacity at all levels to implement market-oriented EASs, failure to harmonize and coordinate institutions involved, weak farmer institutions, and political pressures. The program was terminated in 2014 because of unsatisfactory performance, and the national secretariat was repurposed to undertake other functions. The agricultural extension function was transferred back into the MAAIF, and the Directorate of Agricultural Extension reinstated. In 2016, the country introduced the National Agricultural Extension Policy 2016 (NAEP, 2016).

1.4.3 Organogram of EASs in Uganda

The EASs system under the MAAIF consists of the Directorate of Agricultural Extension Services (DAES), a decentralized local government public structure, technical directorates, and agencies; and non-state actors (NSA). At the national level, the DAES provides overall

leadership, management, and coordination of the public and private EASs delivery systems. DAES works with the technical directorates responsible for animal resources, crop resources, fisheries resources, and commodity agencies (e.g., Uganda Coffee Development Authority, Cotton Development Authority, and Dairy Development Authority). The technical directorates and agencies are responsible for generating technical information that is professionally organized by the DAES for dissemination to extension service providers and farmers. Development of commodity value chains is a function of the technical directorates. They define the kind of EASs required along the various value chains and work with DAES to ensure that actors along the value chains get relevant EASs. At the local government levels, agricultural extension functions are a responsibility of the staff deployed at district and subcounty levels. The district- level officers coordinate EASs and report directly to the MAAIF-DAES for technical guidance. Non- state actors play a significant role in policy advocacy at all levels, resource mobilization for agricultural EASs and capacity building, among others.

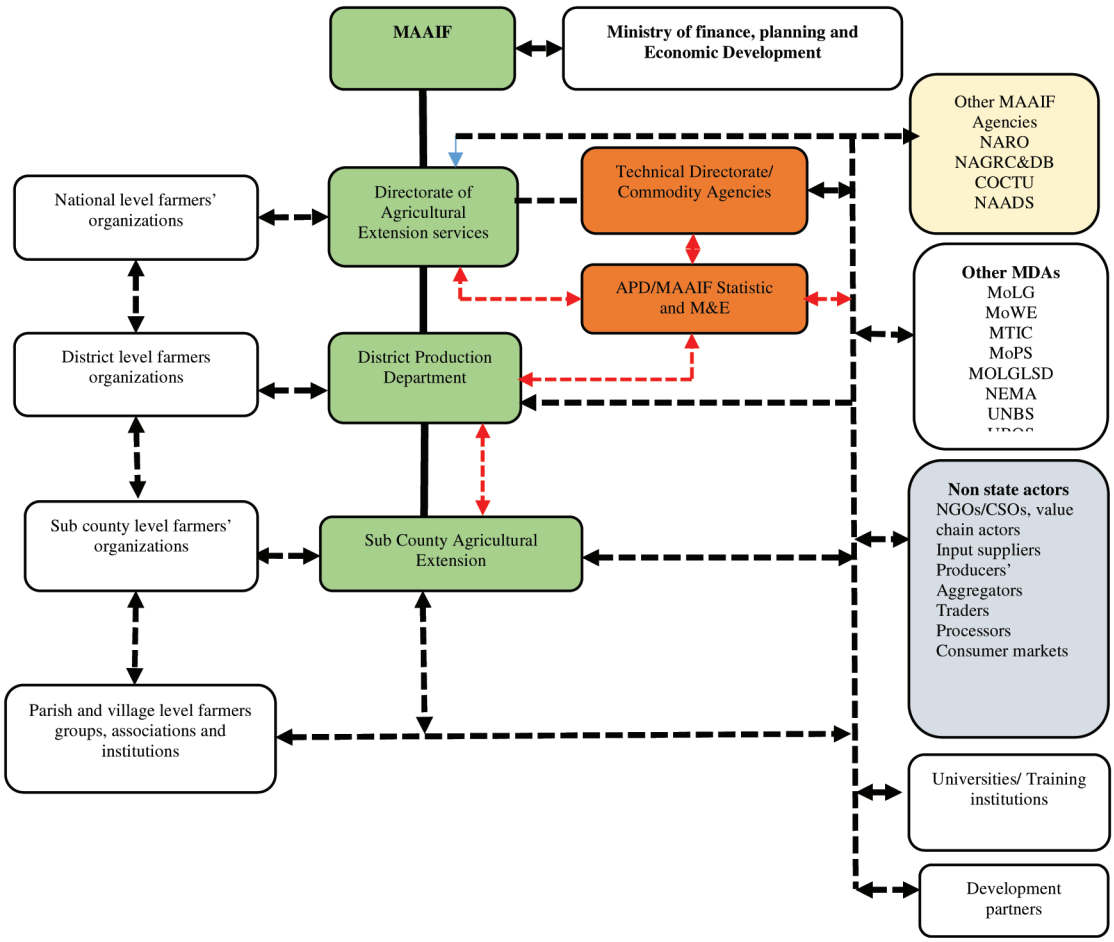

Fig. 1.6: Organogram of the Agricultural EASs in Uganda. ***(Source: MAAIF)***

The other institutions that play a key role in agricultural extension at the national level include: the Uganda National Farmers' Federation, which represents farmers' interests at various levels as well as providing services directly to farmers; the Ministry of Trade, Industry, and

Cooperatives, which provides market information and other services; the Ministry of Water and Environment, which provides meteorological information; and the Ministry of Gender, Labour, and Social Development, which offers guidelines and oversight to ensure inclusive services. The universities, colleges, and training institutions offer training and development for agricultural extension and research institutions (Fig. 1.6).

1.5 KENYA

The Republic of Kenya is in eastern Africa. It has an area of 582,646 square kilometers and a population of about 51.5 million. Bisected horizontally by the equator, Kenya is bordered to the north by South Sudan and Ethiopia, to the east by Somalia and the Indian Ocean, to the south by Tanzania, and to the west by Lake Victoria and Uganda. About one-tenth of the land is arable, and more than one-third is used for grazing cattle, goats, and sheep. Agriculture employs much of the workforce, and tea and coffee are the leading exports.

1.5.1 Agriculture in Kenya

Kenya's economy is heavily dependent on the agricultural sector, which continues to play a crucial role in food security and poverty reduction. The sector is recognized as one of the main drivers to enable the country to achieve the 10% economic growth envisaged in Kenya's Vision 2030 (Government of Kenya [GoK], 2021; GoK, 2012; GoK, 2010; GoK, 2018). The direct contribution of the agriculture sector to the GDP is about 31%; the indirect contribution of about 27% is through linkages with manufacturing and service-related sectors (KNBS, 2021).

Kenya's agriculture sector is key to attaining food security for the country's rising population, which grew from 37.7 million in 2009 to 56.8 million in 2023. The sector serves as a source of employment for up to 40% of the total population and 70% of the rural population (Geopoll, 2018; FAO, 2020; World Bank, 2019). It is also important in environmental protection and sustainable development, and in foreign exchange earnings (World Bank, 2019).

Kenya has a diversity of agro-ecological zones, which makes the country suitable for a wide range of agricultural activities. The country has three main production systems: extensive, semi-intensive, and intensive systems; and three subsectors: crops, livestock, and fisheries (GoK, 2021). The crops subsector comprises mainly food, horticultural, and industrial crops. The main food crops produced are maize, potatoes, beans, and sorghum, with maize being the most widely produced and accounting for over 70% of the marketed value for food crops (KNBS, 2021). Beans are also widely grown in many of the arable parts of the country. In 2020, food crops contributed about 6% of total marketed agricultural production. Horticulture is a key agricultural subsector and one of the leading foreign exchange earners in Kenya. It consists of cut flowers, fruits, and vegetables, including potatoes. In 2020, it accounted for 29.5% of marketed agricultural production, with cut flowers contributing 71.6% of this production. Industrial crops in Kenya are grouped into two categories. Temporary industrial crops consist of sugarcane, pyrethrum, cotton, sunflower, barley, tobacco, coconut, and bixa. The permanent industrial crops are tea, coffee, and sisal. In 2020, industrial crops contributed

about 32.6% of the total marketed agricultural production. Tea, which is the leading foreign exchange earner in Kenya, was responsible for about 73.5% of the marketed output from industrial crops (KNBS, 2021). Kenya is a leading exporter of black tea in the world.

The livestock subsector is an important source of livelihood, with people in ASAL areas relying almost entirely on livestock. In 2019, Kenya had a livestock population of about 2.2 million dairy cattle, 0.56 million dairy beef, 13 million indigenous cattle, 19.3 million sheep, 28 million goats, 4.6 million camels, 1.2 million donkeys, 0.44 million pigs, 30.3 million indigenous chickens, 5.6 million layers, 2.9 million broilers, 0.56 million rabbits, and 1.2 million beehives (KNBS, 2019). This sector accounted for 32% of marketed agricultural produce in 2020 (KNBS, 2021).

The fisheries subsector in Kenya is a significant source of income, food, and employment to a large population. It mainly uses freshwater sources such as lakes, rivers, and dams; marine sources are mainly the Indian Ocean. Aquaculture is pond fish farming. Lake Victoria, which is also shared with Uganda and Tanzania, is the biggest source of freshwater fish, not just in Kenya and East Africa but also on the African continent. Fish production is estimated at 150,000 tons annually, and it accounts for about 5% of the AgGDP (GoK, 2021).

The structure of the agriculture sector in Kenya is dualistic (GoK, 2021). The sector is dominated by small- scale producers consisting of subsistence farmers and fisher folk, pastoralists, commercial small-scale farmers, and commercial fisher folk. This sector is characterized by subsistence production, reliance on rain-fed production, and low mechanization (MoALF&C, 2021). Despite this, the small-scale agriculture sector accounts for 75% of agricultural output and up to 70% of marketed agricultural produce. In 2020, the small-scale agriculture sector accounted for 73% of total marketed agricultural output (KNBS, 2021). The large-scale agriculture sector in Kenya is made up of a relatively small number of producers engaged mainly in large-scale cash crop farming and commercial livestock production. The fisheries subsector in Kenya contributes significantly to the economy and to livelihoods, supporting more than 1 million people in Kenya, directly and indirectly. It is dominated by small-scale fisher folk, who account for 90% of the country's fish production.

According to the 2019 Kenya population census (KNBS, 2019), there were a total of 6.4 million farming households: 1.7 million crop farmers, 3.9 million mixed farmers, 0.76 million livestock farmers, and about 30,000 fisher folks. The majority of the farm sizes fall in the smallholder category, ranging from 0.2 to 3 hectares (KARI, 2019).

1.5.2 The History of Agricultural Extension in Kenya

Agricultural extension services in Kenya have evolved significantly since their introduction in the early 1900s. The evolution pattern in Kenya is not unique -- it is the same general path followed by many other developing country agricultural EASs. The DLEC (2019) identifies four main stages of EAS evolution: the foundation phase in the 1950s and 1960s, the expansion phase in the 1970s and 1980s, privatization in the 1990s and early 2000s, and the post-2008 pluralistic phase.

Agricultural Extension in the Pre-independence Period: This corresponds to the foundation phase in DLEC (2019). Agricultural EASs were introduced in Kenya in the early 1900s during the colonial era. In the early colonial days, there were two separate agricultural EASs delivery arms -- one for white settlers and some limited services for the Africans (Mukembo and Edwards, 2015; GoK, 2012). The Swynnerton Plan of 1954 was instrumental as it was an attempt to intensify African agriculture by expanding crop and livestock production. The plan, implemented over an eight-year period, allowed Africans to grow cash crops, created security of land tenure by promoting individual land ownership, and allowed Africans to access credit. The Swynnerton Plan also made provision for strengthening EASs (GoK 2021; Makana, 2009). The initial EASs were delivered in a top-down, coercive manner through strict enforcement of agronomic requirements, which were delivered simultaneously with harsh soil conservation regulations. This resulted in fear, mistrust, and uneasy relations between the farmers and EASs staff.

Early Post-independence Era: This represents the expansion phase as indicated by DALEC (2019). After independence, agricultural EASs became the responsibility of government and were established under the Ministry of Agriculture (Muyanga and Jayne, 2006; Nambiro et al., 2006). Guided by government policy as set out in Sessional Paper No. 10 of 1965, which was aimed at promoting rapid economic growth, government EASs focused on both smallholder and large-scale farmers and concentrated on high- potential areas where potential impacts could be easily attained (GoK, 2021). Two main approaches were used. One focused on food production, also referred to as the whole- farm approach, which was mainly used by the government extension service. The other was a commodity-based approach focusing on production of cash crops such as tea, coffee, pyrethrum, and sisal, and was mainly used by private- sector and some government owned and corporations (Muyanga and Jayne, 2006). The whole- farm approach was therefore used from independence in 1963 to the '70s and was coupled with the integrated agricultural development approach (GoK, 2012).

In the early independence years, extension services were highly centralized and offered in a top-down and instructive manner. However, in 1983, the government adopted a more decentralized approach to development by adopting the District Focus for Rural Development, which took services closer to the people and encouraged participation in decision making and focus on local priorities. Agricultural programs and projects were planned with local participation through district agricultural committees and district development committees (Nambiro et al., 2006). The decentralization of EASs was pursued in two ways: first, by decentralizing government responsibility for EASs through reforms that were aimed at sharing responsibility for extension with other ESPs, and also by improving accountability and responsiveness (Nambiro et al., 2006). Decentralization of EASs thus facilitated entry of other extension service providers such as NGOs, community-based organizations (CBOs), private companies, and farmer organizations (Muyanga and Jayne, 2006). The management of extension programs was also decentralized through adoption of participatory programs that gave farmers more decision-making power in designing programs and disseminating extension messages (Nambiro et al., 2006).

The T&V system of extension was introduced in Kenya in 1982, as the National Extension Programme (NEP) (Muyanga and Jayne, 2006). It was aimed at improving the management of extension; strengthening research-extension- farmer linkages; focusing the role of extension agents to education only; improving coverage of farmers by limiting the number of farmers each extension agent was to serve; and improving the mobility of extension agents, among others. T&V was based on a rigid fortnightly schedule of trainings and visits and used the contact-follower farmer approach (Benor et al., 1984). The T&V system was implemented countrywide and lasted up to 1998. An impact assessment of T&V revealed that the extension system had limited impact on the institutional development of EASs, and that it failed to achieve sustained improvement in agricultural productivity among Kenyan small-scale farmers (Gautum, 2000).

T&V and other early approaches used under the conventional or traditional agricultural extension model were faulted as being top-down and prescriptive and requiring a lot of resources-- of money, staff, and other supporting resources. With the implementation of the Structural Adjustment Programmes in the 1980s and 1990s, the government agricultural EASs came under sharp criticisms about inefficiencies and failure to deliver (Gautum and Edwards, 2015). As reported by Muyanga and Jayne (2006), the traditional public extension system came across as outdated and inflexible, among other weaknesses, and could not, therefore, cope with the changing demands of a modernizing agriculture sector.

Recent Extension Approaches, Strategies, and Frameworks: The need to respond to the challenges facing public EASs led the Ministry of Agriculture to develop the National Agricultural Extension Policy (NAEP) in 2001. This was the first agriculture extension policy and was aimed at improving the efficiencies of the agricultural extension service and responding to changing needs at national and farmer level (Kiara, 2011). This laid the foundation for the development of other policies and strategies to guide extension work, along with their implementation frameworks.

The NAEP recognized the need to change from the one-size- fits-all style of extension to a diversified and decentralized extension system that recognized the differences in ecological and other conditions in various parts of the country. The policy articulated the importance of clientele participation and participation of other stakeholders, unlike the earlier extension models that used top-down approaches. It also called for demand-driven extension as opposed to supply- driven extension, where technologies were forced on farmers whether they recognized the need for them or not. The NAEP also recognized the role of the private sector in pluralistic extension and set out modalities for commercialization and privatization of extension services.

The NAEP introduced a participatory approach in EASs by incorporating farmer and other stakeholder participation. The policy promoted pluralism in EASs delivery by supporting the participation of diverse extension service providers. The key features of EASs under the NAEP include demand-driven, self-reliance, professionalism, participation and holism, sustained natural resources management, and research-extension linkages (Kiara 2011).

The National Agriculture and Livestock Extension Programme (NALEP) was the implementation framework for the NAEP. As reported by Cuellar et al. (2006), the program was implemented countrywide by the Ministry of Agriculture through the National Agriculture and Livestock Extension Project (NALEP) with support from the Swedish International Development Agency (SIDA). The program's aim was to strengthen the contribution of agriculture and livestock to social and economic development and poverty alleviation by promoting pluralistic, efficient, effective, and demand-driven EASs to farmers and agro-pastoralists.

NALEP used a shifting focal area approach (SFAA) to actualize the principle of participation, which involved farmers in directly setting and fulfilling their own development goals and thereby resulted in demand- driven extension services (Amudavi, 2003). The SFAA approach, which was aimed at improving effectiveness and efficiency in EASs provision, focused support at the grass-roots level of the administrative division and location where implementation takes place. All extension resources and activities were concentrated in one location at a time, which was selected in a participatory manner involving community representatives. As described by Kiara (2011), the first step in the SFAA was identification of various service providers in the area and their activities. This was followed with mobilization of the community through a participatory, broad-based survey through which a basket of opportunities in agricultural enterprises was prepared and shared with the farmers. Farmers were required to form common interest groups (CIGs) based on an agricultural enterprise chosen from the basket of opportunities. They then obtained extension services through their CIGs on a demand basis. The group method of extension was therefore the preferred way of delivering extension services to farmers. After one year, it was expected that there would be sufficient impact of extension, and another focal area would be selected.

1.5.3 Organogram of EASs in Kenya

The agriculture sector in Kenya requires major and sustained transformation to overcome the challenges in the sector, commercialize, and contribute effectively to food security and economic development. Agricultural EASs have a key role in achieving this transformation (GoK, 2012; MoALF&C, 2019; GoK 2021). As emphasized in Kenya's National Agriculture Sector Extension Policy: "...a well-functioning agricultural extension service operated by the public and private sectors is one of the critical inputs required for increased agricultural productivity to transform subsistence farming into modern and commercial farming, attain food security, improve incomes and reduce poverty" (GoK, 2012).

This critical role of effective EASs in transforming agricultural systems and addressing global social and economic development objectives is widely recognized (DLEC, 2019). Agricultural EASs are an important avenue for sharing important knowledge and technologies and informing farmers' production decisions, resulting in optimization of returns on investments made in agriculture (GoK, 2021; Gido et al., 2015; Kingiri, 2020). The EASs also help link farmers to other actors in the agricultural value chains (GoK, 2021). Agricultural EASs in Kenya are dominated by the public sector. However, in the past decade, recognition and involvement of the private sector in EASs delivery have been increasing (GoK, 2012; IFPRI,

2019; GoK, 2010). The organogram of public EASs in Kenya from national to village level is depicted in Figure 1.7.

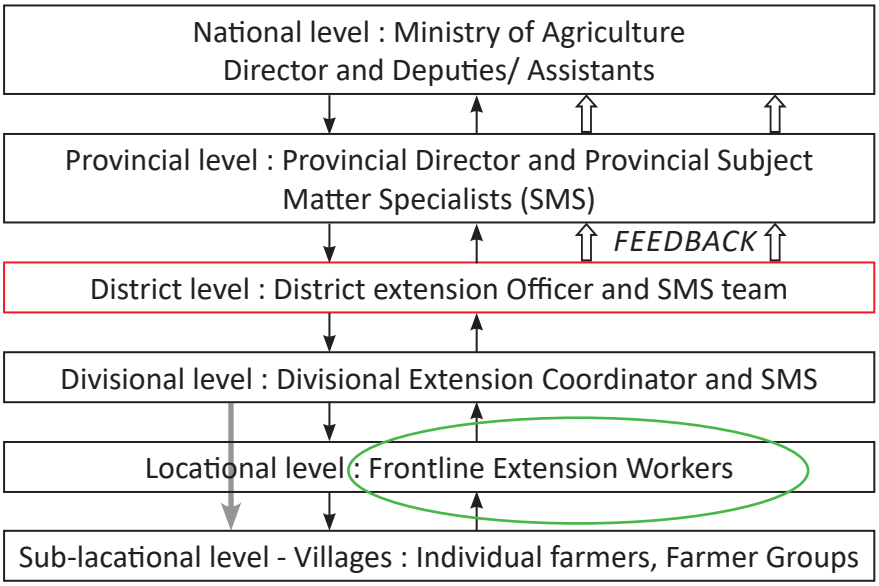

Fig. 1.7. Organogram of EASs in Kenya

The other strategies/policies aimed at transforming the agricultural sector and improving EASs in Kenya are:

- Agriculture Sector Development Strategy (ASDS). 2010-2020
- ASDS II, 2017-2022
- Agricultural Sector Transformation and Growth Strategy (ASTGS), 2019-2029
- The Agriculture Policy, 2021
- Kenya Agriculture Sector Extension Policy. (KASEP) (draft), 2022

1.6 STUDY BACKGROUND AND SIGNIFICANCE

Agricultural food system transformation and increased productivity in sub-Saharan Africa are dependent to a large extent on the delivery of agricultural EASs to farmers and other food system actors (Danson et al., 2018). This is achieved through the provision of research-based educational and informational programs, typically for farmers. Historically, extension workers assisted farmers through educational procedures aimed at improving farming methods and techniques, increasing production efficiency and income, and bettering standards of living. Today, extension workers serve both rural and urban populations with a wide range of programs aimed at helping to improve their quality of life. To effectively respond to the multidimensional challenges facing agriculture and food systems, the agricultural EASs delivery approach has undergone a paradigm shift -- from a public- sector- driven, top-down extension system to pluralistic, demand-driven services. In this latter approach, the intended beneficiaries participate in the identification and prioritization of learning needs (Suvedi and Kaplowitz, 2016), and extension professionals are expected to respond to the needs of

farmers and other food system actors rather than deliver predetermined, packaged solutions.

Extension professionals are the most valuable assets of successful agricultural development programs and service delivery. They are critical actors who support the improvement of farmers' knowledge, skills, and attitudes through effective and timely communication of up-to-date information useful in making informed decisions (Tesso, 2016). Also, they need to support the numerous other value chain actors involved in food processing and distribution. To be effective, extension professionals are expected to achieve excellence in carrying out their services and so give the highest level of satisfaction to the individuals involved. They are expected to remain current with emerging technologies, and capable of handling challenges, tapping into opportunities, and demonstrating competencies in their services (Nwaogu and Akinbile, 2018). They need to possess a set of core process skills and functional competencies upon which the organization bases its primary operation or services.

Process skills and core competencies are basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks effectively. Thus, extension staff members must be skilled in technical subject-matter areas across several value chains, the administration and operation of EASs delivery mechanisms, gender issues, the dynamics of human resource management and development, project planning and appraisal, program development coordination and process, instructional and knowledge-sharing skills, communication strategies, and evaluation techniques (Suvedi et al., 2018). These capabilities will ensure a high level of professional competence among extension professionals and enhance ability to carry out their functions.

Agricultural training institutions are responsible for producing agricultural development professionals and administrators who can shoulder the responsibilities of enhancing sustainable food and agricultural systems and reducing poverty for rural populations across the globe (Baker, 2015). In addition to teaching technical skills, these institutions should offer training on process skills and competencies in response to global changes that have influenced agricultural development (Kaynacki and Boz, 2019). However, the agricultural training institutions in Africa have changed little since their inception and remain averse to change (Davis et al., 2007; Fredua-Kwarteng, 2019). In most cases, the training content reflects the influence of Western universities more than 50 to 60 years ago, and the learning methods and materials are out-of-sync with current agriculture needs in the local contexts (Freer, 2015; Fredua-Kwarteng, 2019). The result is that instructors deliver to students heavily theoretical knowledge and information that do not meet the needs of employers and smallholder and entrepreneur clients (Freer, 2015). In turn, students have little opportunity to develop critical thinking and problem-solving process skills that are necessary to align training content and instruction with employment outcomes.

1.7 RESEARCH QUESTIONS

This study addressed the following research questions with focus on MSU-AAP Consortium members --Nigeria, Malawi, South Africa, Uganda, and Kenya.

1. Do extension programs effectively address the needs of current food and agricultural systems?
2. What are the critical job skills and core competencies required of extension workers to effectively plan, implement, and evaluate extension work in today's changing context?
3. Does the undergraduate (UG) curriculum in extension education include education and/or training on these job skills or core competencies?
4. What are the barriers to effectively training extension workers with required core competencies, and how can these barriers be removed?

1.8 OBJECTIVES

1. Review agricultural extension curricula currently in use at AAP member universities at the UG level in Nigeria, Malawi, South Africa, Uganda, and Kenya.
2. Identify critical process skills and competencies of agricultural extension professionals, process skills gaps, and areas of potential curricular reform.
3. Recommend improvements/reforms of agricultural extension curricula to prepare the next generation of agricultural extension professionals to competently handle EASs delivery.
4. Introduce new/improved curricula among the agricultural extension faculty engaged in training and education in sub-Saharan countries.

1.9 ORGANIZATION OF THE REPORT

Chapter One gives an overview of the agricultural sector and the history of agricultural extension and gives organogram of the public extension service and challenges in agricultural extension in Nigeria, Malawi, South Africa, Uganda, and Kenya. It also describes the study background and significance, research questions, and objectives of the study. The second chapter, on theoretical orientation, discusses process skills and competency gaps in UG agricultural extension curricula. Chapter Three describes methods used and limitations of the study. The fourth chapter focuses on the results and discussion of an online survey and focus group discussions (FGDs). The conclusions and policy implications of the study are highlighted in the fifth chapter. References and the instruments used for quantitative and qualitative data collection are appended at the end.

CHAPTER 2 - THEORETICAL ORIENTATION

PROCESS SKILLS AND COMPETENCY GAPS IN AGRICULTURAL EXTENSION CURRICULUM

2.1 CHALLENGES IN AGRICULTURAL EXTENSION ADVISORY SERVICES IN AFRICA

Agricultural EASs consist of all the various activities that provide the information and services needed and requested by farmers and other actors to assist them in developing their technical, organizational, and management skills and practices to improve their livelihoods, as well as to promote a more sustainable agriculture (Sulaiman et al., 2022). The EASs involve a diversity of actors in the provision of services and support to farmers (beyond information and knowledge), such as facilitation, intermediation, advice, and brokering (Sulaiman and Davis, 2012; Christoplos, 2010).

The role of EASs is crucial in supporting African farmers in addressing challenges and realizing new opportunities. During the 20th century, the implementation of the public-sector-driven EASs model in Africa was narrowly focused on:

- Disseminating information on best practices.
- Advising farmers in their decision making.
- Educating farmers to make informed decisions in the future.
- Supporting the transfer of technology.

Though this model was well-established, public spending in the agricultural sector varied widely across regions of Africa, which in turn limited the availability of EASs. As a result, most African countries lagged behind the rest of the world in delivery of effective EASs to the farmers (Gro-Intelligence, 2015).

The general challenges in delivery of EASs in Africa include:

- A gradual reduction in governmental funding for agricultural extension.
- Declining number of professional staff members engaged under publicly funded systems.
- The agricultural industry's demand for efficient EASs.
- New programs in food, nutrition, and health resulting in market-driven production.
- Current developments such as climate change, globalization, national and regional poverty reduction and food security strategies, etc.

In this changing context, the conventional top-down, supply- and technology-driven extension system no longer appears to be an appropriate model. To meet the challenges, the options chosen by some of the African countries in EASs delivery include:

- Privatization.
- Multiple service providers.
- Public-private partnerships.
- Decentralized and/or bottom-up services.
- Market-driven or fee-for-service systems.

The specific challenges in the delivery of EASs in the five focus countries are briefly summarized below.

2.1.1 Challenges in Agricultural Extension in Nigeria

In Nigeria, agricultural EASs are mostly provided by government organizations. However, the existing public agricultural EASs are characterized by many shortfalls, such as grossly inadequate and untimely funding, a very weak research-extension-farmer-inputs linkages system, top-down and supply-driven extension approaches, and poor targeting of women, youths and vulnerable groups, among others (Osondu et al., 2015; World Bank, 2020). In addition, the poor work conditions and a non-existent career ladder for the ADP staff, the multiplicity of extension approaches and lack of coordination /networking among the extension providers, misplacement of subsidy priorities, negative political influences in extension management, lack of low- cost credit that small -scale farmers can easily access, and poor loan recovery rates are critical challenges. Also, low numbers of agricultural extension staff compared with the farming population (Banful et al., 2010; Omotayo, 2010), means that not all farmers' concerns can be addressed in a timely manner. In attempting to reach the most marginalized farmers, agricultural EASs in rural Nigeria face the compounding challenges of decaying infrastructure (FMARD, 2016), lack of transportation (FMARD, 2016), low farmer education levels (Phillip et al., 2009), and the need to replace retiring staff (Banful et al., 2010). Generally, the Nigerian agricultural extension staff is spread too thinly to adequately serve the assigned geographic areas using current strategies. Further, women farmers face unique barriers to integration in agricultural extension systems staffed predominantly by men (Banful et al., 2010; Osaze, 2015). Other major challenges of Nigeria's agricultural EASs include: lack of a legislated agricultural extension policy, compounded by policy somersaults in the sector; grossly inadequate and untimely funding; poor leadership and coordination, low private sector participator, a very weak research-extension-farmer-inputs linkages system and driven by ineffective top-down, supply-driven, extension approaches. As a result, the public extension system is unable to respond to the increasingly diversified extension needs of rural clients.

2.1.2 Challenges in Agricultural Extension in Malawi

The Ministry of Agriculture has developed the National Agricultural Extension and Advisory Services Strategy (NAEASS) to strengthen the effectiveness and efficiency of pluralistic, demand-driven, and market-led EASs (from 2020 to 2025) with a view to contributing to agricultural transformation for food, income, and nutritional security in Malawi (GoM, 2020). The NAEASS reviewed the performance of agricultural EASs in Malawi using the seven guiding

principles of the Agricultural Extension Policy of 2000 as a frame of reference. The principles are: pluralism, demand-driven services, accountability, those who benefit pay, resource sustainability, equalization, and decentralized coordination (GoM, 2000). The assessment concentrated on pertinent policy documents that recognize the crucial role of agricultural EASs in contributing to the achievement of objectives such as the National Agriculture Policy (NAP), the National Agriculture Investment Plan (NAIP), and the Decentralization Policy. The NAP, for example, acknowledges delivery of agricultural information and innovations as the key duty of agricultural extension (GoM, 2016). Figure 2.1 portrays the interrelationships of the principles of the Agricultural Extension Policy of 2000 and how they influenced the effectiveness and quality of agricultural EASs. The figure also points out policy weaknesses that hamper effective services delivery to clientele in Malawi.

The major challenges in agricultural extension in Malawi are related to:

- Regulatory framework for EASs.
- Coordination of EASs.
- Institutional and organizational capacity for EASs.
- Ethical erosion in EASs.
- Agricultural extension approaches and pluralistic methods.
- Financing EASs.
- Food and nutrition security.
- Gender, HIV education, and youth participation
- Climate change and variability.
- Agriculture commercialization and agribusiness management.

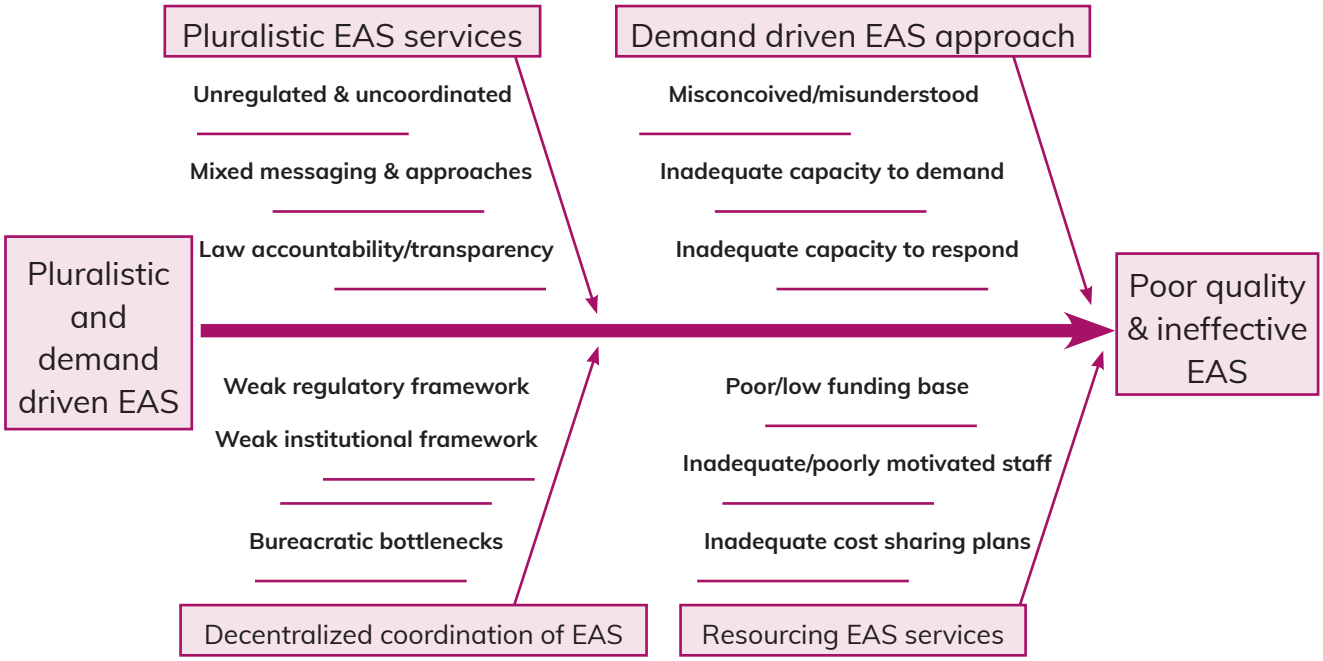

Fig. 2.1.: Agricultural EASs Challenges in Malawi (Source: GoM, 2020)

2.1.3 Challenges in Agricultural Extension in South Africa

According to the latest government review, the challenges in the public agricultural EASs in South Africa include the following (DALRRD, 2020):

- The general public criticizes EASs for being ineffective and invisible. The department, however, attributes this to internal departmental limitations in available resources and argues that extension staff members have no control over several factors such as the value chain, government structures and policies, climate change, and deteriorating natural resources.
- Training for extension practitioners is inadequate.
- Capacity building funds to the sector is limited.
- Some staff members follow a tunnel- vision approach, focusing only on the here and now instead of taking a holistic approach.
- Extension staff members lack professional expertise and adequate opportunities to gain practical experience.

Extension practitioners say that limited funding restricts their ability to render services efficiently. Available technologies are often unsuitable for rural farmers, and extension professionals often lack experience and necessary training (Duvel, 2004; Oladele, 2015). Davis et al., 2019, also found in their study among members of the SASAE that extension professionals have tended to blame farmers for being the authors of their own problems. Extension staff is also well aware of the accusations of inefficiency, and that awareness can contribute to a lack of motivation and self-efficacy, and consequentially low performance (Agholor, 2019).

Farmer opinions on the efficiency of EASs are divided -- some receive adequate support in their view, while others have never received assistance from an extension professional. Studies in the Eastern Cape province, Gauteng province, and Western Cape province have found that farmers considered public extension services ineffective (Khapayi and Celliers, 2016; Maake and Antwi, 2022). Reasons included inadequate competencies of extension staff, absent extension staff, and differing views between farmers and extensionists about the goals and outcome of efficient extension (Afful, 2016; Sebopetsa, 2018; von Maltitz et al., 2021; Maake and Antwi, 2022). Equipping agricultural extensionists with relevant skills and competencies through appropriate higher education is undeniably the basic foundation of an effective role in EAS.

2.1.4 Challenges in Agricultural Extension in Uganda

In Uganda, the national annual agricultural output grew at only 2% over the past five years, which is well below the population growth rate and below the 3% to 5% growth rates in other East African countries (World Bank, 2018). Government policy and regulatory measures have been ineffective. Consequently, gaps still persist in the areas of:

- Agricultural productivity and resilience of agricultural systems and rural livelihoods to weather and climatic shocks.

- Producer arrangements and value chain competitiveness.
- The regulatory and institutional environment.

To this end, farmers should be equipped with climate-smart land, water, crop, and livestock management practices, irrigation infrastructure, and access to climate and disaster-risk information. Agricultural EASs need to play a key role in all these efforts.

Commercialization of the agricultural sector is impeded by farmers' limited use of fertilizer and quality seeds, and a lack of irrigation infrastructure, which renders production vulnerable to climatic extremes and pest infestations. Growth in agriculture is also impaired by the lack of quality packaging capabilities, insufficient storage facilities, poor postharvest handling practices, shortage of agricultural credit, high freight costs, lack of all-weather feeder roads in rural areas, a complicated and inefficient land tenure system, and limited knowledge of modern production practices and EASs. Ugandan producers often find it difficult to meet sanitary and phytosanitary standards required for exporting goods to Europe and the United States. Ugandan poultry, sugar, and milk products face export restrictions from Kenya (ITA, 2022).

One of the key challenges that the National Agricultural Extension Policy 2016 (NAEP 2016) seeks to address is fragmentation, low quality services and lack of coordination of agricultural EASs actors. The extension system has been characterized by a weak regulatory system; poor linkages of farmers and other actors to markets, processors, and financial services; high cost of EASs delivery; institutionally weak farmer organizations; uncoordinated delivery approaches, and low technological uptake. Accordingly, under the NAEP 2016, the new strategic direction is to transform extension from a system of parallel, institutionally fragmented public and non-state actors to a well -coordinated, harmonized, regulated, pluralistic service with multiple providers addressing diverse needs. The second dimension of the new direction is to address the extension needs along the entire value chain (as opposed to the previous focus on mainly primary production) and synergistic integration with other agricultural support services for optimum return on investment. The vision of the NAEP is: "...prosperous farmers and other agricultural actors for socio-economic transformation and welfare of the population". The mission of the policy is to: "...promote application of appropriate information, knowledge, and technological innovations for commercialization of agriculture." The NAEP framework requires reorienting mindsets of all actors to facilitate a shift from considering EAS as an exclusive public sector undertaking toward pluralism – multiple providers.

Despite reforms, the performance of EASs has been low. Over the past three decades, EASs have served a limited number of farmers (less than 20%) and tended to benefit only better- off farmers. Studies revealed that women, youths, and persons with disabilities had lower access to EASs than men. Given that women farmers provide over 70% of the agricultural labor force, their limited access to EASs has contributed to lower adoption of improved technologies (estimated at 17 less compared with men) and consequently a smaller contribution to productivity and output. Similarly, youth (10 to 30 years of age), who make up 57% of Uganda's population, live primarily in rural areas where agriculture in the

main economic activity, but they are lagging in accessing EASs. This is true despite the fact that the National Youth Policy (2001) clearly stipulates that youth who are farmers should be provided with market information and agricultural EASs. Against this background, it is important to build the capacity of EAS in inclusive and gender- responsive approaches that target women, youths, poorer farmers, persons with disabilities, and other special interest groups.

2.1.5 Challenges in Agricultural Extension in Kenya

The major challenges in EASs delivery as outlined in GoK (2021) include:

- Inadequate legal and policy frameworks, with many policies and legislation being outdated and inconsistent with the current constitution of Kenya.
- Land subdivision and fragmentation, whereby over subdivision has resulted in uneconomical agricultural units.
- Low adoption of agricultural technology and innovation mainly by smallholder farmers, who make up the majority of agricultural producers.
- Land degradation and declining soil fertility.
- Decreasing land for agricultural production due to increasing competition from alternative land uses.

Other challenges include (Geopoll 2018; GoK, 2018; GoK, 2021; KARI, 2019):

- Frequent conflicts between communities due to cattle rustling, and livestock and wildlife encroachment on private land due to scarcity of pastures, especially during periods of drought.
- Prevalence of pests and diseases that result in high preharvest and postharvest losses.
- Climate change and its associated negative effects.
- Non-adherence and inadequate quality control systems, which negatively affect the export market.
- Reliance on a few external market outlets, which exposes agricultural exports to risks of changes in demand and unexpected non- trade barriers from foreign markets.
- Inadequate market access and marketing information infrastructure due to poorly organized market information systems at the domestic front.
- High cost, adulteration, low and inappropriate application of key inputs.
- Poor infrastructure.
- Overreliance on rain- fed agriculture.
- Gender inequalities at the household level, which constrain women farmers' access to and control over productive resources and their participation in agriculture value chains.
- Loss of biodiversity and vectors for pollination mainly due to excessive use of pesticides and other farming practices that have a negative effect on productivity.

- The challenge of aging farmers, whereby most of the agricultural enterprises are owned and/or managed by elderly people. Youth participation in agriculture in Kenya remains quite low as many of them shun the sector because they have negative attitudes and low access to resources.
- Inadequate entrepreneurial skills and lack of entrepreneurial mindsets among many small-scale farmers, which hinder commercialization.

The implementation of the National Agricultural Extension Policy (NAEP, 2001) was not as successful as had been anticipated in Kenya. Some of the challenges that led to failure included inadequate institutional arrangements, narrow ownership, lack of a legal framework, lack of good will and commitment among some of the top managers, and slow flow of resources. This led to review and revision of the policy to create the National Agricultural Sector Extension Policy (NASEP). Unlike the NAEP, which focused narrowly on agriculture, the NASEP adopted a sector wide approach to address a number of challenges that had been identified in the NAEP. The areas of focus for NASEP included:

- Managing pluralistic EASs for effective service delivery.
- Developing private- sector-operated EASs to complement public extension services.
- Commercializing and privatizing public EASs without compromising public interest. Three models were proposed: Model 1: offers free public EASs; Model 2: with partial cost-shared provision of EASs; and Model 3: with fully commercialized EASs.
- Harmonizing extension approaches and methods, especially those promoting demand-driven extension and capacity building for grass-roots institutions.
- Addressing institutional weaknesses in capacity building and technology development and dissemination.
- Addressing weaknesses in research-extension-clientele linkages, packaging and disseminating technologies.
- Creating functioning institutional frameworks to coordinate and provide linkages among stakeholders, including those involved in providing extension facilitating factors.
- Mainstreaming cross-cutting issues in extension messages such as sustainable use of natural resources, gender, HIV/AIDS, quality of goods, and food safety.
- Efficient management of pluralistic extension services and development of private-sector-operated extension.
- Guidelines on matters of standards, ethics, and approaches for all players to strengthen coordination, partnership, and collaboration.
- Use of ICTs in the approaches used by extension service providers for wider coverage and enhanced information sharing.

The above review on challenges in agricultural EASs delivery in Nigeria, Malawi, South Africa, Uganda, and Kenya point to the conclusion that demand-driven -- not supply-driven -- agricultural EASs is the dominant approach today. In this approach, extension responds to

what farmers or other clientele ask for to satisfy their educational and informational needs. The hope is that recipients will value the educational advice so much that they will be willing to invest their own resources to receive the service. Service providers under this approach would be accountable to the users, and the users would have free choice of service providers (Suvedi and Sasidhar, 2020). The emergence of a global economic system, expansion of scientific knowledge and discoveries, and the rapid spread of ICTs have had a profound impact on agricultural extension. To succeed, the agricultural extension system must (Axinn, 1988; Chambers, 1997; Swanson, 2008; Christoplos, 2010; Sulaiman and Davis, 2012; Sulaiman et al., 2022):

- Become more decentralized, farmer-led, and market-driven.
- Change its role from a supply-driven to a demand-driven system.
- Change from a top-down, technology transfer system to a bottom-up, participatory process.
- Serve the needs of female farmers, who have been neglected by traditional extension services in most developing countries.
- Learn to work in partnership with many public, not-for-profit and private- sector organizations that offer similar services to farmers and agribusiness operators.
- Be flexible to meet the educational and informational needs of new clientele groups.
- Provide knowledge- brokering functions and facilitate interactions between actors and stakeholders in agricultural innovation systems (AIS).
- Facilitate participatory development and the effective use of innovative solutions.
- Create and/ or help in securing of decent jobs, especially for rural women and youth.
- Facilitate achieving several sustainable development goals (SDGs), especially SDG 1 (no poverty), 2 (end hunger), 3 (good health and well-being), 5 (gender equality), 8 (decent work and economic growth), 10 (reduced inequalities) and 13 (climate action).

2.2 PROCESS SKILLS AND COMPETENCY GAPS IN AGRICULTURAL EXTENSION CURRICULUM

There has been growing interest in competency studies in recent times due to the functional perspective of competence and the attempt to further it for human resource development (Schneider, 2019). Extension professionals are the main human resources for agricultural EASs. The competency of extension professionals is directly related to their performance. “Competence” refers to the general capability of persons (or organizations) to perform a task or to solve an emerging problem. A higher level of competency leads to higher efficiency in services, better performance, and higher satisfaction among staff members and their clients. Seevers et al. (2007) used the term “core competency” to describe the basic knowledge, skills, attitudes, and behaviors that contribute to workers’ excellence in their respective professions (e.g., agricultural extension). The terms “competencies” and “core

competencies" are used interchangeably in the literature. In this study, "core competencies" refers to "process skills" or "soft skills" required to perform a job well. There are many views on how core competencies can be imparted and assessed. Following are some important views on competencies:

- Process skills and core competencies are a collection of observable dimensions – individual skills, knowledge, attitudes, behaviors, and collective processes and capabilities – necessary for individual, organizational and program success (Athey and Orth, 1999).
- Competence is the ability to perform the roles and tasks required by one's job to the expected standard (Eraut and Boulay, 2000).
- Competence refers to behavior a person should be able to demonstrate (Moore et al., 2002).
- A competence is defined as the ability to meet individual or social demands successfully, or to carry out an activity or task (OECD, 2002).
- Competence is a concept that integrates knowledge, skills, and attitudes, the application of which enables the professional to perform effectively, and to respond to contingencies, change, and the unexpected (RCVS, 2006).
- Competency is an underlying set of personal characteristics that facilitate superior performance (Boyatzis, 2008).
- A competency is a standard: the performance of a skill at a predetermined level of performance (Welsh et al., 2009).
- Professional competence is seen as the generic, integrated, and internalized capability to deliver sustainable effective (worthy) performance (including problem solving, realizing innovation, and creating transformation) in a certain professional domain, job, role, organizational context, and task situation (Mulder, 2014).

The above views on competencies recognize that requirements and expectations change depending on job role and context. It also recognizes that competence develops, and that an individual may work competently at many levels, either at different stages of his or her career, or indeed from one day to the next depending on the nature of the work (RCVS, 2006). Further, being knowledgeable and/or intelligent does not indicate that a person is an effective and efficient provider of services – performance is a function of knowledge plus skills and attitudes (McClelland, 1973). Hence, extension professionals should not be judged solely on how knowledgeable they are in their technical subject area of expertise but on how skilful and able they are in delivering EASs to their clients. It should also be noted that core competency needs are contextual, and extension workers' contexts affect their competency needs and competency levels.

Process skills and core competencies are necessary for individual, organizational and program success. These competencies are context- specific and enable functioning of individuals to be effective in a certain profession, organization, position, or role (Davis, 2015; NFSMI, 2004;

Mulder, 2014; Mulder, 2015). In the context of EASs, competencies of agricultural extension professionals should be judged on how knowledgeable they are in their core areas, and how skilful and able they are in applying that knowledge when delivering EASs to clients. Agricultural EASs are transitioning from a focus on technology transfer to facilitating a range of interventions in complex contexts. An agricultural extension curriculum is expected to support this transition by imparting the required process skills and core competencies at the undergraduate level. Therefore, understanding and assessing gaps in competencies of agricultural extension professionals at regular intervals is a pathway to informing curricular modifications.

2.2.1 Desired Process Skills and Core Competencies and their Assessment

According to the National Research Council of the National Academies (2009), agricultural graduates should develop competency in "teamwork and working in diverse communities, working across disciplines, communication, critical thinking and analysis, ethical decision making, and leadership and management" (p. 40). Professional associations and accreditation boards also have contributed to establishment of knowledge and competency requirements for graduation in various technical and vocational fields. Food and agribusiness employers rank interpersonal skills and critical thinking twice as highly as production agriculture experience as components necessary for career success. In addition, graduates need to be knowledgeable about issues of globalization, the value of a diverse workplace, information literacy, and how their products/processes affect environmental sustainability (APLU, 2009).

Various competency and competency assessment models exist in extension (Scheer and Cochran, 2011). Those that have been applied in the American context to identify and develop competencies include the Texas Agri-Life Extension YES Model, the Michigan State University Extension Core Competency Initiative, and the 4–H PRKC model for 4–H (Fred Shimali et al., 2021). These models differ in the number of core competency areas (Harder et al., 2015), and the types of competencies or their extent may vary from country to country. For example, extension staff in developed countries may require a higher level of computer skills than those in a developing country. Similarly, staff members having multiple roles -- such as educator, grant writer, and administrator -- need different competencies than those having a single function or role. For example, county extension directors in the United States, who have diverse roles, need a different set of competencies than an extension educator in Malawi / Nigeria whose primary role is technology transfer. Core competencies, when combined with sound technical skills, form the foundation for becoming a successful educator.

Michigan State University Extension (MSUE), for example, launched its core competency development initiative in 1993. A group of campus and off-campus staff members identified essential skill sets for extension educators. MSUE supports core competency development throughout the organization. It is designed to encourage staff members to take responsibility for and be actively engaged in their professional development (MSUE, 2015).

Agricultural extension workers should be knowledgeable in the essential competencies required of a "*New Extensionist*" (Davis, 2015). To accomplish this, it is essential that extension workers clearly understand these requirements. "Skills" and "competence" are specific activities, and 'competence' is the ability to carry out an activity effectively, safely, and efficiently. The most critical competencies are those that relate to skills that an extension worker is expected to perform.

While emphasizing competency development as a long-term investment for extension, Sulaiman and Davis (2012), Davis and Sulaiman (2014), Davis (2015), CRISP (2015), and Prasad et al. (2015) articulated the need to develop functional and technical competencies across three levels: the individual level, the organization level, and the enabling environment level. As key to competence development, Sandberg (2000) identified three approaches to competency assessment: work- oriented, worker- oriented, and multimethod -oriented. In this study, we followed the individual / worker- oriented approach, which aids in identifying the skills, knowledge, and abilities needed for effectiveness at work and improvement of EASs performance.

To address the challenges outlined in the previous section, the competencies required of an agricultural extension worker at the individual level may be classified into two broad categories:

a. Process Skills or Functional Competencies or Soft Skills

Example: Engaging stakeholders in program planning, implementation, and evaluation, networking with local organizations, facilitating group formation, resolving conflicts, etc.

b. Technical Skills

Example: Identifying disease-causing organism in crops, conducting a method demonstration on how to perform artificial insemination in dairy animals, etc.

Good agricultural extension workers must possess both process and technical skills to perform their tasks well. The combination of these core competencies with technical knowledge and skills enables an agricultural extension worker to be more effective in addressing the challenges of the work.

Scholars and practitioners have proposed many areas of core competencies for agricultural extension educators (Cooper and Graham, 2001; Levine et al., 2002; Maddy et al., 2002; Scheer et al., 2006; Sulaiman and Davis, 2012; Davis and Sulaiman, 2014; CRISP, 2015; Davis, 2015; Prasad et al., 2015; Suvedi and Kaplowitz, 2016; Suvedi and Sasidhar, 2020; Fred Shimali et al., 2021).

On the basis of the review of challenges that EASs are facing in the five study countries and an analysis of literature on extension roles and responsibilities, we identified and included in this study 11 broad areas of competencies required by extension professionals to address the needs of demand-driven, decentralized, pluralistic, participatory agricultural EASs (Box 2.1).

Box 2.1: Process Skills and Core Competencies Identified

1. Program planning
2. Program implementation
3. Communication
4. Information and communication technologies (ICTs)
5. Program monitoring and evaluation
6. Personal and professional development
7. Diversity and gender
8. Marketing, brokering, and value chain development
9. Extension soft skills
10. Nutrition
11. Technical subject matter expertise

The subcompetencies under these 11 competencies are briefly discussed in the following sections.

Program Planning: Planning is the most basic role of extension educators under the decentralized, pluralistic, demand-driven extension system. Developing educational programs and services with community input, establishing clear and relevant objectives, and making efficient use of resources to serve the needs of targeted audiences result in a strong impact. For agricultural extension professionals, the subcompetencies under program planning include:

- Familiarity with the vision, mission, and goals of national /state (subnational) EASs and agricultural development strategies, programs, and policies.
- Ability to conduct needs assessment and engage stakeholders to prioritize local needs.
- Ability to conduct baseline or benchmark studies.
- Ability to mobilize resources / funds to address priority needs.
- Ability to engage local stakeholders (e.g., NGOs, cooperatives, local agro-dealers) in extension program planning.
- Familiarity with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).

Program Implementation: The extension educator is responsible for effective program execution. To be effective, s/he should be able to:

- Coordinate local extension programs and activities.
- Demonstrate teamwork skills to achieve extension results.
- Form farmers' groups and support them.

- Engage local stakeholders (e.g., NGOs, SHGs, cooperatives) in implementing extension programs.
- Demonstrate negotiation skills to reach consensus and resolve conflicts.
- Follow participatory decision making in extension work.
- Delegate responsibilities to staff as needed.
- Engage minority groups (e.g., female farmers and youth development groups) in extension work.
- Integrate private or public-private partnerships in extension service provision.

Communication: As planners, educators, and managers of local educational programs, extension workers must possess strong communication skills. These include:

- Selecting appropriate communication methods.
- Establishing communication with various stakeholders.
- Respecting local culture while communicating with clients.
- Preparing required progress reports.
- Sharing success stories and lessons learned with stakeholders through various media.
- Using extension methods (e.g., individual, group, and mass contact methods) to disseminate information about extension activities and programs.
- Demonstrating good listening skills and listening to all clients and stakeholders.
- Demonstrating good public speaking and presentation skills.

Information and Communication Technologies (ICTs): In the information technology age, using ICTs has become a part of extension educators' daily work, so it is important that all extension educators possess abilities related to:

- Word processing (e.g., typing, editing, printing) and designing graphics.
- Data entry and analysis software such as Excel, SPSS, etc.
- Power Point for making presentations.
- Audiovisual aids such as charts, graphs, and puppet show for teaching and learning.
- Mass media such as FM radio stations and television channels for communication.
- Computers (email, Internet) for communication.
- Mobile phone services (e.g., texting, SMS service) for communication.
- Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication.
- ICT tools to improve access to information, knowledge, technologies, and other innovations.
- ICT tools to enhance collaboration and partnerships.
- ICT tools for collecting data, monitoring, and evaluating extension programs.

Program Monitoring and Evaluation: In the era of accountability, funding agencies continually ask questions about impacts of extension work, such as:

- What did you do with the money?
- Why should we continue to fund extension programs / projects?
- Are the extension programs effective?
- How will you improve or terminate ineffective extension program / projects?

Evaluation is needed to answer accountability questions (Frechtling et al., 2002; Ghere et al., 2006). Results add to the scholarly work of learning that helps us improve programs and document the net social value of extension programs. Sharing evaluation results with stakeholders strengthens support for our programs. Therefore, to be relevant, every extension professional should:

- Understand theories and principles of monitoring and evaluation.
- Conduct monitoring and evaluation of extension programs.
- Develop data collection instruments -- interview schedules / questionnaires -- for monitoring and evaluating extension programs.
- Conduct online surveys for monitoring and evaluating extension programs.
- Apply qualitative tools and techniques (e.g., focus group discussion, case study, etc.) to collect evaluation data.
- Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data.
- Analyze and interpret data (qualitative and quantitative).
- Write evaluation reports.
- Share evaluation reports within their organizations and with stakeholders.
- Apply the evaluation findings in replicating/scaling-up of extension programs.

Personal and Professional Development: Personal and professional development is the ability of agricultural extension professionals to:

- Apply principles of good governance (i.e., client's participation, accountability, and transparency) in extension work.
- Show commitment to career advancement (participate in lifelong learning, inservice training, professional development events and conferences).
- Apply professional ethics in extension work -- i.e., promote research-based recommendations or technology.
- Follow organizational policies and directives for professional development.
- Demonstrate honesty and a positive attitude toward extension work.

Diversity and Gender: Agricultural extension professionals live and work in communities with people having a variety of racial backgrounds (e.g., race, caste, ethnicity, or tribe), cultures, and religions or faiths. To be effective, extension educators should be able to:

- Understand that diversity exists within and among clients and stakeholders.
- Identify the needs of small-scale farmers.
- Identify the needs of minority groups.
- Develop extension programs to benefit women farmers.
- Develop extension programs to benefit youth.
- Engage marginalized and vulnerable groups in extension programs (e.g., disabled, resource- poor farmers).
- Work with a diverse team.

Marketing, Brokering, and Value Chain Development: Every extension educator should promote extension's reputation, image, and awareness, and support its programs. S/he should engage communities, decision makers, and users of extension services and media in promoting extension. Extension staff members should:

- Have basic knowledge of agribusiness development.
- Apply brokering / advisory skills in agribusiness development.
- Have knowledge of various agricultural markets and linkages.
- Demonstrate knowledge of value chain logistics and input-output linkages in the value chain.
- Facilitate entrepreneurship development among extension clientele groups.
- Be able to link farmer producers' organizations / cooperatives / agribusiness companies with extension.

Extension Soft Skills: To be relevant, every extension professional should have soft skills and competencies, which include:

- Critical thinking.
- Problem solving.
- Time management.
- Stress management.
- Leadership.
- Teamwork.
- Flexibility.
- Self-motivation.
- Interpersonal skills.
- Positive work attitude.

- Collaboration.
- Conflict management.
- Group formation and development.
- Negotiation skills.
- Networking skills.
- Facilitation skills.
- Creativity /innovativeness.

Nutrition: Poor diets and malnutrition in all its forms are among the greatest global social challenges of our time. Nutrition- related challenges contribute to about 45% of deaths in children under age 5 in the entire world (UNICEF, 2022). For example, in Uganda, out of the 2.2 million children under 5 years of age, 29% are stunted, 11% are underweight, and 4% are wasted (UBOS and ICF, 2017). The agriculture sector ensures that diverse foods are available, affordable, and safe for feeding the people (Fanzo, 2015; FAO, 2013). Agricultural extension workers can build farmers' capabilities to attain their full potential in production of crops and livestock for food and income security (Sala et al., 2016). Effective nutrition education can be possible only when the trainers have the right competencies to undertake such activities (Hughes et al., 2012). Agricultural extension professionals should possess the following competencies related to nutrition:

- Demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms etc).
- Understand life-cycle nutrition needs of various household members (e.g ., children of various age groups, pregnant and breast-feeding mothers, elderly).
- Able to advise families on what crops and livestock to produce to ensure balanced diets.
- Advise families to improve gender relations for increased agricultural production and improved nutrition.
- Demonstrate postharvest handling technologies that conserve nutrients and keep food safe (e.g., food storage, freezing fruits and vegetables, making pickles, jams, jellies).
- Have basic knowledge about food labeling (e.g., organic foods).
- Able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/ HIV, heart health, kidney disease, osteoporosis, weight loss and obesity).

Technical Subject Matter Expertise: At the individual level, the technical skills and competencies for extension field workers vary by specialization. For example, an extension professional working in the livestock sector needs to have basic technical knowledge and skills in veterinary science and animal husbandry, which would differ from their counterparts in crop or home science or fisheries sectors. Accordingly, the technical subject matter competencies of extension professionals include:

- Demonstrate technical knowledge in their basic discipline (e.g., field crops / livestock/ fishery/ horticulture, etc.).
- Understand adult learning principles and have practical skills required to teach improved farming practices.
- Understand a new technology being promoted -- i.e., what it is, why it is recommended, and how it works.
- Facilitate farmers' access to inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.).
- Educate community members about various types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.).
- Educate community members about climate change and climate- smart agriculture.
- Refer to and make use of publications -- journals, research reports, etc.
- Generate knowledge and produce research reports / journal publications.
- Harness, document, validate, and integrate local / indigenous knowledge.
- Understand the social system under which farming takes place (e.g., rural sociology knowledge).

The above competencies are core to the extension profession. They are needed irrespective of extension position assignment, whether field crop educator, livestock educator, or nutrition educator. One of the greatest challenges is that extension staff members often do not have the appropriate and updated skills to perform effectively. Knowledge and skill levels among extension workers vary greatly, primarily because of variations in types and quality of pre- and in-service training programs for extension professionals (Suvedi and Sasidhar, 2020). In many African countries, fiscal constraints have forced public extension systems to hire staff members having few competencies or skills. Many extension organizations do not have a well-defined system of in-service training for systematic staff development.

The problem of professional incompetence among frontline extension educators has been a persistent issue within extension. Related to this problem is lack of motivation among extension employees to develop the core competencies they need for their jobs. Some of the pertinent related questions are:

- How do we establish a vibrant staff development unit?
- How do we motivate workers to participate in professional development programs?
- What mechanisms should we have to reward staff members who excel in these professional competencies or disincentivize those who consistently lack these skills?

For example, in the United States, the Extension Committee on Organizational Policy (ECOP) has been involved in designing strategies for extension services, including core competencies for U.S. Cooperative Extension professionals. These documents -- Gibson and Hillison (1994) and ECOP (2002) -- have been instrumental in helping U.S. universities develop their staff

members' core competencies and inspired other organizations in the United States and globally to develop and redevelop their staffs' core competencies. Extension professionals have to be prepared with the knowledge, skills, and behaviors to help meet the demands and needs of clients, including those in the sub-Saharan Africa countries of Nigeria, Malawi, South Africa, Uganda, and Kenya.

The changes in the role of the EASs demand different core competencies among extension professionals (Cooper and Graham, 2001) -- different types of knowledge and attitudes along with more diverse skills and working patterns. Ultimately, this has tremendous implications for preservice training curricula (undergraduate and graduate levels) in agricultural extension education (Scheer et al., 2006). It also has implications for professional development of extension professionals- - specifically, the content of in-service training programs. To put it simply, the changes taking place within the agricultural extension system call for significant modifications in curriculum- based capacity development programs to impart the core process skills and competencies that agricultural extension professionals need.

To fill the process skills and competencies gaps in the agricultural extension curriculum, this study focuses on the important job skills and competencies of extension workers and whether the undergraduate curriculum adequately addresses them. The goal is to identify gaps and suggest areas for agricultural extension curricular revisions to better serve the needs of contemporary bottom-up, pluralistic, and demand-driven extension systems.

CHAPTER 3 - METHODOLOGY

3.1 STUDY AREA AND RESEARCH DESIGN

The study was undertaken in five countries in Africa: Nigeria, Malawi, South Africa, Uganda and Kenya during 2021-2023. These five countries cover a wide expanse of sub-Saharan Africa -- Nigeria represents the west of Africa; Malawi, Uganda, and Kenya represent the east; and South Africa represents the south of Africa. Mixed- method research design, comprising quantitative and qualitative approaches, was employed in collecting data from the study population. The population for the study was agricultural extension professionals within these five countries drawn from universities, public- sector organizations, private- sector organizations, and non-governmental organizations (NGOs).

3.2 QUANTITATIVE APPROACH -- OPERATIONALIZATION AND MEASUREMENT

An online survey was conducted for collecting quantitative data in the five countries using the Qualtrics software. The core objective of the study was to identify process skills and competency gaps in the undergraduate (UG) agricultural extension curricula in Nigeria, Malawi, South Africa, Uganda, and Kenya. A combination of process skills and competencies enables agricultural extension professionals to be effective in performing their tasks and responding to contingencies and changes to meet the needs of their clients. The respondents were asked to keep this in mind while completing the online survey questionnaire.

3.2.1Demographic and Institutional Characteristics

To gather demographic information, the respondents were asked to indicate the country's extension system they represent, age (in years), gender (male, female, or prefer not to respond), and highest educational qualification / bachelor's, master's, Ph.D., and other degrees).

In the institutional characteristics section, the respondents were asked to indicate their familiarity with current undergraduate-level agricultural extension curriculum (familiar or not familiar), familiar with how many universities' UG agriculture extension curriculum (number), current position (university extension staff, public- or private- sector extension professional, and others working for NGOs and/or private- sector companies), experience in extension profession / agriculture- related fields (in years).

3.2.2 Process Skills and Core Competencies

Process skills and core competencies in the present study were operationalized as the basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks well in the following 11 skills and competency areas:

1. Program planning.
2. Program implementation.

3. Communication.
4. Information and communication technologies (ICTs).
5. Program monitoring and evaluation.
6. Personal and professional development.
7. Diversity and gender.
8. Marketing, brokering, and value chain development.
9. Extension soft skills.
10. Nutrition.
11. Technical subject matter expertise.

The researchers identified and included the above 11 broad areas of competencies in the online survey instrument keeping in view the basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks well.

3.2.2.1 Program Planning Skills and Competencies

"Program planning skills and competencies" was operationalized as the direction and intensity of agricultural extension efforts to bring about desirable change among clients in view of national agricultural development strategies, programs, and policies. Six items in the questionnaire assessed this area of skill and competency.

3.2.2.2 Program Implementation Skills and Competencies

"Extension program implementation skills and competencies" was operationalized as the ability of agricultural extension professionals to coordinate extension programs, demonstrate teamwork and negotiation skills, engage diverse local stakeholders, delegate responsibilities, and follow participatory decision making in extension work, among others. Nine questionnaire items assessed this skill and competency.

3.2.2.3 Communication Skills and Competencies

"Communication skills and competencies" was operationalized as the ability of agricultural extension professionals to select appropriate communication methods, establish communication with various stakeholders, respect local culture while communicating with clients, prepare required progress reports, share success stories and lessons learned with stakeholders through various media, use extension methods to disseminate information about important extension activities and programs, and demonstrate good listening, presentation, and public speaking skills. Eight questionnaire statements were administered to assess this area of skill and competency.

3.2.2.4 Information and Communication Technologies (ICTs) Skills and Competencies

"ICTs skills and competencies" was operationalized as ability of extension professionals to use computers, audiovisual aids, mass media, mobile phones, and social media for communication, teaching, and learning. The questionnaire used 11 items to assess this skill and competency.

3.2.2.5 Program Monitoring and Evaluation Skills and Competencies

"Program monitoring and evaluation skills and competencies" was operationalized as the ability of agricultural extension professionals to understand the theories of monitoring and evaluation, conduct online surveys for monitoring and evaluation of extension programs, develop data collection instruments, apply qualitative and quantitative tools to collect, analyze, and interpret evaluation data, write evaluation reports, and share results with stakeholders. Eleven questionnaire items were administered to assess this skill and competency.

3.2.2.6 Personal and Professional Development Skills and Competencies

"Personal and professional development skills and competencies" was operationalized as the ability of agricultural extension professionals to apply principles of good governance, show commitment to career advancement, apply professional ethics in work, follow organizational policies and directives, and demonstrate honesty and positive attitudes toward extension work. Five questionnaire items were administered to assess this skill and competency.

3.2.2.7 Diversity and Gender Skills and Competencies

"Diversity and gender skills and competencies" was operationalized as the ability of agricultural extension professionals to understand diversity within and among clients and stakeholders, identify the needs of small-scale farmers, develop extension programs to benefit women and youths, engage marginalized and vulnerable groups in extension programs, and do teamwork with diverse staff members at various levels. The questionnaire included six items to assess this skill and competency.

3.2.2.8 Marketing, Brokering, and Value Chain Development Skills and Competencies

"Marketing, brokering, and value chain development skills and competencies" was operationalized as the ability of extension professionals to have basic knowledge of agribusiness development, apply brokering / advisory skills in agribusiness development, have knowledge on various agricultural markets and linkages, demonstrate knowledge of value- chain logistics and input-output linkages in the value chain, facilitate entrepreneurship development among extension clientele groups, and be able to link farmer producer organizations (FPOs) / cooperatives / agribusiness companies with extension. Six questionnaire items were administered to assess this skill and competency.

3.2.2.9 Extension Soft Skills and Competencies

"Extension soft skills and competencies" was operationalized as the ability of extension professionals to develop skills and competencies in the areas of critical thinking, problem solving, time management, stress management, leadership, teamwork, flexibility, self-motivation, interpersonal skills, positive work attitude, collaboration, conflict management, group formation and development, negotiation, networking, facilitation, and creativity/ innovativeness. The questionnaire included 17 items to assess this skill and competency.

3.2.2.10 Nutrition Skills and Competencies

"Nutrition skills and competencies" was operationalized as the ability of extension professionals to demonstrate basic human nutrition knowledge, understand life-cycle nutrition needs of various household members, advise families on what crops and livestock to produce to ensure balanced diets, advise families to improve gender relations for increased agricultural production and nutrition, demonstrate postharvest handling technologies that conserve nutrients and assure food safety, have basic knowledge about food labeling, and advise on healthy diets. Seven questionnaire items were administered to assess this skill and competency.

3.2.2.11 Technical Subject Matter Expertise/Skills and Competencies

"Technical subject matter expertise / skills and competencies" was operationalized as the ability of agricultural extension professionals to demonstrate technical knowledge in their basic discipline; understand adult learning principles and have practical skills required to teach improved farming practices; understand a new technology being promoted; facilitate farmers' access to inputs and services; educate community members about various types of risks and uncertainties, climate change, and climate- smart agriculture; refer to and make use of publications; generate knowledge and produce research reports / journal publications; harness, document, validate, and integrate local / indigenous technical knowledge (ITK); and understand the social system under which farming takes place. Ten questionnaire items assessed this skill and competency.

Keeping in mind their experience in agricultural extension work and the UG extension curriculum, the respondents were asked to rate the importance of the above 11 process skills or competencies and their coverage in the UG extension curriculum on a five-point Likert scale as follows:

a. **How important is this skill or competency?** Respondents rated items on a 1 to 5 scale with 1 = Not Important; 2 = Somewhat Important; 3 = Moderately important; 4 = Important; and 5 = Very Important.

b. **How well does our UG extension curriculum address this competency?** Respondents were asked to rate the statements on a 1 to 5 scale with 1 = Not at All Covered; 2 = Minimally Covered; 3 = Moderately Covered; 4 = Well Covered; and 5 = Very Well Covered.

To see the difference between two means on how important the skill or competency is and how well the UG extension curriculum addresses the skill or competency, a paired sample t-test was applied. Cross-tabulation on demographic and institutional characteristics vis-a-vis perception on process skills and competencies also worked out. Through an open- ended question, the respondents were asked to list the additional skills and competencies that extension professionals need but are not covered above.

3.2.3 Strategies to Make the Agricultural Extension Curriculum Robust and Practical

This was operationalized as the perceptions of extension professionals on strategies for improving the UG agricultural extension curriculum, such as providing practical and

contemporary skills; including various soft skills and business management concepts and practices in the extension curriculum, exposing students to market opportunities, linking farmers with service providers and developing entrepreneurship, preparing students with broad-based, general agriculture courses, etc. Through 11 questionnaire items these strategies were assessed, and the respondents were required to indicate if each strategy ''already existed'', ''does not exist, but essential to have'', and ''does not exist, but fine to leave out''.

3.2.4 Appropriate Ways to Acquire Process Skills or Core Competencies

This was operationalized as the perceptions of agricultural extension professionals on acquiring the skills or competencies through:

- Preservice training by revising or updating the curriculum.
- Internship at various work environments during undergraduate programs.
- Basic induction training.
- In-service training opportunities – e.g., attend trainings, seminars, workshops, webinars, etc.

The respondents were asked to rate them on a four-point Likert-type scale -- i.e., not appropriate, somewhat appropriate, appropriate, and very appropriate, with scores of 1, 2, 3, and 4, respectively. Through another open-ended question, the respondents were asked to list additional appropriate ways to acquire process skills or competencies not already covered.

3.2.5 Major Barriers to Effective Implementation of Agricultural Extension Curriculum

This was operationalized as the perceptions of extension professionals on the major barriers to effective implementation of the UG agricultural extension curriculum training, such as development of an effective extension curriculum, quality faculty to teach extension courses, quality textbooks and/or manuals, classroom and demonstration farms or facilities, accreditation of curriculum, time constraints, etc. The respondents were required to indicate their responses by indicating their perceived barriers to effective implementation of the undergraduate extension curriculum.

3.3 DESIGN AND DEVELOPMENT OF THE ONLINE SURVEY INSTRUMENT

The questionnaire with all the above variables was developed after careful review of literature, formatted using the Qualtrics software, and pretested with 14 team members of the PIRA project from USA, India, Nigeria, Malawi, South Africa, Uganda, and Kenya. On the basis of the pretesting, the questionnaire was modified and finalized for data collection (Annexure 1). The Institutional Review Board (IRB) approval for human subjects' research was obtained from Michigan State University (MSU).

3.4 COLLECTION AND ANALYSIS OF THE ONLINE SURVEY DATA

Email lists of agricultural extension professionals in Nigeria, Malawi, South Africa, Uganda, and Kenya were compiled by scanning the websites and directories of research institutions, universities, government departments, NGOs, and private- sector organizations. Emails

of agricultural extension professionals were also obtained from professional associations and forums -- Agricultural Extension Society of Nigeria (AESON), South African Society for Agricultural Extension (SASAE), Nigeria Forum for Agricultural Advisory Services (NIFAAS), Malawi Forum for Agricultural Advisory Services (MaFAAS), Uganda Forum for Agricultural Advisory Services (UFAAS), and The Forum for Agricultural Advisory Services, Kenya (KeFAAS). The mailing lists of Focus Group Discussion (FGD) participant were also merged, and duplicate emails were removed.

Using the Qualtrics software, the online survey questionnaire was administered to 1497 agricultural extension professionals in the five countries, and five reminders were sent to non-respondents to increase the response rate. The filled- in questionnaires were checked for completion, and incomplete surveys were excluded from the analysis. A total of 635 respondents completed the online survey (Table 3.1).

Table 3.1: Sample of Online Survey Participants

Country	Agricultural Extension Professionals Received the Online Survey	Agricultural Extension Professionals Responded to the Online Survey
Nigeria	349	198
Malawi	210	45
South Africa	288	65
Uganda	400	243
Kenya	250	84
Total	1497	635

Source: Compiled by Authors

It should be noted that a few questions/items were not completed by some of the respondents. Hence, the respondents' number is incorporated in the results section separately for each item in the tables.

The demographic and institutional characteristics of the respondents were analyzed using frequency, percentage, and mean. The process skills and core competencies and appropriate ways to acquire skills and core competencies were analyzed using mean scores and paired sample t-test. Finally, the strategies for improving the undergraduate agricultural extension curriculum and major barriers to effective implementation of an improved UG extension curriculum were analyzed using frequency and percentage. The Statistical Package for Service Solution (SPSS), version 24, was used for the statistical analysis, and results are presented by country and for total data.

3.5 QUALITATIVE APPROACH – FOCUS GROUP DISCUSSIONS

Needs assessment is a remarkably complex process (Krueger and Casey, 2000). Focus group discussions (FGDs) can be used as an extension tool to assess needs and enhance awareness

in program development and evaluation, and thereby facilitate change processes (Bitsch, 2004). Focus groups enable people to ponder, reflect, listen to experiences and opinions of others, and interact (Krueger and Casey, 2000; Wilkinson, 2004; Onwuegbuzie et al., 2009). Therefore, for gathering qualitative data, FGDs were planned and conducted in 12 locations involving 97 participants across Nigeria, Malawi, South Africa, Uganda, and Kenya. The project team of each country had a moderated interaction with a group of invited participants and collected data.

3.5.1 Population and Sample

The population for the FGDs was agricultural extension professionals within the five countries drawn from universities, public- sector organizations, private- sector organizations, and NGOs. A purposive sampling procedure was applied to select the participants for the FGDs. The research team members in each country identified suitable participants using existing databases of extension professionals, their networks, key informants, and available public information. The sample for each focus group is shown in Table 3.2.

Table 3.2: Sample of Focus Group Discussion Participants

Country	Number of FGDs (Mode)	Total number of participants (Female/Male)
Nigeria	2 (One in-person and one hybrid)	22 (9/13)
Malawi	2 (In-person)	14 (6/8)
South Africa	3 (Online)	21 (6/15)
Uganda	3 (Online)	14 (4/10)
Kenya	2 (One in-person and one online)	26 (15/11)
Total	**12**	**97 (40/57)**

Source: Compiled by the authors

3.5.2 FGDs in Nigeria

Two FGDs were carried out in Nigeria. The first was an in-person session with nine participants: members from the Department of Agricultural Extension, UNN, Nsukka; Enugu State Agricultural Development Program; African Centre for Rural Development and Environment; Agriculture and Extension Services Enterprises, Enugu State; Advisory Services for Catfish and Allied Farm Services Association, Enugu State; and Network of Women in Agriculture in Nigeria. The second one was hybrid in nature -- four members attended in person; the other nine participants attended online. The participants were drawn from: the University of Nigeria; Alex Ekwueme Federal University Ndufu-Alike, Abakiliki; the University of Abuja; the University of Ibadan; the Federal University of Technology Akure; the University of Port Harcourt; Ahmadu Bello University; and Michael Okpara University of Agriculture, Umudike.

3.5.3FGDs in Malawi

Two FGDs were conducted in Malawi. The first comprised seven members from the Kalenjeka Farmer Field School. The second consisted of seven members, with one member from each of these organizations: Agricultural Research and Extension Trust (ARET); the Department of Agriculture Extension Services (DAES); Farm Radio Trust (FRT); Agriculture Planning Services (APS); Concern Worldwide, a charity organization; Self-help Africa; and Lilongwe University of Agriculture and Natural Resources (LUANAR).

3.5.4 FGDs in South Africa

Three FGD sessions were conducted online in South Africa. The first session was conducted with six participants: members from Vinpro, Department of Agriculture and Rural Development, Free State Province, University of the Free State, and Department of Sustainable Food Systems and Development. The second session was conducted with five participants: members from the University of KwaZulu Natal, the University of Mpumalanga, the Western Cape Department of Agriculture, and the University of Pretoria. The third session was conducted with eight participants: members from Cotton South Africa; Free State Agriculture; the Department of Agriculture, Land Reform and Rural Development (DALRRD), Limpopo Province; and companies Intelligro and Hortgro. There were two facilitators for each FGD. Two participants could not find a suitable time to attend and returned their answers to the questions via email.

3.5.5 FGDs in Uganda

Three FGDs were conducted in Uganda. The first FGD was conducted with eight academic staff members from Kyambogo University, Christian University, Gulu University, Makerere University, and Bishop Stuart University. The second FGD was involved two agricultural extension experts in the public sector: a district product marketing officer from Buvuma District local government; and a representative of Sasakawa African Association (SAA). The third FGD in Uganda was conducted with four members from the private sector: the Zirobwe Agaliawamu Business Traders' Association (ZABTA), the Alliance for Farmer Development Uganda (AFADU), and Grain Pulse Limited. The FGDs in Uganda were carried out virtually.

3.5.6FGDs in Kenya

Two FGDs were conducted in Kenya. The first FGD was conducted in person with 14 members from: the Ministry of Agriculture; Bio Vision Africa Trust and Farming Systems, Kenya; Egerton University; Baraka Agricultural College; and the Kenya Forum for Agricultural Advisory Services (KEFAAS). The second FGD was conducted online with 12 participants: members from Jaramogi Odinga University of Science and Technology, the School of Agriculture at Machakos University, Mercy Corps (NGO); Samburu County government, Egerton University, Laikipia University, Masinde Muliro University of Science and Technology, Pwani University, and Just Earth (NGO).

3.5.7 Design and Development of the FGD Instrument

After a vigorous literature review, a FGD semi-structured questionnaire was developed to maintain uniformity across all the FGDs in the five countries. The questionnaire consisted of 12 open-ended questions (Annexure 2).

At the beginning of each FGD, the moderator explained the study purpose to the respondents and obtained verbal consent, including consent for audio recording. Written informed consent also was obtained from the FGD participants. The notes and audio/Zoom recordings were transcribed shortly after the sessions. The facilitators of each focus group encouraged participants to think critically and speak honestly, and freely about their experiences with and perceptions of agricultural extension in their country during the discussions. The FGD sessions were conducted both in person and online because of the COVID pandemic situation. One member of the project served as facilitator, another member documented the discussion, and the third conducted independent data method quality assurance. The FGD participants were encouraged to brainstorm ideas for explaining the current issues in agricultural extension, critical skills and competencies required by agricultural extension professionals, gaps in the agricultural extension curricula, barriers to training undergraduates, and finally, recommendations to improve the agricultural extension curricula in participants' African countries. The facilitator guided the sessions, offering procedural clarifications where necessary. Each participant independently generated a set of ideas to address the questions, after which all the individual responses were collected and identical ones were grouped by the documenter. The online focus groups were recorded through the Zoom platform, and the transcripts were computer- generated.

3.5.8 FGDs Data Analysis

Despite the long history of focus group research, it lacks a proper guide that delineates the types of qualitative analysis techniques for focus group research. Analyzing FGDs data is much more complex than analyzing data from an individual interview, and an array of qualitative analysis techniques is available to qualitative researchers (Onwuegbuzie et al., 2009). Glaser (1965) developed a method called constant comparison analysis, also known as the method of constant comparison, which was first used in grounded theory research. This is used as one best way to analyze transcripts of interviews (Memon et al., 2017). Constant comparison analysis consists of four main steps: inductive categorization, refinement of categories, exploration of relationships across categories, and integration of data (Memon et al., 2017). This study adopted a modified approach of the constant comparison analysis. The analysis was done using the transcripts, both audio recorded and then manually transcribed and online-generated. Transcript-based analysis is the most rigorous and time-intensive mode of analyzing data (Onwuegbuzie et al., 2009). This study thus adopted five steps to analyze the FGDs data:

1) The first step involved carefully reading and reviewing all the transcripts of all FGDs conducted in the five countries to familiarize researchers with the content.

2) The second step was to identify themes. The researchers identified six themes:

   i. Challenges of extension service delivery systems of each country.

   ii. Recommendations to improve the agricultural extension systems.

   iii. Critical job skills / core competencies required for agricultural extension workers.

   iv. Skills competency gaps in the UG extension curriculum.

   v. Barriers to training UG extension students with the required skills.

   vi. Suggestions for the improvement of the UG extension curriculum.

3) In the third step, a color code was developed and highlighted the context within the transcripts for each country based on the themes (Fig 3.1).

	Challenges of the extension service delivery systems of each country
	Recommendations to improve the agricultural extension systems
	Critical job skills/core competencies required for "agricultural extension workers", "training students"
	Skill competency gaps in the undergraduate extension curriculum
	Barriers to train students with the required skills
	Suggestions for the improvement of the curriculm

Fig. 3.1: Color Code for the FGD Themes

4. The fourth step was highlighting the statements that resonated with each of the themes and categorizing them. The statements of the respondents identified for each theme were then listed in an Excel sheet. The researchers then read all the statements and further categorized these statements into subcategories. For example, all the statements that supported the theme "issues in the current extension system" were sorted and categorized under six broad subtopics:

   i. Capacity gaps of the extension officers (EOs).

   ii. Issues related to public extension systems.

   iii. Lack of support to EOs.

   iv. Issues related to information delivery by the EOs.

   v. Issues related to the farmers.

   vi. Lack of trust in extension officers.

The statements under the theme recommendations were classified into four categories:

   i. Human resource development and support.

   ii. Ways to improve extension programs and delivery.

   iii. Recommendations for the public extension systems.

   iv. Recommendations for the universities.

The barriers were categorized as:

i. Human resource development.

ii. Institutional barriers.

iii. Issues related to the curriculum.

5) The final step was counting the frequency of respondents who supported a particular statement identified across the five countries. Though the frequencies were counted, the numbers were not included in the reports for several reasons: sample size in the FGDs is too small, not everyone answered every question, and some participants may have commented multiple times on the same issue. Instead, modifiers such as “no one”, “few”, “many”, “most”, or “all” were used to describe how many participants talked about an issue (Krueger and Casey, 2000).

3.6 LIMITATIONS OF THE OVERALL STUDY

Considerable care and thought were exercised in making the study as objective and systematic as possible. Though every care was taken to collect and interpret the relevant information, there could be some distortion in the interpretation of the responses. The opinions of the respondents may not be free from individual biases and prejudices. Our small sample size from Malawi, South Africa, and Kenya poses some limitation to the external validity of results. However, our data collection approach of collecting information from a variety of stakeholders within the agricultural extension system and verification of their opinions through the qualitative data help to mitigate this limitation. Thus, our result is externally valid, and the approach we utilized can be applied in the broader context to other countries in Africa where similar conditions prevail.

CHAPTER 4 - RESULTS AND DISCUSSION

4.1 RESULTS – ONLINE SURVEY

4.1.1Demographics

Table 4.1 shows that 38.27% of the respondents were from Uganda, and 31.19% of them were from Nigeria. The remaining respondents were drawn from Kenya (13.21%), South Africa (10.24%), and Malawi (7.09%). Also, 27.75% of the respondents were between ages 31 and 40 years, while 27.17% of them were within the age range of 41 to 50 years. Most (66.92%) of the respondents who participated in the study were males; females constituted 33.08% of the study population. The results further show that 35.36% of the respondents had master's degrees, 31.18% had doctorates (Ph.D. degrees), and 26.05% had bachelor's degrees/HNDs.

Table 4.1: Demographics of Agricultural Extension Professionals

1. Representation of Each Country's Extension System (n=635)		
Country	*Frequency*	*Percent*
Nigeria	198	31.19
Malawi	45	7.09
South Africa	65	10.24
Uganda	243	38.27
Kenya	84	13.21
Total	**635**	**100.00**
2. Age (In Years) (n=519)		
Category (In Years)	*Frequency*	*Percent*
21-30	68	13.10
31-40	144	27.75
41-50	141	27.17
51-60	130	25.05
above 60	36	6.94
Total	**519**	**100.00**

3. Gender (n=523)		
Category	Frequency	Percent
Male	350	66.92
Female	173	33.08
Total	**523**	**100.00**
4. Education (n=526)		
Category	Frequency	Percent
Bachelor's degree/HND	137	26.05
Master's degree	186	35.36
Doctoral (Ph.D.) degree	164	31.18
Other	39	7.41
Total	**526**	**100.00**

4.1.2 Institutional Characteristics

The results in Table 4.2 reveal that the majority (81.96%) of the extension professionals were familiar with the undergraduate agricultural extension curriculum. Also, the majority (83.83%) of the respondents indicated that they had deep knowledge of the undergraduate extension curriculum of only one university; 13.66% of them had deep knowledge of the undergraduate extension curriculum of two to three universities, and only 2.51% of them had deep knowledge of the undergraduate extension curriculum of four or more universities. The results further show that a greater proportion (39.62%) of the respondents were public- sector extension professionals; 36.76% of them were private -sector and NGO extension professionals. University extension staff constituted 23.62% of the study population. Furthermore, 29.92% of the respondents had extension profession/agriculture- related field experience of 20 years and above, 19.31% of them had 0 to 5 years' experience, 19.11% had 11 to 15 years' experience, 18.92 % had 6 to 10 years, and 12.74% had 16 to 20 years.

Table 4.2: Institutional Characteristics of Agricultural Extension Professionals

1. Familiarity with Undergraduate Agricultural Extension Curriculum (n=654)		
Category	Frequency	Percent
Familiar	536	81.96
Unfamiliar	118	18.04
Total	**654**	**100.00**

2. Familiar With How Many Universities' UG Agriculture Extension Curriculum (n=637)		
Number of Universities	*Frequency*	*Percent*
1	534	83.83
2 -3	87	13.66
4 or more	**16**	**2.51**
Total	**637**	**100.00**
3. Current Position (n=525)		
Category	*Frequency*	*Percent*
University Extension Staff	124	23.62
Public- Sector Extension Professionals	208	39.62
Private- Sector Extension Professionals and Others	193	36.76
Total	**525**	**100.00**
4. Experience in Extension Profession / Agriculture- Related Fields (In Years) (n=518)		
Category	*Frequency*	*Percent*
0-5	100	19.31
6-10	98	18.92
11-15	99	19.11
16-20	66	12.74
above 20	155	29.92
Total	**518**	**100.00**

4.1.3Process Skills and Core Competencies

4.1.3.1 Program Planning Skills and Competencies

The respondents perceived that all six program planning skills and competencies were important and moderately covered in the UG extension curriculum. Also, the mean scores of all six program planning skills and competencies were higher than the corresponding mean scores of the extent of coverage of these skills and competencies in the undergraduate extension curriculum. There were also significant differences (p = 0.00) between the importance of all six program planning skills and competencies and their coverage in the UG extension curriculum (Table 4.3).

Table 4.3: Program Planning Skills and Competencies (n=437)

Extension professionals should be:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Familiar with the vision, mission, and goals of national /state (subnational) extension service and agricultural development strategies, programs, and policies.	4.63 (0.67)	3.45 (1.00)	1.19	23.06 (0.00)
Able to conduct needs assessment and engage stakeholders to prioritize local needs.	4.68 (0.61)	3.43 (1.03)	1.25	23.46 (0.00)
Able to conduct baseline or benchmark studies.	4.51 (0.73)	3.31 (1.06)	1.20	21.32 (0.00)
Able to mobilize resources/ funds to address priority needs.	4.28 (0.92)	2.83 (1.11)	1.45	23.01 (0.00)
Able to engage local stakeholders (e.g., NGOs, cooperatives, local agro-dealers) in extension program planning.	4.63 (0.65)	3.28 (1.12)	1.35	23.38 (0.00)
Familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).	4.38 (0.80)	3.01 (1.14)	1.37	22.36 (0.00)
Index	4.52 (0.52)	3.22 (0.87)	1.31	28.66 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.2 Program Implementation Skills and Competencies

Table 4.4 reveals that the respondents rated all nine program implementation skills and competencies as important. They also indicated that these skills were moderately covered in the undergraduate extension curriculum. However, there were significant differences (p = 0.00) between the importance of all nine program implementation skills and competencies and the extent of their coverage in the UG extension curriculum.

Table 4.4: Program Implementation Skills and Competencies (n=434)

Extension professionals should be:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Coordinate local extension programs and activities.	4.70 (0.62)	3.50 (1.03)	1.20	22.47 (0.00)
Demonstrate teamwork skills to achieve extension results.	4.71 (0.54)	3.59 (1.00)	1.11	22.36 (0.00)
Able to form farmers' groups and support them.	4.69 (0.59)	3.51 (1.11)	1.18	20.96 (0.00)
Engage local stakeholders (e.g., NGOs, self- help groups, cooperatives) in implementing extension programs.	4.61 (0.65)	3.33 (1.08)	1.28	22.27 (0.00)
Demonstrate negotiation skills to reach consensus and resolve conflicts.	4.53 (0.73)	3.14 (1.16)	1.39	22.88 (0.00)
Follow participatory decision making in extension work.	4.67 (0.60)	3.56 (1.06)	1.11	20.53 (0.00)
Delegate responsibilities to staff as needed.	4.36 (0.79)	3.40 (1.09)	0.96	16.98 (0.00)
Be able to engage minority groups (e.g., female farmers and youth development groups) in extension work.	4.60 (0.64)	3.41 (1.09)	1.19	21.40 (0.00)
Integrate private or public-private partnerships in extension service provision.	4.54 (0.73)	3.14 (1.17)	1.40	22.45 (0.00)
Index	4.61 (0.46)	3.39 (0.88)	1.22	27.25 (0.00)

* *Scale for Importance: 1 = Not important, 2 =Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.3 Communication Skills and Competencies

The respondents indicated that all eight communication skills and competencies were important and moderately covered in the UG extension curriculum (Table 4.5). The table further reveals a significant difference (p = 0.00) between the importance of all eight communication skills and competencies and the extent of coverage in the UG extension curriculum.

Table 4.5: Communication Skills and Competencies (n=429)

Extension professionals should be able to:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Select appropriate communication methods.	4.77 (0.53)	3.90 (0.95)	0.87	18.60 (0.00)
Establish communication with different stakeholders.	4.69 (0.58)	3.63 (1.00)	1.06	20.96 (0.00)
Respect local culture while communicating with clients.	4.76 (0.52)	3.84 (1.00)	0.91	19.04 (0.00)
Prepare required progress reports.	4.70 (0.56)	3.57 (1.08)	1.14	21.37 (0.00)
Share success stories and lessons learned with stakeholders through various media.	4.62 (0.58)	3.32 (1.13)	1.30	22.79 (0.00)
Use extension methods (e.g., individual, group, and mass contact methods) to disseminate information about extension activities and programs.	4.80 (0.50)	3.95 (0.92)	0.84	18.87 (0.00)
Demonstrate good listening skills and listen to all clients and stakeholders.	4.75 (0.55)	3.72 (1.03)	1.03	20.04 (0.00)
Demonstrate good public speaking and presentation skills.	4.75 (0.54)	3.73 (1.03)	1.02	19.89 (0.00)
Index	4.73 (0.40)	3.71 (0.80)	1.02	26.34 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.4 ICTs Skills and Competencies

As indicated by the respondents, the 11 ICTs skills and competencies were rated as important. Also, all but "ICT tools to enhance collaboration and partnerships" and "ICT tools for collecting data, monitoring, and evaluation of extension programs" were rated as moderately covered in the UG extension curriculum. These variables were minimally covered in the UG extension curriculum. Table 4.6 further shows that there is a significant difference (p = 0.00) between the importance of all 11 ICTs skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.6: ICTs Skills and Competencies (n=424)

Extension professionals should be able to:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics.	4.64 (0.63)	3.52 (1.14)	1.13	19.70 (0.00)
Data entry and analysis software such as Excel, SPSS etc.	4.59 (0.65)	3.25 (1.21)	1.34	22.32 (0.00)
Microsoft Power Point for making presentations.	4.70 (0.61)	3.55 (1.16)	1.14	19.69 (0.00)
Audiovisual aids such as charts, graphs, and puppet show for teaching and learning.	4.67 (0.58)	3.50 (1.09)	1.17	21.09 (0.00)
Mass media such as FM radio stations and television channels for communication.	4.56 (0.66)	3.10 (1.20)	1.46	23.06 (0.00)
Computers (email, Internet) for communication.	4.64 (0.64)	3.47 (1.16)	1.18	19.72 (0.00)
Mobile phone services (e.g., texting, SMS service) for communication.	4.64 (0.63)	3.47 (1.21)	1.18	19.74 (0.00)
Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication.	4.50 (0.77)	3.21 (1.24)	1.29	20.42 (0.00)
ICT tools to improve access to information, knowledge, technologies, and other innovations.	4.66 (0.58)	3.12 (1.12)	1.54	26.05 (0.00)

ICT tools to enhance collaboration and partnerships.	4.59 (0.64)	2.98 (1.17)	1.61	25.80 (0.00)
ICT tools for collecting data, monitoring, and evaluation of extension programs.	4.66 (0.56)	2.96 (1.19)	1.69	26.89 (0.00)
Index	4.62 (0.46)	3.29 (0.92)	1.34	28.26 (0.00)

* *Scale for Importance: 1 = Not important, 2 =Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.5 Program Monitoring and Evaluation Skills and Competencies

Table 4.7 reveals that the respondents rated all 11 program monitoring and evaluation skills and competencies as important for extension work. Also, the entire program monitoring skills and competencies but "conduct online surveys for monitoring and evaluation of extension programs" were considered as moderately covered in the UG extension curriculum. The aforementioned skill was minimally covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of program monitoring and evaluation skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.7: Program Monitoring and Evaluation Skills and Competencies (n=418)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Understand theories and principles of monitoring and evaluation.	4.61 (0.64)	3.53 (1.01)	1.08	20.23 (0.00)
Conduct monitoring and evaluation of extension programs.	4.70 (0.57)	3.43 (1.03)	1.26	23.43 (0.00)
Develop data collection instruments -- interview schedules / questionnaires- for monitoring and evaluation of extension programs.	4.68 (0.62)	3.61 (1.05)	1.07	19.15 (0.00)
Conduct online surveys for monitoring and evaluation of extension programs.	4.44 (0.77)	2.90 (1.22)	1.54	23.00 (0.00)
Apply qualitative tools and techniques (e.g., focus group discussion, case study etc.) to collect evaluation data.	4.66 (0.61)	3.53 (1.07)	1.13	20.20 (0.00)

Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data.	4.62 (0.62)	3.58 (1.05)	1.04	19.25 (0.00)
Analyze data (qualitative and quantitative).	4.66 (0.62)	3.47 (1.07)	1.19	21.03 (0.00)
Interpret data (qualitative and quantitative).	4.69 (0.58)	3.51 (1.05)	1.18	21.60 (0.00)
Write evaluation report.	4.70 (0.57)	3.43 (1.08)	1.26	22.26 (0.00)
Share evaluation reports within their organizations and with stakeholders.	4.65 (0.64)	3.22 (1.16)	1.43	23.08 (0.00)
Apply the evaluation findings in replicating/scaling-up of extension programs.	4.65 (0.61)	3.09 (1.15)	1.56	25.13 (0.00)
Index	4.64 (0.49)	3.39 (0.89)	1.25	26.44 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.6 Personal and Professional Development Skills and Competencies

The respondents considered all five personal and professional skills and competencies as essential to the extension profession (Table 4.8). They also indicated that these skills and competencies were moderately covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of all five personal and professional skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.8: Personal and Professional Development Skills and Competencies (n=415)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Apply principles of good governance (e.g., clients' participation, accountability, and transparency) in extension work.	4.62 (0.61)	3.30 (1.12)	1.32	22.09 (0.00)
Show commitment to career advancement (participate in lifelong learning, in-service training, professional development events, and conferences).	4.63 (0.61)	3.27 (1.13)	1.36	22.49 (0.00)

Apply professional ethics in extension work -- i.e., promote research-based recommendations or technology.	4.72 (0.53)	3.53 (1.09)	1.19	20.60 (0.00)
Follow organizational policies and directives for professional development.	4.61 (0.62)	3.35 (1.07)	1.27	22.57 (0.00)
Demonstrate honesty and a positive attitude toward extension work.	4.80 (0.48)	3.59 (1.08)	1.20	21.84 (0.00)
Index	4.68 (0.45)	3.41 (0.94)	1.27	25.44 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.7 Diversity and Gender Skills and Competencies

Table 4.9 shows that all the seven diversity and gender skills and competencies were considered to be important for an extension worker. The respondents further indicated that each of the diversity and gender skills and competencies were moderately covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of all seven diversity and gender skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.9: Diversity and Gender Skills and Competencies (n=409)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Understand that diversity exists within and among clients and stakeholders.	4.65 (0.60)	3.59 (1.03)	1.07	20.45 (0.00)
Identify the needs of small-scale farmers.	4.79 (0.46)	3.77 (0.96)	1.02	20.69 (0.00)
Identify the needs of minority groups.	4.71 (0.57)	3.49 (1.06)	1.22	22.70 (0.00)
Develop extension programs to benefit women farmers.	4.68 (0.54)	3.48 (1.05)	1.20	21.60 (0.00)
Develop extension programs to benefit youth.	4.70 (0.54)	3.41 (1.05)	1.29	23.16 (0.00)

Engage marginalized and vulnerable groups in extension programs (e.g., disabled, resource- poor farmers).	4.70 (0.55)	3.23 (1.13)	1.47	25.12 (0.00)
Do teamwork with diverse staffs.	4.71 (0.56)	3.48 (1.06)	1.23	22.94 (0.00)
Index	4.72 (0.42)	3.49 (0.89)	1.22	26.76 (0.00)

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4.1.3.8 Marketing, Brokering, and Value Chain Development Skills and Competencies

The respondents indicated that all six marketing, brokering, and value chain development skills and competencies were important, as shown the Table 4.10. Furthermore, the respondents considered all the marketing, brokering, and value chain development skills and competencies to be moderately covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of all six marketing, brokering, and value chain development skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.10: Marketing, Brokering, and Value Chain Development Skills and Competencies (n=411)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Have basic knowledge of agribusiness development.	4.64 (0.63)	3.37 (1.03)	1.27	22.12 (0.00)
Apply brokering / advisory skills in agribusiness development.	4.50 (0.71)	3.07 (1.12)	1.44	23.35 (0.00)
Have knowledge on different agricultural markets and linkages.	4.66 (0.59)	3.19 (1.06)	1.46	24.91 (0.00)
Demonstrate knowledge of value chain logistics and input-output linkages in the value chain.	4.65 (0.61)	3.15 (1.11)	1.50	24.80 (0.00)
Facilitate entrepreneurship development among extension clientele.	4.66 (0.58)	3.21 (1.06)	1.45	24.79 (0.00)

Be able to link farmers/ producers' organizations/cooperatives/ agribusiness companies with market.	4.71 (0.55)	3.15 (1.11)	1.57	26.34 (0.00)
Index	4.64 (0.50)	3.19 (0.96)	1.45	27.60 (0.00)

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4.1.3.9 Extension Soft Skills and Competencies

The respondents considered all 17 extension soft skills and competencies to be important. They also indicated that the UG extension curriculum covers these skills and competencies moderately. Table 4.11 reveals that there are significant differences (p = 0.00) between the importance of all 17 extension soft skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.11: Extension Soft Skills and Competencies (n=399)

Extension professionals should possess other soft skills such as:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Critical thinking	4.76 (0.51)	3.31 (1.12)	1.45	24.76 (0.00)
Problem solving	4.79 (0.49)	3.48 (1.02)	1.31	24.65 (0.00)
Time management	4.78 (0.51)	3.51 (1.09)	1.28	22.77 (0.00)
Stress management	4.65 (0.61)	3.11 (1.15)	1.55	24.91 (0.00)
Leadership	4.76 (0.52)	3.61 (0.98)	1.15	23.14 (0.00)
Teamwork	4.79 (0.45)	3.58 (1.00)	1.21	24.05 (0.00)
Flexibility	4.68 (0.57)	3.39 (1.08)	1.29	23.37 (0.00)
Self-motivation	4.70 (0.54)	3.42 (1.12)	1.28	22.39 (0.00)
Interpersonal skills	4.73 (0.49)	3.52 (1.05)	1.22	23.03 (0.00)
Positive work attitude	4.77 (0.47)	3.46 (1.10)	1.31	23.63 (0.00)
Collaboration	4.71 (0.54)	3.46 (1.06)	1.25	23.61 (0.00)
Conflict management	4.68 (0.54)	3.40 (1.08)	1.28	23.57 (0.00)

Group formation and development	4.72 (0.52)	3.65 (1.05)	1.07	19.81 (0.00)
Negotiation skills	4.62 (0.60)	3.25 (1.13)	1.37	23.75 (0.00)
Networking skills	4.67 (0.57)	3.34 (1.13)	1.34	22.89 (0.00)
Facilitation skills	4.74 (0.50)	3.47 (1.08)	1.27	23.40 (0.00)
Creativity / Innovativeness	4.79 (0.44)	3.41 (1.08)	1.38	25.18 (0.00)
Index	4.74 (0.39)	3.44 (0.92)	1.30	27.54 (0.00)

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4.1.3.10 Nutrition Skills and Competencies

Table 4.12 shows that the respondents rated all six nutrition skills and competencies as important for the extension worker. They also indicated that the various skills and competencies were moderately covered except "have basic knowledge about food labeling (e.g., organic foods)" and "able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity)", which they said were minimally covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of all six nutrition skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.12: Nutrition Skills and Competencies (n=401)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms, etc).	4.42 (0.74)	3.14 (1.11)	1.28	20.38 (0.00)
Understand life-cycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breast-feeding mothers, elderly).	4.37 (0.77)	3.02 (1.15)	1.35	20.59 (0.00)

Able to advise families on what crops and livestock to be produced to ensure balanced diets.	4.56 (0.71)	3.30 (1.13)	1.26	20.79 (0.00)
Advise families to improve gender relations for increased agricultural production and nutrition.	4.52 (0.68)	3.22 (1.13)	1.30	21.91 (0.00)
Demonstrate postharvest handling technologies that conserve nutrients and assure food safety (e.g., food storage, freezing fruits and vegetables, making pickles, jams, jellies).	4.59 (0.65)	3.31 (1.09)	1.28	22.90 (0.00)
Have basic knowledge about food labeling (e.g., organic foods).	4.37 (0.82)	2.90 (1.18)	1.47	22.72 (0.00)
Able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity).	4.40 (0.82)	2.87 (1.20)	1.53	23.06 (0.00)
Index	4.46 (0.60)	3.11 (0.97)	1.36	25.84 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.3.11 Technical Subject Matter Expertise Skills and Competencies

The 10 technical subject matter expertise skills and competencies listed were regarded as important for extension professionals in carrying out their work (Table 4.13). Also, the respondents considered the various skills as moderately covered in the UG extension curriculum. There are significant differences (p = 0.00) between the importance of all 10 technical subject matter expertise skills and competencies and their extent of coverage in the UG extension curriculum.

Table 4.13: Technical Subject Matter Expertise Skills and Competencies (n=397)

Extension professionals should:	*How important is this skill or competency for an extension worker?**	*How well does the undergraduate extension curriculum cover this skill or competency?***	*Mean difference*	*t-value (2-tailed sig)*
	Mean (SD)	*Mean (SD)*		
Demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/ fishery/horticulture, etc.).	4.82 (0.46)	3.91 (0.94)	0.92	19.36 (0.00)

Understand adult learning principles and hold practical skills required to teach improved farming practices.	4.76 (0.49)	3.84 (0.92)	0.92	19.25 (0.00)
Understand the new technology being promoted -- i.e., what it is, why, and how it works.	4.77 (0.49)	3.61 (0.99)	1.16	21.91 (0.00)
Facilitate farmers' access to inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.)	4.72 (0.54)	3.44 (1.05)	1.29	23.56 (0.00)
Be able to educate community members about different types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.).	4.70 (0.58)	3.42 (1.09)	1.28	22.57 (0.00)
Be able to educate community members about climate change and climate- smart agriculture.	4.72 (0.56)	3.47 (1.05)	1.25	21.95 (0.00)
Refer to and make use of publications-- journals, research reports, etc.	4.57 (0.66)	3.36 (1.07)	1.22	21.10 (0.00)
Generate knowledge or produce research reports / journal publications.	4.54 (0.70)	3.37 (1.08)	1.17	19.54 (0.00)
Able to harness, document, validate, and integrate local / indigenous knowledge.	4.59 (0.70)	3.30 (1.12)	1.29	21.45 (0.00)
Understand social system under which farming takes place (e.g., rural sociology knowledge).	4.72 (0.55)	3.68 (1.03)	1.05	20.19 (0.00)
Index	4.70 (0.43)	3.53 (0.81)	1.16	26.87 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.4 Additional Process Skills or Competencies that Extension Professionals Need

The additional process skills or competencies that extension professionals need as indicated by the respondents are summarised in Box 4.1. Some of these skills are application of extension methods and techniques, policy interpretation and implementation, linking universities to the industry, partnership development, and legal competence in agricultural extension work.

Box 4.1: Additional Process Skills or Competencies that Extension Professionals Need

1. Application of extension methods and techniques.
2. Policy interpretation and implementation.
3. Linking universities to the industry.
4. Partnership development.
5. Legal competence in agricultural extension work.
6. Able to understand political economy of agriculture.
7. Able to organize themed conferences.
8. Ability to promote digital contents.
9. Application of gender analysis tools, gender- responsive project designing, planning, and budgeting.
10. Able to conduct gender-based value chain analysis and development.
11. Public finance management skills.
12. Equity-based resource allocation and resource management skills.
13. Safe handling of agricultural chemicals.
14. Automation, precision farming, and GIS.
15. Indigenous technical knowledge.

4.1.5 Age Differences in Perception of Process Skills and Competencies

Table 4.14 reveals that the respondents in all the age categories considered the 11 process skills and competencies to be important. However, there were significant differences in the perception of the importance of diversity and gender skills and competencies ($p = 0.03$) and nutrition skills and competencies ($p = 0.05$) across respondents in the various age categories. Also, respondents between ages 21 and 30 years indicated that, while other process skills and competencies were moderately covered, communication skills and competencies were very well covered in the UG extension curriculum. The respondents within the remaining age categories also considered all the process skills and competencies to be moderately covered in the UG extension curriculum, except those within ages 51 to 60 years, who indicated that marketing, brokering, and value chain development as well as nutrition skills and competencies were minimally covered in the UG extension curriculum. Similarly, those above 60 years indicated that nutrition skills and competencies were minimally covered in the UG extension curriculum. There are significant differences in the respondents' perception of the extent of coverage of program implementation ($p = 0.01$), communication ($p = 0.01$), information and communication technologies (ICTs), personal and professional development ($p = 0.00$), diversity and gender ($p = 0.00$), marketing, brokering, and value chain development ($p = 0.00$), extension soft skills ($p = 0.00$), nutrition ($p = 0.00$), and technical subject matter expertise ($p = 0.00$) skills and competencies across the age categories.

4.1.6 Gender Differences in Perception of Process Skills and Competencies

Table 4.15 shows that the male and female respondents considered all 11 process skills and competencies as important for extension professionals in carrying out their work. Also, there are no significant differences in their responses, which show that they equally believe that all the process skills and competencies are important. Male respondents indicated that process skills and competencies were well covered in the UG extension curriculum. Similarly, the female respondents considered all the process skills and competencies to be moderately covered in the UG extension curriculum except nutrition skills and competencies, which they perceived was minimally covered. There were no significant differences in the perceptions of males and females on the extent of coverage of the 11 process skills and competencies in the UG extension curriculum.

4.1.7 Education-related Differences in Perception of Process Skills and Competencies

The respondents in the various education categories (bachelor's/HND, master's, Ph.D., and other degrees) indicated that all 11 process skills and competencies were essential for extension work. There was no significant difference in their perception of the importance of these process skills and competencies. Also, all respondents in the various education categories indicated that these process skills and competencies were moderately covered in the UG extension curriculum except for those with doctoral degrees, who indicated that marketing, brokering, and value chain development and nutrition skills and competencies were minimally covered in the UG extension curriculum. There were significant difference in the respondents' perception of the extent of coverage of program planning ($p = 0.01$), ICTs ($p = 0.01$), program implementation ($p = 0.02$), communication ($p = 0.03$), diversity and gender ($p = 0.01$), marketing, brokering and value chain development ($p = 0.00$), nutrition ($p = 0.00$), and extension soft skills ($p = 0.00$) across the education categories (Table 4.16).

4.1.8 Current Position-related Differences in Perception of Process Skills and Competencies

Table 4.17 shows that respondents in all of the extension professionals categories (university extension staff, public sector, and private sector/others) considered the 11 process skills and competencies as important for extension workers. However, there were significant differences in their perception of the importance of ICTs ($p = 0.05$) and program monitoring and evaluation ($p = 0.02$) skills and competencies. Also, the respondents in the various position categories indicated that all 11 process skills and competencies were moderately covered in the UG extension curriculum except for university extension staff, who considered nutrition skills and competencies as minimally covered in the UG extension curriculum. Furthermore, there were significant differences in the respondents' perception of the extent of coverage of program planning ($p = 0.00$), program implementation ($p = 0.00$), communication ($p = 0.05$), personal and professional development (0.02), marketing, brokering, and value chain development ($p = 0.01$), and nutrition ($p = 0.00$) skills and competencies across the position categories of the respondents.

4.1.9 Experience-related Differences in Perception of Process Skills and Competencies

Table 4.18 shows that the various categories of respondents based on their years of working experience considered all 11 process skills and competencies as important for an extension worker. There were no significant differences in their perception of the importance of these process skills and competencies. Also, the respondents in the various categories indicated that all the process skills and competencies were moderately covered in the UG extension curriculum except those with above 20 years of working experience, who indicated that marketing, brokering, and value development as well as nutrition skills and competencies were minimally covered in the UG extension curriculum. There were significant differences in the respondents' perception of the extent of coverage of personal and professional development (p = 0.01), diversity and gender (p = 0.00), marketing, brokering, and value chain development (p = 0.00), extension soft skills (p = 0.00), nutrition (p = 0.00), and technical subject matter expertise (p = 0.04) skills and competencies across the working experience categories.

Table 4.14: Perceptions of Process Skills and Competencies by Age

Process Skills and Competencies	*How important is this skill or competency for an extension worker?* Mean (SD)*							*How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)*						
	Age in Years							*Age in Years*						
	Total	*21-30*	*31-40*	*41-50*	*51-60*	*Above 60*	*F (sig)*	*Total*	*21-30*	*31-40*	*41-50*	*51-60*	*Above 60*	*F (sig)*
Program Planning	4.48 (0.58) n=490	4.45 (0.77) n=63	4.40 (0.59) n=134	4.56 (0.52) n=134	4.51 (0.52) n=126	4.41 (0.57) n=33	1.40 (0.23)	3.24 (0.86) n=378	3.54 (0.85) n=53	3.24 (0.86) n=106	3.13 (0.84) n=97	3.16 (0.87) n=94	3.24 (0.89) n=28	2.24 (0.06)
Program Implementation	4.57 (0.49) n=502	4.66 (0.35) n=64	4.53 (0.57) n=136	4.58 (0.51) n=140	4.56 (0.42) n=129	4.57 (0.55) n=33	0.84 (0.50)	3.42 (0.87) n=394	3.76 (0.81) n=56	3.47 (0.86) n=110	3.24 (0.89) n=102	3.38 (0.86) n=97	3.36 (0.87) n=29	3.49 (0.01)
Communication	4.70 (0.42) n=505	4.78 (0.29) n=63	4.62 (0.54) n=140	4.72 (0.36) n=140	4.72 (0.37) n=128	4.69 (0.42) n=34	2.04 (0.09)	3.73 (0.79) n=393	4.09 (0.64) n=54	3.69 (0.85) n=114	3.61 (0.75) n=102	3.70 (0.81) n=96	3.67 (0.74) n=27	3.59 (0.01)
ICTs	4.54 (0.52) n=503	4.65 (0.41) n=63	4.52 (0.56) n=138	4.58 (0.48) n=139	4.50 (0.51) n=129	4.45 (0.66) n=34	1.40 (0.23)	3.31 (0.92) n=395	3.72 (0.90) n=55	3.25 (0.94) n=111	3.28 (0.86) n=103	3.18 (0.95) n=97	3.31 (0.88) n=29	3.44 (0.01)
Program Monitoring and Evaluation	4.58 (0.53) n=504	4.63 (0.51) n=63	4.54 (0.59) n=141	4.62 (0.46) n=139	4.58 (0.52) n=127	4.49 (0.60) n=34	0.80 (0.52)	3.40 (0.90) n=398	3.73 (0.92) n=54	3.33 (0.96) n=115	3.29 (0.80) n=104	3.44 (0.84) n=96	3.36 (1.02) n =29	2.48 (0.04)
Personal and Professional Development	4.65 (0.48) n=510	4.65 (0.43) n=65	4.62 (0.56) n=141	4.69 (0.43) n=141	4.68 (0.43) n=128	4.58 (0.57) n=35	0.69 (0.60)	3.41 (0.95) n=402	3.85 (0.89) n=56	3.38 (0.98) n=115	3.28 (0.94) n=105	3.39 (0.87) n=97	3.30 (1.04) n=29	3.81 (0.00)
Diversity and Gender	4.69 (0.45) n=508	4.73 (0.43) n=64	4.65 (0.50) n=142	4.78 (0.33) n=140	4.65 (0.47) n=127	4.56 (0.54) n=35	2.66 (0.03)	3.49 (0.89) n=401	3.93 (0.76) n=56	3.52 (0.85) n=116	3.40 (0.87) n=104	3.36 (0.95) n=96	3.28 (0.86) n=29	4.82 (0.00)
Marketing, Brokering, and Value Chain Development	4.58 (0.53) n=511	4.58 (0.51) n=65	4.57 (0.62) n=142	4.61 (0.47) n=141	4.57 (0.52) n=129	4.49 (0.52) n=34	0.39 (0.81)	3.20 (0.95) n=402	3.75 (0.94) n=56	3.19 (0.94) n=116	3.15 (0.92) n=105	2.99 (0.92) n=96	3.02 (0.86) n=29	6.53 (0.00)
Extension Soft Skills	4.70 (0.40) n=501	4.76 (0.31) n=64	4.67 (0.46) n=138	4.73 (0.36) n=139	4.68 (0.41) n=126	4.60 (0.40) n=34	1.31 (0.27)	3.44 (0.92) n=396	3.93 (0.82) n=56	3.55 (0.96) n=113	3.31 (0.88) n=103	3.28 (0.85) n=95	3.04 (0.89) n=29	7.36 (0.00)

Nutrition	4.38 (0.66) n=502	4.50 (0.54) n=63	4.37 (0.71) n=140	4.46 (0.55) n=138	4.33 (0.72) n=127	4.14 (0.75) n=34	2.40 (0.05)		3.11 (0.97) n=396	3.63 (0.99) n=55	3.16 (0.95) n=114	3.05 (0.93) n=104	2.91 (0.89) n=96	2.82 (1.06) n=27	6.11 (0.00)
Technical Subject Matter Expertise	4.63 (0.49) n=503	4.73 (0.38) n=63	4.61 (0.56) n=137	4.66 (0.44) n=140	4.60 (0.52) n=128	4.54 (0.48) n=35	1.16 (0.33)		3.54 (0.82) n=393	3.90 (0.83) n=52	3.59 (0.82) n=111	3.45 (0.83) n=105	3.38 (0.71) n=96	3.53 (0.90) n=29	3.95 (0.00)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table 4.15: Perceptions of Process Skills and Competencies by Gender

Process Skills and Competencies	*How important is this skill or competency for an extension worker?* Mean (SD)*					*How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)*			
	Total	*Male*	*Female*	*t-value (2-tailed sig)*		*Total*	*Male*	*Female*	*t-value (2-tailed sig)*
Program Planning	4.47 (0.58) n=493	4.46 (0.57) n=326	4.49 (0.60) n=167	-0.57 (0.57)		3.23 (0.87) n=382	3.26 (0.87) n=268	3.17 (0.85) n=114	0.92 (0.36)
Program Implementation	4.57 (0.49) n=505	4.56 (0.49) n=337	4.58 (0.49) n=168	-0.52 (0.60)		3.42 (0.87) n=398	3.45 (0.88) n=280	3.34 (0.85) n=118	1.12 (0.26)
Communication	4.69 (0.42) n=508	4.68 (0.44) n=337	4.72 (0.38) n=171	-1.00 (0.32)		3.72 (0.79) n=397	3.74 (0.81) n=278	3.66 (0.75) n=119	0.89 (0.37)
ICTs	4.54 (0.51) n=506	4.56 (0.51) n=339	4.51 (0.52) n=167	0.91 (0.36)		3.31 (0.93) n=398	3.32 (0.94) n=279	3.27 (0.89) n=119	0.45 (0.65)
Program Monitoring and Evaluation	4.57 (0.53) n=508	4.58 (0.52) n=338	4.56 (0.55) n=170	0.44 (0.66)		3.40 (0.90) n=402	3.45 (0.89) n=281	3.26 (0.90) n=121	1.96 (0.05)
Personal and Professional Development	4.65 (0.48) n=514	4.64 (0.50) n=343	4.67 (0.44) n=171	-0.70 (0.48)		3.41 (0.95) n=406	3.43 (0.95) n=284	3.37 (0.94) n=122	0.52 (0.60)
Diversity and Gender	4.69 (0.45) n=512	4.66 (0.47) n=342	4.74 (0.39) n=170	-1.72 (0.09)		3.49 (0.89) n=405	3.53 (0.89) n=284	3.40 (0.89) n=121	1.37 (0.17)
Marketing, Brokering, and Value Chain Development	4.58 (0.53) n=515	4.59 (0.52) n=345	4.55 (0.56) n=170	0.85 (0.40)		3.19 (0.95) n=406	3.22 (0.97) n=286	3.11 (0.91) n=120	1.08 (0.28)
Extension Soft Skills	4.70 (0.40) n=504	4.70 (0.41) n=336	4.69 (0.39) n=168	0.33 (0.74)		3.43 (0.92) n=399	3.45 (0.92) n=281	3.40 (0.91) n=118	0.43 (0.66)
Nutrition	4.38 (0.66) n=505	4.38 (0.65) n=337	4.36 (0.70) n=168	0.35 (0.73)		3.10 (0.97) n=400	3.15 (0.99) n=281	2.98 (0.93) n=119	1.60 (0.11)
Technical Subject Matter Expertise	4.63 (0.49) n=506	4.63 (0.48) n=339	4.62 (0.51) n=167	0.16 (0.87)		3.53 (0.82) n=396	3.56 (0.82) n=277	3.47 (0.80) n=119	0.91 (0.36)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table 4.16: Perceptions of Process Skills and Competencies by Education

Process Skills and Competencies	How important is this skill or competency for an extension worker?* Mean (SD)						How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)					
	Total	Bachelor's degree/ HND	Master's degree	Doctoral (Ph.D.) degree	Others	F (sig)	Total	Bachelor's degree/ HND	Master's degree	Doctoral (Ph.D.) degree	Others	F (sig)
Program Planning	4.48 (0.58) n=496	4.43 (0.63) n=123	4.46 (0.50) n=179	4.55 (0.53) n=160	4.40 (0.90) n=34	1.24 (0.29)	3.23 (0.87) n=384	3.46 (0.87) n=81	3.28 (0.83) n=140	3.07 (0.87) n=136	3.06 (0.89) n=27	3.99 (0.01)
Program Implementation	4.57 (0.49) n=508	4.58 (0.40) n=132	4.51 (0.54) n=182	4.62 (0.46) n=160	4.54 (0.62) n=34	1.47 (0.22)	3.42 (0.87) n=400	3.61 (0.85) n=89	3.44 (0.84) n=144	3.24 (0.90) n=137	3.54 (0.86) n=30	3.51 (0.02)
Communication	4.69 (0.42) n=511	4.70 (0.34) n=132	4.65 (0.48) n=182	4.74 (0.41) n=162	4.67 (0.43) n=35	1.12 (0.34)	3.72 (0.79) n=399	3.86 (0.76) n=90	3.68 (0.77) n=143	3.62 (0.81) n=137	3.98 (0.78) n=29	2.93 (0.03)
ICTs	4.55 (0.51) n=509	4.54 (0.45) n=132	4.49 (0.57) n=182	4.62 (0.47) n=160	4.50 (0.56) n=35	2.08 (0.10)	3.31 (0.93) n=400	3.49 (0.92) n=90	3.29 (0.91) n=144	3.14 (0.93) n=136	3.58 (0.94) n=30	3.61 (0.01)
Program Monitoring and Evaluation	4.58 (0.53) n=511	4.55 (0.53) n=134	4.56 (0.54) n=181	4.63 (0.51) n=161	4.55 (0.48) n=35	0.89 (0.45)	3.40 (0.89) n=404	3.49 (0.94) n=92	3.39 (0.84) n=144	3.37 (0.90) n=140	3.24 (0.99) n=28	0.63 (0.60)
Personal and Professional Development	4.65 (0.48) n=517	4.66 (0.48) n=135	4.62 (0.48) n=185	4.67 (0.50) n=162	4.69 (0.35) n=35	0.44 (0.73)	3.41 (0.94) n=408	3.51 (0.98) n=91	3.39 (0.96) n=147	3.33 (0.92) n=142	3.61 (0.81) n=28	1.12 (0.34)
Diversity and Gender	4.69 (0.45) n=515	4.69 (0.40) n=134	4.68 (0.48) n=182	4.69 (0.46) n=163	4.72 (0.42) n=36	0.09 (0.97)	3.49 (0.88) n=407	3.58 (0.86) n=92	3.53 (0.83) n=145	3.32 (0.94) n=142	3.85 (0.85) n=28	3.72 (0.01)
Marketing, Brokering, and Value Chain Development	4.58 (0.53) n=518	4.58 (0.50) n=134	4.57 (0.56) n=184	4.58 (0.53) n=163	4.64 (0.47) n=37	0.21 (0.89)	3.19 (0.95) n=408	3.52 (0.93) n=92	3.18 (0.94) n=146	2.95 (0.92) n=141	3.35 (0.88) n=29	7.36 (0.00)
Extension Soft Skills	4.70 (0.40) n=507	4.67 (0.41) n=131	4.68 (0.40) n=180	4.73 (0.41) n=160	4.76 (0.33) n=36	0.84 (0.47)	3.44 (0.92) n=401	3.74 (0.88) n=90	3.44 (0.93) n=145	3.17 (0.88) n=137	3.73 (0.82) n=29	8.72 (0.00)
Nutrition	4.38 (0.66) n=508	4.39 (0.65) n=131	4.37 (0.68) n=181	4.35 (0.66) n=159	4.47 (0.61) n=37	0.38 (0.77)	3.10 (0.97) n=402	3.34 (0.92) n=89	3.19 (0.95) n=144	2.81 (0.96) n=139	3.34 (0.98) n=30	7.32 (0.00)
Technical Subject Matter Expertise	4.63 (0.49) n=509	4.61 (0.50) n=129	4.61 (0.47) n=182	4.67 (0.51) n=162	4.59 (0.50) n=36	0.60 (0.61)	3.53 (0.82) n=398	3.62 (0.85) n=88	3.61 (0.73) n=144	3.40 (0.84) n=140	3.56 (0.99) n=26	1.95 (0.12)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table 4.17: Perceptions of Process Skills and Competencies by Current Position

Process Skills and Competencies	How important is this skill or competency for an extension worker?* Mean (SD)					How well does the undergraduate extension curriculum cover this skill or competency? ** Mean (SD)				
	Total	University Extension Staff	Public-Sector Extension Professionals	Private-Sector Extension Professionals and Others	F(sig)	Total	University Extension Staff	Public-Sector Extension Professionals	Private-Sector Extension Professionals and Others	F(sig)
Program Planning	4.47 (0.58) n=495	4.50 (0.62) n=120	4.52 (0.51) n=194	4.40 (0.62) n=181	2.09 (0.12)	3.23 (0.87) n=382	3.00 (0.89) n=106	3.27 (0.87) n=139	3.36 (0.82) n=137	5.62 (0.00)
Program Implementation	4.57 (0.49) n=507	4.62 (0.50) n=121	4.53 (0.52) n=203	4.57 (0.44) n=183	1.35 (0.26)	3.42 (0.88) n=398	3.20 (0.92) n=109	3.42 (0.86) n=149	3.58 (0.82) n=140	5.90 (0.00)
Communication	4.69 (0.42) n=510	4.72 (0.45) n=124	4.69 (0.42) n=202	4.68 (0.40) n=184	0.30 (0.74)	3.72 (0.79) n=397	3.57 (0.81) n=112	3.75 (0.80) n=147	3.81 (0.75) n=138	3.03 (0.05)
ICTs	4.54 (0.51) n=508	4.64 (0.49) n=121	4.52 (0.53) n=202	4.50 (0.51) n=185	3.07 (0.05)	3.31 (0.93) n=398	3.22 (0.91) n=111	3.29 (0.93) n=147	3.41 (0.93) n=140	1.32 (0.27)
Program Monitoring and Evaluation	4.58 (0.53) n=510	4.68 (0.52) n=122	4.58 (0.52) n=203	4.51 (0.54) n=185	3.92 (0.02)	3.40 (0.89) n=402	3.42 (0.85) n=113	3.36 (0.88) n=147	3.42 (0.94) n=142	0.23 (0.79)
Personal and Professional Development	4.65 (0.48) n=516	4.67 (0.53) n=122	4.65 (0.47) n=206	4.64 (0.45) n=188	0.22 (0.80)	3.42 (0.94) n=406	3.29 (0.94) n=114	3.34 (0.96) n=149	3.59 (0.91) n=143	3.97 (0.02)
Diversity and Gender	4.69 (0.45) n=514	4.73 (0.46) n=123	4.66 (0.46) n=205	4.69 (0.43) n=186	1.01 (0.37)	3.49 (0.89) n=405	3.46 (0.88) n=114	3.44 (0.90) n=150	3.57 (0.88) n=141	0.92 (0.40)
Marketing, Brokering, and Value Chain Development	4.58 (0.53) n=517	4.59 (0.57) n=123	4.59 (0.52) n=206	4.55 (0.51) n=188	0.38 (0.69)	3.19 (0.95) n=406	3.02 (1.00) n=113	3.16 (0.93) n=150	3.37 (0.90) n=143	4.56 (0.01)
Extension Soft Skills	4.70 (0.40) n=506	4.74 (0.45) n=120	4.68 (0.39) n=203	4.69 (0.38) n=183	0.88 (0.41)	3.44 (0.92) n=399	3.35 (0.89) n=110	3.40 (0.90) n=149	3.56 (0.95) n=140	1.82 (0.16)
Nutrition	4.38 (0.66) n=507	4.39 (0.67) n=119	4.37 (0.67) n=204	4.38 (0.65) n=184	0.05 (0.95)	3.10 (0.97) n=400	2.82 (1.03) n=110	3.18 (0.91) n=148	3.24 (0.95) n=142	6.56 (0.00)
Technical Subject Matter Expertise	4.63 (0.49) n=508	4.70 (0.46) n=121	4.61 (0.53) n=204	4.59 (0.46) n=183	2.15 (0.12)	3.54 (0.82) n=396	3.48 (0.87) n=112	3.50 (0.77) n=148	3.63 (0.81) n=136	1.29 (0.28)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table 4.18: Perceptions of Process Skills and Competencies by Experience

Process Skills and Competencies	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Experience in Years							Experience in Years						
	Total	0-5	6 to 10	11 to 15	16-20	Above 20	F (sig)	Total	0-5	6 to 10	11 to 15	16-20	Above 20	F (sig)
Program Planning	4.47 (0.58) n=490	4.43 (0.63) n=96	4.42 (0.75) n=89	4.44 (0.53) n=95	4.56 (0.46) n=64	4.52 (0.52) n=146	0.97 (0.42)	3.22 (0.86) n=380	3.35 (0.83) n=77	3.30 (0.83) n=69	3.20 (0.89) n=71	3.21 (0.86) n=50	3.10 (0.89) n=113	1.10 (0.36)
Program Implementation	4.57 (0.49) n=502	4.54 (0.52) n=98	4.54 (0.63) n=89	4.58 (0.41) n=98	4.54 (0.40) n=66	4.60 (0.46) n=151	0.46 (0.76)	3.42 (0.87) n=396	3.54 (0.87) n=80	3.47 (0.87) n=74	3.43 (0.91) n=75	3.40 (0.84) n=50	3.29 (0.87) n=117	1.08 (0.36)
Communication	4.69 (0.42) n=505	4.69 (0.35) n=98	4.64 (0.59) n=92	4.66 (0.43) n=99	4.73 (0.32) n=66	4.73 (0.37) n=150	0.99 (0.41)	3.72 (0.78) n=396	3.93 (0.72) n=80	3.67 (0.85) n=76	3.63 (0.83) n=75	3.72 (0.64) n=51	3.67 (0.80) n=114	1.90 (0.11)
ICTs	4.54 (0.52) n=503	4.52 (0.52) n=96	4.50 (0.62) n=93	4.58 (0.45) n=98	4.59 (0.42) n=65	4.54 (0.53) n=151	0.47 (0.76)	3.30 (0.93) n=396	3.49 (1.00) n=79	3.43 (0.84) n=73	3.21 (0.91) n=75	3.26 (0.85) n=51	3.18 (0.95) n=118	1.91 (0.11)
Program Monitoring and Evaluation	4.57 (0.53) n=505	4.54 (0.57) n=96	4.51 (0.62) n=96	4.61 (0.41) n=99	4.67 (0.45) n=65	4.58 (0.55) n=149	1.17 (0.32)	3.39 (0.89) n=401	3.60 (0.91) n=79	3.45 (0.91) n=78	3.28 (0.90) n=75	3.35 (0.72) n=53	3.31 (0.92) n=116	1.70 (0.15)
Personal and Professional Development	4.65 (0.48) n=511	4.62 (0.48) n=99	4.60 (0.62) n=95	4.71 (0.37) n=99	4.67 (0.44) n=66	4.65 (0.46) n=152	0.80 (0.53)	3.41 (0.94) n=404	3.66 (0.95) n=81	3.58 (0.88) n=76	3.29 (1.00) n=76	3.26 (0.88) n=53	3.28 (0.93) n=118	3.27 (0.01)
Diversity and Gender	4.69 (0.45) n =509	4.69 (0.41) n=97	4.65 (0.56) n=96	4.76 (0.34) n=99	4.71 (0.38) n=66	4.65 (0.48) n=151	1.18 (0.32)	3.49 (0.88) n=403	3.89 (0.76) n=80	3.58 (0.79) n=78	3.40 (0.92) n=75	3.34 (0.82) n=53	3.29 (0.94) n=117	6.69 (0.00)
Marketing, Brokering and Value Chain Development	4.58 (0.53) n=512	4.52 (0.58) n=98	4.52 (0.67) n=97	4.67 (0.38) n=99	4.63 (0.44) n=66	4.57 (0.51) n=152	1.58 (0.18)	3.19 (0.95) n=404	3.57 (0.96) n=79	3.24 (0.92) n=79	3.21 (0.94) n=76	3.03 (0.87) n=53	2.96 (0.92) n=117	5.58 (0.00)
Extension Soft Skills	4.69 (0.40) n=501	4.75 (0.33) n=96	4.67 (0.46) n=95	4.70 (0.39) n=96	4.69 (0.41) n=65	4.67 (0.41) n=149	0.61 (0.65)	3.44 (0.91) n=397	3.87 (0.91) n=79	3.56 (0.89) n=79	3.37 (0.84) n=71	3.26 (0.86) n=52	3.19 (0.89) n=116	8.14 (0.00)
Nutrition	4.38 (0.67) n=502	4.41 (0.65) n=97	4.32 (0.73) n=94	4.41 (0.55) n=97	4.43 (0.62) n=65	4.34 (0.72) n=149	0.53 (0.72)	3.11 (0.97) n=399	3.37 (0.99) n=79	3.33 (0.85) n=78	3.05 (1.04) n=75	3.00 (0.92) n=53	2.86 (0.95) n=114	4.67 (0.00)
Technical Subject Matter Expertise	4.63 (0.49) n=504	4.65 (0.46) n=96	4.55 (0.61) n=95	4.66 (0.39) n=97	4.71 (0.43) n=65	4.60 (0.51) n=151	1.33 (0.26)	3.53 (0.81) n=394	3.72 (0.81) n=76	3.66 (0.80) n=76	3.49 (0.77) n=75	3.45 (0.81) n=52	3.39 (0.84) n=115	2.47 (0.04)

* *Scale for Importance: 1 = Not important, 2 = Somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

4.1.10 Strategies to Make Agricultural Extension Curriculum Robust and Practical

The respondents indicated that interventions such as making UG extension curriculum/ pedagogy more ICT-oriented (74.23%), exposing students to market opportunities, linking farmers with service providers, developing entrepreneurship (71.08%), offering training- of-trainer workshops for extension faculty members (53.88%), including various soft skills in the extension curriculum (51.32%), and developing cutting-edge and practical teaching learning resources – extension textbooks, practical handbooks, training manual, etc, (49.49%) -- are essential to make the UG agricultural extension curriculum robust and practical. The majority of the respondents indicated that the other strategies already exist.

Table 4.19: Strategies to Make Agricultural Extension Curriculum Robust and Practical

Intervention	*n*	*Already exists F(%)*	*Does not exist, but essential to have F(%)*	*Does not exist, but fine to leave out F(%)*
1. Provide practical and contemporary skills (e.g., through mentored internship or attachment to a progressive farmer in a crop season).	503	259 (51.49%)	233 (46.32%)	11 (2.19%)
2. Include various soft skills in extension curriculum.	493	226 (45.84%)	253 (51.32%)	14 (2.84%)
3. Include business management concepts and practices in extension curriculum.	485	245 (50.52%)	225 (46.39%)	15 (3.09%)
4. Expose students to market opportunities, link farmers with service providers, and develop entrepreneurship.	491	127 (25.87%)	349 (71.08%)	15 (3.05%)
5. Grooming students with broad-based, general agricultural courses (e.g., crop and animal production, postharvest, marketing, and joint ventures) along with extension training.	490	335 (68.37%)	141 (28.78%)	14 (2.86%)
6. Incorporate youth development, gender issues, urban/suburban agriculture, and climate change concepts in extension curriculum.	490	239 (48.78%)	232 (47.35%)	19 (3.88%)
7. Recruit highly qualified extension staff or faculty.	485	327 (67.42%)	137 (28.25%)	21 (4.33%)
8. Include research and data analytical skills.	484	284 (58.68%)	185 (38.22%)	15 (3.10%)
9. Offer training- of- trainer workshops for extension faculty members.	490	215 (43.88%)	264 (53.88%)	11 (2.24%)

10. Develop cutting-edge and practical teaching learning resources – extension textbooks, practical handbooks, training manual, etc.	489	231 (47.24%)	242 (49.49%)	16 (3.27%)
11. Undergraduate extension curriculum/ pedagogy should be more ICT- oriented	485	92 (18.97%)	360 (74.23%)	33 (6.80%)

4.1.11 Appropriate Ways to Acquire the Process Skills and Competencies

The respondents rated all the underlisted ways to acquire the process skills and competencies as appropriate (Table 4.20). Their responses were eventually categorized on the basis of age group, gender, education, current position, and experience in extension profession/agriculture-related fields. On the basis of age, there were significant differences in the respondents' perceptions of strategies such as requiring internship at various work environments during undergraduate programs ($p = 0.00$), basic induction training ($p = 0.00$), in-service training ($p = 0.00$), and opportunities to attend trainings, seminars, workshops, webinars, etc. ($p = 0.01$). However, there were no significant differences between the male and female respondents' perceptions of the various strategies to acquire process skills and competencies. On the basis of education categories, there were significant differences in perceptions of strategies such as requiring internship at various work environments during undergraduate programs ($p = 0.03$) and basic induction training ($p = 0.00$). Similarly, the responses of respondents in different employment positions varied significantly in their perception of strategies such as requiring internship at various work environments during undergraduate programs ($p = 0.00$) and basic induction training ($p = 0.00$). On the basis of years of working experience in extension profession/agriculture- related field, there were significant differences in perception among the categories of respondents on strategies such as requiring internship at various work environments during undergraduate programs ($p = 0.00$), basic induction training ($p = 0.00$), and providing opportunities to attend trainings, seminars, workshops, webinars, etc. ($p = 0.00$).

Table 4.20: Appropriate Ways to Acquire the Process Skills and Competencies

Variable		*Through preservice training by revising or updating the curriculum.*	*Requiring internship at various work environments during undergraduate programs.*	*Through bsic induction training*	*Through in-service training*	*Providing opportunities to attend trainings, seminars, workshops, webinars, etc.*
By Age (Years)						
Total	n	510	500	498	498	503
	Mean (SD)	3.10 (0.62)	3.25 (0.59)	3.18 (0.63)	3.18 (0.63)	3.34 (0.61)
21-30	n	67	63	63	62	64
	Mean (SD)	3.15 (0.72)	3.54 (0.59)	3.44 (0.64)	3.39 (0.61)	3.55 (0.69)
31-40	n	141	137	138	138	138
	Mean (SD)	3.10 (0.66)	3.23 (0.61)	3.17 (0.62)	3.27 (0.60)	3.39 (0.61)

41-50	n	138	138	137	137	138
	Mean (SD)	3.12 (0.61)	3.25 (0.58)	3.18 (0.63)	3.17 (0.58)	3.35 (0.61)
51-60	n	130	128	127	127	129
	Mean (SD)	3.08 (0.53)	3.15 (0.53)	3.09 (0.60)	3.03 (0.67)	3.23 (0.59)
above 60	n	34	34	33	34	34
	Mean (SD)	3.03 (0.58)	3.12 (0.64)	3.03 (0.68)	3.09 (0.67)	3.18 (0.39)
F (sig)		0.28 (0.89)	5.37 (0.00)	3.92 (0.00)	4.49 (0.00)	3.76 (0.01)
By Gender						
Total	n	513	503	501	502	506
	Mean (SD)	3.10 (0.62)	3.25 (0.59)	3.18 (0.63)	3.19 (0.62)	3.35 (0.61)
Male	n	344	336	336	336	338
	Mean (SD)	3.13 (0.63)	3.25 (0.60)	3.20 (0.62)	3.17 (0.62)	3.35 (0.61)
Female	n	169	167	165	166	168
	Mean (SD)	3.05 (0.59)	3.24 (0.57)	3.13 (0.65)	3.22 (0.63)	3.36 (0.60)
Mean difference		0.08	0.01	0.07	-0.04	-0.02
t-value (2-tailed sig)		1.44 (0.15)	0.19 (0.85)	1.16 (0.25)	-0.75 (0.45)	-0.29 (0.77)
By Education						
Total	n	516	506	504	505	509
	Mean (SD)	3.10 (0.62)	3.25 (0.59)	3.18 (0.63)	3.18 (0.62)	3.35 (0.61)
Bachelor's degree/HND	n	135	131	131	132	131
	Mean (SD)	3.12 (0.69)	3.34 (0.67)	3.34 (0.65)	3.26 (0.69)	3.44 (0.65)
Master's degree	n	185	183	182	180	184
	Mean (SD)	3.10 (0.62)	3.21 (0.58)	3.15 (0.56)	3.16 (0.61)	3.33 (0.56)
Doctoral (Ph.D.) degree	n	159	156	155	156	157
	Mean (SD)	3.10 (0.58)	3.17 (0.54)	3.04 (0.62)	3.12 (0.59)	3.32 (0.58)
Others	n	37	36	36	37	37
	Mean (SD)	3.05 (0.52)	3.39 (0.55)	3.33 (0.76)	3.30 (0.52)	3.27 (0.84)
F (sig)		0.11 (0.95)	3.03 (0.03)	6.61 (0.00)	1.62 (0.18)	1.29 (0.28)
By Current Position						
Total	n	515	505	503	504	508
	Mean (SD)	3.10 (0.62)	3.24 (0.59)	3.18 (0.63)	3.18 (0.62)	3.35 (0.61)
University Extension Staff	n	121	120	119	120	120
	Mean (SD)	3.10 (0.60)	3.13 (0.56)	3.03 (0.64)	3.15 (0.63)	3.35 (0.56)

Public- Sector Extension Professionals	n	206	202	200	201	204
	Mean (SD)	3.12 (0.63)	3.21 (0.60)	3.16 (0.63)	3.20 (0.60)	3.35 (0.61)
Private- Sector Extension Professionals and Others	n	188	183	184	183	184
	Mean (SD)	3.09 (0.61)	3.36 (0.58)	3.29 (0.61)	3.19 (0.65)	3.34 (0.64)
F (sig)		0.17 (0.84)	5.79 (0.00)	6.41 (0.00)	0.25 (0.78)	0.04 (0.96)
By Experience in Extension Profession / Agriculture- Related Fields (In Years)						
Total	n	509	500	499	501	504
	Mean (SD)	3.10 (0.62)	3.24 (0.59)	3.18 (0.63)	3.18 (0.62)	3.35 (0.61)
0-5	n	100	98	98	97	98
	Mean (SD)	3.13 (0.65)	3.42 (0.62)	3.37 (0.63)	3.32 (0.64)	3.44 (0.67)
6-10	n	94	91	92	93	93
	Mean (SD)	3.06 (0.68)	3.22 (0.57)	3.18 (0.69)	3.23 (0.64)	3.30 (0.70)
11-15	n	98	97	97	96	98
	Mean (SD)	3.00 (0.66)	3.20 (0.66)	3.14 (0.61)	3.18 (0.62)	3.49 (0.52)
16-20	n	64	63	63	64	64
	Mean (SD)	3.25 (0.56)	3.25 (0.47)	3.06 (0.64)	3.13 (0.58)	3.33 (0.59)
above 20	n	153	151	149	151	151
	Mean (SD)	3.11 (0.54)	3.16 (0.57)	3.12 (0.58)	3.09 (0.61)	3.23 (0.53)
	F (sig)	1.74 (0.14)	3.15 (0.01)	3.14 (0.01)	2.23 (0.07)	3.47 (0.01)

4.1.12 Additional Appropriate Ways to Acquire Process Skills and Competencies

Additional appropriate ways to acquire process skills or competencies as indicated by the respondents are summarized in Box 4.2: staff and student exchange programs, field schools in farmers' fields, experiential practical learning, peer-to-peer learning sessions, and robust e-learning.

Box 4.2: Additional Appropriate Ways to Acquire Process Skills or Competencies

1. Staff and student exchange programs.
2. Field schools in farmers' fields.
3. Experiential practical learning.
4. Peer-to-peer learning sessions.
5. Robust e-learning

4.1.13 Major Barriers to Effective Implementation of the Extension Curriculum

Table 4.21 shows the major barriers to the effective implementation of the extension worker training curriculum delineated by age groups, gender, education, current position, and work experience. A greater proportion (27.77%) within the age range of 41 to 50 years noted that budget to support practical learning experiences (e.g., field visits and demonstrations) was a major barrier to the implementation of the UG extension curriculum. A greater percent (28.21%) of those within the ages of 31 to 40 years noted that the major barrier to the effective implementation of the UG extension curriculum was classroom and demonstration farms or facilities. Both male (68.10%) and female (39.10%) respondents noted that budget to support practical learning experience s(e.g., field visits and demonstrations) was the major barrier to the effective implementation of the UG extension curriculum. The respondents in the various education categories (doctoral [32.26%], master's [35.27%], and bachelor's [25.16%] degrees) identified budget to support practical learning experiences (e.g., field visits and demonstrations) as the major barrier to the effective implementation of the UG extension curriculum. Similarly, respondents across the categories of current position and work experience noted that budget to support practical learning experiences (e.g., field visits and demonstrations) was the major barrier to the effective implementation of the UG extension curriculum. Table 4.22 summarizes the responses of the respondents on the major barriers to effective implementation of an improved UG extension curriculum. As earlier observed, the majority (86.50%) of the respondents pointed out that budget to support practical learning experiences (e.g., field visits and demonstrations) was a major barrier. This was followed by classroom and demonstration farms or facilities (59.51%), student motivation to study extension and interest in practical extension work (55.78%), and development of an effective extension curriculum (54.10%), among others.

Table 4.21: Major Barriers to Effective Implementation of Extension Curriculum (n=536)

(a) Age

Barriers	*Category*					
	Total	*21-30 Yrs*	*31-40 Yrs*	*41-50 Yrs*	*51-60 Yrs*	*> 60 Yrs*
Budget to support practical learning experiences (e.g., field visits /demonstrations)	461	57 (12.36%)	127 (27.55%)	128 (27.77%)	117 (25.38%)	32 (6.94%)
Classroom and demonstration farms or facilities	319	35 (10.97%)	90 (28.21%)	89 (27.90%)	81 (25.39%)	24 (7.52%)
Student motivation to study extension and interest in practical extension work	298	30 (10.07%)	85 (28.52%)	77 (25.84%)	79 (26.51%)	27 (9.06%)
Development of an effective extension curriculum	290	34 (11.72%)	78 (26.90%)	83 (28.62%)	74 (25.52%)	21

(7.24%)	267	22 (8.24%)	70 (26.22%)	70 (26.22%)	81 (30.34%)	24 (8.99%)
Teacher motivation to teach required process skills and competencies	267	22 (8.24%)	70 (26.22%)	70 (26.22%)	81 (30.34%)	24 (8.99%)
Quality textbooks and/or manuals	198	18 (9.09%)	46 (23.23%)	58 (29.29%)	57 (28.79%)	19 (9.60%)
Quality faculty to teach extension courses	185	20 (10.81%)	44 (23.78%)	53 (28.65%)	47 (25.41%)	21 (11.35%)
Time constraints	158	21 (13.29%)	36 (22.78%)	48 (30.38%)	41 (25.95%)	12 (7.59%)
Accreditation of curriculum	126	14 (11.11%)	37 (29.37%)	32 (25.40%)	31 (24.60%)	12 (9.52%)

(b) Gender

Barriers	*Category*		
	Total	*Male*	*Female*
Budget to support practical learning experience (e.g., fiekd visits and demonstrations)	464	316 (68.10%)	148 (31.90%)
Classroom and demonstration farms or facilities	319	221 (69.28%)	98 (30.72%)
Student motivation to study extension and interest in practical extension work	299	207 (69.23%)	92 (30.77%)
Development of an effective extension curriculum	290	203 (70.00%)	87 (30.00%)
Teacher motivation to teach required process skills and competencies	269	197 (73.23%)	72 (26.77%)
Quality textbooks and/or manuals	197	143 (72.59%)	54 (27.41%)
Quality faculty to teach extension courses	185	142 (76.76%)	43 (23.24%)
Time constraints	159	112 (70.44%)	47 (29.56%)
Accreditation of curriculum	127	99 (77.95%)	28 (22.05%)

(c) Education

Barriers	*Category*				
	Total	*Bachelor's degree/HND*	*Master's degree*	*Doctoral (Ph.D.) degree*	*Other*
Budget to support practical learning experience (e.g., field visits and demonstrations)	465	117 (25.16%)	164 (35.27%)	150 (32.26%)	34 (7.31%)
Classroom and demonstration farms or facilities	322	67 (20.81%)	116 (36.02%)	115 (35.71%)	24 (7.45%)

Student motivation to study extension and interest in practical extension work	301	72 (23.92%)	108 (35.88%)	100 (33.22%)	21 (6.98%)
Development of an effective extension curriculum	292	76 (26.03%)	99 (33.90%)	98 (33.56%)	19 (6.51%)
Teacher motivation to teach required process skills and competencies	271	51 (18.82%)	96 (35.42%)	104 (38.38%)	20 (7.38%)
Quality textbooks and/or manuals	199	40 (20.10%)	65 (32.66%)	82 (41.21%)	12 (6.03%)
Quality faculty to teach extension courses	186	37 (19.89%)	66 (35.48%)	70 (37.63%)	13 (6.99%)
Time constraints	160	41 (25.63%)	52 (32.50%)	56 (35.00%)	11 (6.88%)
Accreditation of curriculum	126	32 (25.40%)	44 (34.92%)	40 (31.75%)	10 (7.94%)

(d) Current Position

Barriers	*Category*			
	Total	*University Extension Staff*	*Public- Sector Extension Professionals*	*Private- Sector Extension Professionals and Others*
Budget to support practical learning experience (e.g., field visits and demonstrations)	464	111 (23.92%)	178 (38.36%)	175 (37.72%)
Classroom and demonstration farms or facilities	321	91 (28.35%)	130 (40.50%)	100 (31.15%)
Student motivation to study extension and interest in practical extension work	299	77 (25.75%)	116 (38.80%)	106 (35.45%)
Development of an effective extension curriculum	291	76 (26.12%)	116 (39.86%)	99 (34.02%)
Teacher motivation to teach required process skills and competencies	270	81 (30.00%)	97 (35.93%)	92 (34.07%)
Quality textbooks and/or manuals	197	62 (31.47%)	69 (35.03%)	66 (33.50%)
Quality faculty to teach extension courses	185	52 (28.11%)	63 (34.05%)	70 (37.84%)
Time constraints	159	53 (33.33%)	48 (30.19%)	58 (36.48%)
Accreditation of curriculum	126	31 (24.60%)	43 (34.13%)	52 (41.27%)

(e) Work Experience (years)

Barriers	Category (Years)					
	Total	0-5	6-10	11-15	16-20	above 20
Budget to support practical learning experience (e.g., field visits and demonstrations)	459	89 (19.39%)	85 (18.52%)	87 (18.95%)	61 (13.29%)	137 (29.85%)
Classroom and demonstration farms or facilities	318	58 (18.24%)	58 (18.24%)	57 (17.92%)	45 (14.15%)	100 (31.45%)
Student motivation to study extension and interest in practical extension work	296	53 (17.91%)	52 (17.57%)	56 (18.92%)	43 (14.53%)	92 (31.08%)
Development of an effective extension curriculum	289	53 (18.34%)	53 (18.34%)	54 (18.69%)	38 (13.15%)	91 (31.49%)
Teacher motivation to teach required process skills and competencies	268	39 (14.55%)	45 (16.79%)	54 (20.15%)	37 (13.81%)	93 (34.70%)
Quality textbooks and/or manuals	199	32 (16.08%)	28 (14.07%)	40 (20.10%)	30 (15.08%)	69 (34.67%)
Quality faculty to teach extension courses	184	37 (20.11%)	25 (13.59%)	33 (17.93%)	27 (14.67%)	62 (33.70%)
Time constraints	157	33 (21.02%)	21 (13.38%)	32 (20.38%)	23 (14.65%)	48 (30.57%)
Accreditation of curriculum	125	27 (21.60%)	21 (16.80%)	23 (18.40%)	12 (9.60%)	42 (33.60%)

Table 4.22: Summary of Barriers to Effective Implementation of Extension Curriculum (n=536)

Barrier	Frequency	Percentage
Budget to support practical learning experience (e.g., field visits and demonstrations)	464	86.57
Classroom and demonstration farms or facilities	319	59.51
Student motivation to study extension and interest in practical extension work	299	55.78
Development of an effective extension curriculum	290	54.10
Teacher motivation to teach required process skills and competencies	269	50.19
Quality textbooks and/or manuals	197	36.75

Quality faculty to teach extension courses	185	34.51
Time constraints	159	29.67
Accreditation of curriculum	127	23.69

Note: *Research reports with quantitative and qualitative data on "Process Skills and Competency Gaps in UG Agricultural Extension Curriculum"' have been prepared separately for Nigeria, Malawi, South Africa, Uganda, and Kenya. The results of the online survey with quantitative data from these five countries are summarized and comparative tables with brief description are presented in Annexure 3.*

4.2 RESULTS – FOCUS GROUP DISCUSSIONS

The researchers categorized the extensive list of issues that emerged in FGDs into six broad categories:

i. Challenges of Agricultural extension service delivery.
ii. Recommendations to improve the agricultural extension systems.
iii. Critical job skills / core competencies required for agricultural extension workers.
iv. Skills / competency gaps in the UG extension curriculum.
v. Barriers to training UG extension students with the required skills.
vi. Recommendations for improvements /reforms of the UG extension curriculum

4.2.1 Challenges of Agricultural Extension Service Delivery

The FGDs in the five countries revealed the current underlying challenges in the agricultural extension system across Africa. All the statements that supported this theme were sorted and categorized under six broad subtopics (Table 4.23):

i. Capacity gaps of extension officers (EOs).
ii. Issues related to public extension systems.
iii. Lack of support to EOs.
iv. Issues related to information delivery by the EOs.
v. Issues related to farmers.
vi. Lack of trust in extension officers.

Table 4.23: Challenges of Extension Service Delivery

Challenges	*Kenya*	*Malawi*	*Nigeria*	*South Africa*	*Uganda*
i. Capacity gaps of extension officers					
Poor ICT literacy	Many	Many	Few	Few	Few
Lack of practical experience and hands-on experience	Many	Many	Many	Many	Many

Possess outdated information	Few	Many	Many	Few	Many
Lack of knowledge on marketing and business planning	Many	Many	Many	Few	Many
Poor knowledge of the economy	Few	Many	Few	Few	Few
ii. Issues related to public extension services					
Weak government extension system	Many	Many	Many	Many	Many
Less focus on extension in development projects	Few	None	None	None	Few
Agricultural projects do not address the local needs	Few	None	None	None	None
Not effective in dealing with emerging challenges of marketing and other risks such as climate change	None	Many	None	None	Few
Mismatch of policies implemented and what they do	Few	None	None	None	None
Inadequate funding for agricultural extension services	Many	Many	Few	Few	Many
Recruitment of unqualified staff to provide extension	Many	Many	Many	Many	Many
iii. Lack of support to EOs					
Mobility support to the extension officers	Many	Many	Many	Many	Many
Lack of resources to EOs	Many	Many	Many	Many	Many
Demotivated EOs	Many	Many	Many	Many	Many
iv. Lack of trust in EOs					
Poor perception by the public toward extension officers	Few	Many	Few	Many	Many
Doubts on the reports EOs produce	None	None	None	Few	None
v. Issues related to information delivery by EOs					
Inadequate number of field extension officers	Many	Many	Few	Few	Many
Inadequate number of extension programs	None	Few	Few	None	Few
Poor message harmonization feedback	Many	Many	Many	Many	Many
Uncoordinated efforts	Many	Many	None	None	None

Poor promotion of local technology	Few	Few	Few	Few	Few
Lack of local verification of technologies promoted	None	Many	None	None	None
Poor targeting (weak handling of diverse farmers)	Many	Many	Many	None	None
vi. Issues related to farmers					
Poor access to inputs by farmers	Few	Few	None	None	None
Inadequate number of visits by EOs	Few	Few	Many	Few	Few
Poor promotion on value addition by cooperatives	None	Few	None	None	None

Capacity gaps among EOs are a common problem across Africa. The focus group discussions revealed that extension officers lack ICT literacy and show remarkable ineptitude in using such skills. This fact was highlighted by many of the respondents in Kenya and Malawi and a few from Nigeria, South Africa, and Uganda. Experts from Malawi and Uganda noted that:

"Extension workers lack the skills to use such ICT platforms."

"Lack of capacity among extension workers to deliver extension messages through ICT."

"They are illiterate, they manage to handle these phones, they don't know the functions."

Development paradigms have hugely influenced agricultural extension in Africa. Technological advancements and new ways of thinking have influenced how farmers think about agricultural innovation. Further, the roles and attitudes of extension workers are evolving in response to changing agricultural systems in Africa. Therefore, the focus of agricultural extension is widening and becoming more comprehensive at the same time (Anderson and Feder, 2004). As a result of these improvements in extension and development models, the scope of extension practice has been expanded. As Davis et al. (2019) argued, agricultural extension models cannot possibly fit every occasion. Farmers, extension officers, and extension professionals have criticized these existing models as being ineffective and irrelevant at times. According to Tata and McNamara (2018), inadequate information technology resources, insufficient ICT infrastructure, rising costs, and electricity power problems have been highlighted as barriers to agricultural extension workers' adoption of ICTs.

The FGD participants had serious concerns about extension officers' lack of technical and practical knowledge, which was acknowledged by many of the respondents of all five countries. Experts from Nigeria and Uganda said:

"Extension agents give out poor quality information. Extension personnel do not have adequate information about livestock production. For example, in piggery and fish production, extension agents are not grounded in these areas."

"They don't have the knowledge, and if you talk to him about blended fertilizer of the quality standards that are required, he will be at a loss."

Farmers usually look to the extension officers as key informants or advisors who will provide them quality information and advice that will enable them to make vital farming decisions. Therefore, lack of technical and practical skills in the extensional professional poses a huge threat to farmers' perceptions of the trustworthiness of extension services in the future.

Apart from lacking technical and practical skills, EOs do not possess adequate knowledge on business planning, marketing, prevailing economic conditions, or market trends. This fact was acknowledged by many of the respondents in Kenya, Malawi, Nigeria, and Uganda, and a few from South Africa. Experts from Malawi and Uganda said the following, respectively:

> *"The reality is the extension workers that come from the university come with the technical knowledge, but they have been missing out some critical elements like the realistic elements we have just talked about in the markets."*

> *"Extension workers should have business skills. Who told them that they are not supposed to do business? That they should be linking farmers to businesspeople? They can access funds in the bank and start doing business themselves. They are supposed to be business-oriented."*

One serious challenge is that extension agents see their primary purpose as only ensuring access to subsidies or inputs; thus, the core educational component is missing (Camillone et al., 2020). Farmers need holistic advisory services from input gathering until they sell their final output in the market (Sasidhar and Suvedi, 2015). An expert from Uganda said:

> *"Farmers need holistic advisory services including production techniques, processing, marketing, and business planning. Farmers need information on pricing and customer needs, especially concerning the quality of the products."*

Issues related to public extension services include weak administration, failure to address local needs by the agricultural projects, ineffectiveness in dealing with emerging challenges of marketing and other risks such as climate change, mismatch of policies implemented and what they do, inadequate funding for agricultural extension services, and recruitment of unqualified staff to provide extension.

Many of the respondents from all five countries voiced concern about weak government extension systems. For instance, the current agricultural extension system in Malawi, called the Decentralized Agricultural Extension Services System (DAESS), is reported to be overly ambitious and expensive to run, and non-functional except where there are projects that support it (Chanza and Tchuwa, 2022).

A few respondents from Kenya and Uganda noted that most of the development projects have failed to address the local needs. An expert from Kenya noted that:

> *"Most projects did not put agricultural extension as a very important concept in food security."*

This resonates with the argument brought forward by Bridges and Woolcock (2017), who provided a plethora of interventions adopted in Malawi that were known to be "best practices"

elsewhere, yet they failed to fix underlying problems when they were employed in Malawi. This points out that most projects failed because they didn't address the real needs of the farmers.

Few respondents from Kenya brought up the point of mismatch of policies implemented and what they do, noting that government officials don't walk the talk. Recruitment of unqualified staff to provide extension is another challenge identified in all the five countries. Taye (2013) also highlighted the severe shortage of qualified manpower in sub-Saharan Africa. As a result, unqualified staff is recruited to ease the shortage of extension staff. These issues brought into light the severe institutional gaps within Africa.

A Kenyan expert said:

> *"At the national policy level, there is that issue or a bit of mismatch between the policies which are done at the national level and the ones which are being customized, so adopted at the county level."*
>
> *"That policy is on shelves in offices. There is a need for them to read policy because it is there, it emphasizes collaboration, it emphasizes on who is an extension person, and which approaches are really being favored in the field."*

Further, government-led extension is challenged by limited resources and operational funding. Most of the sub-Saharan African countries are regarded as poor (Taye, 2013). This leads to issues such as the government failing to provide the required services, infrastructure, resources, and incentives to the EOs to perform their duties. For instance, the Ministry of Agriculture lacks the resources to cover transport costs so that EOs can visit farmer groups and provide services in remote locations. An expert from Nigeria noted:

> *"Although the Agricultural Development Program (ADP) is unpopular to the political elites, they however established a bureaucratic structure in the ADPs. There are inadequate funds to provide extension services."*

On the other hand, the extension officers lack motivation and perform their duties poorly. One major precursor of this is the lack of government support to the EOs. Many of the respondents of all the five countries pointed out lack of mobility support and lack of resources to carry out the duties bestowed upon the EOs and subsequent demotivation of EOs.

An expert from Kenya said:

> *"The frontline extension workers are not well enthused as they are demotivated with issues like poor housing, poor mobility mostly using push bikes, lack of promotions--because I remember the first time, we joined the extension services we used to have the records, and then you choose a farmer or a farmer has come to the office, and you're supposed to go and visit them. You come prepared in the office only to realize the farmer is like seven kilometers one way, and there is no vehicle, no phone in the office, so you start wondering how do you go? That means if you must visit this farmer, you have to do 14 kilometers. You must go and come back, so that was a very bad experience for me, and I tend to imagine as the farmers say that they don't see the extension workers,*

those are some of the challenges that extension workers meet and they call it off, so I found it a challenge. You feel that you're not motivated as an extension worker."

The public and farmers have poor attitudes and little trust in the extension officers because of EOs' lack of accountability and poor attitudes. Many FGD participants observed that farmers did not place high value on extension advisory services (EASs), and so, for most farmers, EASs were not a priority. A study conducted in Uganda also revealed that farmers have a low level of trust and a poor perception of the extension services (Willy and Edson, 2016). Therefore, experts believed that it is important for extension staff members to demonstrate their reliability and commitment through fairness, credibility, and trustworthiness.

Issues related to extension program delivery include inadequate extension officers and extension programs, poor targeting, lack of promotion of local technology, and poor message delivery and feedback. Inadequate numbers of extension officers serving is a challenge identified in all the five countries. In Africa as a whole, the extension officer-to-farmer ratio averages 1:1000, well below the Food and Agriculture Organization (FAO) recommended ratio of 1:400 (Tata and McNamara, 2018). Thus, each extension officer must cover a large territory, ranging from 20 to 50 square kilometers, with large distances between farmer groups. This was viewed as sometimes ineffective for the dissemination of information and technology (Saliu et al., 2009). Inadequate numbers of extension programs were also identified as a challenge by few participants from Malawi, Nigeria, and Uganda. This could be due to inadequate extension staff to design and implement extension programs for the farming community. Poor message harmonization feedback was pointed out by many of participants of the five countries. An expert from Malawi noted:

"The issue of conflicting message from extension workers due to lack of message harmonization. For example, others will say when you harvest maize, burn the stalk to control fall army worms, yet others say mulch the stalk to conserve moisture."

Further, agricultural extension services must often reach a large and widely dispersed farming population characterized by diversity in opportunities, constraints, individual aspirations, and, consequently, information needs. A farmer from Malawi noted:

"Lack of proper targeting for different categories of farmers like the youth, elderly, women and urban farmers. Most organizations are biased towards rural farmers only when urban agriculture is currently trending."

These types of biased rationing and poor targeting often mean that the quantity and quality of advisory contacts are compromised, especially for the poorest farmers, women, and spatially remote households (Ngomane, 2006). In Nigeria, the government-dominated procurement system was criticized as narrowly targeting large-scale farming and being inefficient in quantity and timeliness of materials reaching farmers. Thus, while Nigeria's small agricultural budget has heavily leaned toward input provisioning and promotion, challenges in implementation have impeded its ability to benefit farmers (Oladele et al.,2004).

Many development analysts have repeatedly pronounced that the key cause of the poor performance of the public extension system is the ineffective incentive structure for the extension agents (Willy and Edson, 2016). The findings of the FGDs of this study also supported this argument. Across Africa, extension staff is faced with organizational challenges and poor transportation infrastructure, as well as limited access to resources (Willy and Edison, 2016; Phiri et al., 2012; McCole et al., 2014). Demotivated because of these challenges, extension staff would in turn fail to carry out their respective duties and responsibilities, resulting in poor performance of the public extension system.

Issues related to the farmers include poor access to farm inputs, inadequate visits by the EOs to the farms, and poor support by farmer cooperatives. An expert from Uganda complained that the inadequate visits are mainly due to the low ratio of extension staff to farmers and inadequate resources provided to extension staff.

> *"You know the challenge we have is the extension farmer ratio. It is very small because like in my instance, one extension staff needs to visit around 18,000 households, which would probably spend another 4 years without visiting the households. The other challenge is resources are inadequate. Some of the extension staff does not have motorcycles."*

The respondents from Malawi complained about the services provided by the cooperatives, especially on the support on value addition of the farm produce. An expert from Malawi said:

> *"The other issue is value addition by cooperatives. Trust me, the cooperatives I saw 10 years ago are no longer vibrant. They just start to add value and stop."*

Therefore, considerable efforts should be developed to improve the cooperatives in such a way that they address the needs of the farmers and the needs of the emerging new markets.

4.2.2 Recommendations to Improve Agricultural Extension Delivery

The FGDs attempted to explore recommendations to improve agricultural extension services in the five countries. The statements under the theme recommendations were classified into four categories (Table 4.24):

i. Human resource development and support.

ii. Ways to improve extension programs and delivery.

iii. Recommendations for the public extension systems.

iv. Recommendations for the universities.

Table 4.24: Recommendations for Improvement of Extension Services

Recommendations	Kenya	Malawi	Nigeria	South Africa	Uganda
i. Human resource development and support					
Provide incentives to EOs	*	*	*	*	*
Provide reliable logistic support	*	*	*	*	*

Provide the necessary working equipment to EOs	*	*	*	*	*
Provide reorientation programs for the EOs				*	
Provide professional trainings to EOs	*	*	*	*	*
Build ICT capacity among extension workers	*	*	*	*	*
Extension officers should have collaborations				*	*
ii. Improve extension programs and delivery					
Improve the quality of extension programs	*			*	
Properly target farmers with innovations and local verification of the technologies		*			
Incorporate urban farmers, who are resource-rich, in the commercialization drive		*			
EOs should build mechanisms to develop close connections with contact leaders				*	
Provide practical demonstrations to farmers on extension services		*			
Increase the number of extension workers in proportion to the number of farmers	*	*			
iii. Recommendations for the public extension systems					
Adopt the pluralistic approach	*	*			
Improve the regulatory aspect of extension	*			*	
Review the District Agricultural Extension and Services System programs	*	*			
Resuscitate farm systems research and extension			*		
Establish more research institutions at division and regional levels					*
Increase funding to new programs	*				
iv. Recommendations for the universities					
Closer collaboration between universities and training institutes and industry		*		*	
Include digital extension approaches in the extension curriculum	*	*	*	*	*
Include knowledge management in the curricula to address the current gap		*			
Increase the funding and support to the university training programs	*				

Agricultural extension is one of the programs that facilitate the access of farmers, value chain participants, and market actors to knowledge, and it is one channel that can possibly increase agricultural productivity. The primary role of extension is to improve farmer decision making and skills needed to apply agricultural innovations and thereby develop the agricultural sector. Therefore, improving the agricultural extension services will lead to improving the farmers' decision making.

Recommendations on human resource development and support made by the participants of all the five countries include motivating extension officers by providing incentives, logistic support, and other resources to the EOs, capacity building by providing training and reorientations, and improving their technical and practical skills and ICT literacy. Motivation of extension officers to serve farmers is crucial for knowledge transfer to farmers. Thus, the overall delivery of extension services at the farmer level is strengthened by recommendations that improve the extension officers' experience (Omulo and Kumeh, 2020). Therefore, it is important to provide incentives -- including compensation, housing, and a decent transport system – which will facilitate their extension activities. Suggestions from some professionals in Malawi and Nigeria, respectively, are presented below:

> *"Support provision of resources to extension staff on the ground (compensation, transport, housing and training)."*

> *"Equip extension workers with necessary working equipment such as computers, protective clothing, and motor bikes."*

Respondents of the FGDs also shared recommendations to improve extension delivery. Improving the quality of extension programs was one recommendation by the experts in Kenya and South Africa. Traditionally, the role of the extension officer has been fulfilled by face-to-face information delivery. This information delivery method has changed as agricultural sectors and economies have evolved and new types of agricultural information communication technologies have become available. In recent years, the agricultural industry has been experiencing increased use of ICTs around the world. This new change has affected extension services' efficiency and productivity of the agriculture sector (Oladele et al., 2004). Therefore, to harness the full potential of new ICTs and apply them in their extension delivery, extension officers need adequate trainings. A professional from South Africa suggested the following:

> *"Digital approaches to lighten the workload of Eos, e.g., Smart pen system -- should be adopted."*

Experts from Malawi pointed out the need for proper targeting of farmers with innovations and local verification of the technologies. Extension services often play crucial roles in both agricultural food production and income-generating purposes in Africa, but research on the impact of agricultural extension and its issues has been limited. The empirical findings of Lee et al. (2020) have implications for local governments and policymakers regarding a comprehensive and realistic strategy to increase investment in local-specific targeting of extension and advisory service delivery. Further, in the long run, agricultural extension policies and practices need to be

tailored to suit the real needs of farmers (Lee et al., 2020). South African professionals mentioned that EOs should build mechanisms to develop close connections with contact leaders of the farmers and thereby improve extension delivery. Previous studies have shown that interpersonal channels were generally found to be more available, accessible, and used by the farmers than the mass media to obtain information on improved farm practices (Okwu and Daudu,2011). Therefore, building close relationships with contact leaders would easily facilitate technology transfer to farmers. Professionals from Malawi recommended more practical demonstrations to farmers on extension services. Practical demonstrations are found to be more convincing than other methods of delivery. Therefore, it is advisable to incorporate practical demonstrations as extension deliverables. Professionals from Malawi and Kenya also suggested increasing the number of extension workers in proportion to the number of farmers as a recommendation to improve delivery. This could serve many farmers.

Malawi and Kenya have highlighted the importance of adopting a pluralistic approach (Mutimba, 2014). Many countries have pluralistic models that involve many different extension providers, but few countries like Malawi make a deliberate effort to tap into the potential synergies between these providers. Non-government organizations have provided complementary advisory services to public extension for decades. Private- sector entities have participated in advisory services in the process of expanding markets for their products. It's also worth noting strategic linkages with non-extension actors (NGOs, private-sector entities) that affect how farmers are treated through the system (Davis et al., 2010). The link between extension and research needs to be strengthened, so that farmers can obtain crucial information and support in a timely manner, and so research activities may be tailored to farmer requirements.

The following comments are from Malawi and South Africa, respectively:

> *"Pluralistic approach has helped many farmers' access extension advisory services. Other players in the extension sector-- e.g., private sector and NGOs -- have resources to be able to reach out to many farmers, supporting the effort of government."*

> *"Public extension services can often learn a lot from private extension services that are privately funded and in many cases with better resources to do their duty."*

The participants further recommended the need to develop, monitor, and review the regulatory aspects of extension services. They also emphasized the need to review the District Agricultural Extension and Services System programs and establish more research institutions at the division and regional levels.

Also, recommendations from South Africa and Malawi suggested that universities should collaborate more closely with training institutes. Revising the curriculum by incorporating digital extension approaches was recommended by FGD members from all the five countries.

> *"Respondents from Malawi suggested including knowledge management in the curricula to address the current gap."*

> *"A respondent from Kenya recommended increasing the funding and support to the university training program."*

Rivera and Schram (2022) mentioned that in almost every country of Africa, technical and financial assistance from the bilateral donors are being provided for strengthening training institutions or training in donor's institution. Yet financial constraints act as barriers in most of the universities.

4.2.3 Critical Job Skills/Core Competencies Required for Agricultural Extension Workers

Table 4.25 summarizes the respondents' feedback on the critical job skills / core competencies required by agricultural extension workers in Africa. The researchers categorized all the skills listed by the respondents into six broad categories that are considered critical:

i. Practical know-how.
ii. Technical knowledge.
iii. Communication skills.
iv. Innovativeness.
v. Managerial skills.
vi. Personal qualities.

Table 4.25: Critical Job Skills/Competencies

Practical know-how	*Technical knowledge*	*Communication skills*	*Managerial skills*	*Personal qualities*
• Practical technical skills • Research/ analytical skills • Skills in partnership mapping • ICT skills and digital literacy	• Agronomy • Animal production • Natural resource management • Disease management • Postharvest management • Production and processing • Home management skills • Farm business management • Product costing • Marketing • Financial management	• Networking • Negotiation • Persuasion • Facilitation • Interpersonal • Conflict resolution • Lobbying • Proposal writing • Soft skills • Gender relations • Group dynamics • Teamwork	• Planning • Organizing • Leadership • Monitoring • Budget and reporting • Program planning and evaluation • Documentation and knowledge management • Entrepreneurship • Innovativeness • Creativity • Critical thinking • Problem solving	• Social and emotional intelligence • Empathy • Integrity • Positive attitude • Respect for other cultures • Self-confidence • Self-directed learning • Professional ethics

The present customer-driven markets added the responsibility to agricultural agents to help farmers understand changing consumer demands. Further, privatization; a demand-driven, grass-roots, bottom-up approach; and decentralization of programs and services had resulted in EOs performing the functions of planning, implementing, and coordinating extension activities at the district, divisional, and local levels. This also increased the responsibilities of the extension officers. Thus, the expectations of extension service providers are no longer restricted to technical agricultural competencies but have expanded to the wider social and economic context of agriculture (Lopokoiyit et al., 2013). This requires different competencies among extension service providers. Competency is a "cluster of related knowledge, attitudes, abilities, behaviors, skills that affect a major part of one's job and the success of others" (Parry, 1998; Davis et al., 2004). Lindner et al. (2003) emphasized the fact that the most important agricultural and extension education competencies varied by country. The authors categorized competencies into knowledge, skills, and abilities, with knowledge comprising theories, principles, and practices related to agricultural development; skills relating to technology design and information technologies; and systems skills and abilities including communication abilities, time management, and problem solving (Lindner et al., 2003). Extension workers' skills can be divided into two categories: functional or technical abilities, and soft or process-oriented skills (Tata and McNamara, 2018).

All the respondents across the five countries acknowledged that EOs lack practical and technical knowledge. Today, every extension agent is expected to be an expert in at least one technical agriculture field and to be able to deliver excellent service. The extension agent must have the knowledge and skills to plan a farm physically, biologically, and economically, as well as the skills to adapt and transform the technical message to be applicable to the specific farm and farmer. Strengthening the extension officers' education system and delivering in-service training courses on topics requested by farmers are some of the critical points that will ensure that the system serves farmers effectively (Davis et al., 2010).

Further, harnessing the full potential of new information and communication technologies (ICTs) innovations to meet farmers' needs requires favorable government policies and investment in telecommunications infrastructure. Study results suggested that there are gaps in ICTs or digital literacy among the extension officers across Africa.

Results also revealed that respondents of all five countries consider communication skills to be critical. Communication is a key factor for interaction between extension officers and farmers. It serves as the vehicle through which extension takes place (Terblanche, 2008). The extension officer must be able and confident to convey information and ideas in a clear and concise manner appropriate to the audience to influence people to accomplish the desired objectives (Terblanche, 2008).The focus group discussions revealed various subsectors of communication skills such as networking, negotiation, persuasion, facilitation, interpersonal, conflict resolution, lobbying, proposal writing, gender relations, group dynamics, and teamwork, which are regarded as critical skills needed by extension officers. Gaps in communication skills were identified in all the five countries.

Managerial skills were also identified as a critical job skill area for extension officers. Planning and organizing skills; leadership skills; monitoring, budgeting, and reporting; program evaluation and documentation; and knowledge management were the skills revealed through the focus group discussions. The results revealed that gaps in marketing skills of EOs were seen in Malawi and South Africa; gaps in knowledge of resource management were specifically identified by the respondents in Malawi; gaps in entrepreneurship were seen in Kenya, Malawi, and Uganda; gaps in project management skills were seen in Kenya, Nigeria, and Uganda; and monitoring and evaluation gaps in Kenya and Nigeria. Respondents from Uganda pointed out that there are gaps in problem solving; respondents from Nigeria and South Africa pointed out gaps in analytical skills. A professional from Uganda pointed out how universities are lagging in problem solving:

> *"One of the things I want to say about universities is that in my own view, universities are in general very good at studying problems. But they are not yet good at solving problems."*

Further, the study revealed that personal qualities of extension officers were seen as being of utmost importance. Respondents listed social and emotional intelligence, empathy, integrity, positive attitudes towards the job, respect for other cultures, self-directed learning, and professional ethics. This was highlighted in some insights from a Malawian farmer on how the poor personal qualities of the EOs have led to poor perception of the overall agricultural extension system:

> *"Our extension agent has a bossy attitude and does not relate well with the farmers. For example, when she comes to teach us something, instead of demonstrating how it should be done, she just stands somewhere and tells us to do it. If we want her to come and demonstrate, she shouts at us that she is learned and hence her job is to tell us what to do.*
>
> *"Sometimes we tell them, but they force us to do it. They say we just have to do it whether we want it or not. The other problem is that the extension worker has groups which she favours in her mind such that when a project comes, for example, a goat pass-on project, she will take it to those groups of her choice. This does not work well with some of us as we feel left out. This further brings disunity among us."*

4.2.4 Skills/Competency Gaps in the UG Extension Curriculum

The study attempted to find out the skill competency gaps identified across Africa as summarized in Table 4.26.

Table 4.26: Skill /Competency Gaps in the UG Extension Curriculum

Gaps	Kenya	Malawi	Nigeria	South Africa	Uganda
Practical and technical skills	*	*	*	*	*
Knowledge of ICTs	*	*	*	*	*
Soft skills: communication, facilitation, social skills	*	*	*	*	*
Marketing		*		*	

Entrepreneurship skills	*	*			*
Knowledge of resource mobilization		*			
Project management skills	*		*		*
Monitoring and evaluation	*		*		
Problem-solving skills					*
Analytical skills			*	*	
Self-confidence	*				

4.2.5 Barriers to Training UG Extension Students with the Required Skills

The barriers to training future agricultural extension professionals are categorized as (Table 4.27):

i. Human resource development.

ii. Institutional barriers.

iii. Issues related to the curriculum.

Table 4.27: Barriers to Training of Extension Workers

Barriers	*Kenya*	*Malawi*	*Nigeria*	*South Africa*	*Uganda*
i. Human resources issues					
Teachers/trainers are not competent in the practical aspects	Few	No one	Many	No one	Few
Inadequate manpower at universities	Few	No one	Many	No one	Many
Lack of motivation of students due to no passion for agriculture	No one	No one	Few	Many	Many
Lack of practical training for teachers	No one	No one	Few	No one	Few
Few student-teacher interactions	No one	No one	No one	No one	Many
ii. Institutional barriers					
Shortage of funding	Few	No one	Few	No one	Many
Poor facilities	Many	No one	Many	No one	Many
Lack of networking with the industry/stakeholders/research institutes	Many	Few	Many	Many	Many
National and university policies	No one	No one	No one	Few	Few
Bureaucracy in decision making	No one	No one	No one	No one	Few

iii. Issues related to the curriculum					
Reviewing the curriculum takes a long time	Few	No one	No one	No one	No one
Poor practical component	Few	Few	Many	Many	Many
Lack of comprehensive outreach programs	Few	No one	Many	Many	Many
Little time for practical	Few	No one	Few	Few	Many
Lack of depth of the courses	Few	Few	Few	Few	Many

The barriers related to human resource development revolve around lack of training, incompetence of trainers, and lack of motivation among students. Teachers'/trainers' lack of competence in the practical aspects was a barrier identified by an extension professional in Kenya:

> *"When it comes to teaching of these courses, it is not just a topic as we look at, it is because we are lacking on how it should be unpackaged to allow the learner to interrogate it, to interact with others and really be able to do practical aspect that makes them to be more competent in the field. That is lacking when it comes to teaching that those who are teaching today, from my own experience, the practical aspect is missing."*

Inadequate workforce to teach students at universities was a major barrier experienced in Nigeria and Kenya. Kenyan and Nigerian professionals, respectively, made observations as follows:

> *"The major barrier I see is manpower. We don't have adequate staff, those who can teach, can handle the agricultural education and even extension, and this could be attributed to maybe funding levels of those universities to hire more staff."*

> *"Lecturer to student ratio is very high, many students with few lecturers."*

Lack of motivation among students was another barrier highlighted in Uganda, South Africa, and Nigeria. Professionals from Uganda and South Africa revealed, respectively:

> *"One of the challenges is that we get students from different family backgrounds and some of them just find themselves in Agriculture, but their passion and interests might not be there, so as they go to the field for them it is a punishment. They are doing it for marks, for earning, so we need to interest them in the discipline they have chosen for us to be able to package them better as extension facilitators or workers."*

> *"Students who do not qualify to study their desired degree often end up in agriculture as a last resort. The result is demotivated people with very little interest in what they do."*

A Nigerian extension professional commented on lack of training for the teachers, whereas professionals from Malawi, Nigeria, and Uganda pointed out the lack of practical trainings for the students.

Human resources are the most important factor in a nation's development. Well-equipped and skilled human resources would thereby contribute to the individual, organizational, and

national development of a country through improved performance (Suvedi and Sasidhar, 2020). Therefore, there is a dire need for a well-trained workforce to train future workers, so they are technically and professionally competent.

Lack of funding and poor facilities was identified as institutional barriers in Uganda, Nigeria, and Kenya. Professionals in Uganda also indicated that having no farms to carry out their practical sessions was a major barrier. Thus, most of the universities across sub-Saharan Africa lack some basic facilities to ensure quality extension education. A Nigerian extension professional noted the poor facilities:

> *"Poor facilities such as communication studio, ICT laboratory, vehicles."*

Apart from lack of funding and poor facilities, the focus group discussions revealed that universities have little interaction with other institutions. Close interactions with other institutes would provide several opportunities to the universities, including internship opportunities and off-campus experience needed for students to understand the real job environment. A Nigerian extension professional emphasized:

> *"There should be synergy between universities and research institutes."*

The respondents also noted that bureaucracy in decision making and poor national policies also acted as barriers to training undergraduates effectively. A South African professional said:

> *"The absence of applicable policy -- for example, the lack of policy on sustainable agriculture -- has a direct impact on the attention/funding."*

> *"At the University of Limpopo, the honors degree in agricultural extension is not recognized by the South African Council for Natural and Scientific Professions."*

The study also revealed some shortfalls of university agricultural extension curricula. The reviewing process of the curriculum itself takes a long time, according to the academics in Kenya. This has discouraged reviewing and updating the curriculum to meet current standards and requirements. Further, the poor practical component in the curriculum is observed as a major barrier in South Africa and Uganda and was pointed out by many participants of the focus groups. However, a participant from South Africa pointed out:

> *"In many instances the diploma students are better equipped than the students with degrees because the focus in diploma programs is more on soft skills and practical skills and not so much on science."*

Lack of comprehensive outreach programs and hands-on experience are also major obstacles to developing the competencies required by future extension professionals. Time allocations and funding have been revealed as major precursors to this, as revealed by a Kenyan academic:

> *"You cannot have a comprehensive outreach program unless you have good funding-; it's a serious problem that needs to be looked into."*

Few participants from Kenya, Nigeria, and South Africa noted that the time allocated for practical components in the curriculum is not sufficient. Few members from Kenya, Malawi,

Nigeria, South Africa, and many participants from Uganda criticized the inadequacies of the depth of courses. As was discussed under the issues of the agricultural extension system, most of the extension officers therefore lack technical skills and knowledge. Inadequacies of the content taught could be a reason for the students who graduate and secure an extension related job to lack the technical knowledge required to serve the farmers.

4.2.6 Recommendations for Improvements /Reforms of the UG Extension Curriculum

Table 4.28 summarizes the recommendations provided by the FGD participants on the improvements / reforms of the UG curricula needed to prepare the next generation of agricultural extension professionals to competently handle EASs. The recommendations are categorized under the following heads:

i. Courses to be included.

ii. Curriculum revision process.

iii. Practical or hands-on experience.

iv. Recruitment of students.

Table 4.28: Recommendations to Improve / Reform the UG Extension Curriculum

Recommendations	*Kenya*	*Malawi*	*Nigeria*	*South Africa*	*Uganda*
i. Courses to be included					
Information and communication technologies (ICTs)	*	*	*		
Plant nutrients and soil fertility		*			
Agribusiness management	*				
Entrepreneurship	*		*		
Proposal management	*				
Community mobilization and local organizations and development				*	
Climate-smart agriculture	*		*		
Management of change				*	
ii. Curriculum revision process					
Review the curriculum.	*	*	*	*	*
Carry out job analyses, identify occupational standards for extension workers, and develop courses accordingly.	*				
Conduct a comparative study to identify the need for changes in the industry.	*				

Avoid repetition of subject matter.	*				
Involve stakeholders who are directly linked into extension/private sector in curriculum revision process.	*	*			*
Make the courses more practical oriented.	*		*		
Standardize the extension curriculum.	*				*
Develop a competency-based curriculum.	*				
Incorporate indigenous technical knowledge (ITK) into the curriculum.		*			
Reduce the specialization courses and include more basics.		*	*	*	
Increase the ratio of practical hours to lecture hours in calculating credit units.			*		*
iii. Practical or hands-on experience					
Work collaboratively with farmers and rural community, commodity associations.	*	*	*	*	*
Monitor the current outreach programs.	*				*
Arrange longer internships.	*	*			*
Invite guest speakers from the field to enhance the knowledge of the students.		*			*
Devise mentorship programs.		*		*	*
Use mini farms for practical experience.		*			
Involve students in more research and projects.					*
Make social skills and communication related courses crosscutting in all undergraduate programs.	*	*	*	*	*
iv. Recruitment of students					
Recruit students who have interest in extension.		*			*

To enhance the technical competencies of the students, the respondents suggested courses on topics such as ICT, plant nutrients and soil fertility, agribusiness management, entrepreneurship, proposal management, community mobilization, local organization development, climate-smart agriculture, and management of change. The following recommendations are from two professionals in Nigeria and one professional from Malawi:

"Drop courses on rural youth and women programs and include entrepreneurial courses."

"Nutrition is an important area that should be included. Other areas are climate change, renewable energy, food security, extension development, and health- related issues."

"I think we should focus on Entrepreneurship. This should be emphasized in the curriculum. This is where partnerships and joint ventures should be emphasized. For, example, students from extension, animal science, agribusiness, and other disciplines can form a partnership and start their own business"

According to Kidane and Worth (2012), students studying agriculture should develop competencies in soil science, plant science, animal science, agricultural economics, basic chemistry, basic biology, and sustainable natural resource management. In addition to these competencies, agricultural sciences and technology should also address social and economic justice issues such as food security and risk management (DoE, 2008). In addition to these skills and knowledge, agricultural science should aim at developing skills such as the ability to investigate and analyze sustainable agricultural practices, indigenous agricultural knowledge and historical development, and interrelated issues in agriculture (SAQA, 2003). Most of the FGD participants recommended incorporating courses on entrepreneurship also. Entrepreneurial capacities and innovation are essential to uplift the lives of the farmers. Therefore, universities need to build the entrepreneurial capacities of the students to ensure that future extension professionals can effectively meet the needs of small-holding farmers and contribute to their successful integration into the food value chain.

Curriculum revision is vital to prepare the next generation for this work. Reviewing the curriculum was suggested by FGD members from all the five countries, emphasizing the dire need for curriculum revision of the agricultural extension programs offered in the African institutions. That process should involve stakeholders who are directly linked into extension and the private sector. Respondents also advised carrying out job analyses and identifying occupational standards for extension workers and developing courses accordingly. Conducting a comparative study to identify the need for changes in the industry would also aid in curriculum revision. Alignment of curricula to the labor market needs is a key requirement that should be met by higher education institutions (Ssebuwufu et al., 2012). The following are some comments from professionals from Kenya, Uganda, Malawi, and Nigeria, respectively:

"When developing the program, the stakeholders have been left out and sometimes when you invite the stakeholders, maybe we are biased just the way professors put it that maybe the participant in this particular training are not well versed in the topic of discussion. When it comes to curriculum development, the stakeholders who were brought on board may not be the ones who are in touch."

"There is need to bring in more experts, but also, I would think that the university can also go back to redesign the curriculum."

"I think there are several actors you can engage. Some of them are the ones we have been mentioning here. Such factors include the cooperatives, the processors of various agricultural produce."

"Although the review of extension curriculum is ongoing, but there is a miscarriage in the curriculum preparation such that experts are not involved in the review of the extension curriculum. Thus, a new curriculum that does not meet emerging areas in agricultural extension may be introduced. It is necessary for the new curriculum to be standardized such that all universities can adopt them."

Standardizing the extension curriculum was another suggestion from the participants from Kenya and Uganda. For instance, the BSc. Agricultural Education and Extension Program (AGED) at Egerton University is the pioneer program in Kenya, and the young universities within Kenya have borrowed heavily from the its curriculum. However, many of these universities have not been able to match the standards at Egerton University, and sometimes their graduates are considered inadequately trained (Oywaya-Nkurumwa, 2022). A standardized curriculum within a country would be a major step in assuring that all graduates produced receive equal and adequate training. The following was said by an expert in Kenya:

"How I wish that even as those other young universities mount the program, there could be a standard curriculum so that we don't have like in Kisii or in Laikipia or Machakos or wherever, I mean, you have a curriculum that is deficient in some skills such that we have graduates out there who feel like they're misplaced."

Incorporating indigenous knowledge into the curriculum was suggested by participants from Malawi. Extension curricula have emphasized acquiring scientific principles and concepts in agriculture. Therefore, most courses are designed around particular subject matter areas. The holistic integration of farmers' indigenous knowledge systems into curricula would give graduates valuable background information when they're engaged in solving farmers' problems.

Participants from Malawi, Nigeria, and South Africa suggested reducing the number of specialization courses and including more basic courses. A participant from Malawi complained about the overspecialization of the students:

"Over specializing is also another barrier. This leaves the students with very narrow area of focus hence they are challenged to work on areas that they did not cover during their training."

Participants from Nigeria and Uganda proposed increasing the ratio of practical hours to lecture hours in calculating credit units. Overall, FGD participants recommended increasing the practical or hands-on experiences of the students. Collaborating with farmers, rural communities, and commodity associations; monitoring current outreach programs; arranging for longer internships; inviting guest speakers from the field to enhance the knowledge of the students; and involving students in research projects using/establishing mini farms for hands-on education are among the recommendations to improve the practical courses

of the agricultural universities. Professionals from Uganda and Malawi said the following, respectively:

> *"If we look at most of these curricula, really, they provide for student outreach and students are involved. They go to the farmers but probably, where we are not doing well is the supervision on the side by the university. Lecturers need to follow up on regular basis. It may be not daily but probably after a week or two, you visit the student who is there in the field."*

> *"I think there is a need to enhance internships and incubations to give the students the practical side of their program. These should not be done after graduating but during their four-year period of study."*

Social and communications skills are also regarded as critical to improving students' practical and hands-on experience. This was pointed out by FGD members from all the five countries. A Nigerian professional suggested:

> *"Students should be taught communication and ICT skills. Therefore, there is a need for a communication studio in all universities so that they may create films/documentaries based on their contacts with farmers, learn how to map communities, get information online, utilize gadgets, and create applications like a one-stop shop for extension agents. This skill will also enable them to organize and conduct interviews, particularly with members of the farming community, to improve students' presentation skills, to present research/field reports with convincing arguments clearly in writing or orally, and to be equipped with information technology skills required for global communication."*

The respondents from Malawi and Uganda suggested that a proper screening of students should be done at the time of intake to the universities and admission be given to students who have some prior knowledge of extension.

> *"There is a need to recruit those students who have a rough idea about extension work so that they have prior knowledge of what the field of extension is."*

CHAPTER FIVE - CONCLUSIONS AND IMPLICATIONS FOR POLICY

Agricultural EASs play a key role in addressing complex challenges, increasing farm productivity and linking farmers to markets in sub-Saharan Africa. On the other hand, poor institutional capacity -- i.e., faculty vis-à-vis the agricultural extension curriculum -- has resulted in poor quality training of extension professionals, resulting in low quality EASs. Process skills and core competencies are basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks effectively. Periodic updating of the UG agricultural extension curriculum is necessary for universities to produce graduates with core process skills and competencies that will enable improved EASs, sustainable food security, improved livelihoods, and natural resources conservation. With changing agriculture and rural development contexts, universities in sub-Saharan Africa are also recognizing the need to revise and upgrade their UG extension curricula.

To strengthen the agricultural extension curriculum, the present study was undertaken in sub-Saharan Africa covering Nigeria, Malawi, South Africa, Uganda, and Kenya during 2021-2023. The population for the study was agricultural extension professionals within these five countries drawn from universities, public- sector organizations, private- sector organizations, and NGOs. Mixed- method research design, comprising quantitative and qualitative approaches, was employed to assess the process skills and competency gaps in UG agricultural extension curricula with the following research questions and objectives.

5.1 RESEARCH QUESTIONS

This study addressed the following research questions with focus on MSU-AAP Consortium members -- Nigeria, Malawi, South Africa, Uganda, and Kenya:

1. Do extension programs effectively address the needs of current food and agricultural systems?
2. What are the critical job skills and core competencies required of extension workers to effectively plan, implement, and evaluate extension work in today's changing context?
3. Does the UG curriculum in extension education include education and/or training on these job skills or core competencies?
4. What are the barriers to effectively training extension workers with required core competencies, and how can these barriers be removed?

5.2 OBJECTIVES

1. Review agricultural extension curricula currently in use at AAP member universities at the UG level in Nigeria, Malawi, South Africa, Uganda, and Kenya.

2. Identify critical process skills and competencies of agricultural extension professionals, process skills gaps, and areas of potential curricular reform.
3. Recommend improvements/reforms of agricultural extension curricula to prepare the next generation of agricultural extension professionals to competently handle EASs delivery.
4. Introduce new/improved curricula among the agricultural extension faculty engaged in training and education in sub-Saharan countries.

5.3 AGRICULTURAL EASs DELIVERY AND CURRENT AGRICULTURAL EXTENSION CURRICULUM

The study reviewed agricultural EASs delivery and extension curricula currently in use at AAP member universities at the UG level. *The review of agricultural EASs delivery in Nigeria, Malawi, South Africa, Uganda, and Kenya led to the conclusion that the conventional top-down, supply-and technology-driven extension EASs no longer appears to be an appropriate model to address the following key challenges in EASs delivery:*

1. Reduction in governmental funding
2. Untimely release of funding
3. Declining number of well-trained public- sector extension staff
4. A very weak research-extension-farmer-inputs linkages systems
5. Inadequate policy, legal, regulatory and institutional frameworks
6. Poor targeting of women, youths and vulnerable groups
7. Multiplicity of extension approaches and lack of coordinated/networking among varied extension providers
8. Unregulated, unsupervised and uncoordinated EASs by NGOs
9. Poor state of infrastructure in terms of offices, equipment and transport.
10. Demand for market-driven and efficient EASs.

These challenges have made it increasingly difficult for the extension systems to adequately respond to the diversified EASs needs of the rural clients. To meet the challenges, the options chosen in EASs delivery include privatization, multiple service providers, public-private partnerships, decentralized and/or bottom-up services, and, market-driven or fee-for-service systems. *We recommend to strengthen the coordination among EAS players through established structures, make more investments in the public extension systems while encouraging more players / partnerships, increase number of frontline extension staff to reduce the staff-to-farmer ratio to manageable levels, increasing the investments of civil society organizations in human resources at the grassroots level so as to bring their services closer to the communities and reduce the burden on public extension workers.*

Agricultural extension curriculum is expected to support this transition by imparting the required process skills and core competencies at the UG level. *The review of current agricultural extension curriculum and its transaction revealed that:*

1. All five AAP partner universities offering agricultural extension training have established curriculum committees to review and recommend the curriculum including learning methods and materials.

2. The committees conducts the curriculum review every five years.

- ***Example 1:*** At the national level, all academic programs in Nigeria are regulated by the National University Commission (NUC) through a comprehensive process of stakeholders' workshops organized to produce the Benchmark Minimum Academic Standard (BMAS) documents for all disciplines, which serve as the benchmark for curriculum in the universities. In the ongoing curriculum review, the NUC recommends "a uniquely structured curriculum that should provide 70% of core courses for UG programmes, while allowing universities to utilize the remaining 30% for other innovative courses in their peculiar areas of focus". The curriculum review process at the institutional level is conducted every five years through a simpler linear consultation involving only stakeholders within the university. However, the most recent review of UG agricultural extension program was conducted in 2007.
- ***Example 2:*** In Kenya, the academic programs are reviewed every four years by the Commission for University Education (CUE), with a new catalogue of academic programs produced after each review.
- ***Example 3:*** In Malawi, South Africa, and Uganda, the individual institutions develop and manage their curricula and change them depending on demand, but not without the approval of councils for higher education.

In all cases, the curriculum reviews are based on stakeholder feedback, changing national and global development needs, and policy changes. Stakeholders include employers, government, alumni, other institutions of higher learning, and the general society. The regulatory bodies have the mandate to stipulate the broad objectives, learning outcomes, requirements for minimum standards/hours, and the nature, organization, and general structure of the program. *To address the needs of demand-driven, pluralistic, decentralized, and participatory agricultural EASs, the authors identified and recommend 11 process skills and core competencies and 97 subcompetencies to the regulatory bodies for their inclusion in the UG agricultural extension curriculum. The broad areas of competencies recommended are program planning; program implementation; communication; ICTs; program monitoring and evaluation; personal and professional development; diversity and gender; marketing, brokering, and value chain development; extension soft skills; nutrition; and technical subject matter expertise.*

5.4 ONLINE SURVEY RESULTS -- CONCLUSIONS AND RECOMMENDATIONS

The results of the online survey on demographic characteristics shows that a greater proportion of the respondents were in young (40.85%) to middle age (27.17%) groups with master's degree and above qualifications (66.54%). *This leads to the conclusion that most extension functionaries are in their young to middle age years, highly qualified, and*

thus a great asset for the required reforms of agricultural EASs in sub-Saharan Africa. The authors recommend systematic in-service training programs to them on demand-driven, decentralized, pluralistic, and participatory agricultural EASs with focus on the process skills and competency gaps.

The female agricultural extension professionals constituted only one-third of the study population. It is important that the universities attract and retain more women in the agricultural extension discipline, and that agricultural extension systems recruit female professionals to help reach underserved audiences (Hill et al., 2010). *The results point to the conclusion that, despite the increase in women's involvement in agricultural production and value chain activities, the EASs in sub-Saharan Africa are dominated by male extension professionals. To bridge the gender gap, encourage more women to enroll and specialize in agricultural extension at UG and postgraduate levels. In addition, recruit more women extension professionals in the public, private, and non-governmental extension organizations for the teaching, research, and field positions which will help in bridging the gender gap, planning gender-specific extension programs, and delivering EASs to meet the needs of women clients.*

The paired t-test index values revealed significant differences between "*how important the skill or competency*" and "*how well does UG extension curriculum address the skill or competency*" of all 11 process skills and core competencies of agricultural extension professionals -- i.e., program planning; program implementation; communication; ICTs; program monitoring and evaluation; personal and professional development; diversity and gender; marketing, brokering, and value chain development; extension soft skills; nutrition; and technical subject matter expertise. Further, the paired sample t-test findings of all the 97 subcompetencies within the 11 broad process skills and core competencies also revealed significant differences between '*how important is the skill or competency*' and '*how well does UG extension curriculum address the skill or competency*' of agricultural extension professionals. *The results point to the conclusion that the agricultural extension professionals are fully aware of the importance of these 11 process job skills or competencies and 97 subcompetencies to performing their extension job well. They are also fully aware that the present UG extension curriculum minimally addresses these skills and competencies.*

The findings of the online survey on 11 process skills and competencies and analysis of existing UG extension curricula in the five countries revealed that curriculum, learning methods, and materials are inadequate with current EASs needs to meet today's challenges. Though some of the broad process skills and competencies are included in UG agricultural extension courses, students have inadequate opportunity to have hands-on training and build up critical thinking and problem-solving process skills to line up with EASs delivery outcomes. *The analysis on distribution of courses based on competence domain covered in UG extension curriculum (Box 5.1) leads to the conclusion that the curricula for the programs are largely aligned with the 11 competency domains, but with outstanding*

emphasis on technical competence rather than process skills and competencies with few exceptions like in Uganda's BARI program, 52% of the credit units are extension methods/ process skills, 15% economics and agribusiness, and 33% are technical agriculture. Some critical professional competency domains such as soft skills, gender and diversity, nutrition and food safety, brokerage, marketing and value chains, and personal and professional development are not well covered in curricula. Also, some subject matter -- particularly on contemporary issues and technologies in competency domains such as ICTs, among others -- is not adequately addressed.

Box 5.1: Courses and Competence Domain Covered in UG Extension Curriculum

Process Skills and Competencies	*Distribution of Courses based on Competence Domain In UG Extension Curriculum (Number of Courses (Percentage)*				
	Nigeria	*Malawi*	*South Africa*	*Uganda*	*Kenya*
1. Program planning	9 (11.5)	5 (10)	2 (5.1)	6 (12.0)	8 (10.5)
2. Program implementation	6 (7.5)	6 (12)	4 (10.2)	10 (20.0)	11 (14.5)
3. Communication	5 (6.3)	2 (4)	1 (2.6)	1 (2.0)	1 (1.3)
4. ICTs	4 (5.0)	2 (4)	1 (2.6)	1 (2)	1(1.3)
5. Program monitoring and evaluation	6 (7.5)	7 (14)	2 (5.1)	4 (8)	4 (5.2)
6. Personal and professional development	0 (0)	3 (6)	1 (2.6)	3 (6)	1(1.3)
7. Diversity and gender	1 (1.2)	2 (4)	0 (0)	1 (2)	1(1.3)
8. Marketing, brokering, and value chain development	5 (6.2)	5 (10)	1 (2.6)	5 (10)	7
9. Extension soft skills	4 (5.0)	0 (0)	1 (2.6)	0 (0)	1(1.3)
10. Nutrition	1 (1.2)	0 (0)	0 (0)	1 (2)	0 (0)
11. Technical subject matter expertise	54 (67.0)	18 (36)	26 (66.7)	18 (36)	41 (53.9)

Source: Compiled by the authors based on country reports

- ***Example 1:*** The UG extension curriculum in Malawi generally covers the monitoring and evaluation (M&E) thematic area well. The BSc. in extension degree program at Bunda and the diploma program at NRC have an entire course on M&E of extension and rural development. However, review of the course content leads to the conclusion that both courses provide inadequate practical skills and focus is on theoretical topics such as key principles, concepts, and philosophies of M&E. There is little coverage of

new skills required in M&E such as use of online platforms to gather information, as well as use of mixed methods (qualitative and quantitative data collection techniques). Further, the current M&E course does not sufficiently help build extension workers' skills to share evaluation findings with stakeholders (e.g., through policy briefs, journals, and stakeholder engagement workshops). The findings of the FGDs also highlighted the need for extension workers to have skills in managing the knowledge generated through M&E in Malawi.

- ***Example 2:*** The UG Agricultural Extension Training Curriculum at Egerton University, Kenya, mentioned gender and development as one of the learning outcomes. Curriculum analysis, however, revealed that diversity and gender concepts are missing from the UG agricultural extension training curriculum. Inclusion and transaction of gender sensitivity concepts, gender analysis, and gender budgeting are required.
- ***Example 3:*** The agricultural extension curriculum at Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi, has specific courses that support the programming of women- inclusive extension programmes. However, diversity concepts such as development of youth- focused extension programs and the engagement of marginalized groups in extension programs are missing and identified as training gaps.
- ***Example 4:*** Soft skills are missing in coursework in Malawi and Uganda, minimally covered in South Africa and Kenya, and reasonably covered in Nigeria. The delivery of soft skills must usually be cross-cutting for all the courses offered by the UG extension program. Most of the soft skills are not only to be acquired not only from classroom sessions but largely from a range of other activities associated with the various courses in the program, such as individual assignments, exams, group tasks, learning tours, practical sessions, etc.
- ***Example 5:*** Diversity competencies are missing in course contents offered in Nigeria, Malawi, and Uganda. The courses covering brokering and value chain competencies are missing in Nigeria and Uganda. There is little focus on courses imparting market linkages and value chain development competencies in Malawi.

In most cases, the proper implementation of curricular recommendations is impacted by budgetary constraints, instructor preparedness, and student / faculty motivation for practical or hands-on learning. As a result, the curriculum transaction is more theoretical and inadequate on practical hands on training. Students have little opportunity to develop critical thinking and problem-solving process skills that are necessary to align training content and instruction with employment outcomes. *Therefore, the results and coverage of process skills and competencies in UG extension curriculum led to a further conclusion that the level of required curriculum transaction and preservice training at the UG level is inadequate to prepare students with the required skills and competencies to provide integrated EASs efficiently to their clients. The ensuing recommendation is that the universities in sub-Saharan Africa specify the skills or competencies in course content with learning*

outcomes to be achieved, suggest pedagogy for facilitating process skills development, support practical training and fieldwork, and focus on enhancing the curriculum transaction processes. We also recommend capacity building of the agricultural extension faculty on the 11 process job skills or competencies and 97 subcompetencies for effective curriculum transaction (see Box 5.2).

The results on competencies related to technical subject matter expertise revealed that agricultural extension professionals receive adequate education in production agriculture disciplines such as field crops, horticultural crops, and livestock, but lack adequate preparation about various types of risks and uncertainties due to climate change, market fluctuations, and natural disasters. There is also lack of basic knowledge of agribusiness management, value chain development, and principles of entrepreneurship development.

Academic departments offering UG programs in agricultural extension are named accordingly in the various universities.

- ***Examples:*** Agricultural Extension (Nigeria & South Africa); Agricultural Education and Extension (Kenya); Extension (Malawi), and; Extension and Innovation Studies (Uganda).

The nomenclature of UG programs is diverse and varying from country to country, and university to university within a country:

- ***Nigeria:*** Agricultural Economics and Extension / Agricultural Extension and Rural Development / Agricultural Extension and Social Engineering / Agricultural Extension and Rural Sociology / Agricultural Extension and Communication /Agricultural Extension and Community Development.
- ***Kenya:*** Agricultural Education and Extension / Agriculture and Human Ecology.
- ***Malawi:*** Agricultural Extension
- ***Uganda:*** Agricultural and Rural Innovation / Agricultural Livelihoods and Farm Production / Vocational Studies in Agriculture with Education / Agri-Entrepreneurship and Communication Management / Agriculture/Agricultural Education & Extension / Sustainable Agriculture & Extension / Agriculture and Community Development
- ***South Africa:*** Agricultural Extension / Agricultural Extension and Rural Resource Management.

Although the traditional nomenclature of the departments and programs still exists in most universities, there are attempts to reform the systems and nomenclature of UG programs in some universities.

- ***Example:*** In Uganda, during the past 25 years, there were three key reforms aimed at aligning the agricultural extension curriculum with prevailing national policy reforms and resultant competency needs. First, was the introduction of the Bachelor of Agricultural Extension Education (BAEE) in 1997. This program targeted field extension workers with diplomas with a policy that all field extension workers would have degrees, so the new program aimed at upgrading this cadre of staff to degrees to avoid them

being retrenched. The second reform was in 2008/2009 when the university reviewed the BAEE program to currently offered Bachelor of Agricultural and Rural Innovation (BARI) program. BARI was a response to global and national policy reforms including decentralization, liberalization and privatization of agricultural EASs among others. These shifts created new competency demands of extension graduates such as client oriented efficient EASs delivery, higher levels of innovation, ability to deal with complexity and uncertainty and business skills. BARI was designed to produce professionals better suited to work in the increasingly competitive, pluralistic agricultural EASs that called for added emphasis on system orientation, innovation and rural development focus. In subsequent years a distance learning version of the program was introduced to cater for the inservice training needs of a growing number of field extension workers employed by the government on flexible short-term contracts under the reforms.

We recommend co-learning among agricultural extension departments within AAP partner universities. Successful examples on reforms from Uganda can be shared with other AAP partner universities through regional workshops and learning conferences. The learning workshops could be organized on a rotational basis, i.e., one university hosting the workshop each year. These workshops could focus on learning from the field. MSU AAP and regional extension networks could co-sponsor these workshops and/or conferences.

Though some of the contents being imparted at UG level are still relevant in the field of agricultural extension, curriculum reforms are important to address new challenges such as demand-driven or market-led pluralistic EASs, contract farming and value chain EASs, agriculture start-ups, digital EASs, management of natural resources, community sustainability, facilitation for development, diversity of extension staff members and clients, changing job markets for agriculture graduates, etc. The introductory concepts and principles of extension come from diverse social science disciplines such as adult education, rural sociology, development communication, economics, psychology, anthropology, management, and development studies. Modernized agricultural extension curricula could be enhanced through the integration of various social science courses and faculties. *In view of all these findings, we propose transforming the terminology and course contents of UG extension curricula with a focus on modernized EASs.* The respondents of online survey indicated some interventions to make the agricultural extension curriculum robust and practical. *We recommend interventions such as using ICT- oriented UG extension curriculum/pedagogy, exposing students to market opportunities and service providers to develop entrepreneurship, offering training-of-trainer workshops for extension faculty members, including the identified soft skills in the curriculum, and developing cutting-edge and practical teaching-learning resources such as extension textbooks, practical handbooks, training manuals, and self- learning materials.*

The study results indicated that methods such as preservice training, internship in various work environments, basic induction training, inservice training, and continuing education opportunities are appropriate methods and could be employed to enhance the skills and core competencies of agricultural extension professionals.

- ***Example:*** In South Africa, the agricultural extension workers are registered, and EASs are approved as a field of practice and a profession. The National Qualifications Framework (NQF) is the guide for education and qualifications at the preservice training level in South Africa. The NQF levels range from 1-10; levels 5-10 are the higher education subqualifications. The framework provides learning pathways at preservice training level as well as options for skill development to bring about better employment opportunities.

We can conclude from the above discussion that there are vital advantages to incorporating precisely defined competency outcomes and job roles in the UG agricultural extension curriculum at preservice and internship training levels. For effective preservice training, we recommend alignment of UG agricultural extension curriculum with NQF in other countries like in South Africa. The 11 process competencies and 97 subcompetencies identified and assessed in this study could be the starting point for defining learning outcomes, job roles, and NQF at preservice and internship levels during UG programs. It is also recommended to define the minimum day-one competencies expected of graduates while revising curricula so that they can be assessed during the preservice training.

Another strength identified in the curriculum is the 10-week to one-year practical extension programs in two universities (Uganda and Nigeria) aimed to close the gap between theory and practice.

- ***Example 1:*** In Uganda, Supervised Experiential Learning Projects (SELPS) place students in public- and private-sector organizations across the country for 10 to 15 weeks under day-to-day mentorship by field supervisors. This is further complemented with full-time students' residence at the university farm (MUARIK) for 12 weeks, where they have hands-on training in various aspects of agriculture to acquire practical skills in a range of areas such as ICTs, poultry management, animal sciences, nutrition and health, apiculture, and field crop management.
- ***Example 2:*** The extension program in Nigeria has a 12-month practical year called the Students' Internship Work Experience Scheme, designed for experiential learning in crop production, animal husbandry, farm records and management, extension practice, etc. During the period, students are engaged in the university farm under the supervision of technical staff and take part in one-week tours/trips to research institutes, agro-industries, private farms, and centers.

Such is not the case in South Africa, Kenya, and Malawi institutions, where programs lack a dedicated practical scheme for students' exposure to career realities. These experiences, however, are constrained by limited funding, among other factors, consequently, courses designed to be practical end up being theoretical. Moreover, many instructors may not be well grounded in the field-based agricultural EASs experience and therefore deliver theory-based information and knowledge that do not equip students with the required competencies. The internship programs are not uniform – length of internship, timing of internship during the undergraduate study, monitoring and supervision, and student

allowances differ by university and country. *We recommend that internship program be standardized and uniformly administered but make it relevant to address local issues in a changing context.*

Most in-service extension functionaries in sub-Saharan Africa are in their young to middle age years, highly qualified, and thus a great positive feature for the required reforms of agricultural EASs. *For the inservice extension functionaries, the authors recommend systematic basic induction trainings, inservice trainings at various work environments, and opportunities to attend short trainings, seminars, workshops, webinars, etc., on the process skills and competency gaps. Further, the competencies can be contextualized through this basic induction training and further refined through staff development or inservice training and continuing education opportunities. The additional appropriate ways to acquire process skills or competencies recommended include staff and student exchange programs, farmers' field schools, experiential practical learning, facilitated peer-to-peer learning, and robust e-learning.*

The results on major barriers to effective implementation of extension curricula in the five countries revealed major similarities in budget to support practical learning experiences (e.g., field visits and demonstrations), classroom and demonstration farms or facilities, student motivation to study extension and interest in practical extension work, development of an effective extension curriculum, teacher motivation to teach required process skills and competencies, quality textbooks and/or manuals, quality faculty to teach extension courses, etc. *To address these barriers and improve agricultural extension training in sub-Saharan Africa, we recommend allocating sufficient budget for extension practical teaching-learning experiences, recruiting quality faculty members to teach extension courses, training and motivating teachers to teach required process skills and competencies, providing good classroom and demonstration facilities, and making available quality textbooks and/or manuals.*

5.5 FGDs RESULTS -- CONCLUSIONS AND RECOMMENDATIONS

The results of the FGDs in the five countries are summarized and recommendations are made under the following headings:

1. Current challenges in delivery of agricultural EASs.
2. Measures to improve the agricultural extension systems.
3. Critical job skills / core competencies required for agricultural extension workers.
4. Skills / competency gaps in the UG extension curriculum.
5. Barriers to training UG extension students with the required skills.
6. Improvements /reforms of the UG extension curriculum.

5.5.1 Current Challenges in Delivery of Agricultural EASs

The major challenges in *'delivery of agricultural EASs'* that emerged during FGDs include capacity gaps of the extension professionals, weak public extension systems, and inadequate

institutional support to extension professionals. The farmers need holistic EASs from input gathering until they sell their final output in the market. However, the FGD participants had serious concerns about lack of technical and practical competencies among extension professionals to provide holistic EASs.

The issues related to *public extension services* include weak administration, failure to address local needs by the agricultural projects, less importance to agricultural extension, ineffectiveness in dealing with emerging challenges and risks, mismatch of policies implemented, inadequate funding for agricultural extension services, and recruitment of unqualified extension staff to ease the severe shortage of qualified manpower in sub-Saharan Africa. Many FGD participants observed that farmers did not place high value on EASs, and so, for most farmers, EASs were not a priority.

Issues related to *extension program delivery* include inadequate number of extension officers and extension programs, poor targeting, inadequate promotion of local technology, and poor message delivery and feedback. Inadequate extension staff is a challenge identified in all the five countries. In Africa as a whole, the extension officer-to-farmer ratio averages 1:1000, well below the Food and Agriculture Organization (FAO) recommended ratio of 1:400. As a result, each extension professional has to cover a large territory ranging from 20 to 50 square kilometers and is often unable to reach a large and widely dispersed farming population characterized by diversity in opportunities, constraints, individual aspirations, and, consequently, information needs.

- ***Example:*** In Nigeria, the government-dominated procurement system was criticized as narrowly targeting large-scale farming and being inefficient in quantity and timeliness of materials reaching farmers. Thus, while Nigeria's small agricultural budget has heavily leaned toward input provisioning and promotion, challenges in implementation have impeded its ability to benefit farmers.

5.5.2 Measures to Improve the Agricultural Extension Systems

The FGDs attempted to explore improving agricultural EASs in the five countries. Measures on *human resource development and support* include: motivating extension professionals by providing incentives, logistic support, and other resources; building capacity by providing training and reorientations; and improving their technical and practical skills and ICT literacy.

Measures on '*ways to improve extension programs and delivery* include: improve the quality of extension programs; properly target farmers with innovations and local verification of the technologies; incorporate urban farmers, who are resource- rich, in the commercialization drive; increase the number of extension workers in proportion to the number of farmers; provide practical demonstrations to farmers on extension services.

5.5.3 Critical Job Skills / Core Competencies Required

The critical job skills listed by the FGDs respondents are categorised into six broad categories: *practical know-how, technical knowledge, communication skills, innovativeness, managerial*

skills, and personal qualities. All the FGD participants across the five countries acknowledged that extension professionals lack practical and technical knowledge. Harnessing the full potential of ICTs innovations to meet farmers' needs requires favorable government policies and investment in telecommunication infrastructure. Study results suggested that there are gaps in ICTs or digital literacy among the extension professionals across sub-Saharan Africa. Results also revealed that respondents of all five countries consider communication skills to be critical. Communication is a key factor for interaction between extension officers and farmers. It serves as the vehicle through which extension takes place. A professional from Uganda pointed out how universities are lagging in problem solving skills -- *"One of the things I want to say about universities is that in my own view, universities are in general very good at studying problems theoretically. But they are not yet good at solving problems in actual field situations."*

5.5.4 Skills / Competency Gaps in the UG Extension Curriculum

The results of the FGDs revealed common skill /competency gaps in the UG agricultural extension curriculum across sub-Saharan Africa. They include practical and technical skills, knowledge of ICTs, soft skills (communication, facilitation, social skills), marketing and entrepreneurship skills, resource mobilization, project management, monitoring and evaluation, and problem-solving analytical skills.

5.5.5 Barriers to Training UG Extension Students with the Required Skills

The barriers related to *human resource development* revolve around lack of training, incompetence of trainers, and lack of motivation among students. Teachers'/trainers' lack of competence in the practical aspects was a barrier identified by an extension professional in Kenya -- *"When it comes to teaching of these courses, it is not just a topic as we look at, it is because we are lacking on how it should be unpackaged to allow the learner to interrogate it, to interact with others and really be able to do practical aspect that makes them to be more competent in the field. That is lacking when it comes to teaching that those who are teaching today, from my own experience, the practical aspect is missing."* Inadequate faculty to teach students at universities was a major barrier experienced in Nigeria and Kenya. Kenyan and Nigerian professionals, respectively, made observations such as: *"The major barrier I see is manpower. We don't have adequate staff, those who can teach, can handle the agricultural education and even extension, and this could be attributed to maybe funding levels of those universities to hire more staff."* *"Lecturer to student ratio is very high, many students with few lecturers."* Lack of motivation among students was another barrier highlighted in Uganda, South Africa, and Nigeria. Professionals from Uganda and South Africa revealed, respectively: *"One of the challenges is that we get students from different family backgrounds and some of them just find themselves in agriculture, but their passion and interests might not be there, so as they go to the field for them it is a punishment. They are doing it for marks, for earning, so we need to create interest in the discipline and be able to package them better as extension facilitators."* *"Students who do not qualify to study their desired degree often end up in agriculture as*

a last resort. The result is demotivated professionals with very little interest in what they do." Therefore, there is a dire need for a well-trained workforce to train future workers, so they are technically and professionally competent.

The *institutional barriers* related to training undergraduates effectively revolve around lack of funding, poor facilities, no farms to carry out practical sessions, little interaction of universities with other stakeholders, bureaucracy in decision making, and poor national policies. Close interactions with other institutions would provide several opportunities to the universities, including internship opportunities and off-campus experience needed for students to understand the real job environment. *Many universities in Africa have initiated internship or mentorship programmes. We strongly recommend making it compulsory in final year to all UG students by determining appropriate credit structure.*

The *agricultural extension curriculum barriers* include the long intervals between curriculum revisions, lack of comprehensive outreach programs, and the poor practical component in the curriculum. However, a participant from South Africa pointed out -- *"In many instances the diploma students are better equipped than the students with degrees because the focus in diploma programs is more on soft skills and practical skills and not so much on science."* Time allocations and funding have been revealed as major precursors to this, as revealed by a Kenyan academic -- *"You cannot have a comprehensive outreach program unless you have good funding -- it's a serious problem that needs to be looked into."*

5.5.6. Improvements /Reforms of the UG Extension Curriculum

The suggested improvements / reforms of the UG extension curricula to prepare the next generation of agricultural extension professionals were related to *courses to be included, the curriculum revision process, practical or hands-on experience, and recruitment of students.* Curriculum revision is vital to prepare the next generation to competently provide EASs to farmers. Reviewing the curriculum at regular intervals was suggested by FGD participants from all the five countries, emphasizing the fact that there is a dire need for curriculum revision of the agricultural extension programs offered in the African universities. The FGD participants commented -- *"Although the review of extension curriculum is ongoing, but there is a miscarriage in the curriculum preparation such that experts are not involved in the review of the extension curriculum. Thus, a new curriculum that does not meet emerging areas in agricultural extension may be introduced. It is necessary for the new curriculum to be standardized such that all universities can adopt them."* Standardizing the extension curriculum was another suggestion from the participants from Kenya and Uganda.

- ***Example:*** BSc. Agricultural Education and Extension Program (AGED) at Egerton University is the pioneer programme in Kenya. The new universities within Kenya have borrowed heavily from the Egerton University AGED curriculum. However, many of these universities have not been able to match the standards at Egerton University, and sometimes their graduates are considered inadequately trained. Therefore, rather

than merely copying things haphazardly, it would be better to have a standardized curriculum within a country to ensure that all graduates produced are given equal and adequate training.

Participants from Malawi, Nigeria, and South Africa suggested reducing the specialization courses and including more basic courses. A participant from Malawi complained about the overspecialization of the students -- *"Over specializing is also another barrier. This leaves the students with very narrow area of focus hence they are challenged to work on areas that they did not cover during their training."* Participants from Nigeria and Uganda proposed increasing the ratio of practical hours to lecture hours in calculating credit units. Overall, FGD participants recommended increasing the practical or hands-on experiences of the students. The respondents from Malawi and Uganda suggested that a proper screening of students should be done at the time of intake to the universities and admission be given to students who have some prior knowledge of extension -- *"There is a need to recruit those students who have a rough idea about extension work so that they have prior knowledge of what the field of extension is."*

The results of the FGDs in the five countries summarized above lead to the following specific conclusions:

- *Extension professionals graduating from universities come with the technical, theoretical knowledge, but they have been missing out on some critical practical competencies such as provision of holistic advisory services including production techniques, processing, marketing, and business planning.*
- *Frontline extension professionals are demotivated by issues such as limited resources, operational funding, infrastructure, and incentives. On the other hand, farmers have little trust in them because of lack of accountability and poor attitudes.*
- *EASs are poorly targeted, and the quantity and quality of advisory contacts are compromised, especially for the poorest farmers, women, and spatially remote households.*
- *Gaps in critical communication skills needed by extension professionals include networking, negotiation, persuasion, facilitation, interpersonal, conflict resolution, lobbying, proposal writing, gender relations, group dynamics, and teamwork.*
- *Gaps in critical managerial skills needed by extension professionals include planning and organizing skills; leadership skills; monitoring, budgeting, and reporting; program evaluation and documentation; and knowledge management.*
- *The social and emotional skill gaps include intelligence, empathy, integrity, positive attitudes towards the job, respect for other cultures, self-directed learning, and professional ethics.*
- *Common skill /competency gaps in the UG agricultural extension curriculum across sub-Saharan Africa include practical and technical skills, knowledge of ICTs, soft skills (communication, facilitation, social skills), marketing and entrepreneurship skills, resource*

mobilization, project management, monitoring and evaluation, and problem-solving analytical skills.

- *Curriculum revisions are not taking place at regular intervals, and most of the universities across sub-Saharan Africa lack some basic facilities and funding to ensure quality extension training to UG students. As concluded under the issues of the agricultural extension system, most of the extension professionals therefore lack the required skills and competencies.*
- *The suggested courses related to process skills include ICTs, agribusiness management, entrepreneurship, program proposal, community mobilization and local organization development, and management of change to enhance the technical competencies of the students.*
- *There is a dire need for curriculum revision of the agricultural extension programs offered in the African universities.*

To address the above issues brought up in the FGDs, we recommend the following:

- The public extension systems to adopt and give space to the pluralistic approach in EASs delivery, and develop, monitor, and review the regulatory aspects of EASs.
- The universities to improve synergy and collaborate more closely with all stakeholders, revise the curriculum at least every five years, ensure adequate funding to extension departments to facilitate proper curriculum transaction, arrange for longer internships, invite guest speakers from the field to enhance the knowledge of the students, and involve students in research projects using/establishing mini farms for hands-on education.
- To promote the scholarship of extension, universities should adopt a separate track for extension/outreach faculty similar to the teaching track.
- Strengthen extension professionals' preservice education and inservice training courses with critical process skills and competencies that will ensure that the system serves farmers and delivers EASs effectively.
- Admit students with genuine interest in extension field jobs, collaborate with farmers, rural communities, and commodity associations and monitor current outreach programs.
- Develop a resource manual to provide extension faculty members with a guide to teaching their curriculum and covering all process skills and competencies.
- Conduct job analyses to identify occupational standards for extension professionals, and revise courses to evolve a standardized curriculum incorporating the 11 process skills and competencies and 97 subcompetencies that every extension professional must possess.

5.6 Process Skills and Competencies to be Included in UG Extension Curriculum

A critical analysis of the overall findings of the online survey and FGDs in Nigeria, Malawi, South Africa, Uganda, and Kenya leads to the following conclusions on the quality dilemma that EASs delivery systems and university extension departments are facing:

- The capacity gaps of the extension professionals, weak public extension systems, and inadequate institutional support to extension professionals.
- The changing student population -- very few come from rural agricultural backgrounds, many have little to no interest in hands-on agriculture, and thus they tend not to farm after graduation.
- The graduates have inadequate practical skills useful in farming because agricultural colleges and universities are unable to provide courses with hands-on process skills.
- Long intervals between curriculum revisions, the physical infrastructure is growing old, and funds are lacking to repair or replace laboratory equipment.
- Faculty members lack motivation to change and update their capacities in the new and emerging areas.
- The faculty recognition and reward system does not support extension or outreach on par with research or teaching.

In the context of the study findings and the quality dilemma discussed above, the preservice education and training of UG agriculture students should prepare them to perform the following roles and functions:

- They must be able to provide participatory, demand-driven extension programs for local communities. They should be able to serve as educators, communicators, community organizers, and facilitators of change.
- They should function as networkers and a link between agricultural researchers, policymakers, farm service providers, and farming communities.
- They can organize farm producers into groups and associations for linking farmers to markets, identifying opportunities, and conducting market analyses.
- They promote gender equality and engage various marginalized groups in extension programs.
- They serve as local change agents to address emerging issues such as adaptation to climate change, promotion of renewable energy, gender integration in development programs, and attracting youth to farming as a vocation.

To the curricular revision bodies in Nigeria, Malawi, South Africa, Uganda, and Kenya, we recommend including the 11 process skills and core competencies and 97 subcompetencies in the UG agricultural extension curriculum with clearly specified learning outcomes. These are the core competencies that every extension professional must possess (Box 5.2).

Box 5.2: UG Agricultural Extension Curriculum – Minimum Process Skills and Core Competencies	
Process Skills and Core Competencies (11)	*Subcompetencies (97)*
Program planning	1. Familiar with the vision, mission, and goals of national /state (subnational) extension service and agricultural development strategies, programs, and policies. 2. Able to conduct needs assessment and engage stakeholders to prioritize local needs. 3. Able to conduct baseline or benchmark studies. 4. Able to mobilize resources / funds to address priority needs. 5. Able to engage local stakeholders (e.g., NGOs, cooperatives, local agro-dealers) in extension program planning. 6. Familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).
Program implementation	1. Coordinate local extension programs and activities. 2. Demonstrate teamwork skills to achieve extension results. 3. Form farmers' groups and support them. 4. Engage local stakeholders (e.g., NGOs, SHGs, cooperatives) in implementing extension programs. 5. Demonstrate negotiation skills to reach consensus and resolve conflicts. 6. Follow participatory decision making in extension work. 7. Delegate responsibilities to staff as needed. 8. Engage minority groups (e.g., female farmers and youth development groups) in extension work. 9. Integrate private or PPP in extension service provision.
Communication	1. Select appropriate communication methods. 2. Establish communication with a variety of stakeholders. 3. Respect local culture while communicating with clients. 4. Prepare required progress reports. 5. Share success stories and lessons learned with stakeholders through various media. 6. Use extension methods (e.g., individual, group, and mass contact methods) to disseminate information about extension activities and programs. 7. Demonstrate good listening skills and listen to all clients and stakeholders. 8. Demonstrate good public speaking and presentation skills.

Information and communication technologies	1. Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics. 2. Data entry and analysis software such as Excel, SPSS, etc. 3. Microsoft Power Point for making presentations. 4. Audiovisual aids such as charts, graphs, and puppet shows for teaching and learning. 5. Mass media such as FM radio stations and television channels for communication. 6. Computers (email, Internet) for communication. 7. Mobile phone services (e.g., texting, SMS service) for communication. 8. Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication. 9. ICT tools to improve access to information, knowledge, technologies, and other innovations. 10. ICT tools to enhance collaboration and partnerships. 11. ICT tools for collecting data, monitoring, and evaluating extension programs.
Program monitoring and evaluation	1. Understand theories and principles of monitoring and evaluation (M&E). 2. Conduct M&E of extension programs. 3. Develop data collection instruments -- interview schedules / questionnaires -- for M&E of extension programs. 4. Conduct online surveys for M&E of extension programs. 5. Apply qualitative tools and techniques (e.g., focus group discussion, case study, etc.) to collect evaluation data. 6. Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data. 7. Analyze data (qualitative and quantitative). 8. Interpret data (qualitative and quantitative). 9. Write evaluation report. 10. Share evaluation reports within their organizations and with stakeholders. 11. Apply the evaluation findings in replicating/scaling-up of extension programs.
Personal and professional development	1. Apply principles of good governance (i.e., clients' participation, accountability, and transparency) in extension work. 2. Show commitment to career advancement (participate in lifelong learning, in-service training, professional development events, and conferences).

	3. Apply professional ethics in extension work -- i.e., promote research-based recommendations or technology. 4. Follow organizational policies and directives for professional development. 5. Demonstrate honesty and a positive attitude toward extension work.
Diversity and gender	1. Understand that diversity exists within and among clients and stakeholders. 2. Identify the needs of small-scale farmers. 3. Identify the needs of minority groups. 4. Develop extension programs to benefit women farmers. 5. Develop extension programs to benefit youth. 6. Engage marginalized and vulnerable groups in extension programs (e.g., disabled, resource- poor farmers). 7. Work in diverse teams.
Marketing, brokering, and value chain development	1. Have basic knowledge of agribusiness development. 2. Apply brokering / advisory skills in agribusiness development. 3. Have knowledge of various agricultural markets and linkages. 4. Demonstrate knowledge of value chain logistics and input-output linkages in the value chain. 5. Facilitate entrepreneurship development among extension clientele groups. 6. Be able to link FPOs / cooperatives / agribusiness companies with extension.
Extension soft skills	1. Critical thinking 2. Problem solving 3. Time management 4. Stress management 5. Leadership 6. Teamwork 7. Flexibility 8. Self-motivation 9. Interpersonal skills 10. Positive work attitude

	11. Collaboration 12. Conflict management 13. Group formation and development 14. Negotiation skills 15. Networking skills 16. Facilitation skills 17. Creativity /innovativeness
Nutrition skills and competencies	1. Demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms, etc.). 2. Understand life-cycle nutrition needs of various household members (e.g. ., children of various age groups, pregnant and breast-feeding mothers, elderly). 3. Advise families on what crops and livestock to produce to ensure balanced diets. 4. Advise families to improve gender relations for increased agricultural production and nutrition. 5. Demonstrate postharvest handling technologies that conserve nutrients and assure food safety (e.g., food storage, freezing fruits and vegetables, making pickles, jams, jellies). 6. Have basic knowledge about food labelling (e.g., organic foods). 7. Advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis, weight loss and obesity).
Technical subject matter expertise	1. Demonstrate technical knowledge in their basic discipline (e.g., field crops / livestock/ fishery/ horticulture, etc.). 2. Understand adult learning principles and have practical skills required to teach improved farming practices. 3. Understand a new technology being promoted -- i.e., what it is, why, and how it works? 4. Facilitate farmers' access to inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.). 5. Educate community members about various types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.). 6. Educate community members about climate change and climate- smart agriculture.

	7. Refer to and make use of publications -- journals, research reports, etc. 8. Generate knowledge and produce research reports / journal publications. 9. Harness, document, validate, and integrate local / indigenous knowledge. 10. Understand social system under which farming takes place (e.g., rural sociology knowledge).

Suvedi and Sasidhar (2020) developed three UG agricultural extension courses for South Asian countries (India, Sri Lanka, and Nepal) by incorporating the 11 process skills and core competencies and 97 subcompetencies, among others, that every extension professional must possess. They also developed the contents to be covered under the recommended courses into 13 blocks, 117 theory units, and 71 application/practical units along with relevant references. On the basis of the gaps identified in the present study, we further updated these three courses to entail 18 blocks, 165 theory units, and 89 application / practical units. *Considering the study findings and similarities in agriculture systems between South Asia and sub-Saharan Africa, and after a careful review of gaps in existing agricultural EASs delivery vis-à-vis UG agricultural extension curricula, we recommend adopting these three UG courses of four semester credits each and offering them during the first three years of the curriculum in Nigeria, Malawi, South Africa, Uganda, and Kenya. These courses can be the starting point for the curriculum revision in sub-Saharan Africa with required local contextualization (Boxes 5.3 and 5.4). The Nigeria Universities Commission recommends "a uniquely structured curriculum that should provide 70% of core courses for UG programmes, while allowing universities to utilize the remaining 30% for other innovative courses in their peculiar areas of focus". We too recommend that about 70% of contents focus on core job skills and competencies and the rest (30%) of the training could focus on local issues and the job environment.*

Box 5.3: Summary of Recommended UG Agricultural Extension Courses

Course Title	*Credits (Theory + Practical)*
1. Foundations of Agricultural Extension	3+1
2. Managing Agricultural Extension Programs	2+2
3. Agribusiness and Supply Chain Management	3+1
Total (12 Credits)	*8+4*

Source: Suvedi and Sasidhar (2020)

Box 5.4: Contents of Recommended UG Agricultural Extension Courses	
Course 1: Foundations of Agricultural Extension (3+1)	
Blocks	*Units (Theory & Application / Practical)*
Block 1: *Agricultural Extension*	*Theory:* 1. Concept of extension: philosophy, process, and principles. 2. Historical development of agricultural extension. 3. Contemporary extension approaches and models. 4. Organization and funding of extension services. 5. Issues facing agricultural extension. 6. Issues related to rural resources management. 7. Climate- smart agriculture development. *Application/Practical:* 1. Prepare a historical timeline of agricultural extension education and extension services. 2. Visit a local extension service center or provincial department of agriculture office and learn organogram of services provided, funding, and issues facing extension services. 3. Visit farmers' groups and/or commercial farmers to explore what extension service providers are serving them, identify major issues, and suggest solutions to improve extension services to the users.
Block 2: Sociology of Agriculture	*Theory:* 1. Rural sociology: meaning and importance. 2. Social values and cultural norms, attitudes, and perceptions. 3. Rural-urban continuum, feeding growing urban population. 4. Basic social processes, including accommodation, adjustment, amalgamation, assimilation, cooperation, consensus, competition, conflict, and integration. 5. Conflict: stages, conflict intensity continuum, conflict management. 6. Introduction to gender: concepts of sex and gender, gender stereotypes, gender roles. 7. Women in development approach, gender and development approach. 8. Social construction of gender: socialization process and gender stereotyping, institutions and systems that reinforce gender stereotyping.

	9. Gender mainstreaming: definition, principles, reasons for mainstreaming gender, challenges to mainstreaming, mainstreaming gender in the project cycle. 10. Caste and ethnic groups: current status and challenges. 11. Social stratification and gender, gender-based discrimination, caste and ethnicity, tribal groups. 12. Social stratification: meaning, bases (class, caste, age, gender), views on stratification. 13. Youth in agriculture: how can extension service serve their needs? 14. Rural social institutions: concept and functions; social institutions: household, family, and its types, marriage system; economic institutions: farming, fishing, hunting, and exchange labor; educational institutions; political institutions; government; and religious institutions 15. Farmer associations and cooperatives: management structures, roles and responsibilities, individual members' roles, roles of clubs; roles of the board, the manager, and the government. 16. Bookkeeping for associations/cooperatives: introduction to accounting, uses of accounting information, accounting equation, accounting cycle, original documents, books of original entry, ledger, trial balance, financial statements, profit- and- loss statement, balance sheet, accounting concepts, double- entry system of accounts. 17. Gender integration in management of associations and cooperatives: gender terminologies, social construction of gender, gender analysis, recommendations to improve women's participation.
	Applications/Practical: 1. Visit a rural community to identify social institutions/groups with which the farmers are associated. 2. Visit a village to learn about and list the taboos, folkways, rituals, and social values in the village. 3. Prepare an interview schedule to study the social characteristics of rural society – pattern of settlement, culture, sex roles, social stratification, social values, social control, customs, social interaction process, social change, and social problems (group exercise). 4. Identify important value systems in the rural setting as a means of social control.

Block 3: Development/ Rural Development	*Theory:* 1. Concepts of development, modernization, and social change. 2. Major theories of development. 3. Common indicators of development. 4. Sustainable development: good practice principles. 5. Historical development of rural development. 6. Citizen participation. 7. Women and development. 8. Youth in development. *Applications/Practical:* 1. Visit a municipality/village to meet with local leaders. Interview one leader to find out her/his perceptions of development -- what does development mean to him/her? 2. Read the list of development indicators in the World Bank publication. Select 10 indicators that could be applicable to your community/municipality situation. Discuss why these are relevant to your context. 3. Develop a list of development indicators for your home village/home municipality.
Block 4: Education: How Adults Learn and Change	*Theory:* 1. Formal, non-formal, and informal education: definitions and characteristics. 2. Characteristics of adult learners and implications for teaching. 3. Teaching-learning process and principles of teaching technical information to adults. 4. Good practice tools for helping adults learn. *Applications/Practical:* 1. Divide the class into three groups: group A, group B, and group C. Group A will discuss the characteristics of formal education, group B will be assigned non-formal education, and group C, informal education. Each group will discuss/ make presentation on the characteristics and importance of formal, non-formal, and informal education in the large class. 2. Interview at least 30 adults to find out how they prefer to learn about new technologies, processes, or practices. Present your findings in the class.

Block 5: Communication and Diffusion of Innovations	*Theory:* 1. Communication process, models, and theories. 2. ICTs and social media. 3. Elements of diffusion of new ideas and innovations. 4. Innovation decision process. 5. Adopter categories and communication channels by adopter categories. 6. Attributes of innovation and their rate of adoption. 7. Good practice tools for communication and effective presentations. *Applications/Practical:* 1. Visit an extension office to meet with an extension worker. Interview her/him to find out the desirable attributes of an innovation that enhance its rate of adoption. List the attributes. 2. Develop a Power Point presentation on a given topic to communicate with community leaders and development partners. 3. Prepare organizational charts (problem tree, flip, flow, organizational). 4. Practice field report writing and presentation. 5. Prepare a newsletter. 6. Write a script and presentation for a radio / TV program on a select technology or new practice.
Block 6: Information and Communication Technologies	*Theory:* 1. Definition and evolution of information communication technologies (ICTs). 2. Philosophy, principles, and functions of ICTs in agricultural extension. 3. Synchronous and asynchronous communication. 4. Relevant computer software for extension work. 5. Microsoft Word for word processing. 6. Microsoft PowerPoint for presentations. 7. Microsoft Excel. 8. Internet and E-mail applications.

	Applications / Practical: 1. Practice using ICTS in agriculture. 2. Develop a Power Point presentation and present it to a suitable audience 3. Collect data and analyze data using Excel. 4. Create graphics using Excel. 5. Create personal Google e-mail, Twitter and Facebook accounts. 6. Practice audiovideo tape presentation. 7. Practice online meeting tools and other software.

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COURSE 2: MANAGING AGRICULTURAL EXTENSION PROGRAMS (2+2)	
Blocks	*Units*
Block 1: Working in the Community	*Theory:* 1. Understanding your community: people, culture, social structure, institutions, resources, local leadership, farming systems, etc. 2. Role of the extension worker. 3. Characteristics of effective extension workers. 4. What process skills and competencies do extension workers need to succeed in the profession? 5. Extension worker as community mobilizer and facilitator of community empowerment. 6. Maslow's hierarchy of needs and its implication in community leadership. 7. Competencies of extension professionals. *Applications/Practical:* 1. Visit a nearby village and write the village profile, summarizing its people, culture, social structure, age, sex/ gender and ethnic distribution, leadership, development challenges facing the village, and available resources. 2. Visit a farm family to conduct an interview about extension services. Conduct separate interviews with male head of household and female head of household, ask about the desirable characteristics of extension workers. Compare the characteristics.
Block 2: Extension Teaching Methods	*Theory:* 1. Helping adults learn: principles of adult learning. 2. Individual teaching methods. 3. Group teaching methods. 4. Mass media methods. 5. Media mix strategies. 6. Participatory methods. 7. Use of ICTs and social media in extension. *Applications/Practical:* 1. Preparing printed materials (poster, booklet, leaflet). 2. Preparing charts (problem tree, flip, flow, organizational).

	3. Preparing and conducting drama (indigenous media). 4. Preparing newsletter and/or extension bulletin, 5. Designing agriculture campaign. 6. Writing a script and presentation for radio / TV program. 7. Developing preparation and presentation skills using Microsoft Power Point. 8. Developing audiotapes and videos. 9. Visit a nearby village and conduct participatory rural appraisal (PRA), prepare PRA diagrams and presentation – group activity.
Block 3: Extension Program Planning	*Theory:* 1. Program planning: definition and types of programs; steps in program planning. 2. Conducting needs assessment. 3. Prioritizing needs and problems. 4. Identifying lay leaders and stakeholders. 5. Conflict management theory and skills. 6. How to effectively communicate with team members and clients. 7. Establish a planning team and engage team in program planning. 8. Acquire and allocate resources. 9. Conduct the nominal group technique, community forums, brainstorming exercises. 10. Identify market opportunities for farm products. 11. Linking farmers to markets through groups and associations. 12. Design services on the basis of gender analysis. 13. Develop an annual work plan. 14. Develop a grant proposal: essential steps. *Applications/Practical:* 1. Class discussions on various types of needs: felt and unfelt needs, ascribed needs, etc. 2. Review and critique a community survey questionnaire. 3. Design a community needs assessment survey (interview schedule). 4. Develop a focus group discussion protocol with sample questions.

	5. Practice data collection using personal interviews schedule or focus group questions. 6. Complete data entry and data analysis using statistical software. 7. Prioritize community needs on the basis of survey results. 8. Develop an educational program on the basis of priority needs.
Block 4: Extension Program Implementation	*Theory:* 1. Implementing extension program: specify program activities, assign responsibilities, allocate budget / resources, ensure timely communication among staff members, manage conflicts, promote teamwork, conduct periodic meetings to check on progress, monitor the program activities, keep records, etc. 2. Understanding group dynamics and facilitation of group development. 3. Managing groups and working as a team. 4. Working with local leaders and development partners. 5. Recognizing and rewarding employees. 6. Creating a safe working environment. 7. Coordinating with stakeholders for acquiring and mobilizing resources. 8. Employing good practices in program implementation. *Applications / Practical:* 1. Practice various process skills and core competencies of extension workers. 2. Conduct farm and home visits. 3. Conduct method and result demonstrations. 4. Organize farmer field schools. 5. Organize farmers' field days. 6. Conduct meetings effectively. 7. Manage conflicts (role play). 8. Conduct a stakeholders' meeting at the community level. 9. Manage time (role play/drama). 10. Write field reports, write for newspapers and/or mass media. 11. Observe extension planning meeting/workshop, research-extension linkages meeting at training center/regional office.

Block 5: Extension Program Evaluation	*Theory:* 1. Introduction to program evaluation: what and why. 2. Common evaluation approaches and types. 3. Ethics of evaluation. 4. Program evaluation frameworks and designs. 5. Evaluability assessment. 6. Approaches to evaluation data collection. 7. Selecting data collection techniques. 8. Developing data collection instruments. 9. Sampling for program evaluation. 10. Collecting and analyzing evaluation data. 11. Communicating evaluation findings with stakeholders. 12. Using evaluation results for accountability and continuous program planning. *Applications/Practical:* 1. Develop an evaluation plan. 2. Practice developing data collection instruments. - Surveys and interview schedules. - Semi-structured interviews for key informants. - Participant observation checklists. - Questions for an in-depth case study. - Protocol and questions for focus group discussion. 3. Develop data collection sheets for benefit/cost analysis. 4. Design a sampling plan for a survey project. 5. Gather survey/interview data, analyze data and prepare survey reports. 6. Share results with a suitable audience.
Block 6: Personal and Professional Development in Extension	*Theory*: 1. Concept of professional development. 2. Types of professional development. 3. Preservice training for extension professionals. 4. In-service training for extension professionals.

	5. Induction or orientation training, mentorship. 6. Maintenance or refresher training. 7. Career development training. 8. Lifelong professional development for extension professionals. 9. Extension professional ethics, codes of ethics, and conduct. *Applications / Practical:* 1. Visit local, provincial, and/or national extension office to study various types of professional development opportunities for extension professionals. 2. Interview extension professionals to determine level of participation in professional development activities.
Block 7 Governance in Agricultural Extension	*Theory*: 1. Governance, management, and administration of EASs at national, provincial, and local levels. 2. Institutional design of extension services, such as the level of decentralization, privatization and pluralism of EASs, as well as monitoring and accountability mechanisms. 3. Roles and responsibilities of the public, private, and civil society sectors in providing and financing EASs as well as the linkages and coordination among these actors. 4. Managing staff and budgets for EASs. 5. Principles of citizen participation. 6. Transparency and accountability of EASs. 7. Need for youth leadership development in extension. 8. Managing stakeholder relationships: collaboration and cooperation with extension partners and supporters.
	Applications / Practical: 1. Visit local, provincial, and/or national extension office to study the administrative, institutional, and organizational structures and processes within which agricultural extension services are rooted. 2. Study and write a report on how extension services are steered, at what level decisions for budget, design, and implementation of extension services are made, and how authority is exercised.

Block 8 : Agricultural Extension Soft Skills	*Theory*: 1. Critical thinking and problem solving in EASs. 2. Time and stress management. 3. Leadership and teamwork in EASs. 4. Flexibility and collaboration in EASs. 5. Self-motivation and interpersonal skills. 6. Positive work attitude and conflict management. 7. Group formation and development. 8. Negotiation, networking, and facilitation skills. 9. Creativity / innovativeness. *Applications / Practical:* 1. Visit local, provincial, and/or national extension office to study extension soft skills in specific settings and write a report on as many soft skills as possible.

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COURSE 3: AGRIBUSINESS, MARKETING, AND SUPPLY CHAIN MANAGEMENT (3+1)	
Blocks	*Units*
Block 1: Agribusiness and Entrepreneurship Development	*Theory:* 1. Agribusiness management in a changing environment: - The elements of a successful agribusiness. - Essential managerial goals and functions for an agribusiness. - Agricultural policy. - Business ethics in agriculture. 2. Entrepreneurship development. 3. Basic business financials and record keeping. Essential recordkeeping for farming purposes. Enterprise budgeting on the farm. The cash-flow statement and budget. 4. Entrepreneurship in small and medium enterprises (SMEs) and their role in development. 5. Developing a winning business idea: idea generation, idea assessment, gross margin analysis, break-even analysis, value chain analysis, idea selections, idea development.

	6. Cooperatives: meaning of cooperation, types of cooperatives, principles of cooperatives, cooperative philosophy, cooperative business principles, cooperative management and structure, formation and registration of cooperatives, fundamentals of cooperative development. 7. Smallholder farmer associations (SFAs): management structures, roles and responsibilities, individual members' roles, roles of clubs, roles of the board, the manager and his committee, the government. 8. Bookkeeping for associations/cooperatives: introduction to accounting, users of accounting information, accounting equation, accounting cycle, original documents, books of original entry, ledger, trial balance, financial statements, profit- and- loss statement, balance sheet, accounting concepts, double- entry system of accounts. 9. Gender integration in management of associations and cooperatives: gender terminologies, social construction of gender, gender analysis in SFGA and cooperatives, recommendations to improve women's participation in business management functions and managerial decisions 10. Preparation of financial statements in financing. 11. Investment appraisals through use of discounted appraisal measures. 12. Value chain analysis: concept, mapping, and approaches. 13. Production planning in agribusiness -- planning production, risk management. 14. World Trade Organization (WTO) and its implications and opportunities in international trade in the agricultural sector. 15. Agricultural policies and their impact on agribusiness enterprises.
	Applications / Practical: 1. Field visit to successful agricultural entrepreneurs – agripreneur start-up, farmer producer organization, SHG business, large business -- to acquaint students with various types of agricultural entrepreneurship to assess the demand-supply of agricultural commodities.

	2. Conduct an analysis of backward and forward linkages of major agricultural product(s). 3. Prepare and analyze a balance sheet. 4. Prepare and analyze profit- and- loss statement. 5. Cash flow analysis of an agro-industry or a cooperative.
Block 2: Farm Management	*Theory:* 1. Concept and scope of farm management. 2. Management of farm resources -- land, labor, machinery/equipment, and civil works/buildings. 3. Principles of farm management decisions -- variable proportion, factor substitution, cost principle, opportunity cost principle, time comparison, and comparative advantage principle. 4. Farm planning -- characteristics and techniques.
	5. Farm budgeting -- enterprise partial budgeting and complete budget. 6. Farm inventory, depreciation and valuation techniques for farm assets. 7. Farm record keeping -- balance sheet, income statement, and cash- flow statement. 8. Farm efficiency measures. 9. Risk and uncertainty -- concepts, types, and safeguard measures. *Applications/Practical:* 1. Farm record keeping -- develop record- keeping sheet for a farm commodity. 2. Preparation of farm inventory. 3. Development of new farm plan. 4. Preparation of balance sheet of a farm. 5. Preparation of income statement of a farm. 6. Development of cash- flow budget of a farm. 7. Computation of depreciation of farm assets. 8. Exercise on time value of money. 9. Exercise on linear programming.

Block 3: Supply Chain Management	*Theory:* 1. Concept of supply chain and value chain management. 2. Customer service management. 3. Supplier relationship management. 4. Supply chain mapping of major agricultural commodities (rice, wheat, lentils, fish, milk, rubber, tea, coffee). 5. Actors and regulators in the supply chain. 6. Role of extension in developing and maintaining supply chain. 7. Supply chain performance analysis and evaluation. 8. Factors augmenting and hindering supply chain management. *Applications / Practical:* 1. Visit an agribusiness unit -- analyze problems, performance, and prospects (a case study). 2. Value chain mapping of major agricultural subsectors. 3. Preparation of business plan for agricultural firms. 4. Determination of optimum input use and maximization of profit using one input. 5. Determination of least-cost combination of inputs. 6. Revenue maximization through optimum enterprise combination.
Block 4: Marketing and Value Chain Development	*Theory*: 1. Marketing and value chains in agriculture. 2. Farming with market in mind. 3. The agricultural marketing process. 4. Market planning and analysis. 5. Understanding value chains in agriculture: value chain development for farmers. 6. Risk management in farming: sources of risk and mitigation methods. 7. Apply brokering / advisory skills in agri-business development. 8. Facilitate entrepreneurship development among extension clientele groups.

	Applications / Practical: 1. Visit an agribusiness value chain handling entity and study identified commodity value chains. 2. Study different agricultural markets and their linkages in the value chain. 3. Study value chain logistics and input-output linkages in the value chain. 4. Study model FPOs / cooperatives / agribusiness companies and how they are linked with EASs.

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Source: Adapted and modified from Suvedi and Sasidhar (2020)

Strengthening Agricultural Extension Training in Nigeria, Malawi, South Africa, Uganda, and Kenya

Dear Colleagues,

We are conducting an online survey under the research project *"Strengthening Agricultural Extension Training in the MSU Alliance for African Partnership Consortium Partners in Africa"* funded by Michigan State University. The core objective of this work is to identify Process Skills and Competency Gaps in Undergraduate Agricultural Extension Curriculum in Nigeria, Malawi, South Africa, Uganda and Kenya. You are invited to participate in this study because you have experience with skills and competencies required for effective extension work.

Process skills and core competencies are basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks well and respond to contingencies, change, and the unexpected. Please keep this definition in mind while you answer the survey questions. The skills and competencies we are researching are categorized as follows in the questionnaire:

1. Program planning
2. Program implementation
3. Communication
4. Information and communication technologies
5. Program monitoring and evaluation
6. Personal and professional development
7. Diversity and gender
8. Marketing, brokering and value chain development
9. Extension soft skills
10. Nutrition skills and competencies
11. Technical subject matter expertise

The findings will be shared with all important stakeholders of agricultural extension education/ training for undergraduate curricular revitalization in Nigeria, Malawi, Kenya, Uganda, and South Africa in specific, and other African countries in general.

The Institutional Review Board approval for human subjects research for this study was obtained from Michigan State University. Please know that your participation in this study is completely voluntary and the information you provide will be treated with strict confidentiality and will only be used for research purposes. You can withdraw at any time or refuse to answer any questions.

It will take approximately 25 minutes to complete this survey. We recommend that you take this survey on a Desktop or Laptop computer. As a token of appreciation, all respondents will receive a soft copy of the research report. If you have any questions regarding the study, please do not hesitate to contact us.

Please follow this link to the Survey: Take the Survey

Or copy and paste the URL below into your internet browser:

https://msu.co1.qualtrics.com/jfe/preview/SV_eA7j51dpEPqrBau?Q_CHL=preview

Follow the link to opt out of future emails:

Click here to unsubscribe

Thank you for your time and cooperation.

Sincerely,

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Strengthening Agricultural Extension Training in Nigeria, Malawi, South Africa, Uganda, and Kenya

1. Primarily which country's extension system do you represent? (Check one)
   - Nigeria
   - Malawi
   - Uganda
   - South Africa
   - Kenya
   - Others (Please specify the other country not listed above) _____)
2. Which university (ies) do you have deep knowledge of undergraduate education in agriculture or allied subjects? (Please write the university name(s)_____)
3. What is your current position? (Check one)
   - Extension Staff in a University
   - Extension Researcher
   - Public Sector Extension Professional
   - Private Sector Extension Professional
   - NGO Extension Professional
   - Employer of Agriculture Graduates
   - Any other (Please specify) ----------
4. Are you familiar with current undergraduate level agricultural extension curriculum in the country or institution in questions 1 and 2?
   - Familiar
   - Not familiar

Instructions: Questions A through K have two components: first you will rate the importance of each competency, and the second, you rate how well the undergraduate extension curriculum covers this competency. Please rate the importance and the level of competency on each statement on a 1 to 5 scale as explained below.

How important is this skill or competency for an extension worker?	Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?
1. Not Important 2. Somewhat Important 3. Moderately important 4. Important 5. Very Important Please check a box (✓) for each statement that best represents your opinion.	1. Not at All Covered 2. Minimally Covered 3. Moderately Covered 4. Well Covered 5. Very Well Covered Please check a box (✓) for each statement that best represents your opinion.

A. Program Planning Skills and Competencies:

Job skills and competencies: Extension professionals should be:		A01					A02				
		How important is this skill or competency for an extension worker?					Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Familiar with the vision, mission and goals of National /State (sub-national) extension service and agricultural development strategies, programs, and policies.										
2	Able to conduct needs assessment and engage stakeholders to prioritize local needs.										
3	Able to conduct baseline or benchmark studies.										
4	Able to mobilize resources / funds to address priority needs.										
5	Able to engage local stakeholders (e.g. NGOs, cooperatives, local agro-dealers) in extension program planning.										

Job skills and competencies: Extension professionals should be:		A01 How important is this skill or competency for an extension worker?					A02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
6	Familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).										

B. Program Implementation Skills and Competencies:

Job skills and competencies: Extension professionals should:		B01 How important is this skill or competency for an extension worker?					B02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Coordinate local extension programs and activities.										
2	Demonstrate teamwork skills to achieve extension results.										
3	Able to form farmers groups and support them.										
4	Engage local stakeholders (e.g., NGOs, Self Help Groups, Cooperatives) in implementing extension programs.										
5	Demonstrate negotiation skills to reach consensus and resolve conflicts.										

Job skills and competencies: Extension professionals should:		B01 How important is this skill or competency for an extension worker?					B02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
6	Follow participatory decision-making in extension work.										
7	Delegate responsibilities to staff as needed.										
8	Be able to engage minority groups (e.g. Female farmers and youth development groups) in extension work.										
9	Integrate private or public-private partnerships in extension service provision.										

C. Communication Skills and Competencies:

Job skills and competencies: Extension professionals should be able to:		C01 How important is this skill or competency for an extension worker?					C02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Select appropriate communication methods.										
2	Establish communication with different stakeholders.										
3	Respect local culture while communicating with clients.										
4	Prepare required progress reports.										
5	Share success stories and lessons-learned with stakeholders through various media.										

Job skills and competencies: Extension professionals should be able to:		C01 How important is this skill or competency for an extension worker?					C02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
6	Use extension methods (e.g., individual, group and mass contact methods) to disseminate information about extension activities and programs.										
7	Demonstrate good listening skills and listen to all clients and stakeholders.										
8	Demonstrate good public speaking and presentation skills.										

D. Information and Communication Technologies (ICTs) Skills and Competencies:

Job skills and competencies: Extension professionals should be able to use:		D01 How important is this skill or competency for an extension worker?					D02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics.										
2	Data entry and analysis software such as Excel, SPSS etc.										
3	Microsoft Power Point for making presentations.										

4	Audio-visual aids such as charts, graphs, and puppet show for teaching and learning.										
5	Mass media like FM radio stations and television channels for communication.										
6	Computers (email, Internet) for communication.										
7	Mobile phone services (e.g., texting, SMS service) for communication.										
8	Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication.										
9	ICT tools to improve access to information, knowledge, technologies and other innovations.										
10	ICT tools to enhance collaboration and partnerships.										
11	ICT tools for collecting data, monitoring, and evaluation of extension programs.										

E. Program Monitoring and Evaluation Skills and Competencies:

Job skills and competencies: Extension professionals:		E01 How important is this skill or competency for an extension worker?					E02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Understand theories and principles of monitoring and evaluation.										
2	Conduct monitoring and evaluation of extension programs.										

Job skills and competencies: Extension professionals:		E01 How important is this skill or competency for an extension worker?					E02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
3	Develop data collection instruments - interview schedules / questionnaires- for monitoring and evaluation of extension programs.										
4	Conduct online surveys for monitoring and evaluation of extension programs.										
5	Apply qualitative tools and techniques (e.g., focus group discussion, case study etc.) to collect evaluation data.										
6	Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data.										
7	Analyze data (qualitative and quantitative).										
8	Interpret data (qualitative and quantitative).										
9	Write evaluation report.										
10	Share evaluation reports within their organizations and with stakeholders.										
11	Apply the evaluation findings in replicating/ scaling-up of extension programs.										

F. Personal and Professional Development Skills and Competencies:

Job skills and competencies: Extension professionals should:		F01 How important is this skill or competency for an extension worker?					F02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Apply principles of good governance (i.e., clients participation, accountability and transparency) in extension work.										
2	Show commitment to career advancement (participate in lifelong learning, in-service training, professional development events and conferences).										
3	Apply professional ethics in extension work i.e., promote research-based recommendation or technology.										
4	Follow organizational policies and directives for professional development.										
5	Demonstrate honesty and positive attitude towards extension work.										

G. Diversity and Gender Skills and Competencies:

	Job skills and competencies: Extension professionals should:	G01 How important is this skill or competency for an extension worker?					G02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Understand that diversity exists within and among clients and stakeholders.										
2	Identify the needs of small-scale farmers.										
2	Identify the needs of minority groups.										
3	Develop extension programs to benefit women farmers.										
4	Develop extension programs to benefit youth.										
5	Engage marginalized and vulnerable groups in extension programs (e.g. disabled, resource poor farmers).										
6	Do teamwork with diverse staffs.										

H. Marketing, Brokering and Value Chain Development Skills and Competencies

	Job skills and competencies: Extension professionals should:	H01 How important is this skill or competency for an extension worker?					H02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Have basic knowledge of agri-business development.										
2	Apply brokering / advisory skills in agri-business development.										

Job skills and competencies: Extension professionals should:		H01 How important is this skill or competency for an extension worker?					H02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
3	Have knowledge on different agricultural markets and linkages.										
4	Demonstrate knowledge of value chain logistics and input-output linkages in the value chain.										
5	Facilitate entrepreneurship development among extension clientele.										
6	Be able to link farmers producers' organizations / cooperatives / agri-business companies with extension.										

I. Extension Soft Skills and Competencies

Job skills and competencies: Extension professionals possess the other soft skills like:		I01 How important is this skill or competency for an extension worker?					I02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Critical thinking										
2	Problem solving										
3	Time management										
4	Stress management										
5	Leadership										
6	Teamwork										
7	Flexibility										
8	Self-motivation										

Job skills and competencies: Extension professionals possess the other soft skills like:		I01 How important is this skill or competency for an extension worker?					I02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
9	Interpersonal skills										
10	Positive work attitude										
11	Collaboration										
12	Conflict management										
13	Group formation and development										
14	Negotiation skills										
15	Networking skills										
16	Facilitation skills										
17	Creativity /Innovativeness										

J. Nutrition Skills and Competencies

Job skills and competencies: Extension professionals should:		J01 How important is this skill or competency for an extension worker?					J02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms etc).										
2	Understand lifecycle nutrition needs of different household members (e.g ., children of various age groups, pregnant and breastfeeding mothers, elderly).										

Job skills and competencies: Extension professionals should:		J01 How important is this skill or competency for an extension worker?					J02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
3	Able to advise families on what crops and livestock to be produced to ensure balanced diets.										
4	Advise families to improve gender relations for increased agriculture production and nutrition.										
5	Demonstrate postharvest handling technologies that conserve nutrients and food safety (e.g. food storage, freezing fruits and vegetables, making pickles, jams, jellies).										
6	Have basic knowledge about food labeling (e.g., organic foods).										
7	Able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity).										

K. Technical Subject Matter Expertise/Skills and Competencies

Job skills and competencies: Extension professionals should:		J01 How important is this skill or competency for an extension worker?					J02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
1	Demonstrate technical knowledge in their basic discipline (e.g., field crops / livestock/ fishery/ horticulture etc).										

	Job skills and competencies: Extension professionals should:	J01 How important is this skill or competency for an extension worker?					J02 Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?				
		1	2	3	4	5	1	2	3	4	5
2	Understand adult learning principles and hold practical skills required to teach improved farming practices.										
3	Understand the new technology being promoted, i.e., what it is, why, and how it works.										
4	Facilitate farmers to access inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.)										
5	Be able to educate community members about different types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.).										
6	Be able to educate community members about climate change and climate smart agriculture.										
7	Refer to and make use of publications--journals, research reports, etc.										
8	Generating knowledge or producing research reports / journal publications.										
9	Able to harness, document, validate and integrate local / indigenous knowledge.										
10	Understand social system under which farming takes place (e.g., rural sociology knowledge).										

L. Additional Information about Competencies: If you feel there are additional job skills and competencies that extension professionals need, but are not listed above, please write them in the spaces below:

1.

2.

3.

4.

M. How can we make agricultural extension curriculum robust and practical? Please rate the following strategies:

Strategies for Improvement	Already exists	Good to have	Important	Essential
Provide practical and contemporary skills (e.g., through mentored internship or attachment to a progressive farmer in a crop season).				
Include various soft skills in extension curriculum.				
Include business management concepts and practices in extension curriculum.				
Expose students to market opportunities, linking farmers with service providers, and develop entrepreneurship.				
Grooming students with broad-based general agricultural courses (e.g., crop and animal production, postharvest, marketing, and joint ventures) along with extension training.				
Incorporate youth development, gender issues, urban/sub-urban agriculture, and climate change concepts in extension curriculum.				
Recruit extension faculty carefully.				
Include research and data analytical skills.				
Offer training of trainer workshops for extension faculty members.				
Develop cutting-edge and practical teaching learning resources – extension textbooks, practical handbooks, training manual, etc.				
Undergraduate extension curriculum/pedagogy should be more ICT oriented				

N. What are the appropriate ways to acquire the above-mentioned core competencies? Please rate each way or mechanism on a scale given below:

Ways to acquire core competencies:	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
Through **Preservice Training** by revising or updating the curriculum.				
Requiring **Internship** at various work environments (i.e., Public Institutions, NGOs, Private Companies, etc.) during UG, PG, or PhD programs.				
Through **Basic Induction Training** (e.g., job orientation training at the beginning of job)				
Through **In-service Training** (e.g., training offered during the employment at Universities, Training Institutes/Centers, etc.)				
Providing opportunities to attend **trainings,** seminars, workshops, webinars, etc.				

O. If you feel there are additional appropriate ways to acquire process skills or competencies but are not listed above, please write them in the space below.

P. What are the major barriers to effective implementation of extension training curriculum in your country? Please check all that apply.

- Development of an effective extension curriculum
- Quality faculty to teach extension courses
- Quality textbooks and/or manuals
- Classroom and demonstration farms or facilities
- Accreditation
- Time constraint
- Budget to support practical learning experience (e.g. filed visits and demonstrations)

- Student motivation to study extension and in practical extension work
- Teacher motivation to teach requited process skills and competencies
- Other (please specify) _____

Q. What is your age now (in years)? _____

R. What is your gender?

____ Woman

____ Man

S. What is your highest level of education? Select (P) one that applies.

____Bachelor's degree

____Master's degree

____Doctoral (Ph.D.) degree

____Other (please specify_____)

T. How long have you served in extension profession extension or agriculture related fields? (Write total number of years you have worked in extension). _____

U. If you would like to receive a copy of the research report, please provide your e-mail:

Thank you for taking the time to complete this survey!

Strengthening Agricultural Extension Training in Nigeria, Malawi, South Africa, Uganda, and Kenya

FGD Invitation Letter

Date: ----------

To

Dear Sir / Madam,

Greetings.

We are conducting a research project **"Strengthening Agricultural Extension Training in the MSU Alliance for African Partnership Consortium Partners in Africa"** funded by Michigan State University. The core objective of this work is to identify Process Skills and Competency Gaps in Undergraduate Agricultural Extension Curriculum in Africa.

As part of this research work, we are conducting a Focus Group Discussion on **'Process Skills and Competency Gaps in Undergraduate Extension Curriculum'**, with extension faculty, researchers, practitioners and employers in both public and private organizations as well as extension postgraduate students.

Venue: ----------

Date & Time: ----------

The Focus Group Discussion will be followed by a Lunch.

May I request you to kindly participate in the Focus Group Discussion and share your viewpoints on **"Process Skills and Competency Gaps in Undergraduate Extension Curriculum."**

Please confirm your participation by ---------- (date) by calling me at: ---------- (Phone Number) or via e-mail at: ----------

Thank you for your time and cooperation.

Yours Sincerely,

(Name & Designation of Researcher)

Strengthening Agricultural Extension Training in Nigeria, Malawi, South Africa, Uganda, and Kenya

Good morning / afternoon ladies and gentlemen and welcome to the FGD. My name is ---------- (Name & Designation). Assisting me is ---------- (Name & Designation). We have asked you to join us today so that we can listen to you, our colleagues and friends of agricultural extension services. More specifically, we are interested in your thoughts and opinions regarding agricultural extension and how extension services could address the evolving needs of our graduates, farmers, agribusinesses and development partners.

The objectives of this Focus Group are to gather information, including perceptions and ideas, from you about:

a. How effective our extension programmes are in addressing the needs of our food and agricultural systems?

b. What are the critical skills and core competencies required of extension workers to effectively plan, implement and evaluate extension work in the changing context?

c. Does our undergraduate curriculum in extension education include education and /or training on these job skills or core competencies necessary for successful extension service delivery?

d. What are the major barriers to effectively train extension workers with the required core competencies and how can these barriers be removed?

Your responses will be used to supplement the results of a broader, nation-wide, and continental survey. The results of the FGD and the online survey will be used to recommend subsequent development of competency–based curriculum for extension professionals across Africa. Therefore, it is very important that you respond as openly and thoughtfully as you can. There is no right or wrong answers in our discussion today. Many people have different experiences in extension activities, so feel free to comment even if your thoughts, ideas, and experiences are different from what others have to say. My job is to guide the conversation and keep us on time to be sure we finish in the allotted time, so along the way I may interrupt, or I may push us along a little bit faster, so that we can finish our conversation on time.

This session is audio-taped to ensure accuracy in our written summaries. However, we will do everything in our ability to ensure the confidentiality of your responses; no transcribed comments will be attributed to any individual. To make sure we capture all the comments, we ask that you speak one at a time. Indeed, focus groups are mostly successful when participants share the time among themselves, but don't feel like you have to respond to every question. If any question is ambiguous or confusing in any way, please ask for clarifications.

The session may last about 90 minutes and we will not take a formal break, so if at any time, you wish to get up for coffee or a snack, please feel free to do so.

Do you have any question before we begin?

Let us begin by finding out a little more about each other. As we go around the room, please introduce yourselves and tell us a bit about your involvement in extension and agriculture related business or industry.

1. What are you hearing among your fellow extension professionals and/or from people in the agricultural community about agricultural extension in ----- (Country name)?
2. What has been your own experience with respect to agricultural extension? Are you involved in developing extension curriculum, teaching extension courses, hiring extension workers, supervising extension workers or developing extension programs or policies? Please share your experience.
3. How effective are our extension programs in addressing the needs of the changing agricultural systems? What are one/two things that extension service is doing particularly well in your university, state or region in agriculture arena?

   [Pass around a blank white paper page and pencil. Ask them to list one or two things that extension is doing well.]
4. If you could come up with three major recommendations to improve agricultural extension services and program delivery, what would they be?

   [Pass around a blank paper and pencil. Ask them to list three things to improve the extension services.]
5. What are three critical job skills or core competencies required of agricultural extension workers in the changing agricultural and rural development context?

   [Pass around a blank paper and pencil. Ask them to list three process skills or competencies required of extension workers for effective extension work.]
6. Does our undergraduate extension curriculum effectively train students on the above job skills core competencies?
7. If not, what are the gaps that need to be filled in terms of the current curriculum in existence?
8. Again, what are the main barriers to effectively train undergraduate students with the required core competencies and how can these barriers be removed?

   [Pass around a blank paper and pencil. Ask them to list the main barriers and how these barriers can be removed.]
9. What changes or modifications might you recommend with respect to agricultural extension curriculum? Are there courses we are not teaching that we should consider including extension curriculum? What courses or contents are outdated that we should consider dropping out?

10. Finally, we have invited you here because we value your inputs and responses to our questions, but we would like to know who else we should be asking. Do you have suggestions for others we should be including as we continue to seek inputs and advice on how to improve our curriculum? Who are they? What should we be asking them?

11. Are there any final comments?

Our time has passed so quickly. On behalf of Research Team on this Project, I want to thank you for taking time from your tight schedules to share with us this important information. Your comments and suggestions will help us develop recommendations for **"Strengthening Agricultural Extension Training at the Undergraduate Level in Africa."**

If you would like to receive a copy of the research report, please provide your e-mail:

[Pass around a blank paper and pencil to write the e-mails.]

Thank you for your participation!

A1. Perception of Extension Professionals who are Familiar and Unfamiliar with UG Agricultural Extension Curriculum on Importance of Process Skills and Competencies in Africa

Table A1 shows that both those familiar and unfamiliar with the UG agricultural extension curriculum rated all eleven process skills and competencies as important for an extension worker. However, there were significant differences in their perception of the importance of all eleven process skills and competencies.

Table A1: Perception of Extension Professionals who are Familiarand Unfamiliar with UG Agricultural Extension Curriculum on Importance of Process Skills and Competencies in Africa

Skills and Competencies	Total		Familiar with UG Agricultural Extension Curriculum*		Unfamiliar UG Agricultural Extension Curriculum**			t-value (2-tailed sig)
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	Mean Difference	
Program Planning	572	4.46 (0.60)	477	4.50 (0.58)	95	4.28 (0.67)	0.22	3.21 (0.00)
Program Implementation	560	4.57 (0.49)	462	4.60 (0.46)	98	4.38 (0.57)	0.22	4.12 (0.00)
Communication	557	4.69 (0.43)	458	4.73 (0.40)	99	4.51 (0.52)	0.22	4.70 (0.00)
ICTs	547	4.53 (0.52)	451	4.60 (0.48)	96	4.20 (0.55)	0.40	7.16 (0.00)
Program Monitoring and Evaluation	536	4.58 (0.53)	441	4.63 (0.49)	95	4.33 (0.61)	0.31	5.26 (0.00)
Personal and Professional Development	532	4.65 (0.48)	436	4.67 (0.47)	96	4.59 (0.52)	0.07	1.34 (0.18)
Diversity and Gender	528	4.69 (0.45)	433	4.71 (0.42)	95	4.58 (0.54)	0.13	2.52 (0.01)
Marketing, Brokering and Value ChainDevelopment	529	4.58 (0.53)	434	4.63 (0.51)	95	4.36 (0.56)	0.27	4.58 (0.00)
Extension	517	4.70 (0.40)	423	4.73 (0.40)	94	4.57 (0.39)	0.15	3.38 (0.00)

Nutrition	517	4.38 (0.66)	423	4.45 (0.61)	94	4.07 (0.78)	0.38	5.19 (0.00)
Technical Subject Matter Expertise	514	4.63 (0.49)	422	4.68 (0.45)	92	4.38 (0.57)	0.30	5.44 (0.00)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

A2. Program Planning Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The results in Table A2 reveal that the agricultural extension professionals in Nigeria, Malawi, South Africa Uganda and Kenya considered all six program planning skills and competencies as important for the extension worker. However, there were significant differences (0.03) in their perception of the importance of the skill '*able to conduct baseline or benchmark studies*'. Also, the respondents in the different countries considered most of the six program planning skills and competencies to be moderately covered in the UG extension curriculum. There were however some exceptions. In Nigeria, Uganda and Kenya, the respondents indicated that the skill '*able to mobilize resources/funds to address priority needs*' was minimally covered in the UG extension curriculum. Also, the skill '*familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs)*' was minimally covered in the UG extension curriculum in Nigeria and Kenya. There were statistically significant differences in the respondents' perception of the extent of coverage of various program planning skills and competencies across all countries except the skill '*familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs) (p = 0.31)*'.

A3. Program Implementation Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The respondents in all the five countries indicated that the nine program implementation skills and competencies were important for an extension worker (Table A3). However, there were significant differences (p = 0.02) in their perception of the importance of the skill '*demonstrate negotiation skills to reach consensus and resolve conflicts*'. The respondents in all five countries also indicated that most of the nine program implementation skills and competencies were moderately covered in the UG extension curriculum. The respondents in Malawi however noted that the skills '*demonstrate teamwork skills to achieve extension results*' and '*follow participatory decision-making in extension work*' were very well covered in their UG extension curriculum. On the other hand, skills such as 'demonstrate negotiation skills to reach consensus and resolve conflicts' and '*integrate private or public-private partnerships in extension service provision*' were minimally covered in the UG extension curriculum in Nigeria. The results further show that there were significant differences in the respondents' perception of the extent of coverage of various program implementation skills

and competencies across all countries except the skill '*delegate responsibilities to staff as needed (p = 0.14)*'.

A4. Communication Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The results in Table A4 reveal that the eight communication skills and competencies were categorized as important for an extension professional across the five different countries. However, there were significant differences (p = 0.00) in the respondents' perception of the importance of the skill '*respect local culture while communicating with clients*'. The respondents in all five countries also indicated that most of the eight communication skills and competencies were moderately covered in the UG extension curriculum. However, the respondents in South Africa indicated that most communication skills except '*prepare required progress reports' and 'share success stories and lessons-learned with stakeholders through various media'* were very well covered in their UG extension curriculum. The aforementioned skills were moderately covered in their UG extension curriculum. Similarly, the respondents in Malawi rated skills such as '*use extension methods (e.g., individual, group and mass contact methods) to disseminate information about extension activities and programs*' and '*respect local culture while communicating with clients*' as very well covered in the UG extension curriculum. In Kenya, the respondents rated the skills '*select appropriate communication methods*' and '*use extension methods (e.g., individual, group and mass contact methods) to disseminate information about extension activities and programs*' to be very well covered in the UG extension curriculum. Overall, all the communication skills and competencies were very well covered in the UG extension curriculum in South Africa. There were significant differences in the respondents' perception of the extent of coverage of various communication skills and competencies across all countries except the skills '*select appropriate communication methods (p = 0.16)*' and '*respect local culture while communicating with clients (p = 0.39)*'.

A5. ICTs Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The respondents in the five countries rated all twelve information and communication technologies (ICTs) skills and competencies as important for extension workers (Table A5). However, there was a significant difference (p = 0.05) in their perception of the importance of the skill '*mobile phone services (e.g., texting, SMS service) for communication*'. Also, the respondents in all five countries perceived that virtually all the communication skills and competencies are moderately covered in their UG extension curriculum. However, the respondents in Malawi considered the skills '*Microsoft Power Point for making presentations*' as very well covered and the skill '*social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication*' to be minimally covered in their UG extension curriculum. In Nigeria and Uganda, the respondents rated the skills '*ICT tools to enhance collaboration and partnerships*' and '*ICT tools for collecting data, monitoring, and evaluation of extension programs*' as minimally covered in their UG extension curriculum. In Kenya, the respondents rated the skills '*data entry and analysis software such as Excel, SPSS etc*' and '*ICT tools for*

collecting data, monitoring, and evaluation of extension programs' to be minimally covered in their UG extension curriculum. Furthermore, there were statistically significant differences in the respondents' perception of the extent of coverage of the skills '*Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics (p = 0.00)*', '*data entry and analysis software such as Excel, SPSS etc (p = 0.00*)' and '*Microsoft Power Point for making presentations (p = 0.01)*' across the different countries.

A6. Program Monitoring and Evaluation Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Table A6 shows that the respondents considered all eleven program monitoring and evaluation skills and competencies to be important to agricultural extension professionals. There were significant differences in their perception of the importance of the skills '*develop data collection instruments - interview schedules / questionnaires- for monitoring and evaluation of extension programs (p = 0.02)*', '*conduct online surveys for monitoring and evaluation of extension programs (p = 0.00)*' and '*apply qualitative tools and techniques (e.g., focus group discussion, case study etc.) to collect evaluation data (p = 0.03)*'. The respondents in all five countries also indicated that most of the eleven program monitoring and evaluation skills and competencies were moderately covered in the UG extension curriculum. However, in Nigeria and Uganda, the skill '*conduct online surveys for monitoring and evaluation of extension programs*' was minimally covered in their UG extension curriculum. In Kenya, the skills '*conduct online surveys for monitoring and evaluation of extension programs*' and '*apply the evaluation findings in replicating/scaling-up of extension programs*' were minimally covered in their UG extension curriculum. There were significant differences in the respondents' perception of the extent of coverage of various communication skills and competencies across all countries in skills such as '*develop data collection instruments - interview schedules / questionnaires- for monitoring and evaluation of extension programs (p = 0.02)*' '*analyze data (qualitative and quantitative) (p = 0.01)*', and '*interpret data (qualitative and quantitative) (p = 0.04)*'.

A7. Personal and Professional Development Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The respondents considered all five personal and professional development skills and competencies to be important for agricultural extension workers (Table A7). There were, however, significant differences (p = 0.02) in their perception of the importance of the skill '*follow organizational policies and directives for professional development*'. The respondents in all five countries also indicated that all five personal and professional development skills and competencies were moderately covered in the UG extension curriculum. There were no significant difference in their perception of the extent of coverage of all the five personal and professional development skills and competencies across the different countries.

A8. Diversity and Gender Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The results in Table A8 indicates that the respondents in all five countries considered the seven diversity and gender skills and competencies as important for extension professionals

in carrying out their work. There were no significant differences in their perception of the importance of all the diversity and gender skills and competencies. The respondents also noted that most of the diversity and gender skills and competencies were moderately covered in the UG extension curriculum across the five countries. However, the respondents in South Africa rated the skills '*understand that diversity exists within and among clients and stakeholders*', '*identify the needs of small-scale farmers*' and '*identify the needs of minority groups*' to be very well covered in their UG extension curriculum. There were significant differences in the respondents' perception of the extent of coverage of the skills '*understand that diversity exists within and among clients and stakeholders (p = 0.04)*', '*identify the needs of minority groups (p = 0.01)*' and '*do teamwork with diverse staffs (p = 0.03)*'.

A9. Marketing, Brokering and Value Chain Development Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Table A9 reveals that the respondents across the five Africa countries perceived all six marketing, brokering and value chain development skills and competencies as important for an extension professional. There were also no significant differences in their responses. The respondents also rated most of the marketing, brokering and value chain development skills and competencies as moderately covered in the UG extension curriculum. However, the respondents in Nigeria indicated that skills such as '*apply brokering / advisory skills in agribusiness development*', '*demonstrate knowledge of value chain logistics and input-output linkages in the value chain*' and '*be able to link farmers producers' organizations/ cooperatives/agribusiness companies with market*' were minimally covered in their UG extension curriculum. In Kenya, the respondents noted that skills such as ''*demonstrate knowledge of value chain logistics and input-output linkages in the value chain*', '*facilitate entrepreneurship development among extension clientele*' and '*be able to link farmers producers' organizations/cooperatives/agribusiness companies with market*' were minimally covered in the UG extension curriculum. Overall, marketing, brokering and value chain development skills and competencies were minimally covered in the UG extension curriculum in Nigeria. Also, there were significant differences in the respondents' perception of the extent of coverage of all six marketing, brokering and value chain development skills and competencies across the different countries.

A10. Extension Soft Skills among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The respondents considered all seventeen extension soft skills as to be important in carrying out extension work across the five countries (Table A10). Also, there were no significant differences in their responses. Most of the extension soft skills were moderately covered in the UG extension curriculum across the different countries. However, the skills '*team work*', '*group formation and development*', '*facilitation skills*', '*conflict management*', '*positive work attitude*', and '*critical thinking*' were rated as very well covered in the UG extension curriculum in South Africa. Similarly, in Malawi, the respondents indicated that the skill '*group formation*

and development' was well covered in their UG extension curriculum. On the other hand, the skill *'stress management'* was considered minimally covered in the UG extension curriculum in Nigeria and Uganda, respectively. There were significant differences in the respondents' perception of the extent of coverage of most of the extension soft skills except '*leadership (p = 0.09)*'.

A11. Nutrition Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The results in Table A11 the respondents across the five countries considered all seven nutrition skills and competencies to be important for an extension worker. There were significant differences in their perception of the importance of skills such as **'***understand lifecycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly) (p = 0.04)'*and *'advise families to improve gender relations for increased agriculture production and nutrition (p = 0.05)'*. Most nutrition skills and competencies were rated moderately covered in the UG extension curriculum across the five countries. However, in Nigeria, skills such as *'demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms etc)', 'understand lifecycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly)', 'have basic knowledge about food labeling (e.g., organic foods)'* and *'able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity)'* were considered as minimally covered in their UG extension curriculum. In Kenya, the respondents noted that skills such as *'understand lifecycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly)', 'have basic knowledge about food labeling (e.g., organic foods)'* and *'able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity)'* were minimally covered in their UG extension curriculum. In South Africa, the skill *'able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity)'* was rated as minimally covered in their UG extension curriculum. Overall, nutrition skills and competencies were rated as minimally covered in the UG extension curriculum in Nigeria and Kenya. There were significant differences in the respondents' perception of the extent of coverage of most of the nutrition skills and competencies except *''able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity)' (p = 0.12)*'.

A12. Technical Subject Matter Expertise among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

The respondents rated all ten subject matter expertise skills and competencies as important for agricultural extension professionals in carrying out their extension work (Table A12). There were no significant differences in the responses of the respondents across the five countries.

The respondents also perceived that most of the technical subject matter expertise skills and competencies were moderately covered in the UG extension curriculum. However, in South Africa, skills such as '*demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/fishery/horticulture, etc.)*', '*understand adult learning principles*' and '*hold practical skills required to teach improved farming practices*' were very well covered in their UG extension curriculum. Also, in Uganda and Kenya, the respondents indicated that the skill '*demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/fishery/horticulture, etc.)*' was very well covered in the UG extension curriculum. There were no significant differences in the respondents' perception of the extent of coverage of all ten subject matter expertise skills and competencies, except '*demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/fishery/horticulture, etc.) (p = 0.00)*' and '*understand adult learning principles and hold practical skills required to teach improved farming practices (p = 0.02)*', across the five countries.

Table A2: Program Planning Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should be:	*How important is this skill or competency for an extension worker?** *Mean (SD)*							*How well does the undergraduate extension curriculum cover this skill or competency?*** *Mean (SD)*						
	Total (n=572)	*Nigeria (n=185)*	*Malawi (n=42)*	*South Africa (n=57)*	*Uganda (n=199)*	*Kenya (n=73)*	*F (sig)*	*Total (n=441)*	*Nigeria (n=152)*	*Malawi (n=33)*	*South Africa (n=40)*	*Uganda (n=147)*	*Kenya (n=55)*	*F (sig)*
Familiar with the vision, mission and goals of National /State (sub-national) extension service and agricultural development strategies, programs, and policies.	4.57 (0.76)	4.55 (0.71)	4.84 (0.53)	4.53 (0.92)	4.52 (0.75)	4.69 (0.72)	1.73 (0.13)	3.45 (1.00)	3.32 (0.98)	3.76 (0.78)	3.80 (1.03)	3.39 (1.02)	3.54 (0.97)	2.46 (0.03)
Able to conduct needs assessment and engage stakeholders to prioritize local needs.	4.61 (0.74)	4.56 (0.78)	4.86 (0.41)	4.57 (0.80)	4.61 (0.70)	4.68 (0.72)	1.50 (0.19)	3.43 (1.04)	3.14 (1.04)	3.62 (0.78)	3.73 (1.07)	3.59 (1.07)	3.51 (0.94)	4.16 (0.00)
Able to conduct baseline or benchmark studies.	4.42 (0.82)	4.52 (0.74)	4.53 (0.63)	4.40 (0.88)	4.31 (0.85)	4.51 (0.80)	2.55 (0.03)	3.31 (1.06)	3.07 (1.07)	3.65 (0.95)	3.73 (0.87)	3.39 (1.06)	3.25 (1.09)	3.88 (0.00)
Able to mobilize resources/funds to address priority needs.	4.21 (0.97)	4.19 (0.97)	4.26 (0.98)	4.33 (1.02)	4.13 (0.95)	4.42 (0.86)	1.59 (0.16)	2.83 (1.11)	2.60 (1.12)	3.06 (1.01)	3.29 (1.10)	2.89 (1.04)	2.85 (1.16)	3.22 (0.01)

Able to engage local stakeholders (e.g., NGOs, cooperatives, local agro-dealers) in extension program planning.	4.58 (0.72)	4.54 (0.75)	4.72 (0.59)	4.60 (0.73)	4.59 (0.68)	4.62 (0.74)	0.71 (0.62)		3.28 (1.12)	3.03 (1.15)	3.71 (0.91)	3.68 (1.05)	3.36 (1.13)	3.24 (1.04)	3.81 (0.00)
Familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).	4.31 (0.88)	4.33 (0.88)	4.43 (0.74)	4.33 (0.89)	4.26 (0.89)	4.37 (0.83)	0.79 (0.56)		3.01 (1.13)	2.86 (1.08)	3.21 (1.02)	3.23 (1.25)	3.09 (1.19)	2.95 (1.06)	1.20 (0.31)
Index	4.46 (0.60)	4.45 (0.62)	4.63 (0.41)	4.45 (0.69)	4.43 (0.53)	4.55 (0.59)	1.83 (0.11)		3.22 (0.86)	3.00 (0.90)	3.50 (0.68)	3.55 (0.82)	3.29 (0.83)	3.22 (0.88)	4.25 (0.00)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A3: Program Implementation Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should be:	*How important is this skill or competency for an extension worker?** Mean (SD)								*How well does the undergraduate extension curriculum cover this skill or competency?*** Mean (SD)						
	Total (n=560)	*Nigeria (n=182)*	*Malawi (n=41)*	*South Africa (n=55)*	*Uganda (n=195)*	*Kenya (n=73)*	*F (sig)*		*Total (n=441)*	*Nigeria (n=156)*	*Malawi (n=33)*	*South Africa (n=38)*	*Uganda (n=145)*	*Kenya (n=56)*	*F (sig)*
Coordinate local extension programs and activities.	4.67 (0.66)	4.64 (0.70)	4.81 (0.55)	4.68 (0.66)	4.62 (0.69)	4.71 (0.56)	1.22 (0.30)		3.50 (1.03)	3.28 (1.08)	3.61 (0.93)	3.85 (1.06)	3.59 (1.02)	3.55 (0.85)	2.73 (0.02)
Demonstrate teamwork skills to achieve extension results.	4.69 (0.56)	4.66 (0.62)	4.83 (0.38)	4.71 (0.49)	4.65 (0.60)	4.75 (0.46)	1.16 (0.33)		3.59 (1.00)	3.40 (0.99)	4.03 (0.73)	3.82 (1.09)	3.66 (0.98)	3.46 (0.99)	3.60 (0.00)
Able to form farmers' groups and support them.	4.63 (0.64)	4.59 (0.70)	4.71 (0.60)	4.68 (0.61)	4.62 (0.64)	4.64 (0.61)	0.74 (0.59)		3.51 (1.11)	3.21 (1.16)	3.82 (1.01)	3.68 (1.02)	3.67 (1.10)	3.57 (0.97)	4.20 (0.00)
Engage local stakeholders (e.g., NGOs, Self Help Groups, Cooperatives) in implementing extension programs.	4.56 (0.69)	4.53 (0.78)	4.67 (0.65)	4.52 (0.66)	4.57 (0.64)	4.60 (0.62)	0.39 (0.86)		3.33 (1.09)	3.08 (1.20)	3.73 (0.91)	3.53 (1.06)	3.39 (1.02)	3.43 (0.93)	3.33 (0.01)

Demonstrate negotiation skills to reach consensus and resolve conflicts.	4.45 (0.78)	4.47 (0.83)	4.50 (0.77)	4.61 (0.68)	4.31 (0.83)	4.58 (0.58)	2.82 (0.02)		3.15 (1.16)	2.89 (1.23)	3.52 (0.80)	3.47 (1.06)	3.23 (1.15)	3.18 (1.10)	3.03 (0.01)
Follow participatory decision-making in extension work.	4.60 (0.65)	4.59 (0.74)	4.69 (0.56)	4.55 (0.74)	4.58 (0.60)	4.67 (0.55)	0.73 (0.60)		3.56 (1.06)	3.34 (1.12)	4.06 (0.83)	3.87 (1.04)	3.63 (1.04)	3.50 (0.97)	3.76 (0.00)
Delegate responsibilities to staff as needed.	4.29 (0.86)	4.41 (0.83)	4.12 (1.04)	4.22 (0.81)	4.20 (0.86)	4.40 (0.74)	1.83 (0.10)		3.41 (1.09)	3.44 (1.00)	3.64 (0.78)	3.21 (1.17)	3.48 (1.17)	3.09 (1.16)	1.67 (0.14)
Be able to engage minority groups (e.g., Female farmers and youth development groups) in extension work.	4.57 (0.68)	4.56 (0.71)	4.61 (0.74)	4.45 (0.89)	4.58 (0.62)	4.63 (0.54)	0.71 (0.62)		3.41 (1.10)	3.20 (1.15)	3.55 (0.90)	3.66 (1.02)	3.55 (1.10)	3.32 (1.03)	2.31 (0.04)
Integrate private or public-private partnerships in extension service provision.	4.51 (0.75)	4.43 (0.85)	4.52 (0.74)	4.57 (0.76)	4.51 (0.72)	4.66 (0.58)	1.37 (0.24)		3.14 (1.17)	2.84 (1.20)	3.45 (1.09)	3.45 (1.03)	3.26 (1.18)	3.23 (1.03)	3.57 (0.00)
Index	4.57 (0.49)	4.54 (0.59)	4.62 (0.40)	4.57 (0.53)	4.54 (0.42)	4.63 (0.39)	0.80 (0.55)		3.39 (0.88)	3.17 (0.94)	3.71 (0.64)	3.61 (0.83)	3.50 (0.84)	3.37 (0.84)	3.91 (0.00)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A4: Communication Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should be able to:	*How important is this skill or competency for an extension worker?** *Mean (SD)*								*How well does the undergraduate extension curriculum cover this skill or competency?*** *Mean (SD)*						
	Total (n=557)	*Nigeria (n=181)*	*Malawi (n=40)*	*South Africa (n=56)*	*Uganda (n=194)*	*Kenya (n=72)*	*F (sig)*		*Total (n=433)*	*Nigeria (n=154)*	*Malawi (n=31)*	*South Africa (n=38)*	*Uganda (n=142)*	*Kenya (n=56)*	*F (sig)*
Select appropriate communication methods.	4.75 (0.54)	4.74 (0.63)	4.85 (0.36)	4.63 (0.56)	4.75 (0.51)	4.78 (0.48)	1.04 (0.39)		3.90 (0.95)	3.77 (1.00)	3.84 (0.81)	4.08 (1.06)	3.94 (0.91)	4.11 (0.78)	1.59 (0.16)
Establish communication with different stakeholders.	4.65 (0.60)	4.64 (0.60)	4.76 (0.49)	4.61 (0.65)	4.61 (0.67)	4.72 (0.48)	1.35 (0.24)		3.63 (1.00)	3.38 (1.06)	3.75 (0.92)	4.00 (0.96)	3.75 (0.94)	3.70 (0.83)	3.61 (0.00)
Respect local culture while communicating with clients.	4.70 (0.60)	4.77 (0.53)	4.80 (0.40)	4.55 (0.71)	4.60 (0.70)	4.78 (0.48)	3.68 (0.00)		3.84 (1.00)	3.80 (1.06)	4.00 (0.95)	4.03 (0.97)	3.78 (1.00)	3.96 (0.79)	1.05 (0.39)

Prepare required progress reports.	4.64 (0.61)	4.59 (0.66)	4.61 (0.67)	4.59 (0.63)	4.66 (0.57)	4.79 (0.47)	1.35 (0.24)		3.57 (1.08)	3.26 (1.13)	3.39 (1.17)	3.95 (1.01)	3.73 (1.00)	3.86 (0.88)	5.43 (0.00)
Share success stories and lessons-learned with stakeholders through various media.	4.57 (0.66)	4.61 (0.60)	4.55 (0.71)	4.50 (0.76)	4.56 (0.63)	4.51 (0.75)	0.76 (0.58)		3.32 (1.13)	3.06 (1.19)	3.44 (0.95)	3.71 (1.09)	3.47 (1.08)	3.34 (1.00)	3.23 (0.01)
Use extension methods (e.g., individual, group and mass contact methods) to disseminate information about extension activities and programs.	4.75 (0.54)	4.77 (0.54)	4.85 (0.36)	4.66 (0.64)	4.70 (0.59)	4.79 (0.47)	1.78 (0.11)		3.95 (0.92)	3.82 (0.93)	4.16 (0.81)	4.13 (0.84)	3.91 (0.97)	4.14 (0.90)	1.93 (0.09)
Demonstrate good listening skills and listen to all clients and stakeholders.	4.71 (0.59)	4.69 (0.62)	4.59 (0.67)	4.70 (0.57)	4.71 (0.63)	4.82 (0.42)	1.12 (0.35)		3.73 (1.03)	3.55 (1.01)	3.88 (1.01)	4.00 (0.93)	3.78 (1.00)	3.91 (0.98)	2.61 (0.02)
Demonstrate good public speaking and presentation skills.	4.70 (0.57)	4.68 (0.64)	4.80 (0.46)	4.66 (0.58)	4.70 (0.57)	4.72 (0.51)	0.44 (0.82)		3.73 (1.03)	3.50 (1.03)	3.88 (0.91)	4.16 (0.92)	3.78 (1.02)	3.91 (1.00)	3.48 (0.00)
Index	4.69 (0.43)	4.70 (0.48)	4.73 (0.32)	4.61 (0.50)	4.66 (0.41)	4.74 (0.34)	1.14 (0.34)		3.71 (0.80)	3.52 (0.85)	3.78 (0.70)	4.00 (0.76)	3.77 (0.76)	3.87 (0.66)	3.68 (0.00)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A5: ICTs Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should be able to:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=547)	Nigeria (n=177)	Malawi (n=40)	South Africa (n=53)	Uganda (n=190)	Kenya (n=72)	F (sig)	Total (n=428)	Nigeria (n=154)	Malawi (n=31)	South Africa (n=37)	Uganda (n=138)	Kenya (n=55)	F (sig)
Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics.	4.54 (0.71)	4.55 (0.74)	4.70 (0.52)	4.53 (0.70)	4.52 (0.70)	4.46 (0.75)	0.64 (0.67)	3.52 (1.14)	3.28 (1.17)	3.74 (1.09)	3.97 (1.04)	3.74 (1.04)	3.33 (1.11)	5.00 (0.00)
Data entry and analysis software such as Excel, SPSS etc.	4.49 (0.74)	4.52 (0.77)	4.65 (0.62)	4.53 (0.64)	4.46 (0.71)	4.36 (0.84)	0.98 (0.43)	3.26 (1.21)	3.23 (1.25)	3.58 (1.23)	3.65 (1.11)	3.33 (1.14)	2.80 (1.18)	3.28 (0.01)
Microsoft Power Point for making presentations.	4.59 (0.71)	4.63 (0.72)	4.75 (0.44)	4.55 (0.70)	4.57 (0.72)	4.51 (0.79)	0.75 (0.59)	3.55 (1.16)	3.47 (1.19)	4.06 (1.12)	3.89 (1.07)	3.57 (1.12)	3.25 (1.13)	2.90 (0.01)

Audio-visual aids such as charts, graphs, and puppet show for teaching and learning.	4.58 (0.66)	4.69 (0.56)	4.65 (0.53)	4.50 (0.77)	4.52 (0.72)	4.50 (0.69)	1.81 (0.11)	3.51 (1.10)	3.41 (1.05)	3.58 (1.39)	3.78 (0.85)	3.57 (1.14)	3.42 (1.03)	0.93 (0.46)
Mass media like FM radio stations and television channels for communication.	4.44 (0.80)	4.52 (0.73)	4.50 (0.68)	4.26 (1.01)	4.46 (0.74)	4.25 (0.96)	2.08 (0.07)	3.11 (1.20)	3.07 (1.26)	3.39 (1.17)	3.30 (1.18)	3.07 (1.17)	3.07 (1.14)	0.70 (0.62)
Computers (email, Internet) for communication.	4.57 (0.70)	4.56 (0.81)	4.78 (0.42)	4.61 (0.66)	4.51 (0.69)	4.60 (0.60)	1.13 (0.34)	3.47 (1.16)	3.33 (1.20)	3.55 (1.12)	3.92 (1.12)	3.53 (1.16)	3.44 (1.03)	1.87 (0.10)
Mobile phone services (e.g., texting, SMS service) for communication.	4.59 (0.68)	4.67 (0.61)	4.60 (0.67)	4.59 (0.74)	4.46 (0.75)	4.68 (0.53)	2.20 (0.05)	3.47 (1.21)	3.60 (1.17)	3.29 (1.24)	3.65 (1.16)	3.33 (1.31)	3.47 (1.10)	1.12 (0.35)
Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication.	4.42 (0.81)	4.51 (0.79)	4.48 (0.85)	4.50 (0.72)	4.29 (0.88)	4.42 (0.73)	1.54 (0.17)	3.21 (1.24)	3.32 (1.24)	2.94 (1.12)	3.62 (1.06)	3.09 (1.31)	3.09 (1.17)	1.74 (0.12)
ICT tools to improve access to information, knowledge, technologies and other innovations.	4.56 (0.67)	4.62 (0.65)	4.70 (0.52)	4.41 (0.84)	4.52 (0.66)	4.53 (0.67)	1.52 (0.18)	3.13 (1.12)	3.19 (1.14)	3.06 (1.18)	3.38 (1.04)	3.09 (1.15)	3.05 (1.03)	0.83 (0.53)
ICT tools to enhance collaboration and partnerships.	4.50 (0.69)	4.58 (0.69)	4.53 (0.72)	4.44 (0.63)	4.44 (0.71)	4.49 (0.71)	0.83 (0.53)	2.98 (1.17)	2.96 (1.23)	3.13 (1.12)	3.35 (1.06)	2.89 (1.21)	3.00 (1.04)	1.05 (0.39)
ICT tools for collecting data, monitoring, and evaluation of extension programs.	4.57 (0.64)	4.62 (0.63)	4.68 (0.47)	4.48 (0.72)	4.53 (0.66)	4.53 (0.60)	0.93 (0.46)	2.97 (1.19)	2.96 (1.26)	3.03 (1.17)	3.24 (1.06)	2.92 (1.21)	2.91 (1.09)	0.48 (0.79)
Index	4.53 (0.52)	4.59 (0.55)	4.64 (0.34)	4.48 (0.57)	4.48 (0.49)	4.48 (0.52)	1.43 (0.21)	3.29 (0.92)	3.26 (0.95)	3.40 (0.92)	3.61 (0.84)	3.29 (0.93)	3.17 (0.82)	1.40 (0.22)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A6: Program Monitoring and Evaluation Skills and Competenciesamong Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=536)	Nigeria (n=177)	Malawi (n=38)	South Africa (n=53)	Uganda (n=182)	Kenya (n =71)	F (sig)	Total (n =421)	Nigeria (n =155)	Malawi (n =28)	South Africa (n =36)	Uganda (n =134)	Kenya (n =55)	F (sig)
Understand theories and principles of monitoring and evaluation.	4.55 (0.70)	4.63 (0.70)	4.55 (0.85)	4.61 (0.60)	4.44 (0.67)	4.59 (0.67)	1.60 (0.16)	3.53 (1.01)	3.61 (1.01)	3.66 (0.90)	3.86 (0.95)	3.35 (1.04)	3.53 (1.02)	2.05 (0.07)
Conduct monitoring and evaluation of extension programs.	4.64 (0.61)	4.71 (0.59)	4.54 (0.79)	4.72 (0.53)	4.57 (0.63)	4.66 (0.58)	1.42 (0.22)	3.44 (1.03)	3.48 (1.10)	3.52 (0.91)	3.67 (0.96)	3.38 (1.03)	3.27 (0.99)	0.84 (0.52)

Develop data collection instruments - interview schedules / questionnaires- for monitoring and evaluation of extension programs.	4.60 (0.67)	4.72 (0.55)	4.54 (0.82)	4.58 (0.60)	4.48 (0.75)	4.65 (0.59)	2.82 (0.02)	3.61 (1.05)	3.76 (1.05)	3.90 (0.84)	3.78 (1.05)	3.44 (1.11)	3.36 (0.95)	2.64 (0.02)
Conduct online surveys for monitoring and evaluation of extension programs.	4.32 (0.85)	4.46 (0.79)	4.56 (0.64)	4.25 (0.92)	4.15 (0.89)	4.31 (0.77)	3.40 (0.00)	2.90 (1.22)	2.87 (1.34)	3.07 (1.11)	3.33 (1.15)	2.88 (1.22)	2.75 (0.99)	1.37 (0.23)
Apply qualitative tools and techniques (e.g., focus group discussion, case study etc.) to collect evaluation data.	4.60 (0.66)	4.68 (0.60)	4.72 (0.51)	4.62 (0.63)	4.47 (0.72)	4.66 (0.56)	2.54 (0.03)	3.54 (1.07)	3.64 (1.08)	3.67 (1.03)	3.67 (0.96)	3.52 (1.12)	3.24 (0.96)	1.83 (0.11)
Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data.	4.57 (0.68)	4.67 (0.59)	4.66 (0.63)	4.55 (0.64)	4.45 (0.77)	4.58 (0.58)	2.12 (0.06)	3.59 (1.05)	3.73 (1.09)	3.73 (0.87)	3.64 (0.93)	3.51 (1.08)	3.31 (0.98)	1.80 (0.11)
Analyze data (qualitative and quantitative).	4.59 (0.68)	4.66 (0.64)	4.62 (0.75)	4.64 (0.56)	4.54 (0.70)	4.52 (0.65)	1.18 (0.32)	3.47 (1.07)	3.63 (1.08)	3.60 (0.97)	3.75 (1.00)	3.36 (1.08)	3.07 (1.05)	3.22 (0.01)
Interpret data (qualitative and quantitative).	4.63 (0.64)	4.69 (0.56)	4.67 (0.66)	4.64 (0.56)	4.59 (0.69)	4.58 (0.67)	0.99 (0.42)	3.51 (1.05)	3.67 (1.07)	3.60 (0.89)	3.69 (0.98)	3.41 (1.06)	3.20 (1.01)	2.31 (0.04)
Write evaluation report.	4.63 (0.63)	4.70 (0.58)	4.68 (0.57)	4.58 (0.60)	4.60 (0.66)	4.61 (0.60)	1.38 (0.23)	3.43 (1.08)	3.46 (1.13)	3.50 (0.97)	3.75 (0.97)	3.43 (1.10)	3.16 (1.03)	1.38 (0.23)
Share evaluation reports within their organizations and with stakeholders.	4.62 (0.67)	4.61 (0.66)	4.72 (0.69)	4.60 (0.66)	4.61 (0.65)	4.66 (0.58)	0.58 (0.72)	3.23 (1.16)	3.21 (1.18)	3.40 (0.97)	3.44 (0.97)	3.23 (1.22)	3.09 (1.16)	0.65 (0.66)
Apply the evaluation findings in replicating/ scaling-up of extension programs.	4.62 (0.63)	4.61 (0.65)	4.77 (0.48)	4.60 (0.69)	4.56 (0.63)	4.73 (0.51)	1.43 (0.21)	3.10 (1.16)	3.08 (1.16)	3.20 (1.00)	3.42 (1.05)	3.10 (1.20)	2.96 (1.15)	0.81 (0.54)
Index	4.58 (0.53)	4.65 (0.50)	4.67 (0.48)	4.58 (0.48)	4.49 (0.53)	4.60 (0.47)	1.95 (0.08)	3.40 (0.89)	3.47 (0.91)	3.49 (0.73)	3.63 (0.83)	3.34 (0.93)	3.18 (0.86)	1.69 (0.13)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A7: Personal and Professional Development Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=532)	Nigeria (n=178)	Malawi (n =38)	South Africa (n=52)	Uganda (n=180)	Kenya (n=71)	F (sig)	Total (n=416)	Nigeria (n=157)	Malawi (n =29)	South Africa (n=35)	Uganda (n=130)	Kenya (n=54)	F (sig)
Apply principles of good governance (e.g., client's participation, accountability and transparency) in extension work.	4.60 (0.66)	4.53 (0.70)	4.68 (0.57)	4.64 (0.71)	4.62 (0.64)	4.66 (0.58)	0.75 (0.58)	3.31 (1.12)	3.22 (1.12)	3.31 (0.85)	3.81 (1.01)	3.35 (1.20)	3.19 (1.03)	2.09 (0.07)
Show commitment to career advancement (participate in lifelong learning, in-service training, professional development events and conferences).	4.59 (0.64)	4.57 (0.69)	4.71 (0.52)	4.58 (0.67)	4.56 (0.65)	4.65 (0.54)	1.01 (0.41)	3.27 (1.13)	3.28 (1.09)	3.38 (1.05)	3.66 (1.19)	3.19 (1.13)	3.13 (1.23)	1.18 (0.32)
Apply professional ethics in extension work i.e., promote research-based recommendation or technology.	4.69 (0.56)	4.63 (0.64)	4.68 (0.57)	4.71 (0.54)	4.70 (0.53)	4.75 (0.50)	1.40 (0.22)	3.53 (1.09)	3.41 (1.10)	3.31 (1.07)	3.86 (0.88)	3.71 (1.08)	3.43 (1.14)	2.16 (0.06)
Follow organizational policies and directives for professional development.	4.59 (0.64)	4.49 (0.75)	4.50 (0.69)	4.58 (0.64)	4.61 (0.55)	4.79 (0.44)	2.68 (0.02)	3.35 (1.07)	3.27 (1.05)	3.21 (0.94)	3.46 (1.07)	3.53 (1.10)	3.20 (1.09)	1.57 (0.17)
Demonstrate honesty and positive attitude towards extension work.	4.79 (0.50)	4.79 (0.53)	4.68 (0.57)	4.83 (0.43)	4.77 (0.51)	4.85 (0.44)	0.65 (0.66)	3.60 (1.08)	3.54 (1.07)	3.41 (1.02)	3.86 (0.97)	3.69 (1.14)	3.54 (1.09)	1.15 (0.33)
Index	4.65 (0.48)	4.60 (0.56)	4.65 (0.42)	4.67 (0.50)	4.65 (0.43)	4.74 (0.39)	1.13 (0.34)	3.41 (0.95)	3.35 (0.95)	3.32 (0.83)	3.72 (0.90)	3.50 (0.94)	3.30 (0.97)	1.53 (0.18)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A8: Diversity and Gender Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n =528)	Nigeria (n=176)	Malawi (n =37)	South Africa (n =52)	Uganda (n=179)	Kenya (n=70)	F (sig)	Total (n=414)	Nigeria (n=156)	Malawi (n=29)	South Africa (n=35)	Uganda (n=131)	Kenya (n=54)	F (sig)
Understand that diversity exists within and among clients and stakeholders.	4.63 (0.60)	4.62 (0.65)	4.71 (0.52)	4.60 (0.57)	4.61 (0.59)	4.61 (0.64)	1.28 (0.27)	3.59 (1.03)	3.49 (1.05)	3.66 (1.01)	4.08 (0.84)	3.63 (1.06)	3.44 (0.96)	2.29 (0.04)
Identify the needs of small-scale farmers.	4.77 (0.49)	4.76 (0.51)	4.82 (0.46)	4.67 (0.51)	4.76 (0.49)	4.82 (0.46)	1.26 (0.28)	3.78 (0.96)	3.74 (0.94)	3.79 (1.05)	4.14 (0.85)	3.73 (1.00)	3.76 (0.93)	1.17 (0.32)
Identify the needs of minority groups.	4.68 (0.61)	4.66 (0.68)	4.78 (0.48)	4.67 (0.62)	4.67 (0.55)	4.63 (0.64)	0.83 (0.53)	3.48 (1.07)	3.47 (1.05)	3.41 (0.95)	4.11 (0.80)	3.42 (1.14)	3.26 (1.05)	3.15 (0.01)
Develop extension programs to benefit women farmers.	4.66 (0.58)	4.70 (0.55)	4.68 (0.57)	4.60 (0.80)	4.65 (0.53)	4.58 (0.60)	0.94 (0.46)	3.48 (1.05)	3.48 (1.07)	3.45 (0.91)	3.89 (0.96)	3.49 (1.05)	3.19 (1.07)	2.02 (0.07)
Develop extension programs to benefit youth.	4.67 (0.57)	4.71 (0.57)	4.71 (0.52)	4.62 (0.66)	4.64 (0.58)	4.62 (0.54)	0.82 (0.54)	3.41 (1.05)	3.46 (1.02)	3.24 (1.12)	3.83 (1.04)	3.36 (1.06)	3.24 (1.01)	1.82 (0.11)
Engage marginalized and vulnerable groups in extension programs (e.g., disabled, resource poor farmers).	4.67 (0.59)	4.66 (0.59)	4.79 (0.53)	4.60 (0.75)	4.65 (0.55)	4.68 (0.58)	1.10 (0.36)	3.23 (1.13)	3.14 (1.17)	3.24 (0.91)	3.71 (0.93)	3.30 (1.16)	3.00 (1.12)	2.08 (0.07)
Do teamwork with diverse staffs.	4.68 (0.61)	4.69 (0.60)	4.82 (0.46)	4.58 (0.70)	4.68 (0.60)	4.63 (0.62)	0.85 (0.51)	3.49 (1.06)	3.38 (1.06)	3.66 (0.94)	3.83 (1.04)	3.61 (1.04)	3.31 (1.08)	2.50 (0.03)
Index	4.69 (0.45)	4.70 (0.47)	4.78 (0.38)	4.62 (0.55)	4.68 (0.39)	4.65 (0.47)	1.40 (0.22)	3.49 (0.89)	3.45 (0.90)	3.49 (0.81)	3.94 (0.77)	3.51 (0.89)	3.31 (0.89)	2.35 (0.04)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

** *Scale for Coverage in UG courses: 1 = Not at all covered, 2 = Minimally covered, 3 = Moderately well covered, 4 = Very well covered, 5 = Extremely well covered.*

Table A9: Marketing, Brokering and Value Chain Development Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=529)	Nigeria (n=177)	Malawi (n=38)	South Africa (n=51)	Uganda (n=178)	Kenya (n=71)	F (sig)	Total (n=413)	Nigeria (n=155)	Malawi (n=29)	South Africa (n=34)	Uganda (n=129)	Kenya (n=54)	F (sig)
Have basic knowledge of agribusiness development.	4.58 (0.66)	4.50 (0.78)	4.82 (0.46)	4.59 (0.64)	4.58 (0.59)	4.63 (0.62)	1.91 (0.09)	3.38 (1.03)	3.08 (1.06)	3.55 (0.78)	3.76 (0.92)	3.60 (1.03)	3.43 (0.92)	5.50 (0.00)
Apply brokering / advisory skills in agribusiness development.	4.41 (0.77)	4.41 (0.81)	4.61 (0.55)	4.43 (0.64)	4.41 (0.74)	4.28 (0.94)	1.14 (0.34)	3.07 (1.12)	2.86 (1.18)	3.24 (0.87)	3.50 (0.99)	3.24 (1.13)	3.06 (0.98)	3.37 (0.01)
Have knowledge on different agricultural markets and linkages.	4.60 (0.64)	4.55 (0.70)	4.71 (0.65)	4.69 (0.65)	4.56 (0.61)	4.69 (0.52)	1.17 (0.32)	3.20 (1.07)	3.02 (1.09)	3.34 (0.97)	3.76 (1.02)	3.24 (1.10)	3.20 (0.96)	3.02 (0.01)
Demonstrate knowledge of value chain logistics and input-output linkages in the value chain.	4.57 (0.66)	4.56 (0.65)	4.74 (0.55)	4.58 (0.64)	4.53 (0.69)	4.56 (0.75)	1.15 (0.33)	3.16 (1.12)	2.98 (1.13)	3.31 (0.97)	3.71 (1.10)	3.28 (1.14)	2.98 (0.98)	3.38 (0.01)
Facilitate entrepreneurship development among extension clientele.	4.61 (0.61)	4.59 (0.65)	4.71 (0.52)	4.75 (0.48)	4.53 (0.66)	4.68 (0.53)	1.54 (0.18)	3.22 (1.06)	3.07 (1.08)	3.24 (0.83)	3.74 (1.05)	3.36 (1.09)	2.96 (0.95)	3.43 (0.00)
Be able to link farmers producers' organizations/ cooperatives/ agribusiness companies with market.	4.67 (0.61)	4.62 (0.60)	4.79 (0.53)	4.65 (0.74)	4.65 (0.66)	4.75 (0.50)	1.27 (0.27)	3.16 (1.11)	2.96 (1.13)	3.52 (0.95)	3.59 (1.05)	3.26 (1.13)	2.98 (1.04)	3.31 (0.01)
Index	4.58 (0.53)	4.54 (0.60)	4.73 (0.41)	4.61 (0.53)	4.55 (0.49)	4.60 (0.51)	1.37 (0.24)	3.19 (0.96)	2.99 (1.00)	3.37 (0.73)	3.68 (0.95)	3.33 (0.98)	3.10 (0.84)	4.09 (0.00)

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Table A10: Extension Soft Skills among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should possess the other soft skills like:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=517)	Nigeria (n=173)	Malawi (n=36)	South Africa (n=51)	Uganda (n=173)	Kenya (n=70)	F (sig)	Total (n=405)	Nigeria (n=150)	Malawi (n=28)	South Africa (n=34)	Uganda (n=127)	Kenya (n=54)	F (sig)
Critical thinking	4.71 (0.55)	4.69 (0.56)	4.74 (0.64)	4.71 (0.61)	4.71 (0.52)	4.67 (0.53)	0.56 (0.73)	3.31 (1.13)	3.14 (1.16)	3.41 (0.95)	4.00 (0.74)	3.44 (1.12)	3.09 (1.14)	4.50 (0.00)
Problem solving	4.76 (0.49)	4.75 (0.52)	4.66 (0.63)	4.80 (0.40)	4.77 (0.49)	4.80 (0.40)	0.52 (0.76)	3.48 (1.02)	3.29 (1.05)	3.66 (0.81)	3.91 (0.87)	3.59 (1.03)	3.43 (1.00)	2.81 (0.02)
Time management	4.75 (0.52)	4.73 (0.55)	4.68 (0.63)	4.67 (0.55)	4.79 (0.47)	4.81 (0.43)	0.87 (0.50)	3.51 (1.09)	3.24 (1.08)	3.48 (0.95)	3.97 (0.83)	3.80 (1.07)	3.39 (1.11)	5.76 (0.00)
Stress management	4.59 (0.64)	4.64 (0.59)	4.50 (0.80)	4.61 (0.67)	4.53 (0.70)	4.69 (0.50)	0.97 (0.44)	3.11 (1.15)	2.97 (1.11)	3.24 (1.12)	3.62 (0.89)	3.30 (1.17)	2.83 (1.18)	4.43 (0.00)
Leadership	4.72 (0.53)	4.75 (0.55)	4.81 (0.46)	4.78 (0.42)	4.68 (0.53)	4.71 (0.49)	0.92 (0.47)	3.61 (0.98)	3.52 (0.96)	3.72 (0.84)	3.97 (0.72)	3.69 (1.04)	3.41 (1.04)	1.92 (0.09)
Teamwork	4.77 (0.48)	4.76 (0.49)	4.79 (0.47)	4.76 (0.47)	4.77 (0.49)	4.76 (0.43)	0.13 (0.99)	3.58 (1.00)	3.43 (1.00)	3.62 (0.90)	4.12 (0.81)	3.71 (1.00)	3.37 (1.05)	3.64 (0.00)
Flexibility	4.65 (0.59)	4.65 (0.59)	4.55 (0.69)	4.65 (0.59)	4.65 (0.62)	4.67 (0.47)	0.22 (0.95)	3.40 (1.08)	3.32 (1.03)	3.52 (0.87)	3.89 (0.99)	3.45 (1.13)	3.24 (1.06)	2.50 (0.03)
Self-motivation	4.69 (0.55)	4.66 (0.55)	4.63 (0.54)	4.80 (0.40)	4.65 (0.62)	4.77 (0.46)	1.22 (0.30)	3.43 (1.12)	3.28 (1.06)	3.59 (0.87)	3.97 (1.00)	3.58 (1.13)	3.11 (1.19)	4.12 (0.00)
Interpersonal skills	4.71 (0.50)	4.65 (0.56)	4.74 (0.50)	4.71 (0.46)	4.75 (0.48)	4.74 (0.44)	0.97 (0.44)	3.52 (1.05)	3.37 (1.03)	3.62 (0.94)	3.97 (0.87)	3.64 (1.06)	3.35 (1.14)	2.61 (0.02)
Positive work attitude	4.76 (0.48)	4.80 (0.47)	4.66 (0.58)	4.78 (0.42)	4.72 (0.52)	4.80 (0.44)	1.01 (0.41)	3.47 (1.10)	3.39 (1.06)	3.45 (1.02)	4.00 (0.95)	3.56 (1.09)	3.26 (1.20)	3.19 (0.01)
Collaboration	4.69 (0.54)	4.67 (0.56)	4.63 (0.59)	4.69 (0.58)	4.66 (0.55)	4.77 (0.42)	0.79 (0.56)	3.46 (1.06)	3.26 (1.06)	3.72 (0.80)	3.94 (1.01)	3.53 (1.08)	3.44 (1.00)	3.10 (0.01)
Conflict management	4.65 (0.56)	4.74 (0.48)	4.62 (0.68)	4.65 (0.59)	4.58 (0.59)	4.66 (0.48)	1.80 (0.11)	3.40 (1.08)	3.21 (1.10)	3.57 (0.96)	4.00 (0.78)	3.52 (1.09)	3.24 (1.03)	3.96 (0.00)
Group formation and development	4.67 (0.57)	4.69 (0.54)	4.82 (0.39)	4.61 (0.67)	4.66 (0.59)	4.60 (0.55)	0.90 (0.48)	3.65 (1.05)	3.41 (1.11)	4.03 (0.82)	4.12 (0.77)	3.81 (1.00)	3.41 (1.07)	5.34 (0.00)
Negotiation skills	4.57 (0.62)	4.57 (0.64)	4.71 (0.52)	4.57 (0.73)	4.52 (0.60)	4.60 (0.55)	0.64 (0.67)	3.25 (1.13)	3.03 (1.16)	3.62 (0.94)	3.82 (0.87)	3.36 (1.12)	3.06 (1.09)	4.28 (0.00)
Networkiing skills	4.64 (0.58)	4.61 (0.63)	4.66 (0.58)	4.76 (0.47)	4.59 (0.59)	4.69 (0.47)	0.94 (0.46)	3.34 (1.13)	3.04 (1.14)	3.66 (0.86)	3.94 (0.74)	3.55 (1.14)	3.20 (1.14)	5.97 (0.00)
Facilitation skills	4.71 (0.52)	4.72 (0.53)	4.86 (0.35)	4.75 (0.48)	4.68 (0.52)	4.66 (0.54)	1.03 (0.40)	3.47 (1.09)	3.08 (1.08)	3.86 (0.74)	4.03 (0.72)	3.72 (1.13)	3.41 (0.98)	8.61 (0.00)
Creativity / Innovativeness	4.75 (0.47)	4.79 (0.42)	4.74 (0.45)	4.80 (0.45)	4.70 (0.52)	4.76 (0.46)	0.83 (0.53)	3.42 (1.08)	3.25 (1.06)	3.66 (0.94)	3.85 (0.89)	3.53 (1.10)	3.28 (1.14)	2.96 (0.01)
Index	4.70 (0.40)	4.71 (0.42)	4.69 (0.43)	4.71 (0.41)	4.68 (0.37)	4.72 (0.38)	0.20 (0.96)	3.44 (0.92)	3.24 (0.92)	3.62 (0.69)	3.95 (0.72)	3.60 (0.92)	3.27 (0.94)	5.31 (0.00)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

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Table A11: Nutrition Skills and Competencies among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	How important is this skill or competency for an extension worker?* Mean (SD)							How well does the undergraduate extension curriculum cover this skill or competency?** Mean (SD)						
	Total (n=517)	Nigeria (n=171)	Malawi (n=38)	South Africa (n=51)	Uganda (n=174)	Kenya (n=69)	F (sig)	Total (n=405)	Nigeria (n=151)	Malawi (n=28)	South Africa (n=34)	Uganda (n=127)	Kenya (n=53)	F (sig)
Demonstrate basic human nutrition knowledge (e.g., food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms etc).	4.31 (0.81)	4.29 (0.77)	4.47 (0.73)	4.18 (0.87)	4.34 (0.79)	4.39 (0.88)	1.23 (0.29)	3.14 (1.11)	2.96 (1.11)	3.57 (0.96)	3.24 (1.10)	3.29 (1.09)	3.06 (1.08)	2.46 (0.03)
Understand lifecycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly).	4.26 (0.85)	4.21 (0.84)	4.45 (0.65)	4.02 (1.09)	4.37 (0.76)	4.26 (0.85)	2.33 (0.04)	3.02 (1.15)	2.89 (1.16)	3.69 (0.76)	3.06 (1.10)	3.12 (1.17)	2.79 (1.15)	3.06 (0.01)
Able to advise families on what crops and livestock to be produced to ensure balanced diets.	4.49 (0.76)	4.43 (0.76)	4.66 (0.58)	4.29 (1.04)	4.55 (0.66)	4.58 (0.83)	1.80 (0.11)	3.30 (1.13)	3.05 (1.09)	3.72 (0.70)	3.40 (1.26)	3.43 (1.14)	3.34 (1.18)	3.03 (0.01)
Advise families to improve gender relations for increased agriculture production and nutrition.	4.45 (0.74)	4.41 (0.75)	4.68 (0.53)	4.25 (1.02)	4.50 (0.62)	4.49 (0.70)	2.28 (0.05)	3.23 (1.13)	3.00 (1.16)	3.72 (0.80)	3.26 (1.16)	3.47 (1.11)	3.09 (1.02)	4.16 (0.00)
Demonstrate postharvest handling technologies that conserve nutrients and food safety (e.g. food storage, freezing fruits and vegetables, making pickles, jams, jellies).	4.54 (0.71)	4.46 (0.74)	4.68 (0.57)	4.45 (0.88)	4.61 (0.58)	4.55 (0.78)	1.32 (0.25)	3.31 (1.09)	3.09 (1.09)	3.55 (0.99)	3.26 (1.21)	3.54 (1.07)	3.30 (0.91)	2.72 (0.02)
Have basic knowledge about food labeling (e.g., organic foods).	4.27 (0.86)	4.23 (0.86)	4.55 (0.72)	4.22 (1.10)	4.28 (0.79)	4.32 (0.76)	1.27 (0.28)	2.90 (1.18)	2.69 (1.15)	3.48 (0.99)	3.15 (1.23)	3.08 (1.23)	2.64 (1.06)	4.00 (0.00)

Able to advise on healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/ HIV, heart health, kidney disease, osteoporosis; weight loss and obesity).	4.32 (0.88)	4.32 (0.84)	4.55 (0.69)	4.02 (1.22)	4.33 (0.83)	4.41 (0.83)	1.92 (0.09)		2.87 (1.20)	2.73 (1.17)	3.31 (1.11)	2.82 (1.31)	3.02 (1.23)	2.74 (1.09)	1.76 (0.12)
Index	4.38 (0.66)	4.34 (0.68)	4.58 (0.51)	4.20 (0.88)	4.42 (0.54)	4.43 (0.67)	2.07 (0.07)		3.10 (0.97)	2.91 (1.00)	3.54 (0.63)	3.17 (1.08)	3.28 (0.94)	2.99 (0.91)	3.39 (0.01)

* *Scale for Importance: 1 = Not important, 2 = somewhat important, 3 = Average, 4 = Important, 5 = Essential.*

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Table A12: Technical Subject Matter Expertise among Agricultural Extension Professionals in Nigeria, Malawi, South Africa, Uganda and Kenya

Extension professionals should:	*How important is this skill or competency for an extension worker?* Mean (SD)*							*How well does the undergraduate extension curriculum cover this skill or competency?* Mean (SD)*						
	Total (n=514)	*Nigeria (n=174)*	*Malawi (n= 37)*	*South Africa (n=50)*	*Uganda (n=169)*	*Kenya (n=70)*	*F (sig)*	*Total (n=400)*	*Nigeria (n=151)*	*Malawi (n=28)*	*South Africa (n=34)*	*Uganda (n=122)*	*Kenya (n=54)*	*F (sig)*
Demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/ fishery/horticulture, etc.).	4.76 (0.60)	4.70 (0.64)	4.68 (0.71)	4.84 (0.42)	4.77 (0.59)	4.83 (0.51)	0.89 (0.49)	3.91 (0.95)	3.58 (0.95)	3.93 (1.07)	4.03 (0.94)	4.14 (0.86)	4.19 (0.80)	6.82 (0.00)
Understand adult learning principles and hold practical skills required to teach improved farming practices.	4.71 (0.54)	4.71 (0.58)	4.71 (0.65)	4.65 (0.56)	4.72 (0.48)	4.76 (0.46)	0.26 (0.93)	3.84 (0.92)	3.63 (0.96)	4.07 (0.96)	4.00 (0.73)	3.94 (0.88)	3.91 (0.96)	2.84 (0.02)
Understand the new technology being promoted, i.e., what it is, why, and how it works.	4.73 (0.55)	4.71 (0.59)	4.68 (0.66)	4.73 (0.53)	4.74 (0.50)	4.79 (0.48)	0.32 (0.90)	3.62 (1.00)	3.45 (1.07)	3.79 (0.94)	3.76 (0.85)	3.74 (0.93)	3.61 (0.88)	1.62 (0.15)
Facilitate farmers to access inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.)	4.66 (0.61)	4.63 (0.66)	4.61 (0.68)	4.69 (0.62)	4.65 (0.56)	4.74 (0.53)	0.57 (0.72)	3.44 (1.05)	3.31 (1.07)	3.45 (1.18)	3.85 (1.02)	3.54 (1.01)	3.33 (0.99)	1.93 (0.09)
Be able to educate community members about different types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.).	4.65 (0.62)	4.60 (0.66)	4.55 (0.72)	4.63 (0.75)	4.68 (0.51)	4.77 (0.49)	1.17 (0.32)	3.43 (1.09)	3.27 (1.11)	3.38 (1.24)	3.82 (1.06)	3.54 (1.04)	3.37 (1.01)	1.92 (0.09)
Be able to educate community members about climate change and climate smart agriculture.	4.68 (0.61)	4.65 (0.64)	4.63 (0.71)	4.67 (0.68)	4.67 (0.57)	4.80 (0.44)	0.70 (0.62)	3.48 (1.05)	3.35 (1.09)	3.55 (1.02)	3.76 (1.10)	3.57 (1.03)	3.37 (0.98)	1.34 (0.25)

Refer to and make use of publications--journals, research reports, etc.	4.49 (0.73)	4.57 (0.67)	4.47 (0.89)	4.53 (0.70)	4.43 (0.69)	4.40 (0.79)	0.95 (0.45)	3.36 (1.07)	3.45 (1.07)	3.48 (1.09)	3.38 (1.18)	3.27 (1.05)	3.26 (1.01)	0.66 (0.66)
Generating knowledge or producing research reports / journal publications.	4.41 (0.81)	4.53 (0.72)	4.42 (0.86)	4.41 (0.75)	4.32 (0.85)	4.33 (0.86)	1.39 (0.23)	3.37 (1.09)	3.40 (1.06)	3.52 (1.02)	3.41 (1.21)	3.40 (1.07)	3.19 (1.10)	0.61 (0.69)
Able to harness, document, validate and integrate local / indigenous knowledge.	4.53 (0.71)	4.55 (0.71)	4.50 (0.92)	4.54 (0.73)	4.52 (0.65)	4.50 (0.72)	0.06 (1.00)	3.31 (1.12)	3.24 (1.12)	3.32 (1.16)	3.65 (0.98)	3.37 (1.10)	3.22 (1.14)	1.31 (0.26)
Understand social system under which farming takes place (e.g., rural sociology knowledge).	4.66 (0.63)	4.71 (0.61)	4.61 (0.72)	4.56 (0.79)	4.61 (0.61)	4.73 (0.51)	0.91 (0.47)	3.68 (1.03)	3.63 (1.05)	3.55 (1.15)	3.65 (0.95)	3.79 (0.97)	3.67 (1.10)	0.44 (0.82)
Index	4.63 (0.49)	4.64 (0.53)	4.58 (0.64)	4.62 (0.52)	4.61 (0.40)	4.66 (0.39)	0.22 (0.95)	3.54 (0.82)	3.43 (0.88)	3.61 (0.88)	3.73 (0.75)	3.62 (0.73)	3.51 (0.79)	1.26 (0.28)

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About This Document

This AAP-PIRA research report contributes significantly to strengthen the undergraduate (UG) agricultural extension curriculum in sub-Saharan Africa covering Nigeria, Malawi, South Africa, Uganda, and Kenya. The study assessed process skills and competency gaps in UG agricultural extension curricula with specific research questions: (a) Do extension programs effectively address the needs of current food and agricultural systems? (b) What are the critical job skills and core competencies required of extension workers to effectively plan, implement and evaluate extension work in today's changing context? (c) Does the UG curriculum in extension education include education and/or training on these job skills or core competencies? and (d) What are the barriers to effectively training extension workers with required core competencies and how can these barriers be removed? Overall, the findings revealed a significant gap between existing and required core competencies. To address the needs of demand-driven, pluralistic, decentralized and participatory agricultural extension advisory services in sub-Saharan Africa, the authors identify and recommend 11 process skills and core competencies with 97 subcompetencies for their inclusion in the UG agricultural extension curriculum.

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