

Strengthening Agricultural Extension Training

Process Skills and Competency Gaps in Undergraduate Agricultural Extension Curriculum in Uganda

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CONTENTS

List of Tables and Figures.....	v
Abbreviations and Acronyms	vi
Acknowledgements	vii
Executive Summary	viii
1.0 INTRODUCTION	1
1.1 Agriculture in Uganda.....	1
1.2 History of Agricultural Extension in Uganda (1990-2015).....	2
1.3 Current National Agricultural Extension Context (2016 to Date).....	3
1.4 Organogram of Extension Advisory Services in Uganda.....	4
1.5 Study Background.....	5
1.6 Significance of the Study and Research Questions	6
1.7 Organization of the Report	7
2.0 THEORETICAL ORIENTATION: PROCESS SKILLS AND COMPETENCY GAPS IN AGRICULTURAL EXTENSION CURRICULA.....	8
2.1 Agricultural Extension Curriculum Competences at Undergraduate Level	8
2.2 Overview of Undergraduate Agriculture Education in Uganda.....	9
2.3 Makerere University Context	10
3.0 METHODOLOGY	15
3.1 Research Design.....	15
3.2 Population and Sampling	15
3.3 Data Collection Procedures	15
3.4 Development of the Survey Instrument.....	17
3.5 Data Analysis.....	21
3.6 Limitations of the Study	21
4.0 RESULTS AND DISCUSSION.....	22
4.1 Extension Needs of the Changing Food and Agricultural Systems in Uganda	22
4.2 Core competencies required of agricultural extension workers and coverage in undergraduate curriculum.....	26

4.2.1	Program planning.....	27
4.2.2	Program implementation.....	28
4.2.3	Communication skills and competencies.....	30
4.2.4	Information and communication technologies (ICTs) skills and competencies.....	31
4.2.5	Program monitoring and evaluation skills and competencies.....	32
4.2.6	Personal and professional development skills and competencies.....	34
4.2.7	Diversity and gender skills and competencies.....	34
4.2.8	Marketing, brokering and value chain development skills and competencies.....	35
4.2.9	Extension soft skills.....	37
4.2.10	Nutrition skills and competencies.....	39
4.2.11	Technical subject matter expertise/skills and competencies.....	40
4.3	Ways to acquire the process skills and competencies.....	43
4.4	How well does the Makerere University undergraduate curriculum address critical extension job skills and core competencies?.....	44
4.5	How to make agricultural extension curriculum robust and practical.....	55
4.6	Major barriers to effective implementation of extension worker training curriculum.....	57
5.0	CONCLUSIONS AND IMPLICATIONS FOR POLICY.....	60
	REFERENCES.....	62
	Annexure 1 – Online Survey.....	66
	Annexure 2 – FGD Instrument.....	84

LIST OF TABLES AND FIGURE

Table 1 :	Agricultural extension and education University programs in Uganda	9
Table 2:	Demographics of Respondents in Uganda	19
Table 3 :	Institutional characteristics of respondents in Uganda	20
Table 4 :	Extension needs of post production value chain actors	25
Table 5 :	Program planning skills and competencies	27
Table 6 :	Program implementation skills and competencies	28
Table 7 :	Communication skills and competencies	30
Table 8 :	Information and communication technologies (ICTs) skills and competencies	31
Table 9 :	Program monitoring and evaluation skills and competencies	33
Table 10 :	Personal and professional development skills and competencies	34
Table 11 :	Diversity and gender skills and competencies	35
Table 12 :	Marketing, brokering and value chain development skills and competencies	36
Table 13 :	Extension soft skills	37
Table 14 :	Nutrition skills and competencies	39
Table 15 :	Technical subject matter expertise/skills and competencies	41
Table 16 :	Ways to acquire the process skills and competencies in Uganda	43
Table 17 :	Alignment of Makerere University Bachelor of Agriculture and Rural Innovation curriculum (3 years) with competence domains	45
Table 18 :	Alignment of Makerere University Bachelor of Science Agriculture curriculum (4 years) with competence domains	47
Table 19 :	Distribution of course credit units across disciplines for Makerere University BSc Agriculture and BARI curriculum	53
Table 20 :	How to make agricultural extension curriculum robust and practical in Uganda	56
Table 21 :	Major barriers to effective implementation of extension worker training curriculum in Uganda	57
Figure 1:	Organogram of the Agricultural Extension and Advisory Services in Uganda	5

ABBREVIATIONS AND ACRONYMS

AEAS	Agricultural Extension and Advisory Services
BARI	Bachelor of Agriculture and Rural Innovation
DAES	Directorate of Agricultural Extension Services
FGD	Focus Group Discussion
GDP	Gross Domestic Product
ICT	Information and Communications Technology
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MSU	Michigan State University
NAADs	National Agricultural Advisory Services
NAEP	National Agricultural Extension Policy
NARO	National Agricultural Research Organization
NGOs	Non government organization
NPA	National Planning Authority
NSA	Non state actors
SSA	Sub Saharan Africa
UFAAS	Uganda Forum for Agricultural Advisory Services
UG	Under graduate
PIRA	Partnership for Innovative Research in Africa

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- **Authors**

EXECUTIVE SUMMARY

Periodic updating of under graduate agricultural extension curricula is necessary to enable training institutions produce graduates with core competencies suited to the changing landscape and job market. While curriculum reviews should be informed by systematic assessments, such studies have not been conducted in Uganda and other African countries for the past decade hence this study sought to address the following 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 undergraduate 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?

The study employed a sequential mixed methods research design starting with a qualitative study followed by a quantitative survey. Data were collected between August 2021 and April 2022. The population comprised all agricultural extension actors in the academia, public sector, private sector and non-governmental organizations involved in agricultural extension in Uganda. For the qualitative study, four FGDs were conducted with a total of 21 respondents falling within four categories: (i) recent graduates of Makerere University, Bachelor of Agricultural and Rural Innovation (BARI) (n=7); (ii) academic staff from seven universities (n=8) ; (iii) national-level managers from public and civil society organizations that employ graduates (n=2); and (iv) private sector agricultural practitioners (n=4).

The sampling frame for the quantitative study was constructed using the database of the Uganda Forum for Agricultural Advisory Services (UFAAS). UFAAS is a platform that brings together all public, private, and civil society actors in agricultural extension in Uganda. Quantitative data was collected through an online survey using the Qualtrics software. Due to the usual low response rates for online surveys, all people listed on the sampling frame were contacted.

Email invitations for the online survey were sent to 400 extension actors in Uganda. A total of 243 respondents completed the online survey after 3 email reminders to encourage non respondents. FGDs used a mix of unconventional and innovative data collection methods to accommodate the prevailing restrictions to movement and public gatherings during the COVID 19 pandemic lockdown. Three of the FGDs were done purely online using the Zoom platform, and one was blended. The discussions were recorded and transcribed verbatim. Analysis involved reading and rereading the transcripts several times for a thorough comprehension, followed by coding. Chunks of text with a similar idea were assigned the same code and

highlighted with the same color. We assembled all text with the same code together and read it several times to get the meaning. We compared responses of different categories of respondents on the same subject to pick similarities and differences, attaching meaning and interpretation based on the kind of respondent and their context. Next, we wrote text to capture the gist of the message for each theme (a cluster of text for each code) and picked a few direct quotes from the transcripts to illustrate the write-up.

The online survey questionnaire based on literature was formatted using the Qualtrics software and pretested with the 11 team members of the PIRA project. The Institutional Review Board (IRB) approval for human subject's research was obtained from Michigan State University.

The survey tool comprised of structured questions on process skills and core competencies operationalized as the basic sets of knowledge, skills, abilities, and behaviors (a list of between 5 to 17 items under each domain) that agricultural extension professionals require to perform their tasks well in eleven areas: 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. Respondents rated the importance of the eleven process skills/ competencies and how well the undergraduate extension curriculum addresses the various competencies on a five-point Likert-type scale. Respondents rated pre-structured statements on appropriate ways to acquire process skills or core competencies; strategies to make agricultural extension curriculum robust and practical; and major barriers to effective implementation of extension training curriculum in the country.

The process skills and core competencies and appropriate ways to acquire them were analyzed using mean scores. Strategies for improving undergraduate agricultural extension curriculum and major barriers to effective implementation of the extension curriculum were analyzed using frequencies and percentages. The Statistical Package for the Social Sciences (SPSS) version 24 was used for statistical analysis.

The study found that the most prominent needs of smallholder farmers were advisory services on business and marketing, technical production, postharvest handling, value addition and value chain development. Farmers need advice on product costing, market analysis, planning production to align with market demand, and cost benefit analysis for profit maximization. These perspectives resonate with Uganda's national and global strategic trends.

All the above eleven competency domains were rated as important (mean greater than 4) for extension workers in Uganda in the online survey. While these traditional competencies identified in most countries over the past two decades are still relevant, the nature of skills therein is changing. Emerging areas include the ability to provide business advisory services; ability to source and sieve out good quality information from open-source content online; interpersonal and inter organizational relationship skills; concept development; mobilization and leadership in multi-actor innovation system actors during program

implementation (e.g., dynamic problem solving, innovation, initiation and facilitation of purpose driven multi-actor networks for addressing farmer needs). There is greater emphasis on the need for extension workers to be tech-savvy going beyond basic digital literacy so as to advise on application of digital technology in production, e-marketing, cyber-crime, digital security, and use of e-extension approaches. They are expected to possess a mindset and ability to adapt to dynamic digitization and complexity.

The undergraduate curricula moderately address the required job skills or core competencies of extension workers. The bachelor of agricultural and rural innovation at Makerere University was perceived to be strong in content on extension process functional skills but inadequate in technical agricultural production areas. For the latter, most courses are introductory and some important ones optional/elective. The challenge of striking a proper balance between technical and functional competencies is yet to be resolved, and there is need for empirical evidence to inform suitable curriculum composition. Business skills; ICT tools to enhance collaboration and partnerships, collection of data, monitoring, and evaluation of extension programs; fund raising and resource mobilization, were also perceived to be minimally covered in the curriculum.

The key barriers to effectively training extension workers with required core competencies included poor curriculum implementation arrangements due to inadequate budget support for practical learning experiences, failure to update curricula regularly, low motivation of some students and faculty due to lack of interest in the subject, and to a lesser extent inadequate quality of faculty, time constraints, and quality textbooks and manuals. Recommended measures to make agricultural extension curriculum robust and practical included: regular review and updating of curricula; emphasis on practical and contemporary skills through serious mentored workplace internship for every student, exposure of students to market opportunities that develop their entrepreneurship skills, and utilization of cutting-edge and practical teaching learning resources. University faculty should be urgently re-tooled in experiential teaching and assessment methods that simulate and impart on students job skills suited to the rapidly changing agricultural extension job market.

CHAPTER 1 : INTRODUCTION

1.1 Agriculture in Uganda

The agricultural sector in sub-Saharan Africa is one of the major drivers of economic growth and poverty reduction contributing about 15.3% to the overall GDP (World Bank, 2020). In Uganda, the sector accounts for 70 percent of employment, more than half of all exports and about one-quarter of GDP (World Bank, 2018). Persistent poverty and food insecurity among smallholder farmers and other value chain actors have been largely attributed to low agricultural productivity and underperformance of the agri-food sector (Fawowe, 2020; Bjørnlund et al., 2020).

The Ugandan government has identified agriculture as a key economic sector towards the transition to a middle-income status emphasizing the importance of value addition and commercialization (NPA, 2020). To realize these aspirations, the country seeks to overcome a range of challenges to agriculture productivity growth. According to the World Bank (2018), national agricultural output grew at only 2 percent per annum over the previous five years, which was well below the population growth rate and below the 3-5 percent growth rates in other East African countries. Secondly, government policy and regulatory measures have been ineffective. Consequently, gaps still persist in the areas of (i) agriculture productivity and resilience of agricultural systems and rural livelihoods to weather and climatic shocks; (ii) producer arrangements and value chain competitiveness; and (iii) 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 (World Bank, 2018). Agricultural extension and advisory services play a key role in all these efforts.

In Uganda, diverse agribusinesses, particularly along the dairy, maize and coffee value chains, have developed in recent years, linking farmers to inputs, markets and finance, and improving rural livelihoods. The Uganda Economic Update (World Bank, 2018) painted a positive trajectory for the country, predicting significant growth in demand for agricultural commodities by domestic, regional and urban dwellers who are increasingly consuming processed and protein-rich diets. It is projected that by 2050, about 102 million people will live in Uganda. These projections provide massive opportunities for Uganda's agriculture sector, wider agri-food system, and agricultural extension education. All nodes along the value chain – food production, input provision, processing, handling, marketing, transport and retail – will require labor, both skilled and unskilled. Uganda's agri-food system has the potential to enhance employment opportunities for the country's predominantly young population, the majority of whom live in rural areas contributing to inclusive economic growth. Harnessing the sector's unique opportunities calls for strategic investments to support the nascent agribusiness dynamism and its shift from low-value smallholder

farming towards a higher value-added agri-food sector (World Bank, 2018). This requires increased attention to previously ignored issues such as food safety, supply chain logistics, and national and global market participation strategies, among others. Consequently, mindset shifts and new capacities are needed amongst farmers, other actors in the public and private sector, as well as agricultural extension and advisory services (AEAS) personnel hence the need for curriculum review.

1.2 History of Agricultural Extension in Uganda (1990-2015)

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 Ministry of Agriculture Animal Industry and Fisheries (MAAIF). The merger was intended to address challenges of parallel un-coordinated approaches to extension and advisory services and duplication. It was also meant to professionalize extension education services through teaching and learning as well as increased efficiency and effectiveness of public extension programmes.

The period from 1992-1997 ushered in further radical reforms including decentralization and liberalization. Decentralization transferred powers, functions, and responsibilities for planning and implementation of agricultural extension services from MAAIF to district local governments. MAAIF was left with the role of planning and policy formulation, regulatory functions, technical backstopping and training, setting standards and monitoring performance of the agricultural sector, and managing selected projects. Extension workers at the district level were put under the direction of the local district governments (Friis-Hansen and Kisauzi, 2004; Mangheni, 1999; Bashaasha et al., 2011). In 1998, the MAAIF's directorate of extension was abolished, central staffing was reduced by 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, there was liberalization of service delivery opening space to a proliferation of private companies and NGOs offering extension services to farmers (Friis-Hansen and Kisauzi, 2004).

The most radical reform was under the National Agricultural Advisory Services (NAADS) program from 2001-2014. In 2001, Uganda, through an act of parliament (Government of Uganda, 2001) reformed its public extension system paving way for a decentralized, farmer-owned, demand-driven contract system. Mangheni and Mubangizi (2007) profiled the core characteristic of the NAADS program as follows. National level management of extension services was transferred from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) to a lean semi-autonomous agency, the NAADS secretariat, headed by an Executive Director with policy guidance by a Board of Directors. MAAIF retained the functions of policy formulation, disease and pest control, regulation and quality assurance. At the district and sub-county level, the programme was managed by coordinators. Farmers were mobilized into groups at village level, which aggregated to higher level fora at parish, sub-county, district and national level. The farmers' fora were empowered to select enterprises for service

provision, procure inputs, carry out monitoring and evaluation, participate in recruitment and supervision of service providers. Extension services were delivered to farmers by private staff on short-term contracts initially of 3-6 months, later increased to 1 year. The reform was implemented under the broader macroeconomic policy frameworks of privatization, democratization and decentralization and liberalization that 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 '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' (World Bank, 2010; Mangheni and Mubangizi, 2007).

The NAADs programme faced multiple challenges including inadequate capacity at all levels to implement market-oriented extension and advisory services; failure to harmonize and coordinate institutions involved; corruption; weak farmer institutions and political pressures. The programme was terminated in 2014 due to unsatisfactory performance and the national secretariat repurposed to undertake other functions of supporting strategic value chains through infrastructure development and input supply among others. The agricultural extension function was transferred back into MAAIF and the Directorate of Agricultural Extension was reinstated. In 2016 the country introduced the National Agricultural Extension Policy 2016 (Government of Uganda, 2016).

1.3 Current National Agricultural Extension Context (2016 to Date)

One of the key challenges that NAEP 2016 seeks to address is fragmentation, low quality services and lack of coordination of agricultural extension service actors. The extension system has been characterized by weak regulatory system, poor linkages of farmers and other actors to markets, processors and financial services, high cost of service 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 National Agricultural Extension Policy 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 National Agricultural

Extension Policy Framework requires re-orienting the mind sets of all actors to facilitate a shift from considering EAS as an exclusive public sector undertaking towards pluralism.

Despite the reforms elaborated in this section, the performance of EAS has been low. Over the last three decades, extension services have served a limited number of farmers (less than 20%) and tended to benefit only better off farmers (Government of Uganda, 2016). Women, youth and persons with disabilities had lower access to extension services compared to men. Given that women farmers provide over 70% of the agricultural labor force, their limited access to extension services has contributed to lower adoption of improved technologies (estimated at 17 less compared to men) and consequently a smaller contribution to productivity and output. Similarly, youth (10-30 years of age) comprising 57% of Uganda's population, the majority of whom are residing in rural areas where agriculture is the main economic activity, are lagging behind in accessing extension services. This is despite the fact that the National Youth Policy (2001) clearly stipulates that youth who are farmers should be provided with market information and agricultural extension services. 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.

1.4 Organogram of Extension Advisory Services in Uganda

The extension and advisory service system under MAAIF consists of Directorate of Agricultural Extension Services (DAES), a decentralized local government public structure, technical directorates and agencies; and non-state actors (NSA). At national level, the DAES provides overall leadership, management and coordination of the public and private extension advisory service 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 extension services required along the different value chains; and work with DAES to ensure that actors along the value chains get relevant extension services. At the local government levels, agricultural extension functions are a responsibility of the staff deployed at district and sub county levels. The district level officers coordinate extension services and report directly to the MAAIF DAES for technical guidance. Non-state actors play a significant role in policy advocacy for extension services at all levels, resource mobilization for agricultural extension services, capacity building and service delivery, among others.

The other institutions that play a key role in agricultural extension at the national level include; 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 agri-business related services; the Ministry of Water and Environment which provides meteorological information; and 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.

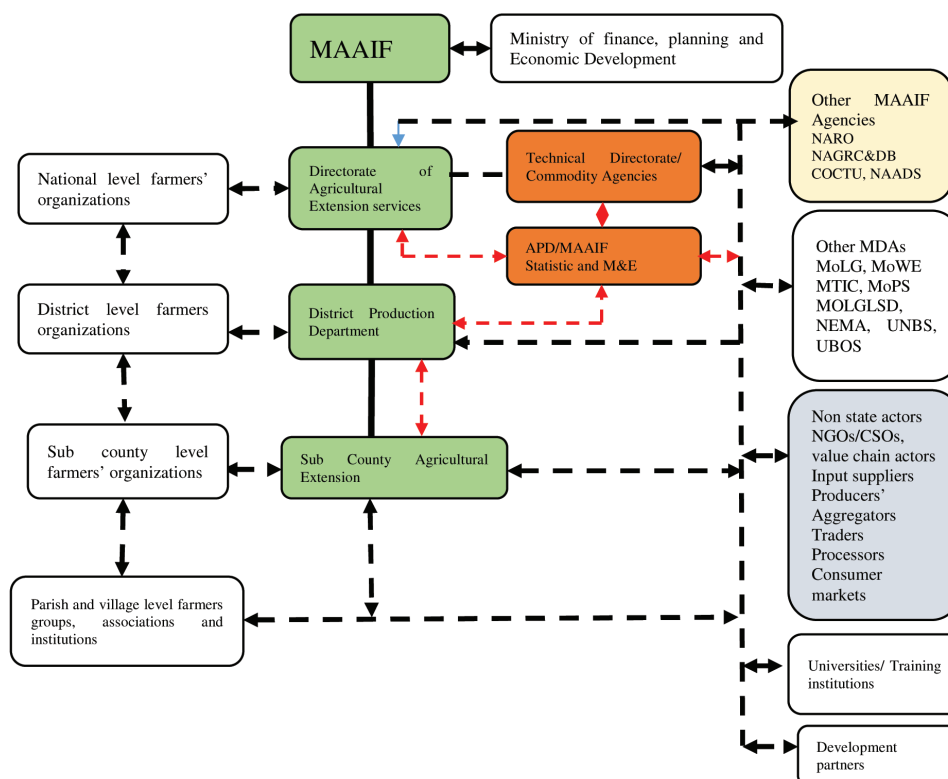


Figure 1: Organogram of the Agricultural Extension and Advisory Services in Uganda

Source: MAAIF

1.5 Study Background

Agri-food system transformation and increased productivity in sub-Saharan Africa are dependent to a large extent on the delivery of effective agricultural extension services to smallholder farmers and other food system actors (Danson-Abbeam et al., 2018). They are critical actors who support the improvement of farmers' knowledge, skills, and attitudes through training and timely communication of up-to-date information useful in making informed decisions (Tesso, 2016). Historically conceived as an education service targeting rural smallholder farmers and aimed at improving farming methods for better incomes and standards of living; extension services are currently evolving to meet broader emerging needs. Rapid economic growth, diverse and dynamic agricultural systems, evolving technologies, market liberalization and growing competition for resources have caused a significant impact on the role of agricultural extension advisory service (AEAS) providers in both developing and developed countries (Suvedi et al., 2018; Chikaire et al., 2018). Consequently, in many countries there is an evolution from predominantly public services targeting farming populations, to more private sector and civil society involvement. There are new clients (including the diverse actors in entire agricultural value chains located in urban areas versus the traditional focus on rural farmers; large-scale commercial farmers as

opposed to subsistence small-scale farmers, youth, women); and new messages. Besides technology transfer, agricultural extension is now expected to advise on business and entrepreneurship, value addition, farmer institution development, and facilitating linkages between farmers, other actors and service providers (Mangheni, 2016). In Uganda, under the current policy the extension service has been required to take on new clientele by supporting numerous other value chain actors including those involved in food processing and distribution (Government of Uganda, 2016). To be effective, extension professionals need to possess a set of core technical, process skills and functional competencies.

Process skills and core competencies are basic sets of knowledge, skills, abilities, and behaviors that agricultural extension professionals require to perform their tasks effectively. 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, many agricultural training institutions in Africa have changed little since their inception and remain averse to change (Fredua-Kwarteng, 2019). In most cases, the training content reflects the influence of Western universities, 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 skills that are necessary to align training content and instruction with employment outcomes suited to the rapidly changing and complex SSA agri-food systems in the context of climate change, regional and global cross border trade. In order to survive and thrive, extension must understand and adjust to rapid changes and emerging challenges, calling for organizational changes and multi-skilled human resources in extension services (Cochran, 2009).

1.6 Significance of the Study and Research Questions

Periodic updating of the undergraduate (UG) agricultural extension curriculum is necessary for agricultural training institutions to produce graduates with core process skills and competencies suited to the changing landscape so as to enable sustainable food security, improved livelihoods, and natural resources conservation. Although there have been studies on core competencies of agricultural extension professionals in sub-Saharan Africa (Davis and Terblanche, 2016; Nwaogu and Akinbile, 2018; Olorunfemi et al., 2020), recent systematic assessment of agricultural extension training within MSU-AAP Consortium members including Makerere University is lacking. This study will help universities to develop the broadly competent extension professionals needed for contemporary agricultural development.

Therefore, this study sought to address the following research questions:

- 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?
- Does the undergraduate curriculum in extension education adequately address these job skills or core competencies?
- What are the barriers to effectively training extension workers with required core competencies, and how can these barriers be removed?

The study objectives were:

1. Review agricultural extension curricula currently in use at Makerere University at the undergraduate level.
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 extension service delivery.

1.7 Organization of the Report

Chapter one introduces the contextual background situating agricultural extension within Uganda's agricultural development strategy and reforms over the past three decades. It describes an overview of the agricultural sector and the history of agricultural extension in Uganda, an organogram of the pluralistic extension service (public and private sector), and challenges in agricultural extension, ending with the problem statement, research questions and objectives addressed by the study. Chapter two presents the theoretical orientation discussing process skills and competency gaps in agricultural extension curricula from a global perspective. Chapter three describes the methodology used and limitations of the study. The fourth chapter focuses on the results and discussion of online survey and focus group discussion. 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 CURRICULA

This section presents a review of literature on the core competencies needed by agricultural extension professionals with a view to development of a theoretical framework to assess undergraduate curricula. It also covers contextual background on agricultural education in Uganda and Makerere University.

2.1 Agricultural Extension Curriculum Competences at Undergraduate Level

According to Issahaku (2014), a competence is a skill, a personal characteristic or a motive demonstrated by various behaviors which contributes to outstanding performance in a job. It is the sufficiency of knowledge and skills that enable a person to act efficiently and effectively in a wide variety of situations (Davis, 2015). Shavelson (2010) defines competence as (1) the physical or intellectual ability, skill or both; (2) performance capacity to do as well as to know; (3) carried out under standardized conditions; (4) is judged by some level or standard of performance as 'adequate', 'sufficient', 'proper', 'suitable' or 'qualified'; (5) can be improved; (6) draws upon an underlying complex ability; and (7) needs to be observed in real-life situations. Competence of staff in AEAS is hence vital for effective and efficient use of existing resources, (particularly human resource) to achieve designated goals.

Agricultural extension professionals should be proficient in the technical aspects of their areas of expertise as well as in the process and delivery of services to farmers (Cochran et al., 2012; Swanson & Rajalahti, 2010; Kibwika et al., 2009). They should demonstrate a high level of professionalism whilst providing services to their clientele. However, it is important to recognize that the roles and corresponding competencies are influenced by the extension model adopted in a particular context. Where extension workers take on roles of technology transfer and development of clients' capacity and potential, they need certain competencies in technical areas as well as human development in order to perform their responsibilities and activities well. 'Human resource development focuses on the educational activities to nurture a self-motivated client who can act voluntarily and rationally based on his/her own decision and who has a sense of self-responsibility and social responsibility. The goal of extension is unleashing the potential of clients and developing their capabilities to their full potential' (Neda Tiraeyari et al., 2010, p. 1381).

The Ohio State University Extension Competency Model according to Cochran (2009) recognizes 14 core competencies central for any job in Extension: (1) communication, (2) continuous learning, (3) customer service, (4) diversity, (5) flexibility and change, (6) interpersonal relationships, (7) knowledge of Extension, (8) professionalism, (9) resource management, (10) self-direction, (11) teamwork and leadership, (12) technology adoption

and application, (13) thinking and problem-solving, and (14) understanding stakeholders and communities. The success and efficiency of extension is thus deemed to be dependent on how competent extension personnel are in service delivery of agricultural development programmes, based on the outlined competences.

In the developing world, scholars identify a need for competencies in areas of empowering local farmer organizations, partnership management and enterprise development, lobbying and advocacy, management, communication, human relations and leadership (Kibwika et al., 2009). In addition, they should possess professional competence in administration, program planning and execution, evaluation, communications, teaching and extension methods and understanding human behavior (Chikaire et al., 2018). However, lack of a proper balance between technical and professional competencies in staff has been identified as a common problem in the extension services of developing countries (Suvedi and Kaplowitz, 2016; Khan et al., 2004; Gibson and Hellion, 1994). Competencies needed vary with nature of client served (farmers or other value chain actors), the position of extension personnel and job requirements of the extension program; (Chikaire et al., 2018); and nature of client needs being met (Neda Tiraieyari et al., 2010).

2.2 Overview of Undergraduate Agriculture Education in Uganda

Agricultural education was introduced in Uganda during the colonial era. It was mainly delivered by public institutions through non formal short courses and demonstrations at farmers' training centers, and farm institutes (Wallace, 2007). Like other African countries, policy reforms in the last five decades have brought on board diverse actors from the private and non-government sector to offer agricultural extension education for rural transformation and agricultural productivity (Davis et al., 2008). A total of seven public and 3 private universities offer programs in the area of agricultural extension and education. The nomenclature, focus and curriculum of the programs varies as shown in Table 1 below.

Table 1 : Agricultural extension and education University programs in Uganda

No.	University	Program
1	Makerere University	Bachelor of Agricultural and Rural Innovation (BARI) Bachelor of Science Agriculture (Extension Option)
2	Mbarara University of Science and Technology	Bachelor of Science in Agricultural Livelihoods and Farm Production
3	Kyambogo University	Bachelor of Vocational Studies in Agriculture with Education
4	Gulu University	Bachelor of Science in Agri-Entrepreneurship and Communication Management
6	Kabale University	Bachelor of Science in Agriculture
7	Busitema University	Bachelor of Science in Agriculture

8	Uganda Christian University	Bachelor Science in Agricultural Education & Extension
9	Ndejje University	B. Sc. Sustainable Agriculture & Extension
10	Bishop Stuart University	Bachelor of Agriculture and Community Development

Unlike other tertiary institutions (including vocational education) whose curricula are developed centrally by the BTJET and/or the National Curriculum Development Center (NCDC), Universities have autonomy in the development, management and implementation of their curricula. In this sense, each university that trains agricultural extension and education professionals designs its own curriculum. This autonomy is rooted in the Universities and other Tertiary Institutions Act of (UOTIA) 2001, which provides a detailed account of the governance structure for higher institutions of learning by category. Agricultural education curriculum regardless of the institution, have to meet basic quality standards set nationally by the National Council for Higher Education (NCHE) established under the Universities and Other Tertiary Institutions Act, 2001 to regulate and guide the establishment and management of institutions of higher learning and advise government on higher education issues (UNCHE, 2014). The NCHE accredits all university curricula prior to implementation.

2.3 Makerere University Context

The evolution of higher education in Uganda can be traced to the establishment of Makerere University which began as a technical college in 1922. In 2011, the University transitioned from the Faculty-based to the collegiate system with about 10 constituent colleges; including the College of Business and Management Sciences, College of Computing and Information Sciences, College of Education and External Studies, College of Engineering, Design, Art and Technology, College of Health Sciences, College of Humanities and Social Sciences, College of Natural Sciences, College of Veterinary Medicine, Animal Resources & Bio-security, School of Law and the College of Agricultural and Environmental Sciences (CAES), all operating as semi-autonomous units of the University.

The CAES, formally the Faculty of Agriculture, comprises three schools; The School of Forestry, Environmental and Geographical Sciences (SFEGS), School of Food Technology, Nutrition and Bio-engineering (SFTNB) and the School of Agricultural Sciences(SAS). The schools are further divided into eight departments; the Department of Forestry, Biodiversity and Tourism (F, B &T), the Department of Environmental Management (DEM), Department of Geography, Geo Informatics and Climatic Sciences (GGCS), Department of Agricultural & Bio systems Engineering (ABE), Department of Food Technology and Human Nutrition (DFTHN). Others include; Department of Agricultural Production (DAP), Department of Agribusiness and Natural Resource Economics (DANRE), and Department of Extension & Innovations Studies (DEIS). CAES hosts all agricultural and environmental sciences offered at Makerere University.

The mandate of the School of Agricultural Sciences is to carry out teaching, research and community outreach services in agricultural sciences. Established in 1987 with technical and

financial support from the United States Agency for International Development (USAID), the Department of Extension and Innovation Studies formerly the Department of Agricultural Extension / Education (DAEE) is mandated to equip students enrolled in the diverse programs of the school with competencies necessary to facilitate farmer learning and utilization of agricultural information and technologies. In executing this mandate, DEIS is guided by the University Vision *“To be a leading institution of academic excellence and innovation in Africa”*. Aligned to this vision, is DEIS’s mission. *“To contribute to the national and regional development through producing competent agricultural and rural development professionals able to train, generate knowledge and carryout outreach activities in the area of agricultural communication and extension education”*. Initially the department was envisaged to accomplish the following objectives:

- To offer curriculum and instruction that prepares graduates for placement in secondary schools as teachers.
- Provide in-service education through workshops, seminars, short courses and symposiums for continuous improvement of curricula for teachers of agriculture, extension agents, and others who need updating in agricultural education.
- Design and implement program based research programs activities for continuous improvement of graduates for secondary school agriculture and extension programs
- Disseminate research results in professional journals and through professional seminars and meetings
- Provide leadership for professional organizations
- Provide systematic supervision of practical experiences for pre-service agriculture teachers, extension agents and graduates
- Provide training for agricultural educators at Masters and PhD levels.

One aspect of this mandate focusing on secondary school teacher training was never operationalized.

The department has a total of 18 academic staff specialized in various areas of agricultural extension, innovation, community forestry and natural resource management. All academic staff are expected to have a minimum qualification of a PhD. Expertise in the technical agriculture disciplines is drawn from the other departments of SAS and to a limited extent the wider College level. Aside from the agricultural extension education related courses taught to students enrolled in varied programs at the SAS, DEIS a primary host for two undergraduate, and two post graduate programs in agricultural extension. The undergraduate degree programs are Bachelor of Agricultural and Rural Innovation (BARI) through face-to-face delivery and Bachelor of Agricultural and Rural Innovation external program (BARI-EXT) through distance learning. The DEIS is co-host for the Bachelor of Science Agriculture program students who specialize in agricultural extension in the fourth year, the Bachelor of science Agriculture Extension option.

2.3.1 Curriculum Development Process

Curriculum development in DEIS follows a systematic process involving key stages, namely, situation analysis and goal formulation; programme design; interpretation and development of training materials; implementation; monitoring, evaluation and curriculum review. During situation analysis the teaching staff undertake a diagnosis or examination of needs or factors that exist in the environment or society where the curriculum is going to be implemented. This includes the economic, social, political aspects of society, as well as national needs and aspirations for the agricultural and agri-business sector arising from prevailing policy, strategy and programmatic direction. This process involves a series of stakeholder workshops with subject matter experts and key sector actors especially those that absorb the graduates of the extension education program. To ensure relevance of the curriculum content, key stakeholders often include those working in major agricultural programs (public and private sector), the education field, teaching communities, professional associations, academics, industry and farmer associations.

The goal formulation process specifies what problem the curricula is going to address, and also guides the setting of the learning outcomes. This is often used as a core step that guides the next stage of designing the content, teaching materials and instructional methods. Design of quality education programs is based on a curriculum structure derived from a set of explicitly stated objectives derived from the situational analysis. The learning objectives underlie the curriculum, student assessment, program evaluation and must be the reference point for the professional competency profile of graduates. Curriculum implementation includes interpretation, effective learning arising from an effective teaching and learning environment. The implementation of a new curriculum usually requires availability of resources or at least a rethink of existing learning resources. Departmental Curriculum planners often think at a strategic level about the resources required and how these can be used effectively and efficiently to deliver the program. This often takes into consideration the teaching/ learning infrastructure, finance and human resources within the department (DEIS), school (SAS) and the College of Agriculture and environmental sciences (CAES). Departments are required to produce and defend any new academic programs at various levels (Department, School, College, University Senate, University Council) to ensure adherence to the above standard curriculum design guidelines. After several cycles of implementation, the curriculum undergoes evaluation and review.

2.3.2 Undergraduate Agricultural Extension Curriculum Reforms at Makerere University

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 introduced with support from the Sasakawa Africa Fund for Extension Education program of Winrock International targeted field extension workers with diplomas (DAEE strategic plan 2007-2017). At the time, the government had passed 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 with support from a British Council funded project to produce the currently offered Bachelor of Agricultural and Rural Innovation (BARI) program (DAEE strategic plan 2007-2017). BARI was a response to global and national policy reforms including decentralization, liberalization and privatization of agricultural extension services, emphasis on poverty eradication and globalization among others. These shifts created new competency demands of extension graduates such as client oriented efficient service 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 extension service system that called for added emphasis on system orientation, innovation and rural development focus. The third reform involved introduction of a distance learning version of the program to cater for the in-service training needs of a growing number of field extension workers employed by the government on flexible short-term contracts under the National Agricultural Advisory Service program extension privatization reforms. Such employment terms would make it difficult to afford study leave to undertake regular face to face training at the university.

2.3.3 Description of the BARI Program

The BARI Programme student handbook 2008/2009 stipulates the aims and structure of the programme as elaborated below. The programme is aimed at inculcating a culture of innovation and entrepreneurship among graduates to enable them address challenges of agricultural and rural development in a changing environment. The curriculum seeks to produce professionals with a good balance of theoretical grounding and practical skills for making change in rural communities. It is designed to build technical and professional competencies of diploma holders from agricultural and related fields, as well as those directly from high school with a Uganda Advanced Certificate in Education (UACE).

Specifically, the BARI program aims at the following:

- Integrating social and technical disciplines related to agricultural and rural development so as to enable graduates champion development in agrarian societies;
- Developing a systemic view of development among professionals of rural and agricultural development;
- Developing multi-skilled professionals with agricultural, leadership, creative, analytical, facilitative and reflective competences to coordinate, stimulate and guide innovations and multi-actor partnerships for improving rural livelihoods with a broader view of local, regional and global trends in development;
- Integrating professional and ethical values and mindsets for accountable agricultural and rural development professionals;
- Providing alternative training approaches for more effective professionals to confront the complex challenges of poverty, food insecurity and natural resources management in the sub-Saharan region.

The expected outcome of the program is to produce professionals that are able to facilitate community empowerment to articulate and pursue their demand for agricultural and rural services with a clear development vision. Graduates are expected to have well developed competencies to mobilize communities and support local organization development (including farmer groups and associations) for collective action. The specific critical competencies the program is meant to develop include the following:

- Creativity in engagement with communities to innovate and find solutions to current and future problems through joint learning and experimentation
- Build teams comprising of different fields of expertise to address complex agricultural and rural development problems in a multi-disciplinary way
- Build and sustain institutional partnerships for coordinated and coherent service delivery that addresses the entire value chain
- Management and resolution of social and technical conflicts and mobilize social energy for collective action towards development initiatives
- Ability to target programmes and activities to differentiated demand based on existing social categories taking into account factors for sustainability
- Management of information and knowledge on rural innovations and facilitation of knowledge exchange for continuous learning and change.
- Organizing and conducting relevant training
- Design and implementation of participatory monitoring and evaluation of programmes and activities including facilitating reflective self-evaluation
- Development and nurturing of rural and social entrepreneurship
- Initiation and management of profitable agricultural enterprises in a competitive environment
- Providing advice on practices for enhancing agricultural productivity and food security.
- Working with the farming communities to devise more constructive ways of using and managing indigenous knowledge

The regular BARI is a full-time three-year programme with multi-disciplinary orientation. Each year consists of two semesters of 17 weeks each and one recess practical term of 10 weeks in the first year, and 10 weeks in the second year. The normal semester load ranges from 20 to 22 Credit Units. The distance learning version of the same programme is 4-6 years. Most course units have designated Lecture Hours, Tutorial Hours, and Practical Hours.

CHAPTER 3 : METHODOLOGY

3.1 Research Design

The empirical study employed a sequential mixed methods research design starting with qualitative followed by quantitative data collection. Data from both studies enabled in-depth understanding of the phenomena investigated through triangulation.

3.2 Population and Sampling

Data was collected between August 2021 and April 2022. The population of the study comprised all extension actors in the academia, public sector, private sector and non-governmental organizations involved in agricultural extension in Uganda. For the qualitative study, four FGDs were conducted with four categories of respondents: (i) recent graduates of Makerere University, Bachelor of Agricultural and Rural Innovation (BARI); (ii) academic staff from seven universities; (iii) national-level managers from public and civil society organizations that employ graduates; and (iv) private sector agricultural sector practitioners. Participants in each of the FGDs were relatively homogeneous to ensure comparable experiences with the phenomena of interest and hence a focused discussion. The total number of focus group participants was 21. Out of these seven were BARI graduates (three female and four male). Three of the males were self-employed; one was employed by the government. One female was employed in the private sector (an extension professional organization), and two were unemployed but with some work experience in the private sector. For the academia FGD, a total of eight participated -- four males and four females. Five were from public universities, and three were from private universities. The category of public sector employers had a low response rate. At the first attempt, thirteen were invited, but only one turned up, so the interview was postponed. A second invitation was made with an additional 14 people invited, and out of these, two participated, both male. For the private sector, seven were invited, and four participants attended. It is worth noting that there were overlaps across categories. For example, some of the recent graduates were in the private sector, and some civil society managers and academics owned private farms. FGD participants were knowledgeable people purposively identified and sampled by the researchers using their networks and vast experience of over 20 years in Uganda's extension services.

For the quantitative study, the sampling frame was constructed using the database of the Uganda Forum for Agricultural Advisory Services (UFAAS). UFAAS is a platform that brings together all public, private, and civil society actors in agricultural extension in Uganda. Quantitative data was collected through an online survey using the Qualtrics software. Due to the usual low response rates for online surveys, all people listed on the sampling frame were contacted.

3.3 Data Collection Procedures

Email invitations for the online survey were sent to 400 extension professionals in Uganda. However, 243 respondents completed the online survey after 3 email reminders to encourage

non respondents. It should be noted, however, that a few questions/items were not completed by some of the respondents.

FGDs used a mix of unconventional and innovative data collection methods to accommodate the prevailing restrictions to movement and public gatherings during the COVID 19 pandemic lockdown. Three of the FGDs were done purely online using the Zoom platform, and one was blended. For the latter, three participants were physically in one room with the moderator while one participant and the notetaker logged on virtually via Zoom.

When a question was posed by the moderator, participants were invited to type their responses in the chat interface of Zoom. They were instructed to wait to share until prompted to ensure that people were not influenced by what others had posted before they had had a chance to share their original perspectives. The moderator simulated the collegial, comfortable environment of face-to-face FGDs by maintaining a conversation going during the time when participants were typing in the chat. Here is an example of how questions would be typically asked:

***Moderator:** Okay, when you look at the value chain in Uganda's changing agricultural and food systems, what do you see as the needs? You are free to say these are for farmers and all other key actors that you are aware of that you have met. So, what you are going to do: you are going to type in the chat, and once you do, please do not click "enter". Just type and wait. The idea here is that others are not influenced by what you are going to say. Each of them should have a chance to present what is on their mind / what they know. So please go ahead and type what you see as the extension needs of actors along the value chain in Uganda's changing agricultural and food systems. After you have typed, I will let you know that you may post. Your answers will be very important and be as genuine as your experiences are. So, you can type and wait to click "enter." If you know so many, type as many as you know. For the time I am going to give you maybe 5 minutes, and I am aware that some of you are using your phones, so it may take you a little longer. [Pause]*

***Moderator:** You may now click "enter" for your answers, and each of you are free to go to the chat and see what other colleagues have shared. Okay, so let us go to the chat. If you are still typing, that is fine. Thank you so much again. Appreciate that. Thank you. So, I am just going to share our next question...okay, I'll wait for a few others. I want to thank those who have submitted responses already... [names read out] - thank you, all of you this far, and we wait for others briefly. Okay, let's go to the chat.*

Each participant was invited to expound on the response typed in the chat. The moderator followed up responses with appropriate probing questions to elicit further clarification. The discussions were recorded and transcribed verbatim. Analysis involved reading and rereading the transcripts several times for a thorough comprehension, followed by coding. Chunks of text with a similar idea were assigned the same code and highlighted with the same color. In the next step, we assembled all the text with the same code together. We then read it repeatedly several times to get the meaning. We compared responses of different categories of respondents

on the same subject to pick similarities and differences, attaching meaning and interpretation based on the kind of respondent and their context. Next, we wrote text to capture the gist of the message for each theme (a cluster of text for each code) and picked a few direct quotes from the transcripts to illustrate the write-up. The next section presents the results organized according to the FGD questions.

3.4 Development of the Survey Instrument

The online survey questionnaire was developed based on review of literature and past survey instruments. It was formatted using the Qualtrics software and pretested with the 11 team members of the PIRA project. All have postgraduate qualifications in agricultural extension and over 5 years experience in the field in Africa, USA, and India. On the basis of the pretesting, the questionnaire was modified and finalized for data collection. The Institutional Review Board (IRB) approval for human subject's research was obtained from Michigan State University (MSU).

The survey tool comprised of questions in the following areas (See Annex for the detailed questionnaire):

(i) Process skills and competency gaps in undergraduate agricultural extension curriculum.

Process skills and core competencies were operationalized as the basic sets of knowledge, skills, abilities, and behaviors (a list of between 5 to 17 items under each domain) that agricultural extension professionals require to perform their tasks well in the following eleven areas:

- a) Program planning
- b) Program implementation
- c) Communication
- d) Information and communication technologies (ICTs)
- e) Program monitoring and evaluation
- f) Personal and professional development
- g) Diversity and gender
- h) Marketing, brokering and value chain development
- i) Other extension soft skills
- j) Nutrition
- k) Technical subject matter expertise

Keeping in mind their experience in agricultural extension work and knowledge of undergraduate extension curricula in the country, the respondents were asked to rate the importance of the above eleven process skills or competencies on a five point Likert scale

with options of 1 = not important; 2 = somewhat important; 3 = moderately important; 4 = important; and 5 = very important. The respondents were also required to rate how well the undergraduate extension curriculum addresses/covers the various skills or competencies on a five point Likert scale with options, 1 = not at all covered; 2 = minimally covered; 3 = moderately covered; 4 = well covered; and 5 = very well covered.

(ii) Appropriate ways to acquire process skills or core competencies.

This was operationalized as the perceptions of agricultural extension professionals on the extent to which the listed mechanisms are best suited to equip extension professionals with the skills or competencies. The mechanisms included: pre-service training; internship in various work environments during the UG programs; basic induction training at the beginning of a job; in-service training; and opportunities to attend training, 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.

(iii) Strategies to make agricultural extension curriculum robust and practical.

This was operationalized as the perceptions of extension professionals on the following strategies for improving undergraduate agricultural extension curriculum: providing practical and contemporary skills, including various soft skills in extension curriculum, including business management concepts and practices in extension curriculum, exposing students to market opportunities, linking farmers with service providers and develop entrepreneurship, and grooming students with broad-based general agriculture courses. 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.

(iv) Major barriers to effective implementation of extension training curriculum in your country.

This was operationalized as the perceptions of extension professionals on the following major barriers to effective implementation of training curriculum: development of an effective extension curriculum, quality faculty to teach extension courses, quality text books and/or manuals, classroom and demonstration farms or facilities, accreditation of curriculum, time constraint, etc. The respondents were required to indicate their responses by ticking all barriers that apply to the undergraduate extension curriculum in reference.

(v) Demographic Characteristics

The respondents were asked to indicate their age (in years), gender (man/woman), highest educational level (Bachelor's, Master's and PhD degrees), current position (extension staff in a University, extension researcher, private sector extension professional, extension graduates working for NGOs and/or private sector companies, postgraduate students in extension, public sector extension professional and NGO extension professional), number of years in extension profession or agriculture related fields, university(ies), and familiarity with current undergraduate level agricultural extension curriculum (familiar and not familiar).

A majority of respondents were men (about 76%), above 30 years old (80%) and with a college degree (100%) (table2). Under-representation of youth and women in the sample is a reflection of their proportionately lower numbers in the agricultural professions in general and agricultural extension in particular. Only 24% were women and 20% were less than 30 years old. Forty seven (47%) had a bachelors degree, 43% a masters degree and 9% a PhD.

Most respondents (about 85%) were familiar with the undergraduate curriculum of only one university (table 2). This implies that while Uganda has several universities, results can only be generalized to Makerere university curricula about which most respondents were familiar due to their affiliation with it as either staff or former students or partners. Most identified themselves as extension professionals in the public sector (43%) or private sector (about 49%) while university staff constituted about 7%. Respondents had many years of experience in agricultural extension and agricultural related fields totalling between 6-15 years (about 42%), over 16 years (about 29%). About 29% had less than 5 years of experience.

Table 2 : Demographics of Respondents in Uganda

1. Age (In Years) (n=174)		
Category (In Years)	Frequency	Percent
21-30	35	20.11
31-40	63	36.21
41-50	37	21.26
51-60	34	19.54
above 60	5	2.87
Total	174	100.00
2. Gender (n=173)		
Category	Frequency	Percent
Men	131	75.72
Women	42	24.28
Total	173	100.00
3. Education (n=175)		
Category	Frequency	Percent
Bachelor's degree/HND	83	47.43
Master's degree	76	43.43
Doctoral (Ph.D.) degree	16	9.14
Total	175	100.00

Table 3 : Institutional characteristics of respondents in Uganda

1. Familiarity with UG Agricultural Extension Curriculum (n=243)		
Category	Frequency	Percent
Familiar	181	74.49
Unfamiliar	62	25.51
Total	243	100.00
2. Familiar With How Many Universities' UG Agriculture Extension Curriculum (n=239)		
Number of Universities	Frequency	Percent
1	202	84.52
2 -3	33	13.81
4 or more	4	1.67
Total	237	100.00
3. Current Position (n=174)		
Category	Frequency	Percent
University Extension Staff	13	7.47
Public Sector Extension Professionals	75	43.1
Private Sector Extension Professionals and Others	86	49.43
Total	174	100.00
4. Experience in Extension Profession / Agriculture Related Fields (In Years) (n=174)		
Category	Frequency	Percent
0-5	50	28.74
6-10	39	22.41
11-15	34	19.54
16-20	11	6.32
above 20	40	22.99
Total	174	100.00

3.5 Data Analysis

The demographic and institutional characteristics of the respondents were analyzed using frequencies, percentages and means. The process skills and appropriate ways to acquire them were analyzed using mean scores. Finally, the strategies for improving undergraduate agricultural extension curriculum and major barriers to effective implementation of UG extension curriculum were analyzed using frequencies and percentages. The statistical package for service solution (SPSS) version 24 was the software used for the statistical analysis.

3.6 Limitations of the Study

Our small sample size of 243 respondents, non-exhaustive sampling frame, and non-random sampling poses some limitations to the external validity of our results. However, our approach of collecting data from different stakeholders within the agricultural extension system and triangulation of their opinions through the qualitative data helps to mitigate this risk. 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

This section integrates findings from focus group discussions and online survey of extension professionals and practitioners to answer the following research questions:

- What are the extension needs of Uganda's current food and agricultural systems?
- What are the critical job skills and core competencies required of extension workers to effectively plan, implement, and evaluate extension work in the changing context?
- How well does the undergraduate curriculum in extension education address these job skills and core competencies?
- What are the barriers to effectively training extension workers with required core competencies, and how can these barriers be removed?
- What strategies can make agricultural extension curriculum robust and practical?

4.1 Extension Needs of the Changing Food and Agricultural Systems in Uganda

Four themes emerged from the focus group discussions regarding prevailing agri-food system changes in Uganda. First is the gradual evolution from subsistence to business-oriented farming driven by emerging opportunities of new markets locally, within the region, and beyond. Second are new enterprises, improved technologies, and innovations -- notably ICT and other digital technologies which have changed the way producers and other value chain actors do business. Thirdly, agricultural practices are changing in response to new constraints and challenges, especially climate change and reducing land sizes. Fourth are changes in agricultural value chain actor profiles notably increased investment by the private sector, foreign investors and farmer institutions that help farmers come together for joint action, voice, and economies of scale. These changes are in turn driving the changing extension needs.

FGD participants identified value chain actors with specific extension needs as farmers, agro-input stockists, farmer institution leaders, traders and aggregators of farm produce, agricultural extension workers, and paid farm workers. The extension needs of smallholder farmers featured most prominently in all the FGDs around themes of marketing, business, technical production, postharvest handling, and value addition. These perspectives resonate with the national and global strategic trends. Uganda's national development plan for the period 2020-2025 (NPA, 2020) aims to increase commercialization and competitiveness of agricultural production and agro processing. Key expected results include: increasing export value of selected agricultural commodities, increasing the agricultural sector growth rate, increasing labor productivity in the agro-industrial value chain, creating jobs in agro-industry, and increasing the proportion of households that are food secure. This calls for market oriented advisory services, defined by the Neuchatel Initiative's Common Framework 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). The themes are expounded in the following sections followed by a table presenting the extension needs of the other less prominent value chain actors.

Farmer extension needs

Marketing

Extension should build the capacity of farmers to understand markets of agricultural products in terms of customer quality standards for specific market segments, volumes needed, as well as the ability to forecast future market trends. Farmers need support to ensure consistent production to meet market needs by addressing challenges associated with various constraints in production, and input deliveries. For example, extension can support farmers to establish viable groups that aggregate produce for collective marketing to meet volume requirements that attract buyers.

According to one participant, “Some traders don’t want to go to the villages because they know farmers don’t have volumes. So, if an extension worker can have an insight on how to bring these farmers closer and explain to them why they are supposed to work together to bridge that gap or the fear of the traders that the farmers don’t have the volumes. Once they have the volumes, then it is easy” (FGD, private sector).

There was consensus across all the FGDs that smallholder farmers have increased interest in marketing their produce. Market-oriented extension should therefore build the capacity of farmers to conduct market analysis, which in turn would drive production decisions such as enterprise selection and market penetration.

“Where is the market for what you want us to produce? So, farmers need to know about the quality issues, they want to know about the quantity that the market out there may be demanding” (FGD, civil society extension organization).

The importance of market analysis is well illustrated in this quote:

“Approaching extension from the marketing side is critical because it is a driving force for all other chains like production to postharvest. Once an extension worker is well versed on how to penetrate the markets, how to help farmers penetrate the markets, how to help farmers grow for markets, success is guaranteed” (FGD, private sector)

Farmers need linkages to profitable markets for their produce, their preference being direct connection to markets so as to eliminate middlemen.

“Of late, after our interventions, they want to have an interaction with the off-takers, so this is something that is also becoming of keen interest so that they agree then they can move forward” (FGD, civil society extension organization).”

In addition to linking farmers to markets, extension needs to build their confidence to engage with off-takers to negotiate fair terms and prices. These skills are also essential to enable farmers to successfully navigate power asymmetries when engaging with middlemen and

private sector investors, who tend to take advantage of farmers, especially in monopoly circumstances. A participant whose job responsibilities involved linking farmers to markets illustrated this point using his personal experience as follows:

“How do we build the confidence of these farmers to effectively engage traders, off-takers? It looks too basic, but I have quite often noticed as a person who has been doing the linkage that you don’t do anything extra apart from, let’s say, for example, moving to Owino [market], you identify the traders, you entice them that there is produce that is available, and you agree on the price. That is something a farmer would never do, and sometimes it is because of lack of confidence” (FGD, civil society extension organization).

Farmers need skills in developing strategies for looking for markets, pricing commodities, product branding, and choosing marketing options/channels for profit maximization. They should differentiate commodities and price them differently on the basis of quality attributes. One participant illustrated this with an example -- biofortified orange-fleshed sweet potato.

“It has a nutritional value, but when you put it out there, anyone who sees it will say, ah, which sweet potato is this? But when you can attach the nutritional value, then somebody’s interest moves to another level and willingness, probably even to pay for a higher price” (FGD, civil society extension organization).

Business

Farmers need to know the economics of what they are producing. Identified needs around this theme included economic benefit analysis to inform enterprise selection, preparation of business plans, preparation and pitching of bankable business proposals, and record keeping.

“Farmers want to be able to compare and say I think this works for me as opposed to the other, so that ability to do enterprise selection, being able to do economic benefit analysis to have better informed decisions” (FGD, civil society extension organization).

“There are issues on business planning for them to be able to position themselves with banking institutions to receive resources. Some of them can’t put together business plans. How do you empower them to learn basic record keeping, basic pitching of their businesses so that they can be bankable and probably be able to receive resources?” (FGD, civil society extension organization).

Technical production and postharvest handling

FGD participants listed farmers’ technical needs in the areas of production and postharvest handling.

Production

- Organic agronomic practices
- Proper utilization of improved inputs -- e.g., pesticides, insecticide, seeds
- Identification of quality seed

- Agroecology as a way of reducing impact of climate change
- Good agronomic practices of all crop commodities produced
- Good management practices of livestock produced – e.g., cattle, piggery
- Sustainable production
- Information and communication technologies

Postharvest handling

- Food processing and value addition
- Nutrition
- Storage with a long shelf life

The table below presents the needs of other value chain actors including farmer leaders, agricultural input stockists, traders, and extension workers.

Table 4 : Extension needs of post production value chain actors

Extension needs	Academia	Civil society, private sector, public sector
Farmer leaders Empowerment/voice to negotiate with investors for their interests Capacity to provide leadership for sustainable management of communally natural resources such as lakes for fishing	×	 × ×
Farmer organizations Financial literacy to enable proper utilization of micro finance loans and grant Capacity to form member-owned, independent, self-sustaining groups	×	 × ×
Agricultural input stockists Technical competence to give advisory to farmers		×
Traders and aggregators Agricultural products quality and safety standards for regional and international markets		×

Source: Focus group discussions

4.2 Core competencies required of agricultural extension workers and coverage in undergraduate curriculum

This section presents findings on the core competency domains needed by agricultural extension workers and the extent to which they are covered in the undergraduate curriculum at Makerere University. Findings from both the qualitative and quantitative study revealed that extension workers need a package of skills to address the complex real-world problems faced by farmers. The package comprises technical skills, functional and soft skills, a problem-solving mindset, flexibility, and innovativeness. These would enable them to offer effective services to farmers in diverse and dynamic circumstances. The two quotes below illustrate this complexity, diversity, and dynamism.

“We (extension workers) are so good in those things like agronomy, those technical things – the science. Those things: we are almost perfect, but now the other things that make science function, they are the problematic things How do you connect people? Networking. In the community, you have the church. Do you know the capacity of the church to promote agriculture in the community? The power of the church and the mosque? It is amazing! But if you tell an extension worker to go to church, he will say come on, you’re taking me back. Tell me about lines and what? Diseases, you know? So, things like planning because you have the market. How are you going to plan so that season in, season out you have produced for that market, you see? And then of course things like resource mobilization, yeah? You have a problem. Irrigation. There are people who are able to provide these services. How do you manage that, now we have a new problem in agriculture, it is labor...? Even if you have the money, it may be difficult to get the right people to do the job. How do you create demand for this service like what is going to drive that? ... so, you have to find innovative ways of identifying the service providers who provide the services to the farmers” (FGD, private sector).

“You go out to a world that is very complicated, that is very complex, and so it does not require one’s simple information of, let’s say, disease management because after the disease is gone, then the farmer will ask you now my chickens are not doing well. What next? You see that? So, it’s the application, and since we are talking about that curriculum review, what are we training these extension workers for? What is the problem? And much of our education I think has been that people come out not to solve problems, but I think we are not so problem- oriented. The problem is not just the disease, yeah? It’s not just the disease – it’s so many different things in the community, and so, solving this problem requires several skill sets and all of that, so to me I think we really have to understand – what is the problem that these guys go in there to solve? And then you give them a package that allows them to work around all those issues, otherwise they go out there, they know just a little bit so they can’t fully help the farmer” (FGD, private sector)

Literature attests to the growing complexity of the agricultural extension work environment. Rapid economic growth, diverse and dynamic agricultural systems, evolving technologies, market liberalization and growing competition for resources have caused a significant impact on the role of

agricultural extension advisory service (AEAS) providers in both developing and developed countries (Suvedi et al., 2018; Chikaire et al., 2018). In Malaysia, extension is expected to build capacity of producers to meet market requirements whereby manufacturers are demanding for products that are produced in a sustainable way and with assurance that they are truly conforming to the standards of Good Agriculture Practice (Neda Tiraieyari et al., 2010). Due to a general increase in demand for high quality and quantity of farm produce; traditional subsistence agriculture is gradually being replaced by market-oriented or commercial agriculture (Chikaire et al., 2018).

Current trends involving socio-demographic variations, climate change, evolving technologies, globalization, national and regional poverty reduction and food security strategies present new challenges for extension, calling for competent agricultural extension personnel (Shimali et al., 2021). In response, the scope of agricultural extension services (AES) has widened, and the need to adapt to changing contexts is expanding. This 'new wave' presents new challenges skewed to offering new services, ensuring the quality of services, and strengthening collaboration and synergy among extension service providers (Sulaiman & Davis, 2012). This means that to thrive, extension must understand and adjust to rapid changes and emerging challenges, calling for organizational changes and multi-skilled service providers in a wide range of competence domains (Cochran, 2009).

4.2.1 Program planning

The structured survey sought participants' perspectives on importance of program planning competence items, namely, having a good grasp of the national agricultural and extension policy and strategic direction, ability to work with stakeholders to identify priority needs, conduct benchmark studies, mobilise funds and utilize funds and human resources properly within the organization set up (Fanzo et al., 2013; Chikaire et al., 2018). All these competencies were rated as important or essential (Mean >4). Most competencies were perceived to be moderately well covered in the curriculum (mean between 3.09-3.59). The most deficient area was mobilization of resources and funds (Mean 2.89) (Table 5).

Table 5 : Program planning skills and competencies

Extension professionals should be:	How important is this skill or competency for an extension worker? (n=199)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=145)**
	Mean (SD)	Mean (SD)
Familiar with the vision, mission and goals of National /State (sub-national) extension service and agricultural development strategies, programs, and policies.	4.52 (0.75)	3.39 (1.02)
Able to conduct needs assessment and engage stakeholders to prioritize local needs.	4.61 (0.70)	3.59 (1.07)

Able to conduct baseline or benchmark studies.	4.31 (0.85)	3.39 (1.06)
Able to mobilize resources/funds to address priority needs.	4.13 (0.95)	2.89 (1.04)
Able to engage local stakeholders (e.g., NGOs, cooperatives, local agro-dealers) in extension program planning.	4.59 (0.68)	3.36 (1.13)
Familiar with administrative and financial rules of their respective organizations (to utilize human and financial resources in extension programs).	4.26 (0.89)	3.09 (1.20)

* 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.

4.2.2 Program implementation

Competencies needed to implement programs (table 6) were clustered into those needed to work with other stakeholders, with other staff within the program, and with clients (Fanzo et al., 2013; (Chikaire et al., 2018). Under stakeholder relationships, extension workers should be able to engage and coordinate with other public and private sector actors in the innovation system. Within the extension program, the extension worker should be able to work in teams, exercise inclusive participatory decision making, delegate responsibility, and effectively resolve conflicts so as to maintain good relationships with others. With regard to client relations, the extension worker should be able to facilitate and support formation and growth of farmer groups (Suvedi and Kaplowitz, 2016); and engage minority groups such as women and youth in programs (Davis, 2015). All of these competencies were rated as important or essential (Mean >4) and they were moderately to very well covered in the curriculum (Mean between 3.23-3.67).

Table 6 : Program implementation skills and competencies

Extension professionals should be:	How important is this skill or competency for an extension worker? (n=195)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=142)**
	Mean (SD)	Mean (SD)
Coordinate local extension programs and activities.	4.62 (0.69)	3.60 (1.03)
Demonstrate teamwork skills to achieve extension results.	4.65 (0.60)	3.67 (0.99)
Able to form farmers' groups and support them.	4.62 (0.64)	3.66 (1.10)

Engage local stakeholders (e.g., NGOs, Self Help Groups, Cooperatives) in implementing extension programs.	4.57 (0.64)	3.41 (1.01)
Demonstrate negotiation skills to reach consensus and resolve conflicts.	4.31 (0.83)	3.23 (1.16)
Follow participatory decision-making in extension work.	4.58 (0.60)	3.63 (1.04)
Delegate responsibilities to staff as needed.	4.20 (0.86)	3.47 (1.17)
Be able to engage minority groups (e.g., Female farmers and youth development groups) in extension work.	4.58 (0.62)	3.54 (1.09)
Integrate private or public-private partnerships in extension service provision.	4.51 (0.72)	3.26 (1.19)

* 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.

Interpersonal and inter organizational relationship skills of team building, networking, collaboration, negotiation, advocacy, and lobbying were identified in FGDs as essential for bridging the social capital across the value chain actors. Extension workers should be able to map out and lobby for the complementary services that farmers need to engage profitably in value chains of interest. They should look out for the different partners that can come in to solve the problems of farmers. One FGD participant put it this way:

“It’s not necessarily that extension provides all those things, but how do you lobby for the different services that the farmers need? ...for example: farmers have issues with finance. How do you lobby the financial institutions and get them to come up with a tailored model of financing these farmers? You will have solved the problem of financing the farmers. Also, how do you work with the logistics companies, for example, or transporters around to see that they soften the issues of transporting farmers’ produce. Yeah, basically, you should be a good lobbyist or advocate. You advocate for activities to be able to come into your play so that you can deliver” (FGD, private sector).

The FGDs and survey open ended question responses identified a need for program implementation competencies in the domain of administration, project and organization management. Extension workers should possess skills in concept development, work plan development, execution and reporting. Specifically under this domain, extension workers should have financial management skills including budget development and management, accountability, and financial literacy. They should be able to advise on farm human resource management aspects such as sourcing, training, and managing farm labor. They should possess leadership skills such as decision making, capacity to mobilize, connect, and organize people, resources, services needed to troubleshoot, innovate, and solve complex

problems. While previous studies have identified a need for competencies in the domain of program planning and implementation as crucial for extension workers (Chikaire et al., 2018; Neda Tiraieyari et al., 2010), qualitative findings from this study have unpacked a nuanced understanding of soft skills needed by extension workers to provide leadership in multi-actor innovation system actors during program implementation (e.g., dynamic problem solving, innovation, initiation and facilitation of purpose driven multi-actor networks for addressing farmer needs).

4.2.3 Communication skills and competencies

Within the communication domain (Table 7), extension professionals should be able to select appropriate communication methods suited to different audiences (individual, group, wider public) and local cultural contexts (Cochran, 2009; Fanzo et al., 2013; Chikaire et al., 2018). They should be able to communicate through various media including writing reports, short stories, public speeches, presentations and listening to all clients and stakeholders. All of these competencies were rated as important or essential (Mean >4) and were moderately to very well covered in the curriculum (Mean between 3.47-3.94).

Table 7 : Communication skills and competencies

	How important is this skill or competency for an extension worker? (n=194)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=141)**
Extension professionals should be able to:	Mean (SD)	Mean (SD)
Select appropriate communication methods.	4.75 (0.51)	3.94 (0.91)
Establish communication with different stakeholders.	4.61 (0.67)	3.75 (0.95)
Respect local culture while communicating with clients.	4.60 (0.70)	3.78 (1.00)
Prepare required progress reports.	4.66 (0.57)	3.73 (1.00)
Share success stories and lessons-learned with stakeholders through various media.	4.56 (0.63)	3.47 (1.08)
Use extension methods (e.g., individual, group and mass contact methods) to disseminate information about extension activities and programs.	4.70 (0.59)	3.91 (0.97)
Demonstrate good listening skills and listen to all clients and stakeholders.	4.71 (0.63)	3.78 (1.00)

Demonstrate good public speaking and presentation skills.	4.70 (0.57)	3.78 (1.02)
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* 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.

Extension workers should be able to package and present information to farmers in a manner they can understand and speak the local languages (FGD, private sector). Under this conventional competence domain, qualitative findings added the new dimension of the need for information sourcing skills and ability to sieve out what is authentic and good quality given the proliferation of open-source content online.

“... So, there is no uniform standard on what information is getting to the farmer. My worry is that because the situation has warranted them to go for open-source materials all the time, this information is not quality assured. Everyone throws any kind of information out there onto Google where these graduates go out to look for information, which is a problem” (FGD, private sector).

4.2.4 Information and communication technologies (ICTs) skills and competencies

Extension professionals should possess crosscutting ICT competencies of word processing, keyboard skills, and how to operate key communication equipment such as computers, phones, radios, televisions. In addition, they should have basic skills to collect data and use computer software to analyze data; make presentations; source new information; communicate and network with others; and operate tools to manage collaborations and partnerships. They should be able to use ICTs to conduct training. All of the competencies in this domain (Table 8) were rated as important or essential (Mean >4) and most were moderately to very well covered in the curriculum (Mean between 3.07-3.74). The exceptions were ICT tools to enhance collaboration and partnerships and ICT tools for collecting data, monitoring, and evaluation of extension programs which were considered to receive minimal to moderate coverage in the curriculum (Mean 2.89 and 2.92, respectively).

Table 8 : Information and communication technologies (ICTs) skills and competencies

	How important is this skill or competency for an extension worker? (n=190)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=138)**
Extension professionals should be able to:	Mean (SD)	Mean (SD)
Microsoft Word for word processing (e.g., typing, editing, printing) and designing graphics.	4.52 (0.70)	3.74 (1.04)
Data entry and analysis software such as Excel, SPSS etc.	4.46 (0.71)	3.33 (1.14)

Microsoft PowerPoint for making presentations.	4.57 (0.72)	3.59 (1.11)
Audio-visual aids such as charts, graphs, and puppet shows for teaching and learning.	4.52 (0.72)	3.57 (1.14)
Mass media like FM radio stations and television channels for communication.	4.46 (0.74)	3.07 (1.17)
Computers (email, Internet) for communication.	4.51 (0.69)	3.53 (1.16)
Mobile phone services (e.g., texting, SMS service) for communication.	4.46 (0.75)	3.33 (1.31)
Social media (WhatsApp, Facebook, Twitter, Instagram, etc.) for communication.	4.29 (0.88)	3.09 (1.31)
ICT tools to improve access to information, knowledge, technologies and other innovations.	4.52 (0.66)	3.09 (1.15)
ICT tools to enhance collaboration and partnerships.	4.44 (0.71)	2.89 (1.21)
ICT tools for collecting data, monitoring, and evaluation of extension programs.	4.53 (0.66)	2.92 (1.21)

* 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.

FGD participants emphasized ICT and research skills with a call that ‘extension workers should be tech-savvy’ going beyond being just digitally literate. They should be able to train farmers on the application of digital technology in agriculture including advice on e-marketing. They should understand issues of cyber crime and digital security so as to protect their personal and organizational information, and use ICT and other digital extension methods and approaches. They should have a mindset and ability to adapt to digitization. They should be capable of investigating new trending technologies for adaptability of the farmers’ conditions; data collection, analysis, and reporting.

“We need extensionists who are specializing in research collecting data on the challenges from the grass roots, from the farmers. ...they should be able to report either using an app or using a central database from different points of the farmers in the field.”

4.2.5 Program monitoring and evaluation skills and competencies

Extension professionals should understand theories and principles underpinning monitoring, evaluation, learning (MEL) and utilization of MEL findings to inform replication/scaling-up of extension programs (Fanzo et al., 2013; Chikaire et al., 2018). They should possess skills to conduct program M&E using participatory and non-participatory qualitative and quantitative research methods and tools via conventional and online approaches. Necessary competencies span the continuum from development of data collection tools to data collection, analysis,

interpretation, reporting and utilization of M&E results. All competencies in this domain were rated as important or essential (mean >4) and most were moderately well covered in the curriculum (Mean between 3.09-3.51). The competency area of conducting online surveys for monitoring and evaluation of extension programs was perceived to be minimally covered in the curriculum (Mean 2.88).

Table 9 : Program monitoring and evaluation skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=182)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=133)**
	Mean (SD)	Mean (SD)
Understand theories and principles of monitoring and evaluation.	4.44 (0.67)	3.35 (1.04)
Conduct monitoring and evaluation of extension programs.	4.57 (0.63)	3.38 (1.03)
Develop data collection instruments - interview schedules / questionnaires- for monitoring and evaluation of extension programs.	4.48 (0.75)	3.44 (1.11)
Conduct online surveys for monitoring and evaluation of extension programs.	4.15 (0.89)	2.88 (1.22)
Apply qualitative tools and techniques (e.g., focus group discussion, case study etc.) to collect evaluation data.	4.47 (0.72)	3.52 (1.12)
Apply quantitative tools and techniques (e.g., survey, interview, farm data, etc.) to collect evaluation data.	4.45 (0.77)	3.51 (1.08)
Analyze data (qualitative and quantitative).	4.54 (0.70)	3.36 (1.08)
Interpret data (qualitative and quantitative).	4.59 (0.69)	3.41 (1.07)
Write an evaluation report.	4.60 (0.66)	3.43 (1.10)
Share evaluation reports within their organizations and with stakeholders.	4.61 (0.65)	3.23 (1.22)
Apply the evaluation findings in replicating/ scaling-up of extension programs.	4.56 (0.63)	3.09 (1.20)

* 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..

4.2.6 Personal and professional development skills and competencies

Extension workers should exhibit professional ethics including good governance principles (such as client’s participation, accountability and transparency); provide scientifically evidence-based recommendations to clients; and demonstrate honesty and positive attitude towards extension work. They should exhibit personal attributes such as commitment to career advancement through participation in lifelong learning, in-service training, and professional development and adherence to policies of their organizations. All competencies in this domain were rated as important or essential (mean >4) and were moderately well covered in the curriculum (mean between 3.19-3.69).

Table 10 : Personal and professional development skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=180)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=130)**
	Mean (SD)	Mean (SD)
Apply principles of good governance (e.g., client’s participation, accountability and transparency) in extension work.	4.62 (0.64)	3.35 (1.20)
Show commitment to career advancement (participate in lifelong learning, in-service training, professional development events and conferences).	4.56 (0.65)	3.19 (1.13)
Apply professional ethics in extension work i.e., promote research-based recommendation or technology.	4.70 (0.53)	3.71 (1.08)
Follow organizational policies and directives for professional development.	4.61 (0.55)	3.53 (1.10)
Demonstrate honesty and positive attitude towards extension work.	4.77 (0.51)	3.69 (1.14)

* 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.

4.2.7 Diversity and gender skills and competencies

Extension workers often work with diverse staff, stakeholders and clients. Aside from the easier to reach better off farmers, clients include hard to reach groups such as women, youth, minorities, and poorer small-scale farmers (Davis, 2015). In many African cultures

women have unique constraints and needs arising from their socially constructed roles and position in society. Extension agents should be able to understand and engage all these groups to participate and benefit from extension programs. All competencies in this domain were rated as important or essential (mean >4) and were moderately or very well covered in the curriculum (mean between 3.30-3.73).

Table 11 : Diversity and gender skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=179)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=130)**
	Mean (SD)	Mean (SD)
Understand that diversity exists within and among clients and stakeholders.	4.61 (0.59)	3.63 (1.06)
Identify the needs of small-scale farmers.	4.76 (0.49)	3.73 (1.00)
Identify the needs of minority groups.	4.67 (0.55)	3.44 (1.12)
Develop extension programs to benefit women farmers.	4.65 (0.53)	3.49 (1.05)
Develop extension programs to benefit youth.	4.64 (0.58)	3.36 (1.06)
Engage marginalized and vulnerable groups in extension programs (e.g., disabled, resource poor farmers).	4.65 (0.55)	3.30 (1.16)
Do teamwork with diverse staffs.	4.68 (0.60)	3.61 (1.04)

* 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.

4.2.8 Marketing, brokering and value chain development skills and competencies

Extension professionals should have basic knowledge of agribusiness development and the capacity to provide advisory services in this area. Extension workers should be conversant with different agricultural markets and linkages, value chain logistics, and how to facilitate entrepreneurship development among extension clientele (Chikaire et al., 2018; Davis et al. 2008). All competencies in this domain were rated as important or essential (mean >4) and were moderately or very well covered in the curriculum (mean between 3.24-3.60) (Table 12).

Table 12 : Marketing, brokering and value chain development skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=178)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=129)**
	Mean (SD)	Mean (SD)
Have basic knowledge of agribusiness development.	4.58 (0.59)	3.60 (1.03)
Apply brokering / advisory skills in agribusiness development.	4.41 (0.74)	3.24 (1.13)
Have knowledge on different agricultural markets and linkages.	4.56 (0.61)	3.24 (1.10)
Demonstrate knowledge of value chain logistics and input-output linkages in the value chain.	4.53 (0.69)	3.28 (1.14)
Facilitate entrepreneurship development among extension clientele.	4.53 (0.66)	3.36 (1.09)
Be able to link farmers producers' organizations/cooperatives/agribusiness companies with market.	4.65 (0.66)	3.26 (1.13)

* 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.

FGD participants unpacked business and marketing into specific areas of farming as a business involving product costing, market analysis, planning production to align with market demand, and cost benefit analysis for profit maximization. Some summarized it as 'business planning and management'. Other competencies in this domain identified from FGDs and open-ended survey responses revolved around value addition and value chain development extension services:

- Value addition and processing
- Quality control of agricultural products
- Linking farmers to better local markets and international markets
- International market relationships
- Value chain analysis and development
- Food systems analysis

Some FGD participants disputed the common notion that extension workers should link farmers to markets or business persons, suggesting that they should have the capability to do business themselves. The argument here is that extension workers should possess practical experience in business so as to be role models for the farmers.

“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. For example, if you know that ZABTA is buying maize from the farmers and ZABTA is using the buying agents or village agents, okay? You are the one who gave the extension to these farmers and now the produce is ready, can’t you go and access money from the Centenary bank and start supplying me with 10 tons per week? Instead of linking the farmer to another person. You lead by example if you tell them, it is easy to make business, you do it and they see it” (FGD, private sector).

4.2.9 Extension soft skills

Soft skills rated as important or essential (mean >4.5) included (i) problem solving (critical thinking, creativity/innovativeness); (ii) self-management (time management, stress management, self-motivation); (iii) interpersonal skills (conflict management, negotiation, networking); (iv) personality attributes (flexibility, positive work attitude); (v) inter- and intra-organization relationships (collaboration, leadership, teamwork); and (vi) facilitation skills. All soft skills were rated as moderately to very well covered in the curriculum (mean 3.44-3.81).

Table 13 : Extension soft skills

Extension professionals should possess the other soft skills like:	How important is this skill or competency for an extension worker? (n=173)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=124)**
	Mean (SD)	Mean (SD)
Critical thinking	4.71 (0.52)	3.44 (1.12)
Problem solving	4.77 (0.49)	3.59 (1.03)
Time management	4.79 (0.47)	3.80 (1.07)
Stress management	4.53 (0.70)	3.30 (1.17)
Leadership	4.68 (0.53)	3.69 (1.04)
Teamwork	4.77 (0.49)	3.71 (1.00)
Flexibility	4.65 (0.62)	3.44 (1.14)
Self-motivation	4.65 (0.62)	3.58 (1.13)
Interpersonal skills	4.75 (0.48)	3.64 (1.06)
Positive work attitude	4.72 (0.52)	3.56 (1.09)

Collaboration	4.66 (0.55)	3.53 (1.08)
Conflict management	4.58 (0.59)	3.53 (1.10)
Group formation and development	4.66 (0.59)	3.81 (1.00)
Negotiation skills	4.52 (0.60)	3.36 (1.13)
Networking skills	4.59 (0.59)	3.54 (1.14)
Facilitation skills	4.68 (0.52)	3.74 (1.11)
Creativity / Innovativeness	4.70 (0.52)	3.53 (1.10)

* 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..

Other soft skills identified through FGDs were:

Farmer capacity building

Empathy

Mentorship

Coaching

Counselling

Motivational skills

Change management

Community mindset change and development

Self management

Emotional Intelligence

Listening skills

Self-control

Self confidence

Giving feedback

Ability to evaluate self after an activity

Personality and character attributes

Patience

Proactiveness

Self driven

Adaptable.

Exemplary

- Empathy

How do you fit into the farmers' shoes to bring the farmer to your level? (FGD, public sector)

- Training material development -- How to develop suitable training materials for farmer training:

"Knowing how to start off with what the community is doing so that you build on their knowledge and then move it to the next level" (FGD, civil society)

- Mentoring farmers.

"Of late, we are talking of mentoring as opposed to training because we know they may have already been trained, but there are issues where you just need to mentor them to where they should be going" (FGD, civil society).

4.2.10 Nutrition skills and competencies

Without being nutrition specialists, extension workers should have basic human nutrition knowledge to be able to advise farm families on what crops and livestock to be produced and how to utilize them to ensure balanced diets. Examples of required basic nutrition competencies include food composition, balanced diet, supplements, nutritional composition of various foods, nutrition deficiency symptoms; understanding life cycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly); postharvest handling technologies that conserve nutrients and food safety; and food labeling. Extension should be able to advise families on transformation of socio-cultural gender norms around food provisioning to improve gender relations for increased agriculture production, household food security and nutrition (Shimali et al., 2021). All competencies in this domain were rated as important or essential (mean >4) and were moderately or very well covered in the curriculum (mean between 3.03-3.54). (table 14).

Table 14 : Nutrition skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=174)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=126)**
	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.).	4.34 (0.79)	3.29 (1.09)

Understand life cycle nutrition needs of different household members (e.g., children of various age groups, pregnant and breastfeeding mothers, elderly).	4.37 (0.76)	3.12 (1.17)
Able to advise families on what crops and livestock to be produced to ensure balanced diets.	4.55 (0.66)	3.43 (1.14)
Advise families to improve gender relations for increased agriculture production and nutrition.	4.50 (0.62)	3.47 (1.11)
Demonstrate postharvest handling technologies that conserve nutrients and food safety (e.g., food storage, freezing fruits and vegetables, making pickles, jams, jellies).	4.61 (0.58)	3.54 (1.07)
Have basic knowledge about food labeling (e.g., organic foods).	4.28 (0.79)	3.10 (1.22)
Able to advise on a healthy diet (e.g., for fitness and sports, diabetes, cancer and AIDS/HIV, heart health, kidney disease, osteoporosis; weight loss and obesity).	4.33 (0.83)	3.03 (1.22)

* 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.

4.2.11 Technical subject matter expertise/skills and competencies

The technical subject matter expertise required was categorized in 5 key areas: (i) agricultural disciplines, (ii) technologies, (iii) extension and training methods, (iv) innovation system, and (v) the social system. Extension workers should be competent in their basic agriculture disciplines (e.g., field crops/livestock/fishery/horticulture) (Neda Tiraieyari et al., 2010; Chikaire et al., 2018). They should understand the technologies they promote to clients and possess a dynamic learning mindset that keeps on the lookout for new emerging technologies to address the rapidly changing circumstances such as climate change and climate smart agriculture.

Extension professionals should understand adult learning principles and possess practical skills required to teach improved farming practices. They should be skilled in agricultural extension methods and techniques so as to deploy suitable ones under different circumstances (Fanzo et al., 2013; Chikaire et al., 2018). They should be able to educate community members about different types of risks and uncertainties including natural disasters and market fluctuations among others. Recognising that agricultural extension services function within a broader innovation system, extension workers should understand the complex systemic

nature of the landscape and be able to facilitate farmers to access necessary complementary services such as inputs, finance, business development among others (Davis et al, 2008). They should understand the social system under which farming takes place (e.g., rural sociology knowledge) and be able to harness, document, validate and integrate local / indigenous knowledge (Neda Tiraieyari et al., 2010; Chikaire et al., 2018). All competencies in this domain were rated as important or essential (mean >4) and were moderately or very well covered in the curriculum (mean between 3.24-3.94). Technical knowledge in the basic agriculture disciplines was highest rated in terms of importance (mean 4.77) and coverage in the curriculum (mean 4.14) closely followed by knowledge on technologies and practical teaching skills (Table 15).

Table 15 : Technical subject matter expertise/skills and competencies

Extension professionals should:	How important is this skill or competency for an extension worker? (n=169)*	How well does the undergraduate extension curriculum cover this skill or competency? (n=121)**
	Mean (SD)	Mean (SD)
Demonstrate technical knowledge in their basic discipline (e.g., field crops/livestock/ fishery/horticulture, etc.).	4.77 (0.59)	4.14 (0.86)
Understand adult learning principles and hold practical skills required to teach improved farming practices.	4.72 (0.48)	3.94 (0.88)
Understand the new technology being promoted, i.e., what it is, why, and how it works.	4.74 (0.50)	3.73 (0.92)
Facilitate farmers to access inputs and services (e.g., credit, seed, fertilizers, feed, artificial insemination, etc.)	4.65 (0.56)	3.52 (1.00)
Be able to educate community members about different types of risks and uncertainties (e.g., due to market fluctuations, natural disasters, etc.).	4.68 (0.51)	3.54 (1.04)
Be able to educate community members about climate change and climate smart agriculture.	4.67 (0.57)	3.57 (1.03)
Refer to and make use of publications-- journals, research reports, etc.	4.43 (0.69)	3.27 (1.05)

Generating knowledge or producing research reports / journal publications.	4.32 (0.85)	3.40 (1.07)
Able to harness, document, validate and integrate local / indigenous knowledge.	4.52 (0.65)	3.37 (1.10)
Understand the social system under which farming takes place (e.g., rural sociology knowledge).	4.61 (0.61)	3.79 (0.97)

* 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.

Other areas identified by stakeholders in the FGDs and open-ended survey response included:

Agriculture

- Sustainable agricultural productionintensification
- Proper handling of improved agricultural inputs
- Aflatoxins control and food safety
- Livelihood assessment and sustainable livelihoods
- Farm planning and layouts
- Farm structure design
- Organic agronomic practices
- Identification of quality seed
- Agroecology for climate change response
- Soil management
- Value addition for crops and livestock products
- Emerging crop pests and diseases
- Handling emergencies such as desert locusts invasions, upsurges and plagues
- Agricultural mechanization/ Farm Machinery operations
- Farmirrigation systems
- Good agronomic practices of common crops
- Good livestock management practices
- Food quality management

Extension methods

- Farmer Field School methodology
- Action planning. e.g., Community based natural resource action planning.
- Community mobilization skills
- Participatory rural appraisal methods
- Farmer institutional development
- Proposal development and appraisal

Other areas

- Legal competence in regard to agricultural extension activities.
- Litigation issues on farm Policy formulation, review and implementation
- Motor vehicle driving skills, motorcycles riding
- Basic skills in photography and video clips
- Political economy of agriculture
- Skills in predicting future scenarios
- Knowledge of more than one language including the official language

4.3 Ways to acquire the process skills and competencies

The required process skills and competencies can be acquired by extension workers through pre-service and in-service approaches. Pre-service training approaches considered appropriate by a majority of respondents included updating the curriculum (about 83%) and making internships a requirement during undergraduate programs (about 92%). On the other hand, ways for equipping extension workers while on the job included basic induction during job orientation (about 89%), in service training (about 90%), and providing opportunities to attend seminars, workshops, webinars (about 91%).

Table 16 : Ways to acquire the process skills and competencies in Uganda

Ways	Total	Not appropriate F (%)	Somewhat appropriate F (%)	Appropriate F (%)	Very appropriate F (%)	Mean (Sd)*
Through preservice training by revising or updating the curriculum.	173	1 (0.58%)	28 (16.18%)	107 (61.85%)	37 (21.39%)	3.13 (0.61)
Requiring Internship at various work environments (i.e., Public Institutions, NGOs, Private Companies, Farmer Organizations, Cooperatives, etc.) during undergraduate programs.	168	1 (0.60%)	12 (7.14%)	97 (57.74%)	58 (34.52%)	3.19 (0.60)
Through Basic Induction Training (e.g., job orientation training at the beginning of job)	169	0 (0.00%)	18 (10.65%)	91 (53.85%)	60 (35.50%)	3.09 (0.68)
Through Inservice Training (e.g., training offered during the employment at Universities, Training Institutes/Centers, etc.)	167	4 (2.40%)	12 (7.19%)	107 (64.07%)	44 (26.35%)	3.18 (0.66)
Providing opportunities to attend Trainings, Seminars, Workshops, Webinars, etc.	169	2 (1.18%)	13 (7.69%)	85 (50.30%)	69 (40.83%)	3.42 (0.59)

* Scale for appropriateness: 1 =Not appropriate; 2=somewhat appropriate; 3 =Appropriate; 4 = Very appropriate

Open ended responses regarding additional appropriate ways extension professionals can acquire competencies:

Pre-service:

- Training design should have more on farm-based training than theory.
- Job placements for fresh agriculture extension graduates with NGOs
- Undergraduates running own project enterprises

In-service:

- Post graduate studies in extension e.g., diplomas
- Exchange programs between different countries/regions, study/exposure visits/tours for benchmarking
- Peer learning sessions

On line courses

- Personal online research self-study
- Job shadowing
- Extension workers being farmers themselves
- In service exams after every three years of service

Extension workers need refresher training and regular updating of their knowledge.

“Updating the skills of extension workers is not given the due attention; most of the focus is on criticism that they are not performing well... Many of them were trained a long time ago, and they are still relying on what was trained to them, and nobody is caring so for me, that is why I was proposing refresher training always to help them update themselves” (FGD, academia).

4.4 How well does the Makerere University undergraduate curriculum address critical extension job skills and core competencies?

A vast majority of the competencies in the domains covered in the structured survey and rated as important or essential (mean >4) were moderately or very well covered in the curriculum (mean between 3.03-3.54). Only a few areas, notably mobilization of resources and funds and ICT tools to enhance collaboration and ICT tools for M&E were considered to receive minimal to moderate coverage in the curriculum (mean 2.89 and 2.92 respectively). Qualitative data from curriculum document analysis and FGDs helped reveal areas of strength and weaknesses in undergraduate curricula. A review of the curriculum document of the three-year Bachelor of Agricultural and Rural Innovation (BARI) program at Makerere University (Table 17) shows that the program covers courses in all the essential competence domains. This program hosted by the department of extension and innovation studies is intended to produce professionals with a good balance of theoretical grounding and practical skills for making change in rural communities. The course has a heavier focus on functional competencies compared to the technical agriculture area.

The four-year Bachelor of Science Agriculture (BSc. Agriculture) (Table 18) hosted by the School of Agricultural Sciences has multiple tracks or areas of specialization. All students cover core courses together for the first three years. In the fourth year they make a choice to specialize in either crop science, animal science, agricultural economics or agricultural extension. The course is intended to produce professionals suited to a wider range of employment areas such as research, academia, among others. Many BSc Agriculture graduates (including those who do not specialize in agricultural extension) end up in agricultural extension jobs.

Table 17 : Alignment of Makerere University Bachelor of Agriculture and Rural Innovation curriculum (3 years) with competence domains

Competence domain	BARI course addressing the domain	
	Core	Elective
Program planning	<ul style="list-style-type: none"> - Participatory approaches to agricultural and rural development - Project planning and management 	-
Program implementation	<ul style="list-style-type: none"> - Project planning and management - Community mobilization and group dynamics - Developing sustainable Rural institutions/organizations - Organizational management and leadership - Innovation systems management 	-
Communication	<ul style="list-style-type: none"> - Introduction to communication for agrarian development - Documenting and disseminating development information 	-
Information and communication technologies	<ul style="list-style-type: none"> - Introduction to computer applications 	-
Program monitoring and evaluation	<ul style="list-style-type: none"> - Statistics and data analysis - Social research methods 	-
Personal and professional development	<ul style="list-style-type: none"> - Social skills for professional performance - Ethics and integrity 	-
Diversity and gender	<ul style="list-style-type: none"> - Gender and other socio-Economic Issues in Development 	-

Competence domain	BARI course addressing the domain	
	Core	Elective
Marketing, brokering and value chain development	<ul style="list-style-type: none"> - Agricultural Marketing - Entrepreneurship and small business management I & II - Principles of Economics - Production economics - Post-Harvest Technology and small scale Agro processing - Farm management I& II 	-
Extension soft skills	<ul style="list-style-type: none"> - Extension and training methods - Psychology for rural innovations 	-
Nutrition	<ul style="list-style-type: none"> - Food security and Nutrition 	-
Technical subject matter	<ul style="list-style-type: none"> - Animal nutrition and feeding - Principles of soil management - Integrated soil fertility management - Poultry management 1&2 - Introduction to Animal Agriculture - Livestock production and management - Introduction to agronomy and farming systems - Rural sociology - Introduction to agriculture and rural development 	<ul style="list-style-type: none"> - Field crop diseases - Apiculture - Vegetable production - Principles of plant breeding - Integrated pest management - Animal health and hygiene - Tropical soils management
Cross cutting	<ul style="list-style-type: none"> - Supervised experiential learning projects 1&2 	-

Source: Developed by authors based on Makerere University, Department of Agricultural Extension/Education Bachelor of Agriculture and Rural Innovation programme Student Handbook 2008/2009

Table 18 : Alignment of Makerere University Bachelor of Science Agriculture curriculum (4 years) with competence domains

Competence domain	BARI course addressing the domain	
	Core	Elective
Course units offered by all BSc Agriculture students		-
Program planning Program implementation	- Programme Development & Evaluation I	-
Program monitoring and evaluation		-
Communication	- Introduction to communication and Extension methods - Introduction to Agric. Extension - Rural Sociology - Agric. Ext. Educ. Practical skills	-
Personal and professional development		-
Extension soft skills		-
Information and communication technologies	- Introduction to Computer Applications	-
Research methods	- Introduction to Statistics - Biometrics - Social Research Methods I	-
Diversity and gender	- Gender in Agricultural Development	-
Marketing, brokering and value chain development	- Introductory Microeconomics - Introductory Macroeconomics - Agric. Econ. Practical skills - Production Economics - Principles of Farm Management and Accounts - Agricultural Marketing - Farm Management Case study	-
Nutrition	Nil	-

Competence domain	BARI course addressing the domain	
	Core	Elective
Technical subject matter	Basic sciences: <ul style="list-style-type: none"> - Mathematics - Agricultural Botany and Plant Physiology - Plant Microbiology - Biochemistry 1 - Zoology and Animal Physiology - Soil Physics & Chemistry Animal agriculture: <ul style="list-style-type: none"> - Introduction to Animal Agriculture - Animal production practical skills - Animal Nutrition - Introductory Livestock Management - Poultry Management I - Dairy Production Systems - Apiculture - Animal Health and Hygiene - Animal Feeds & Feeding Crop agriculture: <ul style="list-style-type: none"> - Introduction to Agronomy & Ecology - Introduction to Entomology and Nematology - Crop production practical skills - Annual Crops Agronomy - Introduction to Genetics - Perennial Crops Agronomy - Weed Science - Horticulture 	-

Competence domain	BARI course addressing the domain	
	Core	Elective
	<ul style="list-style-type: none"> - Pasture Agronomy - Principles of Plant breeding - Economic Entomology and Nematology - Field Crops Diseases Soil science: <ul style="list-style-type: none"> - Introduction to Soil Science - Soil Biology I - Soil Science Practical Skills - Soil Fertility and Plant Nutrition - Pedology & Land Use Potential - Soil Conservation & Land Reclamation Agricultural engineering: <ul style="list-style-type: none"> - Climatology & Field Engineering - Practical skills in Agric. Engineering - Farm Power and Machinery - Farm Structures - Post-Harvest Technology 	-
Cross cutting	Field Attachment (Internship)	-
Year 4 specialization in Crop Science		-
	<ul style="list-style-type: none"> - Plant Pathology - Crop Physiology - Integrated Pest Management Systems - Seed Science & Technology - Applied Soil Fertility and Plant analysis - Agricultural Policy & Planning - Plant Breeding Technologies - Plant Biotechnology 	<ul style="list-style-type: none"> - Organizational Management and Leadership - Agro-forestry

Competence domain	BARI course addressing the domain	
	Core	Elective
	<ul style="list-style-type: none"> - Plant Virology and Bacteriology - Land Use Policy & Law - Agribusiness Management 	-
<i>Year 4 specialization in Animal Science</i>		
	<ul style="list-style-type: none"> - Livestock and Poultry Breeding - Pig and Rabbit Production systems - Poultry Management II - Fish farming - Meat, Poultry & Fish Technology - Applied Ruminant Nutrition - Beef Production and Range Management - Animal Physiology & Biotechnology - Small Ruminant Production Systems - Land Use Policy & Law - Agribusiness Management 	<ul style="list-style-type: none"> - Organizational Management and Leadership - Agroforestry
<i>Year 4 specialization in Soil Science</i>		
	<ul style="list-style-type: none"> - Soil Survey & Land Evaluation - Applied Soil Fertility & Plant analysis - Soil Biology II - Mineral Fertiliser Technology - Applied Soil Physics - Bio-fertiliser technology & organic farming - Soil & Environmental Protection - Soil Productivity Management & Assessment - Land Use Policy & Law 	<ul style="list-style-type: none"> - Organizational Management and Leadership - Agribusiness Management - Agro-forestry

Competence domain	BARI course addressing the domain	
	Core	Elective
Year 4 specialization in <i>Agricultural Economics</i>		-
	<ul style="list-style-type: none"> - Agricultural Policy & Planning - Applied Farm Management - Econometrics - Intermediate Macroeconomics - Social Research Methods II - Resource and Environmental Economics - Agricultural Finance 	Organizational Management and Leadership Agroforestry
	<ul style="list-style-type: none"> - International Trade in Agriculture - Agri-business Management - Rural Development - Land Use Policy & Law 	-
Year 4 specialization in <i>Agricultural Extension</i>		-
	<ul style="list-style-type: none"> - Agricultural Communication - Adult Education - Curriculum Development and Training Methods - Participatory Approaches in Extension - Social Research Methods II - Extension Methods - Organizational Management and Leadership - Program Development and Evaluation II - Land Use Policy & Law - Agribusiness Management 	One elective

Source: Developed by authors based on Makerere University, Bachelor of Science Agriculture curriculum 2011

Perspective on on-job performance of graduates: a comparison of BARI with BSc Agriculture program at Makerere University

Technical skills

Perspectives on how well undergraduate curricula are training students on required technical and functional skills varied by category of FGD respondents. Regarding technical skills,

employers in the private sector indicated that generally, young recent graduates are doing well in technical skills, attributing it to their skills in troubleshooting and sourcing information online to meet farmer needs. When confronted with technical issues in the field, it was perceived that these graduates can quickly consult online sources to get solutions. This however poses challenges of stifling innovation and original thinking as well as the dangers of using open-source information that is not quality assured. Sample quotes include:

“For science, they know it. In fact, for the extension workers that are coming for them, they are not even stuck to go and open books. They simply go in immediately and get the solution. They are not stuck. So, even when they do not know something--they simply look for it quickly before even saying I left the book home.... That one, I have seen them going to the field, the farmer asks them challenging questions, he just puts on his data quickly. Look for this symptom, it is the cause for this. This is the solution immediately. Not simply saying, “I will get back to you tomorrow when I contact my book.” So there, they have the science, and if it is for referral, they refer quickly on the internet and then they get the answer” (FGD, private sector 1).

“We are having young graduates who even come for internships, they go out to the community, immediately, they know what to do because you’ll not waste time asking so and so he will just – that’s why Google is very important. Google’s syntax gets the technical information, sends it to the farmer practical because we also have some applications which you can be feeding, say, if you want to look at plant nutrition, it just checks for you and tells you what is lacking” (FGD, private sector 2).

“They are more assertive to information flow, so they look around for any information. They are open to information. So, when you said, for example, a newspaper or I used a tweet putting aside Mr. Google alone. They would pick information and be able to relate or to understand what is coming their way, so it gives them a chance” (FGD, private sector 3).

Quote on limitations with open-source online information:

“Mr. Google cripples their ability to think outside the box and we run a risk. The day Mr. Google collapses, they are not even going to go back to their books, and we are not sure of the open source of information on Mr. Google because it’s an open- space platform where everybody puts anything. Right now, anybody does a video, they throw it there, teaching on no fact sheet, no background reviews – it’s a very big risk. So, there is no uniform standard on what information is getting to the farmer depending on it, so it becomes hard. My worry again is that because the situation has warranted them to go for open-source materials all the time, this information is not quality assured. Everyone throws any kind of information out there onto Google where these graduates go out to look for information, which is a problem” (FGD, private sector).

However, some technical deficiencies were identified for graduates of the bachelor of agriculture and rural innovation program at Makerere. There was a view that the program

doesn't cover the full scope of required agriculture discipline areas in adequate depth. Those who do the traditional bachelor of science in agriculture degree program were perceived to be stronger in technical skills. This opinion was expressed by the FGDs with the public sector, academic staff and recent graduates.

“Someone who did a Bachelor of Agriculture and Rural Innovation, when it comes to the real agriculture the farmers want, for example dealing with pests and diseases, I've found them lacking. When you get somebody who has a Bachelor of Agribusiness, when it comes to the basics that the farmers want to know on their farms, they are lacking” (FGDs, public sector and civil society).

“Technical aspects of crop agronomy are a bit lacking, so there is a need to improve crop production and animal production” (FGD, recent graduates of BARI, Makerere University).

The BARI graduates also recommended more coverage of technical agriculture in the course content. They felt that making animal and crop production courses introductory and advanced courses in this area elective undermines the capacity of students to acquire the necessary job skills.

“...so you find that as a BARI student ... if I am not very interested in animal production, I tend not to do the electives that are animal related, yet after graduation in the field farmers will not know that I specialize in crop production; so, I become limited in-service delivery. It is therefore required that for somebody to be a good extensionist, they have all the skills for service delivery in terms of animal production, crop production and even soil.”(FGD, recent graduates, BARI)

Table 19 shows a distribution of program credit units across technical agriculture, agribusiness and extension related disciplines for the BSc agriculture options and BARI. The BARI program has the highest proportion of extension related courses (52%) and lowest proportion of agriculture courses (33%).

Table 19 : Distribution of course credit units across disciplines for Makerere University BSc Agriculture and BARI curriculum

Program	Agric and basic sciences		Econ and agribusiness		Extension, rural innovation and social research methods	
	Credit units	%	Credit units	%	Credit units	%
BSc Agric (Crop option)	137	75	29	16	16	9
BSc Agric (Animal option)	140	77	26	14	16	9
BSc Agric (Soil option)	138	78	23	13	16	9
BSc Agric (Agric Econ option)	112	62	50	28	19	10

BSc Agric (Extension option)	112	63	26	15	41	23
BARI	37	33	16	15	58	52

Source: Developed by authors based on Makerere University, BSc Agriculture curriculum 2011 and BARI programme Student Handbook 2008/2009. The credit units exclude internship and Supervised Experiential Learning Projects.

The computer course in the program is introductory and deficient in depth of coverage and application to agricultural extension service delivery competence needs.

“The introduction to ICT course unit should be enriched/broadened to catch up with the computerized agricultural extension delivery needs rather than being just an introduction” (FGD, recent graduates, BARI).

Regarding agribusiness related courses, graduates felt that while this area is covered in the curriculum, it is not given its due importance, recommending that “agribusiness course units should be taken seriously”. (FGD, recent graduates, BARI)

Overall, the BARI graduates felt that the content of the program was appropriate for the needs of the job market. All course units were relevant but only needed strengthening through more practical training methods that impart skills for application beyond the classroom.

“Our program was well thought out, the content is very okay, but the delivery makes it hard for the graduates to think beyond the classroom.” (FGD, recent graduates, BARI)

Functional/Process/Soft Skills

Perspectives from the employers (FGD civil society and public sector) pointed out some shortcomings of graduates in a range of functional skills, including communication, training, project planning and implementation.

Communication and training methods: Some package and deliver technical knowledge to farmers using materials and methods suited to formal classroom setups and not practical oriented adult farmer learning. They lack skills to package training materials that situate learning in the farmers’ context building on their (farmers’) knowledge and experiences.

“... how to package and communicate technical knowledge to the beneficiaries is one of the big problems. People want to deliver it as if it is a classroom, and yet you are dealing with a farmer whose interest in the classroom way of delivering it to him may distract him from learning, so the issue of emphasizing the communication, presentation, the packaging of information for me is one area that I think needs to be incorporated” (FGDs, civil society and public sector).

“The other one is training material development. How do you develop the best training material to take out to the community? ...They don’t know how to even start off with what the community is doing so that you build on their knowledge and then move it to the next level” (FGDs. civil society and public sector).

Project planning and implementation: Graduates lack basic skills in development of concepts, workplans, budgeting.

“I don't know the course content, and I am not sure those things are actually part and parcel. But most times you see somebody come, he can't develop a concept, he can't develop a work plan, he can't develop a budget, and it's a struggle...” (FGD, civil society and public sector).

For Makerere University, BARI compared with BSc Agriculture was perceived to do better on equipping graduates with functional skills (FGDs, academia and recent graduates), while BSc. Agriculture did better on technical agriculture skills (FGD, civil society and public sector). However, the perspectives about BSc agriculture lumps together those specializing in crop science, animal science, soils, agricultural economics and agricultural extension (Tables 18 and 19). A more in-depth analysis is needed to understand whether those who specialize in agricultural extension have an edge over others which would inform curriculum design in Uganda and elsewhere. A proper balance between technical and functional competencies has been identified as a common problem in the extension services of developing countries (Suvedi and Kaplowitz, 2016; Khan et al., 2004; Gibson and Hellion, 1994), hence the need for further research to generate more empirical evidence to inform undergraduate curricula design.

4.5 How to make agricultural extension curriculum robust and practical

The pre-structured online survey invited respondents to rate whether the listed areas were essential for a robust curriculum and whether they already exist. Statements to embody robustness included coverage of soft skills; business management concepts; youth development, gender issues, urban/sub-urban agriculture, and climate change concepts; broad based agriculture disciplines; research and data analytics. This would be complemented by recruitment of highly qualified extension staff or faculty competent to use ICT oriented pedagogy, and regularly participating in training of trainer workshops to update their skills. A robust university curriculum should provide practical and contemporary skills, offer mentored internship or attachment to a progressive farmer in a crop season; expose students to market opportunities that link farmers with service providers, and develop entrepreneurship; and utilize cutting-edge and practical teaching learning resources such as extension textbooks, practical handbooks, and training manuals. All these statements were perceived by respondents to be essential for making the curriculum robust and practical. Only about 1 to 8% felt it was fine to leave out the respective interventions. Interventions which most respondents felt Makerere University was doing well included recruitment of highly qualified faculty (about 74%), grooming students with broad-based general agricultural courses (e.g., crop and animal production) (about 69%) and research and data analytics (about 60%). Essential interventions which are missing include students' exposure to market opportunities (about 74%) and making pedagogy ICT oriented (about 73%).

Table 20 : How to make agricultural extension curriculum robust and practical in Uganda

Intervention	N	Already exists f (%)	Does not exist, but essential to have f (%)	Does not exist, but fine to leave out f (%)
Provide practical and contemporary skills (e.g., through mentored internship or attachment to a progressive farmer in a crop season).	168	100 (59.52%)	65 (38.69%)	3 (1.79%)
Include various soft skills in extension curriculum.	163	87 (53.37%)	73 (44.79%)	3 (1.84%)
Include business management concepts and practices in the extension curriculum.	162	92 (56.79%)	66 (40.74%)	4 (2.47%)
Expose students to market opportunities, linking farmers with service providers, and develop entrepreneurship.	164	40 (24.39%)	121 (73.78%)	3 (1.83%)
Grooming students with broad-based general agricultural courses (e.g., crop and animal production, postharvest, marketing, and joint ventures) along with extension training.	164	113 (68.90%)	47 (28.66%)	4 (2.44%)
Incorporate youth development, gender issues, urban/sub-urban agriculture, and climate change concepts in extension curriculum.	162	84 (51.85%)	73 (45.06%)	5 (3.09%)
Recruit highly qualified extension staff or faculty.	163	120 (73.62%)	34 (20.86%)	9 (5.52%)
Include research and data analytical skills.	160	96 (60.00%)	61 (38.13%)	3 (1.88%)
Offer training of trainer workshops for extension faculty members.	164	78 (47.56%)	83 (50.61%)	3 (1.83%)
Develop cutting-edge and practical teaching learning resources – extension textbooks, practical handbooks, training manual, etc.	162	84 (51.85%)	75 (46.30%)	3 (1.85%)

Undergraduate extension curriculum/ pedagogy should be more ICT oriented	162	30 (18.52%)	118 (72.84%)	14 (8.64%)
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FGD participants' suggestions to improve the curriculum were around the theme of training methods. There should be emphasis on providing students with more hands-on experience, practical training and field exposure, with about 65% of the curriculum taught in the communities or on farms". (FGD, recent graduates, BARI). Training methods that bring the field experience into the classroom, for example, through guest lectures by practitioners in the private sector and NGOs could also be used.

"There is quite a lot of innovation in the private sector, and in this case, I am also looking at the NGOs. Having an opportunity for us to present some of what we do, whether it is the models, how we are doing it, can help give extra information that can be given within the package that you give to extension students" (FGD, civil society).

"I see the models we are testing in the field, how we are trying to tweak a little bit here and there and then these are things that will probably help enhance the skills of that extension service provider if they get to know them at the right time and they can interest themselves" (FGD, civil society; recent graduates, BARI).

Continuous assessments shouldn't only be through written assignments and class presentations but also field assessments.

4.6 Major barriers to effective implementation of extension worker training curriculum

The most frequently cited barriers to effective implementation of extension worker training curriculum included inadequate budget support for practical learning experiences (about 65%), classroom and farm demonstration facilities (about 42%), and development of effective curricula (about 42%). Other barriers were student motivation (37%), teacher motivation (35%), quality of faculty (21%), time constraints (21%), and quality textbooks and manuals (20%).

Table 21 : Major barriers to effective implementation of extension worker training curriculum in Uganda

	n=243
Development of an effective extension curriculum	101 (41.56%)
Quality faculty to teach extension courses	52 (21.40%)
Quality textbooks and/or manuals	48 (19.75%)
Classroom and demonstration farms or facilities	101 (41.56%)
Accreditation of curriculum	47 (19.34%)

Time constraint	51 (20.99%)
Budget to support practical learning experience (e.g., field visits and demonstrations)	157 (64.61%)
Student motivation to study extension and in practical extension work	90 (37.04%)
Teacher motivation to teach required process skills and competencies	86 (35.39%)
Other (please specify)	23 (9.46%)

Two shortcomings with both technical and functional skills were mentioned in the FGDs, namely, inadequate practical skills (consensus in FGD, recent graduates) and failure to harmonize curricula across the many universities in the country (FGDs, civil society and public sector). Several universities offer agriculture programs and produce graduates who serve as extension workers. A total of four were represented in the FGD. They each offer different curricula—there was a recommendation to harmonize curricula so that there is consensus on a basic minimum content these programs should cover.

“So, how do we harmonize at the higher institutions of learning so that we have a common curriculum whether they are teaching agriculture in Kyambogo or Makerere, it is the same thing. Otherwise, when there are those disparities, for us who work with them we are getting very many challenges. You take a lot of time mentoring them and training them even on the basics that they should have had from the university” (FGD, public sector).

Other barriers to effective implementation of extension worker training curriculum from open ended responses were:

- *Unemployment:*
Students do not have the opportunity to practice what they have learned immediately after school due to high unemployment
- *Student motivation to practice in the field low due to the way they are recruited into the course:*
Relying on good high school grades but not passion and interest to be an extensionist.
Doing extension as a way of getting a degree
Student motivation to practice agriculture low
- *Curriculum not dynamic enough:*
Curriculum does not catch up with the rapidly changing technology and climate change
Synchronizing curricula content with ever changing farmer/client needs especially market for their produce
Lack of a serious practical internship programme
- *Poor government policy on harmonization of curricula across universities:*

Policy on uniformity of undergraduate extension programs across universities is lacking

Multiple institutions training extension workers using different approaches

Lack of enough training institutions for training extension workers

- *Quality of faculty:*

Over specialization of faculty staff in specific teaching subjects. The quality of extension professionals is therefore dependent on many disciplines taught by various staff and the quality of individual staff influences the outcomes. This gives rise to few “holistically grounded” extension staff in the field

Teaching for money is also another big problem

Limited funding for research and Postgraduate scholarships at Makerere University

CHAPTER 5 : CONCLUSIONS AND IMPLICATIONS FOR POLICY

The study sought to improve the relevance of undergraduate agricultural extension curriculum in Uganda and other African countries to the changing agricultural extension service needs. Stakeholder perspectives obtained through FGDs and an online survey informed understanding of the extension needs and core competencies required of extension workers to effectively provide services in the changing context. In addition, we assessed how well the undergraduate curriculum at Makerere university addresses the core competencies, barriers to effective training of extension workers and how these barriers could be removed to make agricultural extension curriculum robust, practical and relevant.

We conclude based on the qualitative data that the perceived most prominent extension needs of smallholder farmers were advisory services on business and marketing, technical production, postharvest handling, value addition and value chain development. These perspectives resonate with the national and global strategic trends that lay emphasis on increased commercialization and competitiveness of agricultural production and agro processing. Market oriented advisory 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 are being prioritized.

All the following pre-structured eleven competency domains were rated as important (mean greater than 4) for extension workers in Uganda in the online survey: 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. This means that these competencies identified in literature as basic extension skills that are needed by extension professionals in most countries over the past two decades are still relevant. However, while these old domains remain important, the nature of skills therein is changing and new domains are emerging.

The undergraduate curricula at Makerere university moderately address the required job skills or core competencies of extension workers. The bachelor of agricultural and rural innovation undergraduate curriculum is relatively strong in content on functional and soft skills but inadequate in technical agricultural production areas. The bachelor of science agriculture is strong in technical agriculture and weaker in functional areas especially for students who don't specialize in agricultural extension although this needs further investigation for conclusive evidence.

The key barriers to effectively training extension workers with required core competencies include poor curriculum implementation arrangements, mainly use of theoretically oriented methods that don't equip students with adequate practical skills. There is insufficient budget support for practical learning experiences, failure to update curricula regularly, low student

motivation due to lack of interest in the subject, low teacher motivation, and to a lesser extent inadequate quality of faculty, time constraints, and quality textbooks and manuals.

Recommended measures to make agricultural extension curriculum robust and practical included regular review and updating of curricula, emphasis on practical and contemporary skills, serious mentored workplace internship for every student; exposure of students to market opportunities that link farmers with service providers and develop entrepreneurship; and utilize cutting-edge and practical teaching learning resources such as extension textbooks, practical handbooks, and training manuals.

Based on the above conclusions, we draw the following implications for policy:

- Improvement of pre-service undergraduate programs at Universities
 - Universities should institutionalize periodic engagement with the employers of graduates to inform curriculum revisions and ensure relevance to job market needs.
 - Revise admission requirements and recruit students with demonstrated motivation and interest in agriculture.
 - Establish mandatory field internship whereby students are attached to experienced field staff.
 - Institutionalize and adequately fund practical training methods and assessment..
- Improve in-service training and professional development for extension workers and university faculty through institutionalized mechanisms for regular in-service training in the core areas to keep abreast of dynamic changes in technology and know-how in the field.
 - Government and non-state extension providers should design and implement professional development courses, webinars targeted at extension workers.
 - Assess competencies of university faculty in the areas identified in this study particularly experiential teaching and assessment methods with a view to identifying gaps.
 - Conduct tailored training and/or use other capacity building avenue to address identified gaps.
- Curriculum revitalization
 - Review the existing BARI curriculum at Makerere University to incorporate/enhance coverage of topics identified in this study which are missing, e.g., financial resource mobilization, monitoring, evaluation and learning, advanced ICT for extension.
 - Revise regulations of the BARI program and make all technical agriculture courses that have hitherto been electives core to enable students to get all-round knowledge and skills.

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Strengthening Agricultural Extension Training Process Skills and Competency Gaps in Undergraduate Agricultural Extension Curriculum in Uganda

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 Africa. 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](https://msu.co1.qualtrics.com/jfe/preview/SV_eA7j51dpEPqrBau?Q_CHL=preview)

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

Process Skills and Competency Gaps in Undergraduate Agricultural Extension Curriculum in Uganda

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.

<p>How important is this skill or competency for an extension worker?</p> <ol style="list-style-type: none"> 1. Not Important 2. Somewhat Important 3. Moderately important 4. Important 5. Very Important <p>Please check a box (✓) for each statement that best represents your opinion.</p>	<p>Based on Your Answer in Question 2, How Well Does the Undergraduate Extension Curriculum Cover this Competency?</p> <ol style="list-style-type: none"> 1. Not at All Covered 2. Minimally Covered 3. Moderately Covered 4. Well Covered 5. Very Well Covered <p>Please check a box (✓) for each statement that best represents your opinion.</p>
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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					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		
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					B02						
		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	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					B02						
		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		
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					C02						
		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	Select appropriate communication methods.												
2	Establish communication with different stakeholders.												
3	Respect local culture while communicating with clients.												
4	Prepare required progress reports.												

Job skills and competencies: Extension professionals should be able to:		C01					C02						
		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		
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.												

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

Job skills and competencies: Extension professionals should be able to use:		D01					D02						
		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	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					E02				
		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	Understand theories and principles of monitoring and evaluation.										

Job skills and competencies: Extension professionals:		E01					E02						
		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		
2	Conduct monitoring and evaluation of extension programs.												
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.												

Job skills and competencies: Extension professionals:		E01					E02						
		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		
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					F02						
		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	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					G02					
		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	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					H02					
		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	Have basic knowledge of agri-business development.											
2	Apply brokering / advisory skills in agri-business development.											

Job skills and competencies: Extension professionals should:		H01					H02						
		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		
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					I02						
		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	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					I02				
		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
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					J02				
		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	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					J02						
		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		
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					J02						
		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	Demonstrate technical knowledge in their basic discipline (e.g., field crops / livestock/ fishery/ horticulture etc).												

Job skills and competencies: Extension professionals should:		J01					J02						
		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		
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. field visits and demonstrations)

- Student motivation to study extension and in practical extension work
- Teacher motivation to teach required 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
Process Skills and Competency Gaps in Undergraduate
Agricultural Extension Curriculum in Uganda

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)

Sample of Introductory Page & FGD Questions

Strengthening Agricultural Extension Training **Process Skills and Competency Gaps in Undergraduate** **Agricultural Extension Curriculum in Uganda**

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 on **“Strengthening Agricultural Extension Training in the MSU-Alliance for African Partnership (AAP) Consortium Partners in Africa (Nigeria, Malawi, Uganda, Kenya and South Africa).”** The results of the FGD and the nation-wide 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!

About This Document

The AAP-PIRA study assessed how well the undergraduate (UG) agricultural extension curriculum in Uganda addresses the core competencies and barriers to effective training of extension workers 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 undergraduate 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? Stakeholder perspectives were obtained through review of UG agricultural extension curricula at Makerere University, analysis of agricultural extension services in Uganda, focus group discussions and an online survey. Overall, the results revealed that the UG curricula moderately address the required core competencies of extension workers. To make curriculum robust, practical and relevant, the authors identify and recommend 11 process skills and core competencies with 97 subcompetencies for inclusion in the UG agricultural extension curricula in Uganda.

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