Capacity Development for Modernizing African Food Systems (MAFS) Working Paper

Tracer Study of Agricultural Graduates in Uganda

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The Modernizing African Food Systems (MAFS) Consortium

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Modernizing African Food Systems (MAFS) Consortium

Objective: The MAFS Consortium aims to help African agricultural education and training (AET) institutions develop the technical skills and institutional capacity required to modernize African food systems.

MAFS Consortium Members:

- Makerere University
- Michigan State University
- Stellenbosch University
- University of Pretoria

Activities and Outputs: The MAFS Consortium has assembled a technical team from four major agricultural universities to produce a series of empirical background studies that will provide evidence necessary for informing capacity development efforts in African AET institutions. Substantively, the activities center around the following four thematic areas.

Theme 1. Food System Dynamics in Africa and Consequent Skill Requirements in the Private and Public Sectors

Theme 2. Models of AET Engagement with Private and Public Sector Employers

Theme 3. Existing Capacity of African AET: Case studies of African universities with regional footprints

Theme 4. Impact of past AET institution-building efforts in Africa

Funding:

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EXECUTIVE SUMMARY

There has been increased demand for food not only on the African continent but globally. This has been largely attributed to the high population growth with changing food preferences. This calls for the transformation of Africa's agriculture and food systems through transforming agricultural production, markets, agricultural education and training institutions. Agricultural training institutions such as universities and agricultural colleges have a lot to contribute but they need to run relevant curricula in order to produce well trained human resource that will guide stakeholders in production, value addition and marketing, hence quality and quantity food supply.

To establish the gaps in the training offered by Agriculture Education Training (AET) institutions, Makerere University in collaboration with Universities of Pretoria and Michigan State conducted a tracer study involving graduates of agriculture education training institution, specifically Makerere University.

The study was to identity the current technical content, facilities, practices, scientific skills and non-agricultural skills being used in agricultural training institutions, their relevance to the current society needs, missing gaps and appropriate intervention areas for improved curricula that can equip graduates with demand-driven knowledge and skills. The specific objectives were to:

1. document the destined fields of graduates of agricultural training institutions;
2. assess the relevance of studied course units to the careers occupied by graduates of agricultural training institutions;
3. establish the missing skills and activities in agricultural training that would have enhanced the performance of graduates of agricultural training institutions on their career; and
4. solicit for recommendations on knowledge, skills and activities that can better prepare students for success in agriculture and agribusiness.

The tracer study was conducted among Makerere University graduates of agriculture who had graduated with Bachelors Degree in Agriculture at least five years ago. Study revealed that employment was strongly related with the course offered at the training institution. However, courses with business, entrepreneurship and management components such as agricultural economics, farm management, production economics, and entrepreneurship were relevant across different jobs. Activities such as field attachment, special projects, field visits and research, and farm business management students were reported as vital activities in agricultural training.

The study noted that different jobs required different skills. However, skills such as research and proposal writing were universal. Internship, farm business management case studies, research and participation in symposium and shows were reported as important activities that linked the agricultural training institutions to private sector. However, skills in leadership were reportedly a missed skill in agricultural training. Other major skills missed, especially by the non-agribusiness and non-agricultural economics graduates were management, business and entrepreneurial skills.

Almost all the agricultural graduates were willing to recommend high school students for agricultural course in higher institutions of learning. Wide variety of employment opportunities, career development and relevance of the training to Uganda's economy were major reasons for the recommendation.

Value addition, research and entrepreneurship were the technical areas that need more human power training, while collaborative research, regular review of curriculum, business training, entrepreneurship, compulsory internship and student project report were reported as the best methods to make agricultural training more relevant to current employment.

Practical teaching, regular review of curriculum, emphasis on needs assessment research and collaborative curriculum development between universities, private sector and organizations at national, regional and global level were some of the main ways of improving technical content. Construction of modern study rooms, renovation and/or construction of laboratories equipped with ICT, setting up demonstration farms and subscription to relevant journal were also reported.

To improve on practical training that equips graduates with hands on skills, field attachment, equipping laboratories with modern facilities, outreach programs (field visits/excursions), and involving the private sector in training as guest professors were recommended. Non-agricultural skills were also recommended to be emphasized in training by agricultural training universities and colleges. These include management skills such financial, project and human resource management, communication, entrepreneurship, leadership, business proposal writing, and career guidance.

For primary and secondary schools to better agriculture training, the graduates recommended school demonstration gardens, career guidance in agriculture, compulsory teaching of agriculture at all levels, offering agriculture as co-curricular subject, and incorporation of agribusiness component in secondary school curriculum.

This study therefore concludes that for agricultural universities and colleges to deliver quality training and produce graduates that are relevant for the changing job market, they must carry out regular curriculum review. This should be done in partnership with other key stakeholders including the private and public sector institutions. Training facilities should be modernized and field attachments/practical emphasized. The curricular should have components of business, management and planning to produce graduates who are able to handle multi skilled tasks as demanded today's job market.

1.0 Introduction

1.1. Background

There has been a global increase in food demand largely due to increasing population growth especially on the African continent. This calls for the transformation of Africa's agriculture and food systems through transforming agricultural production, markets, agricultural education and training institutions. Training of professional agriculturalists has been looked at as one of the ways that can lead to increased food production and marketing under modernized food systems. This will be possible if agricultural training institutions such as universities and agricultural colleges use relevant curricula to produce well trained human resource to guide different agricultural stakeholders in aspects of production, value addition and marketing hence quality and quantity food supply.

In addition, agricultural sector especially in developing countries has been earmarked as an area with lots of opportunities for university graduate in terms of self-employment as entrepreneurs as well as direct employment by other stakeholders. Due to these values attached to agricultural training institutions in face of increase food insecurity, many of these institutions are offering agricultural related courses in their curriculum especially at higher level of learning. However, food insecurity and unemployment have persistently increased. Therefore there is a need to understand the relationship between the technical content, activities, practices and facilities being used while training agricultural students, and the current employment needs under the Africa's rapidly growing and fast transforming agricultural markets.

To establish the gaps in the training offered by Agriculture Education Training (AET) institutions, Makerere University in collaboration with Universities of Pretoria and Michigan State conducted a tracer study involving graduates of agriculture education training institution, specifically Makerere University.

1.2. Objectives of the study

The main objective of the tracer study was to identity the current technical content, facilities, practices, scientific skills and nonagricultural skills being used in agricultural training institutions, their relevance to the current society needs, gaps and appropriate intervention areas for improved curricula that can equip graduates with demand-driven knowledge and skills. The specific objectives were:

1. To document the destined fields of graduates of agricultural training institutions
2. To assess the relevance of studied course units to the careers occupied by graduates of agricultural training institutions
3. To establish the missing skills and activities in agricultural training that would have enhanced the performance of graduates of agricultural training institutions on their career.

4. To solicit for recommendations on knowledge, skills and activities that can better prepare students for success in agriculture and agribusiness.

1.3. Research questions

1. What organizations that mostly absorb graduates of agricultural training institutions?
2. Does the content, skills, activities and practices acquired from agricultural training institutions relevant to job market?
3. What are the missed content, skills and activities that would better agricultural graduates in their career?
4. What should be done to improve training in agricultural training institutions in terms of technical content, facilities, scientific skills and practical applications?
5. What are the non-agricultural skills that should be included in agricultural training to better equip agricultural graduates?

1.4. Significance of the Study

Irrespective of mushrooming agricultural education and training institutions in Africa, food shortage and unemployment has persisted. This could be partly due to the nature of the courses, activities, practice and facilities that are not matching with the current rapid agricultural marketing transformation adopted by Africa under modernized food systems. Therefore, there is a need for agricultural education and training institutions to transform current curricula to equip graduates for future professional requirements. This can only be done when the relevance of current training with the current African agricultural needs is established. This study provides information on different organizations that absorb university and agricultural college graduates. It examines the relevance of the training received to different jobs occupied by former students, documents training gaps in terms of the technical content, facilities, scientific skills, practical applications and non-agriculture skills. The study findings will help agricultural education and training institutions to design a functional curriculum that is relevant to current agricultural community needs. This will result into production of adequately trained graduates that are relevant for the job market, and in transforming African agriculture and food systems.

2.0 Methodology

2.1. Sample selection

The tracer study was conducted among Makerere University graduates of agriculture. Makerere University was chosen because of its long history (since 1958) of agriculture training. Originally, the study had proposed to trace and interview at least 300 graduates selected from each decade since the 1960s. However, traceability was cumbersome due to lack of contacts, and being widely located in many places within and outside Uganda made it financially infeasible. In order to increase chances of tracing as many as possible, we targeted those who had graduated with Bachelors Degree in Agriculture at least five years ago. Despite this, the number of graduates that participated in the study remained much lower (40) than the initial target. Nonetheless, the responses received give a reliable representation and adequately addresses the study objectives.

2.2. Data collection and data analysis

The study used a questionnaire to collect data from the selected graduates. Two methods were used to administer the questionnaire; face to face interviews and mailing the questionnaire to the graduates. The collected data were coded and analyzed using descriptive statistics. In this report, results are summarized in tables and figures.

3.0 Results and Discussion

3.1.0 Educational background of agriculture graduates

Study results revealed that about 81% of the interviewed graduates had advanced their studies to Masters Level Table 1.1), and 4 of them to doctoral degree level (Table 1.2) at different Universities in various agricultural disciplines. The majority (75.8%) were still in contact with their mother university. The majority had specialized in Agricultural Economics at undergraduate level (53.1%). Animal Science and Soil Science had the least.

Table 1.1: Master's Study fields and awarding institutions

		Institution								
Programme of study	**Field of study**	**Adhra Pradsesh Ag**	**California Polytechnic State University**	**MUK**	**Open University UK**	**Sokoine University of Agriculture**	**University of Birmingham**	**Van Hall University, Wageningen**	**Wageningen University**	**Total**
MSc	Crop Science	1	0	5	0	0	0	0	0	6
	Agricultural Economics	0	0	11	1	0	0	1	1	14
	Extension	0	1	1	0	0	0	0	0	2
	Entomology	0	0	1	0	0	0	0	0	1
	Agricultural Engineering	0	0	1	0	0	0	0	0	1
	Animal Science	0	0	0	0	1	0	0	0	1
	Conservation Biology	0	0	0	0	0	1	0	0	1
MBA	Project Management	0	0	1	0	0	0	0	0	1

Table 1.2: Doctorate program, awarding institutions, year of completion, place of work and position held

Name of institution	Field of study	Year of completion	Place of work	Position currently held
BOKU, Austria	Animal Science	2010	NARO	Research officer
Curtin University, West Australia	Agricultural Economics	2012	CCA Integrated Seed sector development program	CCA Regional Field Manager Africa
Kenyatta University	Agricultural Economics	On going		Monitoring, E valuation and communication Advisor
University of FST.SA	Agricultural Economics	On going	University of Free Stat South Africa	PhD Candidate

Table 1.3 summarizes work places and positions held by the agriculture graduates. They occupy different jobs/positions depending on their respective fields of study. Some are employed as Financial Managers; Loans Officers in banks particularly centenary bank; Value Chain specialists; Monitoring and Evaluation Officers; Socio-economic research analysts, Program and Marketing Officers, among others.

Table 1.3: Place of work, position held of study and year of graduation

Place of work	Position held	Field of study by program			Year of Graduation by program		
		Bachelors	**Masters**	**PhD**	**Bachelors**	**Masters**	**PhD**
World Relief	Agri-finance Consultant	Economics	Agricultural Economics		2001	2013	
Centenary Bank	Agric loans Officer		Agricultural Economics			2008	
Ngora District local gov	Agricultural officer	Agricultural Economics	Rural Development		2008	2013	
USAID FtF CPMA	Area Value Chain Coordinator	Agricultural Economics	Agricultural Economics		2002	2002	
USAID Uganda ZFeed the future	Area Value Chain Coordinator	Agricultural Economics			2001	N/A	
CCA	CCA Regional Field Manager Africa	Crop Science	Agricultural Economics	Agricultural Economics	2001	2005	2012
Research organisation	Research Coordinator	Crop Science	Crop Science		2004	2008	
Sasakawa Global 2000-Uganda	Coordinator Crop production Enh	Economics	Extension		1998	2001	
Sasakawa Global 2000-Uganda	Coordinator Monitoring and Evaluation	Agricultural Economics	Agricultural Economics		2003	2007	
Tullow Oil	Field Environ Officer	Agricultural Economics	Agricultural Economics		2001	2010	
World vision	Food security@livelihood Office	Crop Science	Agricultural Economics		2003	2013	
Uganda Cooperative Alliance	Head Prod and Marketing	Agricultural Economics			2008		
Kisoro	Head of loans	Agricultural Economics			2004		
NARO	Head, Uganda National groundnut	Crop Science	Crop Science		2003	2007	
Centenary Bank	Loan officer	Agricultural Economics			2011	N/A	
Integrated Seed sect dev't	Monitoring, Evaluation and communication Advisor	Agricultural Economics	Agricultural Economics	Agricultural Economics	2001	2007	Ongoing
ABI	Monitoring and evaluation	Agricultural Economics	Agribusiness		1999	2004	
Buikwe District	Natural Resource officer	Crop Science	Crop Science		1992	1998	
ENR Africa nentre	Natural resource economist	Agricultural Economics	Crop Science			2013	
University of Free State South Africa	PhD Candidate	Agricultural Economics	Agricultural Economics	Agricultural Economics	2005	2010	Ongoing
ASERECA	Programme Assistant	Forestry	Conservation Biology		2000	2007	
NAADS	Program Officer	Agricultural Economics	Agricultural Economics		1999	2011	
Office of prime minister	Program Officer	Agricultural Economics	Agricultural Economics		2003	2012	
ASERECA	Programme Assistant	Crop Science	Crop Science		1988	2004	
IITA-Uganda	Research Associate	Pathology	Entomology		2003	2009	
NARO	Research Officer	Animal Science	Animal Science	Animal Science	2001	2005	2010
NARO	Research Officer	Agricultural	Crop Science		2000	2014	

		Economics			
NARO	Research officer(PM&E)	Crop Science	Agricultural Economics	2001	2009
Heifer International	Senior Diary Specialist	Food Science	Agriculture	1996	1999
USAID community connector	Senior technical Advisor	Crop Science	Agricultural engineering	1991	1994
Centenary Bank	Supervisor	Crop Science		2004	N/A
Centenary Bank	Supervisor Agricultural loans	Crop Science	Project Management	2004	2013
Uganda Cooperative Alliance	Training and Advisory manager	Agricultural Economics	Agricultural Economics	2001	2007

N/A – No response

3.1.2. Useful Courses Studied in Formal Agricultural Training

At PhD level, our sample had only two fields of study; Agricultural Economics and Animal Science were reported (Table 1.4). The useful courses reported by both categories included Advanced Microeconomics, Advanced Macroeconomics, Applied Production Economics, and Research Methodology.

Table 1.4: PhD responses on most useful courses in formal agricultural education

Most useful courses in formal agricultural education	PhD courses		
	Agricultural Economics	Animal Science	Total
Agricultural Economics	1	1	1
Advanced Microeconomics	1	1	2
Advanced Macroeconomics	1	1	1
Resource Economics	1	0	1
Applied Production Economics	3	1	3
Agricultural Policy	1	0	1
Statistics	0	1	1
Math For Economics	1	0	1
Crop Science	1	0	1
Crop Physiology	1	0	1
Horticulture	1	0	1
Research Methodology	1	1	1
Animal Science Practical	0	1	1
Total	13	2	15
Cases	3	1	4

At Masters Level, a variety of courses were reported as useful. These are presented in Table 1.5. They include Farm Management, Applied Statistics/Biometrics, Research Methodology, and Crop Productivity Management. Agricultural Economics, Advanced Micro and Macroeconomics, Decision Analysis for Agribusiness, Agricultural Policy, Project Planning and Management, Project Planning and Investment Analysis, Agricultural Finance, Research Methods, Agricultural Marketing and International Trade were the most important courses for graduates of Agribusiness Management at Master's level. Agricultural policy, poverty and food security, and agricultural development were the useful courses for graduates of Rural

Development acquired during formal agricultural training. Animal scientists, on the other hand, reported research methods and animal hygiene and health as the most useful courses.

At Undergraduate level, graduates similarly reported Agricultural Economics, Microeconomics, Macroeconomics, Production Economics, Farm Management, Research Methodology, Project planning and investment, Applied biometrics and statistics, Agricultural Extension, and Poverty and Food Security among the most useful courses (Table 1.6).

Table 1.5: Most useful courses in formal agricultural education as reported by Masters Graduates

Most useful courses in formal agricultural education	Agric. Economics	Crop Science	Project Management	Extension	Entomology	Post-harvest technology	Animal Science	Rural Dev't & food security	Agribusiness Management	Conservation Biology	Total
Agricultural economics	4	0	0	0	0	0	0	0	1	0	5
Advanced micro economics	2	0	0	0	0	0	0	0	1	0	3
Advanced macro economics	1	0	0	0	0	0	0	0	1	0	2
Resource economics	2	0	0	0	0	0	0	0	0	0	2
Applied production economics	5	0	0	0	0	0	0	0	0	0	5
Introduction to computer science	0	0	0	1	0	0	0	0	1	0	2
Crop science	0	1	0	0	0	0	0	0	0	0	1
Crop physiology	0	1	0	0	0	0	0	0	0	0	1
Hot culture	0	2	0	0	0	0	0	0	0	0	2
Dry land farming	0	2	0	0	0	0	0	0	0	0	2
Farm management	5	0	1	0	1	0	0	0	0	0	7
Agricultural finance	2	0	0	0	0	0	0	0	1	0	3
Soil fertility management	1	2	0	0	0	0	0	0	0	0	3
Crop management	0	1	0	0	0	0	0	0	0	0	1
Research methodology	9	0	0	1	0	1	1	0	1	1	14
Agricultural marketing	2	0	0	0	0	0	0	0	1	0	3
Project planning and investment analysis	3	0	0	0	0	0	0	0	1	0	4
Applied statistics and biometrics	2	1	1	0	0	0	0	0	0	1	5
Crop productivity management	0	6	0	0	0	0	0	0	0	0	6
Agronomy	0	3	0	0	0	0	0	0	0	0	3
International trade	2	0	0	0	0	0	0	0	1	0	3
Plant pathology	0	2	0	0	0	0	0	0	0	0	2
Poultry	0	0	0	0	0	0	1	0	0	0	1
Project planning and management	0	0	0	0	0	0	0	0	1	0	1
Animal health and hygiene	0	0	0	0	0	0	2	0	0	0	2
Decision analysis for agribusiness	0	0	0	0	0	0	0	0	1	0	1
Rural development	3	0	0	0	0	0	0	0	0	0	3
Plant breeding	0	2	0	0	0	0	0	0	0	0	2
Accounting	0	0	1	0	0	0	0	0	0	0	1

Econometrics	1	0	0	0	0	0	0	0	0	0	1
Agricultural policy	1	0	0	0	0	0	0	1	1	0	3
Agribusiness finance	2	0	0	0	0	0	0	0	1	0	3
Agricultural extension methods	3	0	0	2	0	0	0	0	0	1	6
Poverty and food security	5	0	0	0	0	0	0	1	0	0	6
Environmental and Natural resources	1	0	0	0	0	0	0	0	0	0	1
Plant nutrition	0	1	0	0	0	0	0	0	0	0	1
Post-harvest technologies	0	1	0	0	0	0	0	0	0	0	1
Mathematics for economics	1	0	0	0	0	0	0	0	0	0	1
Agricultural development	0	0	0	0	0	0	0	1	0	0	1
Total	61	23	4	4	1	1	2	3	8	3	112
Cases	13	6	1	1	1	1	1	1	1	1	27

Table 1.6: Most useful courses in formal agricultural education as reported by Undergraduates

Most useful courses in formal agricultural education	Agric. Econ	Crop Science	Social Sciences	Economics	Pathology	Animal science	Soil Science	Food Science	Forestry	Total
Agricultural economics	4	1	0	0	0	0	1	0	0	6
Advanced Microeconomics	3	1	0	1	0	1	0	0	0	6
Advanced macroeconomics	3	1	0	0	0	0	0	0	0	4
Resource economics	1	1	0	0	0	0	0	0	0	2
Applied production economics	3	1	1	1	0	0	0	0	0	6
Introduction to computer science	1	0	0	0	0	0	0	1	0	2
Crop science	0	1	0	0	0	0	0	0	0	1
Crop physiology	0	1	0	0	0	0	0	0	0	1
Hot culture	1	1	0	0	0	0	1	0	0	3
Dry land farming	1	1	0	0	0	0	0	0	0	2
Farm management	3	2	0	0	1	0	1	0	0	7
Agricultural finance	2	0	0	0	0	0	0	0	0	2
Soil fertility management	1	2	0	0	0	0	0	0	0	3
Crop management	0	1	0	0	0	0	0	0	0	1
Research methodology	7	2	1	1	0	1	0	0	1	13
Agricultural marketing	3	0	1	0	0	0	0	0	0	4
Project planning and investment analysis	2	0	1	1	0	0	0	0	0	4
Applied statistics and biometrics	2	3	1	0	0	0	0	0	1	7
Crop productivity management	2	1	0	0	0	0	1	1	0	5
Agronomy	0	4	0	1	0	0	0	0	0	5
International trade	0	0	0	1	0	0	0	0	0	1
Plant pathology	0	3	0	0	0	0	0	0	0	3
Management information systems	0	1	0	0	0	0	0	0	0	1
Entomology	0	1	0	0	0	0	0	0	0	1

Apiculture	0	1	0	0	0	0	0	0	0	1
Project planning and management	1	0	0	0	0	0	0	0	0	1
Animal health and hygiene	0	2	0	0	0	0	0	1	0	3
Decision analysis for agribusiness	1	0	0	0	0	0	0	0	0	1
Plant bacteriology and virology	0	1	0	0	0	0	0	0	0	1
Molecular biology	1	1	0	0	0	0	0	0	0	2
Rural development	2	0	0	1	0	0	0	0	0	3
Plant breeding	0	2	0	0	0	0	0	0	0	2
Accounting	0	1	0	0	0	0	0	0	0	1
Field case study	0	2	0	0	0	0	0	0	0	2
Agricultural policy	2	0	0	0	0	0	0	0	0	2
Agribusiness finance	2	1	0	0	0	0	0	0	0	3
Agricultural extension	2	0	0	2	0	0	0	1	1	6
Poverty and food security	5	0	0	1	0	0	0	0	0	6
Environmental and Natural resources	1	0	0	0	0	0	0	0	0	1
Plant nutrition	0	1	0	0	0	0	0	0	0	1
Post-harvest technologies	0	1	0	0	0	0	0	0	0	1
Mathematics for economics	1	0	0	0	0	0	0	0	0	1
Agricultural development	1	0	0	0	0	0	0	0	0	1
Total	58	42	5	10	1	2	4	4	3	129

3.1.3. Useful Activities in Formal Agricultural Education

The graduates were asked to report the activities in formal agricultural training they found most useful. Field attachment, data analysis and report writing were reported by doctoratal graduates (Table 1.7). At Master's level (Table 1.8), activities such as field attachment, farm management case studies, research assignments, special projects, graduate seminars and field work were reported as the most useful activities by graduates of Msc. Agricultural Economics. Course work, field attachment, special projects and field visits were reportedly useful activities to Crop scientists. Similarly, graduates of agribusiness reported field attachment, farm management case studies, data analysis and report writing and research assignments. Field visits were reportedly vital for agricultural extension. The study noted that field attachment, farm management case studies and field visits and excursions were the dominant useful activities included in formal agricultural trainings for all the study fields.

Table 1.7: Use activities reported by doctorate graduates

Most useful activities in formal agricultural education	PhD courses Agricultural economics	Animal Science	Total
Field attachment/internship	3	1	4
Data analysis and report writing	3	1	4
Field visits and tours	1	0	1
Total	5	1	6
Cases	3	1	4

Table 1.8: Useful activities in formal agricultural reported by master's graduates

Most useful activities in formal agricultural training	Master of science course studied								
	Agric. Economics	Crop Science	Agribusiness Management	Project Management	Extension	Entomology	Animal Science	Rural Dev't	Total
Field attachment/internship	7	3	1	0	1	0	1		13
Farm management case studies	3	1	1	1	0	1	4		11
Course work	0	1		0	1	0			2
Research assignment	5	0	1	0	0	0		0	6
Special projects	1	1		0	0	0			2
Data analysis and report writing	1	0	1	0	0	0			2
Graduate seminars	2	0	1	0	0	0			3
Group work	1	0		0	0	0			1
Field visits and tours	3	2		0	1	0			6
Total	23	8	5	1	3	1	5	0	46

3.2 Agricultural training and employment

3.2.1 Relevance of agricultural skills in getting jobs

The study findings show that the interviewed graduates of agriculture had on average had three different jobs and all of them got because of their agricultural training background (Table 1.9). None of the graduates had a job before graduation. Therefore, agricultural training was very relevant in getting the first and current jobs.

Table 1.9: Number and nature of jobs occupied since graduation

Variable	n	Mean	Std. Dev.	Min	Max
Number of jobs occupied since graduation	33	3.42	1.58	1	8
Number of agricultural jobs got because of agricultural background	32	3.25	1.70	1	8

Graduates from different agricultural training fields reported appreciation of the contribution of agricultural training in getting their current jobs. Research skills were reported to be most relevant. Other skills reported were farm planning and investment analysis, communication skills, budgetary planning, project planning, monitoring and evaluation, institutional development, sustainable crop and livestock management, value chain analysis, enterprise development and econometrics. Table 2.0 shows that Agricultural Economics and Crop Science were reported very relevant in getting the current job. However, this is because most of the respondents in the sample were graduates in these fields (biased responses). It does not, therefore, mean that other fields are not very relevant.

Table 1.9: Relevance of agricultural training in getting the current job

	Percentage of graduates reporting	
Field of study	**Very relevant**	**Relevant**
Agricultural economics	41.4	6.9
Crop science	41.4	6.9
Pathology	0.0	3.5
Animal science	3.5	0.0
Soil Science	3.5	0.0
Food science technology	3.5	0.0
Forestry	0.0	3.5

At the undergraduate level, graduates in Agricultural Economics, Crop Science, Social Science (Economics) and Animal Science reported research skills as the major job relevant acquired skill. Findings consistently revealed that graduates that had their first degree in Agricultural Economics had a lot of acquired skills that were relevant to their jobs. These skills included farm planning and investment analysis, proposal writing, budgetary planning, project planning, monitoring and evaluation, value chain analysis, project management, quantitative and qualitative data analysis, agribusiness development, extension, farm management, enterprise development, leadership and team building.

3.2.2 Acquired skills that proved least important

Results from the study indicate that Animal Science related course units such as animal health and hygiene, piggery, apiculture, entomology and entomology were reported by the majority (73.6%) as least important to their current employment (Table 1.10). This could be attributed to limited employment opportunities for graduates that have specialized in animal science who are usually in competition with graduates of veterinary sciences. In addition, very few individual farmers in Uganda have the capacity to employ such graduates. Consequently, these graduates only find employment opportunities with the few existing research institutions non-governmental organizations. Other reported courses of least importance to current employment were soil science course units and biochemistry, climatology, plant physiology, econometrics, ecology and weed science.

Table 1.10: Acquired skills that proved least important

Least helpful skills or courses	Percent of responses
Animal science course units	73.63
Biochemistry	22.0
Soil science	21.05
Climatology	5.26
Plant physiology	5.26
Econometrics	5.26
Ecology	5.26
Geology	5.26
Weed science	5.26

3.2.3 Practical work experience or links to private sector included as part of training

Results in the Tables 1.11 and 1.12 reveal that field attachments/internship was the major link that could connect agricultural training institutions and the private sector. This is because of the field attachment activities involved which bring on board the student, the training institution and entrepreneurs in the private sector. Some of the entrepreneurs are the potential employees of the graduates. Internship does not therefore only help student score marks as a requirement for the award of a degree but the trainees also get more practical skills and exposure to private sector where they end up finding employment opportunities.

During internship, students are allocated tasks both in office and field operations. This equips them with administrative, practical, team building, interpersonal and organizational dynamics skills all of which are necessary in the working world. On the side of the university, the organization where the internship is being coordinated assesses the students' competences academically, practically and professionally while giving feedback to both university and students. This improves performance of training institutions in terms of imparting demand driven agricultural skills to students. Other private sector links that were included in agricultural training were farm business management case studies, research, participation in

symposium and shows. The study noted that graduates that had specialized in agricultural economics had diversified links such as case study, internship, farm business management, research and participation in symposium and shows that linked them to the private sector compared to graduates in crop, soil, animal, food science and forestry both at undergraduate and graduate levels.

Table 1.11: Masters Graduates' percentage response on practical work/links to private sector that were included as part of the training

Practical work experience or links to private sector	Field of study (%)									
	Agricultural economics	Crop Science	Project Management	Extension	Entomology	Agricultural engineering	Agribusiness management	Soil science	Conservation Biology	Total
Internship	28.6	10.7	0	3.6	0	0	3.6	36	3.6	50.0
Farm business management/case study	14.3	7.1	3.6	0	3.6	36	3.6	0	0	32.14.0
Research	7.1	0	0	0	0	0	0	0	0	7.1
Management information systems	0	0	0	0	0	0	3.6	0	0	7.1
Total	50.0	17.9	3.6	3.6	3.6	3.6	7.1	3.6	3.6	100

Table 1.12: Percentage response of Undergraduates on practical work/links to private sector that were included as part of the training

Practical work experience or links to private sector	Percentage response				
	Agricultural economics	Crop science	Soil Science	Food Science	Total
Internship	24.5	18.2	6.1	3.0	51.1
Farm business management/case study	9.1	12.1	3.0	0	27.3
Research	6.1	0	3.0	0	6.1
Participation in symposium and shows	3.0	0	0	0	3.0
Total	42.4	33.3	9.1	3.0	100

3.2.4 Employers' rating of graduates from agricultural training institutions

During the study, graduates were asked how the employers rated the quality of graduates of the Agriculture and Education Training Institutions; comparing graduates of Agricultural Colleges and Universities. The majority reported that employers rated college graduates of high quality compared to university graduates (Figure 1.1).

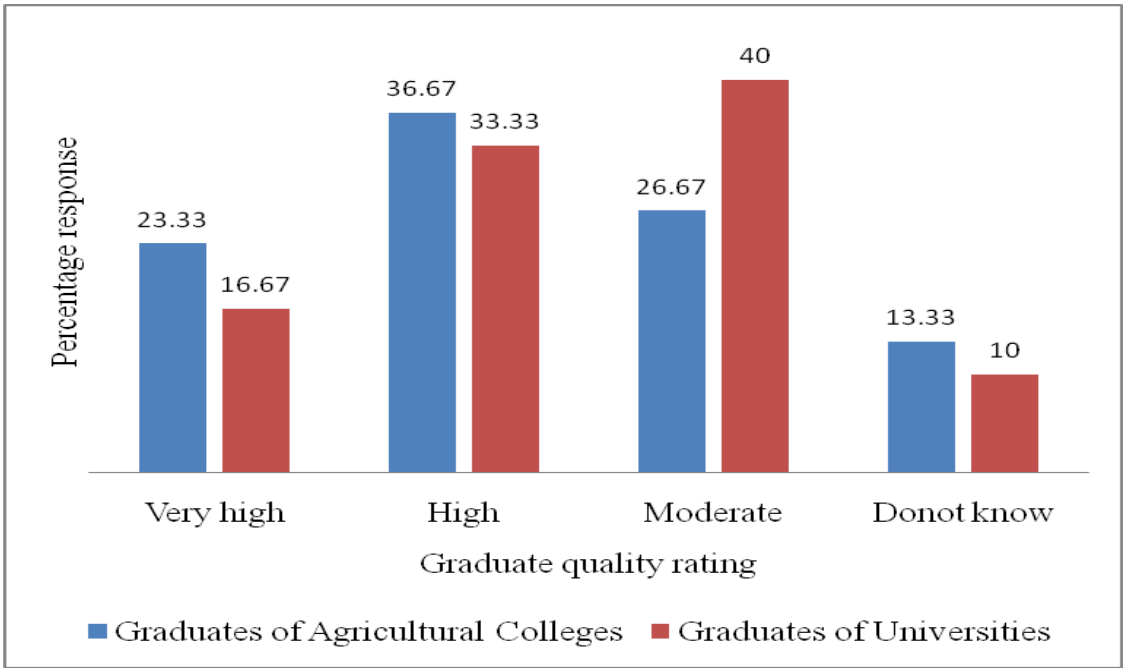

Figure 1.1: Rating (%) of graduates from agriculture and educational training institutions

3.2.5 Skills that would enhance graduates' work performance but were not acquired

Results show that most of missed skills during agricultural training that would have enhanced the performance of graduate on their jobs were leadership skills. The specifically reported leadership skills missed included team building, presentation, lobbying and advocacy. Other missed skills include operation of agricultural production, marketing, resource management including financial, innovation development and adoption, project planning, entrepreneurship, scientific paper writing, partnership development, communication, human resource, research, computer, sourcing and procurement, monitoring and evaluation, financial management, policy formulation and analysis, value chain management and analysis, and gender in agriculture. Only one graduate reported to have missed laboratory skills on crops, soil and animal science. The study noted that the majority skills missed were business and entrepreneurial oriented that could only be acquired by graduates that had done agricultural economics and agribusiness courses.

Nonetheless, all graduates had confidence in the way the university prepared them for their current employment. Figure 1.2 shows that 55% agreed their university education was a good preparation for their employment and 45% strongly agreed.

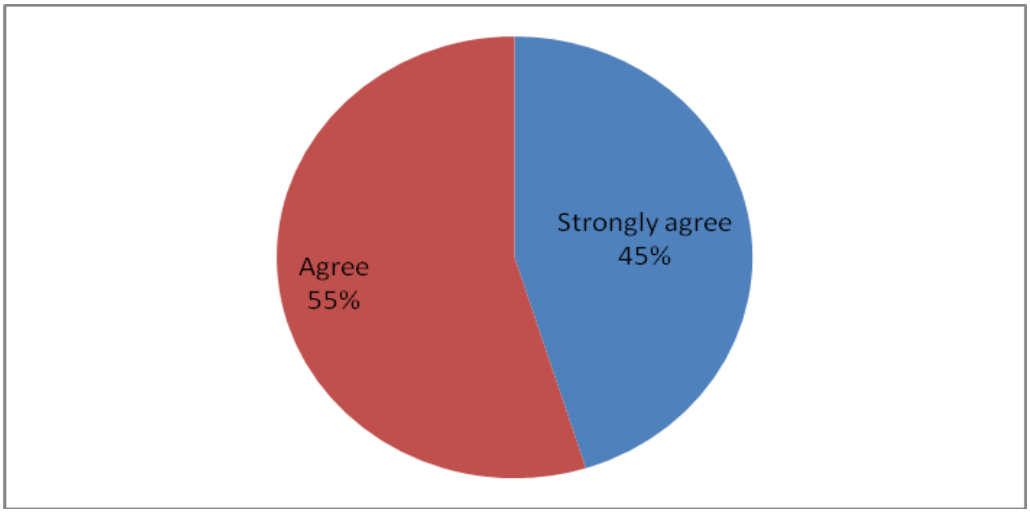

Figure 1.2: Graduates' response on whether the university training prepared them for employment

3.3 Recommendations for improvement

3.3.1 Recommending agricultural training to high school students

The study noted that 93.8% of agricultural graduates were willing to recommend high school students for agricultural course in higher institutions of learning (Table 1.13). Creation of wide range of employment opportunities, relevance of agriculture to Uganda's economy and

enhancement of entrepreneurship skills were the major reasons given for their recommendation.

1.13: Recommendations to high school students to offer agriculture in higher institutions of learning

Would you recommend	Percentage
I would recommend a High School student well known to me to an agricultural course	93.8
I would not recommend a High School student well known to me to an agricultural course	6.2
Total	100

A number of reasons why the graduates would recommend the training to high school students were reported (Table 1.14). Agriculture being the major economic activity, it supports majority Ugandans. Therefore, there is need for training more human power for agricultural sector development as reported by 15.1% of the graduates. This will promote sustainable large scale commercial farming that can produce enough food and income to farmers. The fact that agriculture is an art and science, it has wide range of specialization; agricultural economics, agribusiness management, crop science, soil science, animal science, food science, extension and other environmental related courses and this justifies the need to design practically oriented agricultural courses that would enhance peoples livelihoods (as reported by 15.10% of the graduates), creation of wide range of employment opportunities (by 29.4%), entrepreneurships skills (by 24.2%) and wide range of career development (by 9.0%).

Table 1.14: Reasons for recommending High School Students

Reasons	Percentage responses (n = 33)
Creates a wide range of employment	29.4
Relevant to Uganda's occupation/ economy	27.3
Enhances agricultural entrepreneurship skill	24.2
Practical course for improving rural livelihoods	15.10
More agricultural manpower needed for agricultural sector development	15.1
Wide range of career development	9.0

3.3.2 Technical skill areas requiring most significant manpower training

Results in Table 1.15 show that skills in value addition were one of the main areas that need great attention in the coming two decades. This is mainly because of the increasing demand for high quality foods not only in international markets but also in local domestic markets. Value addition training covering agro processing, packaging, and branding and value chain analysis will produce the necessary human resource to help Ugandan farmers benefit from agriculture through greater participation in commercial agriculture while delivering quality foods for middle and high income earners both locally and internationally.

Agricultural research was another area of emphasis as reported by 21.1% of the graduates. Research helps in identification of agricultural development gaps and recommends the best intervention areas at farmer, processing and marketing levels. The graduates in the study recommended private tailored research in agriculture innovation, value addition, agricultural entrepreneurship, value chain analysis, and market linkage creation skills for agricultural products among agricultural graduates. All these will lead to modernization of agriculture to match with the current global food demands amidst rapid growing population.

Entrepreneurship was another skill area that was reported as necessary. The fact that Ugandan economy depends on agriculture with high growth rate of graduate unemployment, agricultural entrepreneurship training skills are relevant in creation of employment, raising living standards for farmers and graduates resulting from generated income, provision of goods and services as well as contribution to savings for further investment in other sectors.

Other reported skill areas that require significant human power training were agricultural extension, livestock breeding, statistics, and sustainable agriculture.

For training institutions to make agricultural training more relevant to current employment, emphasis on agriculture business oriented training should be scale up. Findings (Table 1.16) show that 35.5% of the graduates recommended agribusiness trainings as a way to go for agricultural training institutions. Another area of concern reported was designing relevant curriculum to accommodate changing society needs while tackling areas like climatic change, value addition and gender in agricultural development. Because of globalization, labour mobility rates have increased in the face of reduced employment opportunities resulting from increased mechanized systems both at production, processing and marketing. This calls for

dynamic curriculum design that produces graduates that compete for work/jobs in such systems.

Table 1.15: Technical skill areas in agricultural and food science that require training in coming two decades

Technical skill area	Percentage response
Value addition	30.2
Agricultural research and development	21.1
Agricultural marketing/ Market linkage creation	9.1
Entrepreneurship	9.1
Agricultural extension	9.1
Livestock breeding	9.1
Statistics	6.0
Sustainable agriculture	6.0
Farm business management	3.0
Food safety	3.0
Rural development	3.0
Agricultural economics	3.0
Agricultural innovation	3.0
Agricultural policy	3.0
Crop improvement	3.0

Consistently, the majority graduates (44.2%) revealed that for agricultural training to be relevant to current jobs, emphasis should be placed on research that is action oriented, innovative and adoptive to the end users (agricultural chain actors). This can only be achieved if agricultural training institutions embrace collaborative research with other universities and employing organizations for appropriate feedbacks, incorporation of research finding in curriculum review and/or design as well as strict supervision of undergraduate student research projects as reported by 11.5% of the graduates. Further, graduates (16.7%) reported field attachment (internships) should be compulsory and should take reasonable period of months. This will create greater opportunities for students to gain more hands on practical experience that is needed in the labor market.

Table 1.16: What to be done to make agricultural training more relevant to current employment

Agricultural training areas of focus for current employment	Percentage response
Research partnership with universities and employing companies for feedback	44.2
Agribusiness training	35.5
Regular review of curriculum to accommodate changing needs of the society	20.0
Entrepreneurship	20.0
Mandatory internship (field attachment)	16.7
Mandatory student research project	11.5
Early agricultural specialization in second year of bachelors'	11.5
Invitation of successful agricultural professionals as guest speakers	11.5
Regular field visits and tours	6.5
Establishing of modern laboratories agricultural in training institutions	3.2

3.3.3 How universities can improve technical content

The most recommended ways by graduates to agricultural training institution to improve technical content were practical teaching (Table 1.17) through field work, laboratory experiments, farm business management case studies and internships. These play a big role in proving worthwhile practical skills to students, which skills match with the society needs. Similarly, 33.22% graduates reported that constant curriculum review strongly improves technical content taught at universities and colleges. Curriculum review gives agricultural universities and colleges a chance to incorporate society changing needs. The needs include value addition, entrepreneurship and gender aspects.

Table 1.17: How agricultural universities/colleges can improve technical content

Methods of technical content	Percent of responses
Practical teaching	38.22
Periodic curriculum	32.35
Emphasis on needs assessment research	11.74
Use qualified staff	11.76
Collaborative curriculum development between agricultural universities and organizations	5.88

Further, the use of qualified staff as instructors at agricultural universities and colleges was reported as another way of improving technical content. Qualified university staff has the capacity to conduct research, read, conceptualize and review both lecture and practical

content to be taught to students using right teaching methods. It was reported that some senior lecturers use their students to teach follow students especially at undergraduate level without prior knowledge on teaching methods. Such graduates have no capacity to develop their own teaching materials apart from carbon copying content that they themselves were taught while pursuing their studies. This practice therefore undermines the consideration to take care of community changing needs.

Collaborative curriculum development between universities, research institutions and organizations was also reported to be very vital in improving technical content at agricultural universities. This can be do through creating platform that brings together all universities or agricultural colleges, research institutions and all organizations that deal in agricultural sector to constantly update the teaching content in line with the changing needs of the society at national, regional and international levels.

3.3.4 Improving agricultural university/college facilities

Among the facilities reported to be improved are lecture and study rooms, laboratories and ICT infrastructure (Table 1.18). Study rooms were reported by the majority (51.5%) of the graduates as the facility that needed modernization if agricultural universities are to offer comfortable learning environment. Most of the university lecture rooms are usually too small to accommodate the growing number of students. In addition, some rooms have inadequate or no basic facilities such as furniture, internet connection, and projectors.
It was further noted that practical learning would be effective if modern laboratories with all the necessary equipment were in place. Renovating and expanding the existing laboratories should be the starting point. All university laboratories should be installed with ICT equipment and modern equipment that match with current technology. Related to laboratories in as far as offering students with practical learning, the institutions should set up farms where students would apply the theoretical knowledge from lecture rooms.

Table: 1.18 Ways of improving agricultural university/college facilities

Area for improvement	Percent of responses
Construction of modern study/lecture rooms	51.5
Construction of modern laboratories	15.2
Modern ICT equipment for research	15.2
Set up institutions farms	6.1
Subscription to relevant journals	6.1
Adequate field work facilitation to lecturers	6.1

3.3.5 Improving agricultural training institutions scientific skills

Recommending how agricultural training universities and colleges can improve scientific skills, the majority (44%) of the graduates suggested research oriented on innovation, adoption and action as the best way (Table 1.19). This would be achieved through strengthening partnerships with research institutions for testing research results and other universities for expertise sharing and exchange. Other reported ways of improving scientific skills in agricultural universities revealed were publications of research findings, establishing

food value addition exhibition centers, setting up of entrepreneurship development centers, and adopting farm field school system teaching system.

Table 1.19. Ways for scientific skills improvement

Areas for scientific skills improvement	Percentage responses
Promotion of Innovative, adaptive and action research	44.0
Establishment of university partnerships with research institutions/organizations	10.3
Publication	7.7
Establishment of food value addition centres	7.7
Establishing agricultural entrepreneurships centers	5.1
Adoption of farm field school system teaching system	5.1
Internship based on R&D partnership	2.6
Food security analysis	2.6
Establishment of best researcher award	2.6
Use of modern equipment in the laboratories	2.6

3.3.6 Improvement in practical application

Regarding improvements in practical applications, the graduates reported establishment of students' farm plots (by 51.3%), field attachments (26.3%), and equipping laboratories with modern facilities (13.9%) as the major areas (Table 1.20). These promote hands on learning in various areas of agriculture and agribusiness. Setting up training demonstrations farms, establishment of agricultural training outreach centres, involvement of private in university training programs, invitation of success agriculturalist as guest speakers at university and exchange programs between universities and farming communities were other reported areas that need improvement.

Table: 1.20 Areas of improvement for enhancing practical applications

Areas of improvement	Percentage responses
Individual student's farm plots	51.3
Field attachment	26.3
Equip laboratories	13.9
Set up university demonstration farms	11.1
Establish farmers' outreach training programs	11.1
Involve private sector for training input	8.3
Invite guest speakers to universities	2.8
Exchange visits between universities	5.6

3.3.7 Non-agricultural skills necessary for success

Graduates were further asked to report the non-agricultural skills they thought were necessary for students while still at universities/colleges. Financial management was the major recommended non agricultural skill as reported by 34.3% graduates (Table 1.21). Skills such as book keeping, budgeting and accounting were considered vital for agricultural project managers to ensure successful project implementation with accurate financial accountability. Marketing skills for agricultural products such as creation of market linkages, branding and promotion were also reported very important. Other skills reported are project management skills ranging from project design, planning, implementation, monitoring and evaluation. Project management skills empower agricultural graduates to serve better as project coordinators, program managers/officers and/or monitoring and evaluation officers. Other non agricultural skills that were deemed important were leadership, information technology and innovations, human resources management, business plan proposal writing, strategic planning and career guidance. The study noted that all non agricultural skills that were largely recommended were management, business and entrepreneurship skills. This justifies the need for diversifying scientific fields of study with business and social science skills in agricultural training institutions**.**

Table: 1.21 Non-agricultural skills that necessary for successful agricultural training

Non-agricultural skills	Percent of responses
Financial management	34.3
Marketing	29.3
Project management	8.0
Communication	5.3
Entrepreneurship	4.7
Leadership	4.7
Information technology and innovations	2.7
Human resource management	2.7
Business proposal writing	2.7
Strategic planning	2.7
Career guidance	1.3

3.3.8 Recommended links with the private sector

Responding to what links are necessary between the agricultural training institutions and the private sector, the graduates reported linkages with agro processing industries as the major link that should be established and strengthened (table 1.22). This is because of the benefits related to value addition, product development, quality control skills as well as job opportunities that these industries offer to agricultural students. Uganda's agricultural development strategy is centered on value addition thus university partnership with processing companies is one main way to produce graduates that are relevant to the job market.

Other public sectors such government ministries and statutory bodies were recommended by 35.1% graduates as another link that agricultural training institutions need for improved performance. The need for establishing links with both public and private sector will improve research done by universities by making it relevant, practical learning through increased field attachment/ internship, enrich agricultural curriculum relevant to needs of public and private sector as well as creating job entry points for agricultural graduates.

Research institutions and non-governmental organisations were other important university linkages recommended by the graduates. Collaboration with research institutions such as National Agriculture Research Organization boasts university research in agricultural through sharing of research agenda and facilities including personnel. Research gaps are jointly identified and relevant innovation and curricula are developed.

Other recommended agricultural universities links were tertiary institutions such as national teachers' colleges, vocational institutions and business schools for absorbing agricultural graduates, Enterprise Uganda for university graduates' entrepreneurship skill training and development, networking organizations such as AGRINET to connect both agricultural universities and agricultural value chains' actors for efficient service delivery in agricultural sector, agricultural producers (farmers), exporters, and agricultural exhibitors for absorbing graduates during internship and after graduation. All these are expected to improve training in agricultural institutions.

Table: 1.22 Recommended agricultural universities' links

Recommended links	Percentage responses(n=33)
Agro processing industries	37.0
Public sectors	35.10
Research institutions	13.51
Nongovernmental organisations	13.51
Tertiary instructions Vocational institutions	8.21
Enterprise Uganda	2.7
Networking organisation (agrinet)	2.7
Producers	2.7
Exporters	2.7
Agricultural exhibiters	2.7

3.3.9 Strategies through which primary, secondary and vocational schools can better serve human skill requirements

One reported way in which primary, secondary and vocational schools would better serve human skill requirements was use of school demonstration gardens (Table 1.23). School gardens in primary and secondary school as well as farms in vocational schools act as practical learning centres for students to put into practice the acquire theoretical skills. Demonstration gardens are known to be one of the ways of shaping learners' ability in crop and animals science management skills, agricultural project planning and management since each learner is given an opportunity to manage a plot. This can be synergized by early introduction of agricultural subject as well as making it compulsory for all learners both in primary and secondary schools based on its nature as a vocational subject. Other

recommended methods were incorporation of agriculture in co-curricular activities so that learners have more practice on school gardens and farms, designing of relevant curriculum with agribusiness component at all levels for agricultural entrepreneurship skill development. Career guidance to all age groups on the importance of agriculture was also recommended as one of the ways for primary, secondary and vocational institutions can use. This will motivate learners to treat agricultural subjects as a lucrative career with a variety of opportunities.

Table 1.23: Methods of improving agricultural training in primary, secondary and vocational schools

Methods	Percent of responses
School demonstration gardens/plots	33.3
Agricultural career guidance in all institutions	23.3
Early introduction of the subject	13.3
Making agriculture subject compulsory for all students	13.3
Teaching Agriculture as a co-curricular subject	10.2
Incorporation of agribusiness component curriculum at all levels of learning	6.7

4. Conclusions and recommendations

For agricultural universities and colleges to deliver quality training and produce graduates that are demanded by the market, regular curriculum review is a must. This activity should be done in partnership with other key stakeholders including the private and public sector institutions. Training facilities should also be modernized and field attachments/practical should be emphasized. The curricular should have components of business, management and planning to produce graduates who are able to handle multi skilled tasks as demanded today's job market.

Appendix

Tracer Survey Questionnaire used

Modernizing Africa Food Systems (MAFS) Consortium
Tracer Survey of Agricultural Graduates

Introduction

The Universities of Makerere, Pretoria and Michigan State are conducting a study whose objective is to develop the technical skills and institutional capacity required to modernize African food systems. The Universities are seeking input from agricultural graduates about how Agriculture Education and Training (AET) institutions can better prepare students for successful careers in agriculture and agribusiness. Part of the study involves a tracer study of graduates from the three Universities stratified by decades (1960-70s; 1980-90s; and 2000's) and gender (males and females). You have been selected as one of the graduates mentioned in the above category. Your responses will form a basis for recommendations to AET instructions.

A. PERSONAL INFORMATION

1. Sex: 1. Male 2. Female
2. Parents' highest level of education: 1. Father: _____2. Mother: _____
3. Parents' occupation: 1. Father: _____ 2. Mother: _____

Educational background

4. Year when you graduated from Higher Learning Institution _____
5. Name of Institution: _____
6. Program done: 1. Diploma 2. 1st Degree: 3. Postgraduate
7. Field of study: _____
8. Do you still have contact with the Institution since your graduation? 1. Yes 2. No
9. What courses did you find most useful in your formal agricultural education? _____
10. What activities did you find most useful in your formal agricultural education? _____

B: EMPLOYMENT

17. Were you already employed while studying for your first degree? 1. Yes 2. No
18. If you were already employed, was your job agricultural related? 1. Yes 2. No
19. How relevant was your agricultural training in getting your first job after graduation?
    1. Very relevant 2. Relevant 3. Not relevant
20. Since graduation, how many jobs/positions have you occupied? _____
21. How many of these jobs did you get because of your background in agricultural training? __
22. How relevant was your agricultural training in getting your current job?
    1. Very relevant 2. Relevant 3. Not relevant
23. What skills acquired during your training do you find most useful in your current position? _____
24. What skills or courses you acquired during your training but have proven least helpful?

_____

25. What practical work experience or links to private sector was included as part of your training? _____
26. Do you agree that your University/College education was a good preparation for your employment? 1. Strongly agree 2. Agree 3. Disagree
27. What skills you did not acquire during your training that would have enhanced your work performance? _____
28. What gaps, if any, do you see in your academic training? _____
29. How do employers rate the quality of graduates of the Agriculture and Education Training Institutions?
    (Use: ***1.*** *Very high;* ***2.*** *High;* ***3.*** *Moderate;* ***4.*** *Low;* ***5.*** *Very low;* ***6.*** *Don't know*)
    (a) Graduates of Agricultural Colleges: ____(b) Graduates of Universities: _____

C: RECOMMENDATIONS FOR IMPROVEMENT

30. Would you recommend a High School student well known to you to an agricultural course in Higher Institution of Learning? 1. Yes 2. No
31. Give reason(s) for your answer above: _____
32. What specific technical skill areas, in the agricultural and food sciences, do you believe will require the most significant manpower training in the coming two decades? _____
33. What do you think needs to be done to make agricultural training more relevant to employment? _____
34. How can agricultural Universities/Colleges improve in terms of:
    a. Technical content? _____
    b. Facilities? _____
    c. Scientific skills? _____
    d. Practical applications? _____
    e. Non-agricultural skills necessary for success: accounting, personnel, marketing, etc. _____
35. What links, if any, would you recommend with the private sector and AET (faculty and students)? _____
36. How can primary, secondary and vocational schools better serve the human skill requirements of agriculture and agribusiness? _____

Thank you so much for your time and responses