

FACT SHEET

MSc. Plant Breeding and Seed Systems

Rationale

Plant breeding, relying on judicious use of plant genetic resources for food and agriculture, has supplied adapted crop varieties to many countries across the globe and ensured food security. But because of limited capacity in Sub-Saharan Africa, and other factors, the impact is still limited in the region, resulting in persistent and rampant hunger and poverty. The process of producing improved varieties requires a strong human resource base backed by long-term commitment to plant breeding and functional seed systems. In many countries application of biotechnology to agricultural research and production has hailed a new era. There is the promise that application of biotechnology can speed up aspects of plant breeding, although the techniques complement rather than substitute conventional plant breeding. The MSc programme therefore aims at integrating traditional plant breeding, biotechnology and seed system approaches to increase the rate of developing new varieties and access to improved seed. The seed sector is still weak in several countries. Unfortunately, there is limited focused effort to build capacity in this area. However, Makerere University, Moi University and University of Zambia have some experience in this area.

Graduate profile

The programme will produce a plant breeder with a mix of knowledge and skills beyond just development of crop varieties, and with the innovativeness to meet future breeding challenges and demands. The graduate will have competencies in plant breeding, seed systems, plant biotechnology, and research methodology. These will allow the breeder to develop suitable crop varieties effectively and efficiently. In addition, the graduate will have non-technical competencies including socio-economics (eg. agri-business), ethical skills and cross-cutting development issues. These are critical for breeders as they in-

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Programme objectives

- To give graduates an opportunity to broaden their knowledge in plant breeding and seed systems by equipping them with an understanding of the concept and principles of genetics, plant breeding and agricultural biotechnology.
- To link plant breeding efforts to seed systems so as to enhance farmer access to improved seed and develop entrepreneurial capacity for managing a seed industry.
- To promote professional development of graduates in agriculture by providing the students with an understanding and hands-on experience of the different disciplines within the realm of plant breeding, biotechnology and seed industry.
- To develop agri-business skills and other social skills among the graduates.

Host Institution

Makerere University, School of Agriculture,
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ter-phase with communities in the definition of breeding objectives, during crop variety development and indeed dissemination of the technologies (the varieties).

Programme duration

The programme consists of course work and research leading to writing a thesis. The programme is implemented for two years covering a total of four semesters. The minimum duration is 18 months and the maximum is 3 years.

Curriculum structure and content

The course work plan for the degree consists of satisfactory completion of a minimum of **12 courses** (totaling **30 Credit Units**) of which eight core courses (**20 Credit Units**) are compulsory and a minimum of four (**10 Credit Units**) electives depending on the candidate's field of research interest. All course work with the exception of Graduate Seminar and Research Implementation Skills must be completed during the first two semesters. Year 2 is reserved for research and thesis writing. Students are required to attend Faculty of Agriculture seminars and scientific activities.

Mode of delivery

The programme has one year of taught course work, consisting of two semesters, and 1 to 1.5 years of research and thesis. The student research must address national and/or regional priorities identified by especially Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) and Southern Africa

Development Community (SADC), should support effective development of human resources for country and regional needs, and as much as possible cover the "orphan crops", forages and tree species that are not receiving much support through regional or global research efforts.

Method (s) of assessment

Coursework

Students sit coursework examinations on semester basis and are expected to pass all course units before formally starting research phase. The University uses External Examiners as part of quality assurance. Each course is assessed on the basis of 100% total marks with proportions as follows: Course work – 40%, Written examination – 60%. Coursework consists of laboratory work and progressive assessment (assignments/tests), each component assessed at 20%. Progressive assessment of laboratory work consists of 40%.

List of Courses

Core courses

- 1) Applied Agricultural Statistics and Biometry
- 2) Principles of cultivar development
- 3) Plant Cell and Tissue Culture
- 4) Practical Plant Breeding Methods
- 5) Graduate Seminars and research implementation skills
- 6) Quantitative and Biometrical genetics
- 7) Bio-policy, Bio-safety, Bio-ethics
- 8) Seed science and seed systems

Electives

- 1) Utilization of plant genetic resources
 - 2) Plant ecology and evolution
 - 3) Principles of population and evolutionary biology
 - 4) Social research methods
 - 5) Crop agronomy and physiology
 - 6) Agricultural marketing and management
 - 7) Crop pest ecology and management
 - 8) Disease management and epidemiology
 - 9) Environmental Impact Assessment
- Programme planning and management

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Thesis

The students are required to conduct research and write a thesis as partial fulfillment of the requirements for the degree award. Thesis examination is done according to the Senate- approved regulations of the hosting university, and has two components:

- i) Thesis evaluation by both internal and external examiners,
- ii) An oral examination (*viva voce*).

Implementation Progress and achievements

The regional programme at Makerere was launched in 2008. Subsequent cohorts of students reported in 2009, 2010, 2011 and 2012.

Field attachment

As part of regionality aspect and quality assurance, the programme has invited a number of visiting experts for teaching and / or supervision. Below is the summary statistics:

- National staff: 6
- Regional (ECSA region) staff: 6
- International (outside Africa): 1

Skill enhancement Courses

As part of quality assurance and building competencies beyond the technical, students in the programme undergo the following short skill enhancement courses (5-7 days): proposal writing, journal publishing, and scientific data management.

Student numbers

The Table below gives a summary of student statistics, including the numbers that applied for the programme per intake.

Table 1: Student numbers in the MSc. Plant Breeding and Seed Systems Programme (2008 – 2015)

Year of Intake	Student Numbers (% females in Brackets)	Status of Students	Countries of origin of Students
Cohort 1 (2008)	20 (38%)	All graduated	Burundi, Rwanda, South Sudan, Uganda,
Cohort 2 (2010)	19 (37%)	12 have submitted thesis; 7 are finalizing writing	Rwanda, Mozambique, Tanzania, Uganda Ethiopia, Kenya, Malawi, Uganda
Cohort 3 (2012)	21 (48%)	Currently Undertaking Course-work	Mozambique, South Sudan, Uganda Kenya, Rwanda, Tanzania, Uganda,
Cohort 4 (2013)	6 (30%)	Finalizing research work	Uganda, Tanzania
Cohort 5 (2014)	29 (48%)	Just completed coursework and now Initiating research activities	Tanzania, Uganda, Benin, Rwanda, Sudan, Kenya Ethiopia
Cohort 6 (2015)	9 (33%)	Just started coursework	Uganda, Ethiopia, Sudan, Tanzania

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The students as part of their training spend 4-6 months working with a seed company and are attached to the National Plant Breeding programmes in Uganda as well as with CGIAR institution in Uganda

Staff exchanges in the programme

As part of regionality aspect and quality assurance, the programme has invited a number of visiting experts for teaching and / or supervision. Below is the summary statistics:

- National staff: 8
- Regional (ECSA region) staff: 6
- International (outside Africa): 1

Skill enhancement Courses

As part quality assurance and building competencies beyond the technical, students in the programme undergo the following short skill enhancement courses (5-7 days): proposal writing, journal publishing and scientific data management.

Table 2: Tracer Study for Cohort I M.Sc. (Plant Breeding and Seed Systems) Alumni 2008-2010 at Makerere University

No.	Name	Nationality	Status	Position on return to home Institution
1.	Habarurema Innocent	Rwandese	Graduated	Research Scientist RAB Wheat Program, Rwanda
2.	Kwemoi Daniel Bomet	Ugandan	Graduated	Research Scientist Maize Program, NaCRRRI Uganda
3.	Namazzi Birabwa Sylvia	Ugandan	Graduated	Maize Breeder Victoria Seeds Uganda Ltd
4.	Namugga Prossy	Ugandan	Graduated	PhD Student ACCI-KwaZulu Natal, South Africa
5.	Ndacyayisenga Theophile	Rwandese	Graduated	Research Scientist RAB Potato Program, Rwanda
6.	Nsabiyera Vallence	Ugandan	Graduated	PhD Student University Sydney, Australia
7.	Nyombayire Alphonse	Rwandese	Graduated	PhD Student ACCI-KwaZulu Natal, South Africa
8.	Obala Jimmy	Ugandan	Graduated	PhD Student ICRISAT, India
9.	Onaga Geoffrey	Ugandan	Graduated	PhD Student University of Göttingen, Germany
10.	Ongom Patrick Obia	Ugandan	Graduated	PhD Student Purdue University, United States of America
11.	Shumbusha Damien	Rwandese	Graduated	PhD Student ACCI-KwaZulu Natal, South Africa
12.	Maurice Mogga Laddo	South Sudanese	Graduated	PhD Student ACCI-KwaZulu Natal, South Africa
13.	Mayada Mamoun Beshir	Sudanese	Graduated	PhD Student Makerere University, Uganda
14.	Gafishi Kanyamasoro Martin	Rwandese	Graduated	Research Scientist RAB Maize Program, Rwanda
15.	Inimahoro Micheline	Burundian	Graduated	PhD Student Stellebosch, South Africa
16.	Niyongabo Fulgence	Burundian	Graduated	Research Scientist ISABU Rice Program, Burundi
17.	Atwok Luka	South Sudanese	Graduated	Research Scientist – Maize program Ministry of Agriculture South Sudan

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Some anecdotal evidence: What the employers are saying

Dr. Vicky Ruganzu (Senior researcher working with Rwanda Agricultural Board and ASARECA focal person for Rwanda) had this to say in 2012: *“Until 2008, these scientists were only junior researchers with first degrees. The appointments mean that RAB is confident that these scientists are best suited to lead efforts to transform our agriculture”.*

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Table 3: Tracer Study for Cohort II M.Sc. (Plant Breeding and Seed Systems) Alumni 2010-2012 at Makerere University

No.	Name	Nationality	Status	Current Position/Institution
1.	Amongi Winnyfred	Ugandan	Graduated	Research Assistant, Bean program CIAT-Kawanda, Uganda
2.	Castiano Binaissa Uassaleia Levene	Mozambican	Submitted	Lecturer at ISPM, Mozambique
3.	Dramadri Isaac Onziga	Ugandan	Submitted	PhD student, Michigan State University, United States of America
4.	Iragaba Paula	Ugandan	Submitted	PGD student Makerere University/NextGen-Cassava Project NaCRRI, Uganda
5.	Kayondo Isamil Siraj	Ugandan	Graduated	PhD Student at WaCCI- Ghana
6.	Kesiime Eunice Vaviter	Ugandan	Defended	Research Scientist, National bean Research Program NaCRRI, Uganda
7.	Mukamuhirwa Floride	Rwandese	Graduated	Research Scientist, RAB - Bean program, Rwanda
8.	Munaganyinka Esperance	Rwandese	Graduated	Research Scientist, RAB - Rice program, Rwanda
9.	Nizeyimana Fidele	Rwandese	Submitted	Research Scientist, RAB - Maize program, Karama Station, Rwanda
10.	Ozimati Alfred Adebo	Ugandan	Graduated	PhD student Cornell University, United States of America
11.	Waniale Allan	Ugandan	Defended	Product Development Officer, Naseco Seed Company Nalweyo, Uganda
12.	Rashid Killoh Lussewa	Tanzanian	Graduated	Principal Agricultural Officer/Rice breeder, LZARDI-Ukiriguru, Tanzania
13.	Nyambok Anne Achieng	Kenyan	Writing	Teaching Assistant, University of Eldoret, Kenya
14.	Nolipher Khaki	Malawian	Submitted	Scientist at the Plant Genetic Resources Centre Chitedze, Malawi
15.	Okot Francis	Ugandan	Writing	Integrated Seed Sector Development (ISSD)- Abi ZARDI Arua, Uganda
16.	Liri Charles	Ugandan	Graduated	Research Scientist Bio-Innovate project at Makerere University, Uganda
17.	Aru John Charles	Ugandan	Submitted	Technician Finger millet project NaSARRI, Uganda
18.	Opio Robert Oluge	Ugandan	Writing	Agricultural Officer, Lira Uganda
19.	Lijalem Embaye	Ethiopian	Writing	Assistant Lecturer Mekelle University, Ethiopia