The Principal, College of Agricultural and Environmental Sciences to present the following for the Conferment of the
Degree of Doctor of Philosophy (Crop Science)

BIRUMA Moses

“Development of molecular based tools for resistance breeding of sorghum to Colletotrichum sublineolum”

Mr. Biruma’s work focused on identification and characterization of anthracnose disease resistance genes in sorghum, identification of new sources of resistance to disease as well as development of molecular makers closely linked and co-segregating with the resistance genes. He used molecular and conventional genetic approaches and identified seven genes five of which, play major roles in resistance. He exploited variations within identified genes and developed molecular markers that can be used for resistance breeding. He also identified unique sources of resistance among different sorghum races. Moses’ work has contributed to understanding mechanisms of sorghum-colletotrichum resistance and provides a foundation for continued functional studies in the sorghum-colletotrichum pathosystem. The work will aid breeders in the development of new sorghum varieties with durable resistances which are critical in mitigating hunger, poverty and malnutrition among sorghum growing communities.

Conferment of the
Degree of Doctor of Philosophy (Crop Science)

BYABAGAMBI Simon

“Cotton Pests and Natural Enemy Interactions in Uganda: A Basis for Biosafety Risk Assessment”

Mr. Byabagambi investigated the likely effects of Genetically Modified (GM) Cotton on non-target while playing an important role in pest control. There is paucity of knowledge regarding GM-cotton impacts on ecological environments and symbiotic relationships that favour the tri-trophic interactions. In addressing these gaps, a study was conducted to document the species/ecological processes of arthropods; prioritize exposure effect pathways; understand the dynamics of pests and search behaviour of natural enemies as influenced by plant characteristics. An updated cotton arthropod profile, with 41% of the arthropods at high risk of exposure to the GM cotton; varietal difference affecting arthropod behaviour; mutualistic interactions in pest control; ladybird larvae being better biological agents, and a framework for the predation process were some of the study outcomes. These findings provide a framework for biosafety risk assessment for cotton and other crops. The study was funded by DANIDA. Supervisors; Prof. Samuel Kyamanywa and Professor Gabor Lovei.

The Principal, College of Agricultural and Environmental Sciences to present the following for the Conferment of the
Degree of Doctor of Philosophy (Plant Breeding)

BOMBOM Alexander

“Interaction of mutant loci opaque-2 and waxy on kernel quality and disease susceptibility in maize”.

Mr. Bombom investigated the interaction of mutant loci waxy with opaque-2 on kernel quality and related plant agronomic traits in maize. Using biochemical and genetic tools, Alex demonstrated that combining the waxy with opaque-2 mutation in maize endosperm improved protein and starch quality of the grain. He also showed that plants that were single recessive for the waxy mutation were more susceptible to biotic stresses than were plants single recessive for opaque-2 or double recessive for the waxy and opaque-2 mutations in endosperm. Outputs from his studies include maize selections that can be advanced to develop inbred lines for hybrid development of specialty maize lines enhanced in vitamin A, protein and processing qualities of the grain with low susceptibility to biotic stress. The study was funded by the World Bank through the Millennium Science Initiative (MSI) administered the Uganda National Council for Science and Technology (UNCST).

Conferment of the

Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

MAPHOSA Mcebisi

“Enhancing genetic resistance to soybean rust disease”

Mr Maphosa’s study sought to understand comparative virulence of soybean rust in the major soybean producing areas of Uganda, understand the genetic basis of resistance and pyramid three soybean resistance genes pair wise in one genetic background. The study identified genotypes that had horizontal resistance to soybean rust that can be ideal sources of resistance. It also found that resistance is mainly controlled by additive gene and complementary additive gene effects. Gene pyramiding enhanced resistance to soybean rust in all the genetic backgrounds. Supervisors; Dr. Phinehas Tukamuhabwa and Dr Herbert Talwana and funded by the International Foundation for Science and RUFORUM.

Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

MUTURI Phyllis Wambui (Ms)

Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

MWOLOLO James Kyalo

“Resistance in tropical maize to the maize weevil and larger grain borer”

Mr. Mwololo’s study evaluated maize genotypes for reaction to maize weevil and larger grain borer through laboratory screening, determined genetic relationship in maize using SSR markers; and mapped QTL for resistance using single nucleotide polymorphism (SNP) markers. The study identified genotypes with dual resistance to the two pests, revealed high genetic divergence among the maize genotypes in relation to resistance and identified QTL for resistance to both pests. The resistant genotypes identified and wide genetic base can be exploited in breeding for resistance. The QTL for resistance identified need validation through fine mapping for adoption and utilization in marker assisted selection. This genetic information once refined, would increase selection efficiency and speed up breeding for resistance and funded by RUFORUM and CIMMYT. Supervisors; Dr. Patrick Okori and Dr. Stephen Mugo. Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

SADIK Kassim

“Enhancement of somatic embryogenesis in recalcitrant East African highland bananas”.

Mr.Sadik investigated the propagation and genetic improvement of EA-AAA banana. The study established proliferation potential of EA-AAA banana cultivars in MS medium through shoot-tip culture and determined combinations of urea-type cytokinins, TDZ and 4-CPPUand salt formulations for embryogenic callus induction from scalps and male flowers. The study developed a regression model for projecting recoverable shoots from a shoot-tip explant and revealed that in vitro proliferation ability and efficiency to recover shoots of EA-AAA cultivars can be improved during subculturing. The research achieved higher embryogenic responses among the studied cultivars suggesting that TDZ and CPPU particularly in Gamborg B5 salt can enhance somatic embryogenesis and overcome recalcitrance in many EA-AAA cultivars. Their application and optimization for induction of embryogenic callus and embryogenic cell suspensions, respectively, will enhance genetic engineering of the EA-AAA banana and funded by UNCST. Supervisors; Dr. Settumba Mukasa and Dr. Geoffrey Arinaitwe.

Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

SEFASI Abel Yoas

Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

TEMBO Langa

Conferment of the
Degree of Doctor of Philosophy in Plant Breeding and Biotechnology

TURYAGYENDA Laban Frank

“Towards improvement of Ugandan Cassava germplasm for drought tolerance”

Mr. Turyagyenda’s study evaluated cassava genotypes for response to moisture stress through field screening, and determined genetic diversity and drought tolerance genes using SSR markers and RT-qPCR, respectively. The study identified tolerant genotypes that can be used directly by farmers or as gene sources for breeding. It showed that most landraces were susceptible to moisture stress and therefore would require genetic improvement for sustainable production. The research revealed high genetic diversity among genotypes, suggesting wide genetic base which had not been exploited. The landraces showed unique alleles and thus their inclusion in hybridization would provide heterogeneous base populations. This research identified four candidate drought tolerance genes that can be used as gene-based markers to support genetic engineering and was funded by NCST and NARO. Supervisors; Prof. David Osiru and Dr. Elizabeth Baryejusya Kizito.

Conferment of the
Degree of Doctor of Philosophy (Agroforestry)

GWALI Samson

“Phenotypic, chemical and molecular characterization of shea tree (Vitellaria paradoxa subspecies nilotica) ethno-varieties in Uganda”

Mr. Gwali investigated the intrinsic variation in shea butter trees in Uganda as a basis for their conservation and breeding. Using participatory rural appraisal techniques, forty-four (44) ethno-varieties based on morphological and organoleptic traits were documented. Quantitative analysis of shea oil composition showed that all ethno-varieties are dominated by oleic acid, suggesting the importance of shea oil for cardiovascular health and cosmetic use. Nuclear microsatellite analysis showed that the highest genetic variation occurred within individual trees while the least variation was found among ethno-variety groupings, indicating that shea tree ethno-varieties are a single randomly mating population. Therefore, selection for conservation and/or breeding of this species should target the entire population. Financial support was received from Makerere University through the INNOVKAR project and Carnegie fund, ICRAF Small Grants, the French government and NARO, Uganda. Supervisors; Dr. John Bosco Lamoris Okullo and Dr. Gerald Eilu.

Conferment of the
Degree of Doctor of Philosophy (Forestry)

MWANJA Matthew