.

MAKERERE UNIVERSITY

P.O Box 7062 Kampala Uganda
URL: http://www.cns.mak.ac.ug

Phone: +256 414 532401
e-mail: principal@cns.mak.ac.ug
Fax: +256 414 531061

COLLEGE OF NATURAL SCIENCES

Office of the Principal

27th November 2017

PRESS RELEASE: INTEGRATED CROP MANAGEMENT FOR SCALING UP BANANA PRODUCTIVITY IN EAST AFRICA; RESEARCH PROJECT

The above mentioned research programme is implemented by a partnership between the College of Natural Sciences (Makerere University) through the Department of Plant Sciences, Microbiology and Biotechnology working with**:** NARO-NARL, Banana Research program (Main grantee), Uganda; International Institute of Tropical Agriculture (IITA); Agricultural Research & Development Institute (ARDI)-Tengeru, Tanzania; Agricultural Research & Development Institute (ARDI)-Maruku, Tanzania; and Bioversity International. It is a four-year project worth USD 5,700,000 (US Dollars Five million and seven hundred thousand) funded by the Bill and Melinda Gates Foundation. Dr. Jerome Kubiriba is the overall project Team Leader and is also the Head of Uganda's National Banana Research Program of NARO at Kawanda. **Role of CoNAS, Makerere University:** Under the leadership of Dr. Arthur K. Tugume the focus is on addressing a basic scientific detail of unravelling the mechanisms by which banana plants recover from *Xcm* bacterial infestation, using laboratory- screenhouse- and field-based methods. The most important beneficiaries of all this research are: Smallholder banana farmers in Uganda and Tanzania, and entire ECA regions; Research fraternity with the new knowledge from the project through increased banana productivity; Private sector will establish demand for their produce; Media will improve their capacity to more accurately document and report agricultural development; Extension workers will build capacity through technical information from project; and Partnerships will be enhanced among the institutions working on the project.

Despite the prime importance of banana in Uganda and East & Central Africa (ECA) region, productivity has remained too low, being unable to exceed 30% of the crop's production potential of 60-70 tonnes ha^{-1} yr^{-1}. In this region, banana production is largely by the efforts of smallholder farmers most of whom own < 0.5ha of land. Therefore, closing the banana yield gap is crucial if the food self-sufficiency, income, and livelihoods of the region's smallholder banana farmers are to be sustained. Over 100 million people in East and Central Africa (ECA) depend on banana for food and/or income. In Uganda alone, over 10 million tons are produced annually making Uganda the world's second largest banana producer. All (100%) of the bananas produced in Uganda are also consumed locally with the world's highest per capita annual banana consumption of 1kg per person per day, translating into income and food security of 70-85% of small-scale farmers in Uganda.

Project Objectives. The main objective of the project is to reduce yield gap and extension support gap in banana productivity in Uganda and Tanzania. This will be achieved by:

(a) Firstly, unravelling strategic critical information necessary for increasing banana productivity.
(b) Secondly, there will be massive testing of the decision support tools on farmers' fields in 5 target sites in Uganda and Tanzania.

(c) Finally, ensuring sustainability of the innovation pipeline for continuous improvement and increase in banana productivity in target sites and beyond through effective communication and information sharing.

The research investment is built on the understanding that:

1. A complex set of biotic and abiotic stresses significantly constrains banana production in ECA including Uganda. The most notable of biotic stresses include banana Xanthomonas wilt (BXW, the most destructive diseases of banana, caused by the bacterium *Xanthomonas campestris pv. musacearum*, *Xcm*), weevils, nematodes, and black Sigatoka fungal disease, while the main abiotic stresses are nutrient deficiencies and drought. The impact of these constraints on banana is not uniform but varies in relative importance in space and time.

2. Banana yields, observed from proper management of some of the most critical biotic and abiotic constraints in isolation shows that it is possible to register 20-65% yield gain without increasing the available arable land under banana cultivation. BXW alone when properly managed leads to a yield gain of 80-100%.

3. The efforts in #2 above, notwithstanding, they are isolated in constraint, space and time. Consequently, the positive synergies that would come out of the different efforts are not optimally exploited to address the banana yield gaps. Interactions between the constraints and/or management need to be considered when customizing interventions to farmers' contexts. For example:
   (a) Potassium (K) and nitrogen (N) exported (harvested) off farm in bunches amount to 20-80 kg K and 10-20 kg N ha^{-1} yr^{-1}, respectively. Such unchecked nutrient losses are bound to exacerbate the nutrient deficiency constraint and associated biotic and abiotic stresses over time.
   (b) Weevil damage in K-deficient plants is twice that suffered by plants that have sufficient K supply. Plants that are deficient in K suffer twice the yield reduction as those that are well-nourished with K.
   (c) Black sigatoka fungal disease is more aggressive on banana plants that are either drought-stressed or nutrient-deficient.
   (d) Resistance to BXW in banana plants is enhanced with application of Silicon (Si), with Si-treated plants showing a higher activity of peroxidase enzymes, although Si is not a critical element for plant growth and development.

4. BXW disease alone can wipe out entire banana plantations, and if not controlled is the single most powerful threat to eliminate the entire banana industry in ECA. There is no information on how crop nutrient and water requirements may impact BXW and *Xcm* latent infections which have been blamed on the resurgence of BXW in areas where the disease was previously controlled.

5. Intensification of banana production in ECA including Uganda is urgently needed to boost productivity in line with increasing demand associated with escalated population pressure. Crop nutrient norms, dynamic crop growth models, a range of pest/disease and water management practices, work in isolation; this project is tasked with generating and recommending a synergy that will catalyze a reduction in banana yield gap.

6. The profitability of mineral fertilizers in banana reduces with increasing distance from the main banana markets, which calls for combined use of mineral and organic nutrient sources and soil water conservation measures since most banana production zones are distant from the markets. The interactions suggest that there are tradeoffs to be optimized and synergies to be harnessed for exploitation with respect to management of these constraints, which complex propositions that require guidelines or decision support tools for simplification. These are currently not available.

For any further information, please contact:

1. Dr. Arthur K. Tugume
   Principal Investigator,
   Department of Plant Sciences, Microbiology and Biotechnology
   College of Natural Sciences, Makerere University,
   P.O. Box 7062, Kampala, Uganda.
   Email: aktugume@cns.mak.ac.ug
   Tel: 0772 514841

2. Prof. J.Y.T. Mugisha
   Principal, College of Natural Sciences
   P.O. Box 7062, Kampala.
   Email: principal@cns.mak.ac.ug
   Tel: +256 414 532401

3. Zaam Ssali
   Communication Officer
   College of Natural Sciences, Makerere University
   P.O. Box 7062, Kampala
   Tel: +256 414 532401
   Mobile: 0772 406356
   Email: pr@cns.mak.ac.ug / zssali@cns.mak.ac.ug