PROCEEDINGS

The First International Congress on Postharvest Loss Prevention

Developing Measurement Approaches and Intervention Strategies for Smallholders

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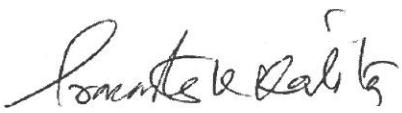
The First International Congress on Postharvest Loss Prevention

Dear Readers,

We are happy to publish the proceedings of the First International Congress on Postharvest Loss Prevention. This is a unique event planned to provide a forum for various stakeholders to share, learn, and work together to develop and plan action items for reducing postharvest loss (PHL). The abstracts represent four themes. The first theme, Postharvest Loss Status & Emerging Issues, highlights losses occurring in various countries, defines specific needs, and identifies technical, social, and policy regulatory factors causing these losses. The abstracts in the second theme, Intervention Strategies for PHL Mitigation, cover topics of innovative/emerging postharvest technologies, farm mechanization and its effect on postharvest quality, economic assessment for sustainability of postharvest technologies, and critical stages in supply chains with a focus on research. The abstracts on Measurement Methods & Metrics of PHL theme address tools and standards/protocols for postharvest quality and quantity loss assessment. As a central theme of the First Congress, the ability to measure PHL using scientific methods is critical for mitigating losses and evaluating the impact of interventions. The abstracts in the final theme of the conference, Education Platform and Decision Support System, focus on the need to develop knowledge platforms and decision support systems, and discuss successful examples where effective tools and community participation proved beneficial.

This publication includes a total of 101 abstracts. The rich contents of this proceedings cover topics related to issues in postharvest loss and approaches for its prevention for many different crops under a variety of climatic conditions. We would like to thank all the authors and their respective organizations. We sincerely thank the Archer Daniels Midland (ADM) Company for establishing the ADM Institute for the Prevention of Postharvest Loss and its support of the First Congress and publication of this proceedings. We would like to thank all members of the Program Committee, including the co-chair Dr. Dirk Maier, for reviewing the abstracts and making useful comments for revisions. I also thank the staff of the ADM Institute for their help in getting all the abstracts in order. Two dedicated people significantly contributed to the publication of this proceedings. Dr. Deepak Kumar of the ADM Institute and Dr. Kathy Partlow of the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois spent many sleepless evenings reviewing and editing the abstracts and finally bringing this proceedings into the current shape. I truly appreciate both of their work and dedication. Without support, guidance, and inspiration from colleagues of the Food and Agriculture Organization (FAO) of the United Nations, the Rockefeller Foundation, the Bill & Melinda Gates Foundation, John Deere, United States Agency for International Development (USAID), University of Illinois at Urbana-Champaign, and the College of Agricultural, Consumer and Environmental Sciences (ACES) at the University of Illinois at Urbana-Champaign, this Congress, Program, and the proceedings would not have come together, and I express my sincere thanks and gratitude to all of them.

Thank you.



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Abstract # ADMI092

Local knowledge for food security in Uganda; Postharvest practices in homegardens of the Ugandan Southwest

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Introduction: Postharvest Losses (PHL) in East Africa destroy 20-60% of the food production (FAO 2011); in Uganda PHL are 35% for fruits and vegetables (Mulumba 2015), with up to 60% losses of more vulnerable crops such as tomatoes (Ogang 2011) primarily due to mold and rot (Kaaya et al. 2005; Kaaya & Kyamuhangire 2006). In seeking solutions to the overwhelming problems of food insecurity in East Africa, reducing PHL may be more effective than increasing yields or farming area (Lotze-Campen et al. 2008; RockstrÃm et al. 2009) with a greater impact than improved cultivation methods (Goletti & Wolff 1999) to sustainably increase the volume of available food, without adverse effects on the regional ecological and economic situation (Hensel 2011). A study of botanical diversity and associated specific cultural practices of Ugandan homegardens in the Greater Bushenyi found many potential endogenous solutions to PHL. Methods Data collection took place around Rubirizi, Sheema, and Ishaka within the Greater Bushenyi Region of the southwest of Uganda, to assess plant use, and to understand related cultural and socio-economic factors. It sought to learn the plant diversity and associated traditional knowledge of farmers in 102 homegardens within 3 distinct geographic areas (forest edge, savannah, wetland). The study was guided, but not constrained (c.f. Vayda 1983), by the hypotheses that the three different biodiversity zones would contain distinct species and traditional knowledge. Villages were randomly selected from groupings of those that fell within the three pre-determined distinct biodiversity locations across the greater Bushenyi region. 11-12 households were randomly selected from each of 3 villages in the forest-edge communities of the far western highlands near Rutoto town in Rubirizi district (Kinoko-A, Kinoko-B, and Remitagu), 3 villages (cells) in the savannah and semi-urban areas of Bushenyi center around Ishaka town (Buhuma, Buramba, and Fort Jesus), and 3 villages in the wetlands of Sheema in the southeast near the town of Bugongi Kyarykunda, Rwabizi, and Nakashambya). Data collection followed a systematic approach fitting to the local culture and included three interviews, in February to April of 2015, based on semi-structured questionnaires about the uses for plants and postharvest practices. Cited species were recorded and identified by Ankole, Luganda, Lukiga, and Latin names with the help of farmers, local botanists, and botanical guidebooks. Specimens were conserved in a field press and are now part of the Makerere botany collection. All data was recorded and uploaded digitally in the field using Microsoft Excel (14.1.0, 2011). Names, uses, and postharvest treatments of recorded species were digitized and subsequently imported into the statistical package R (R version 3.1.1 Copyright (C) 2014 The R Foundation for Statistical Computing). Multiple linear regression analysis was performed using the "lm" function of the R package "psych". Independent 2- group Mann-Whitney U Tests were performed using the R function "fisher.test" and "wilcox.test". Results Local knowledge on postharvest practices for plants was a common factor to all gardens in the sample. By order of importance: farmers commonly processed millet (Eleusine coracana), dried and pounded to make a traditional sweet and sour fermented drink known as Bushera and a wet loaf known as Kalo; peanut (Arachis hypogea) was the next most important, sun-dried or roasted for cooking with meat or as a porridge; beans (Phaseolus spp.), peas (Pisum sativum), and soybeans (Glycine max), were commonly sundried and stored to be cooked as porridge or sold; cassava (Manihot esculenta), was often

sundried and powdered; sweet potatoes (Ipomoea batatas), and potatoes (Solanum tuberosum), were stored for longer periods after harvest; coffee (Coffea canephora), was sundried, as was sorghum (Sorghum bicolor), maize (Zea mays), and tobacco (Nicotiana tobaccum). Fisher's Exact Test for Count Data found significant differences in the number of different postharvest treatments between those homegardens found in swamps of Sheema and those in the forests of Rubirizi. Also important for PHL in the gardens is growing plants that have a flexible year-round harvest. Important plants belonging to this category included three plants eaten as tubers, fourteen used as herbs and five used as spices. Tubers included, arrowleaf elephant ear (Xanthosoma sagittifolium), cassava (M. esculenta), and yam (Dioscorea cayenensis). Herbs included african spiderflower (Gynandropsis gynandra), amaranth (Amaranthus spp.), cranberry hibiscus (Hibiscus acetosella), little mallow (Malva parviflora), rosemary (Rosmarinus officinalis), and tea (Camellia sinensis). Spices included chili (Capsicum frutescens), ginger (Zingiber officinale), lemongrass (Cymbopogon citratus), mlelgueta pepper (Aframomum angustifolium), and sugarcane (Saccharum officinarum). Plants kept in the homegardens that offered a flexible year-round harvest were grown mostly in older gardens; multiple regression analysis showed a positive influence of garden age on the presence of these plants. Farmers manage their homegardens as intercropped banana plantations (Musa spp.) under constant harvest, with banana plants at various stages of maturity. The Musa cultivars Kayinja/Kivuvu and Kisubi are used for making alcohol, representing the only way that bananas are preserved in the gardens. These are harvested green and rot in one week. Sweet Musa cultivars Bogoya and Kabaragara can last for 2 weeks if harvested very young. Whereas Musa cultivars used for cooking Bukumu, Embire, Embwaziruma, Entaragaze, Entukura, Enyeru, Enzagata, Enzirabahima, Eshakara, Gonze, Kibuzi, and Muzuba can last longer than one week after harvest with the exceptional case of the Gonze cultivar which, if harvested young, can last up to 1 month. Regression analysis revealed a significant positive effect of the richness of sales (different plant products sold) on the practice of postharvest preservation on farm. Furthermore, regression revealed an effect of the number of days that a homegarden was used a year on the same process, the more days a garden was used the less postharvest preservation was practiced. In homes with very elderly heads, there is evidence that there exists special traditional knowledge of fermentation techniques and other special postharvest practices to keep food longer for household consumption. Discussion and conclusions Traditional Ugandan foods and crop choices are important mechanisms not only of PHL but also for conservation of traditional culture in Greater Bushenyi. This study is an early step in recording the local knowledge to compare their economic, ecological, and socio-cultural significance. It aims to contribute to a neo-gastronomy (Tencati & Zsolnai 2012), to regard indigenous plants as traditional food and nutrition, to encourage farmers to plant and utilize indigenous plants (Tabuti et al. 2011). That no special food preservation techniques would be found was a widely supported null hypothesis (FAO 2011; Ogang 2011). The actual case was rather that few special conservation or preservation techniques were present in the sample. However, there were many traditional, naturalized, and introduced plants kept in the homegardens that offer year round harvest. Future investigations should explore these traditional knowledge systems expressly using en ethnographic approach. Acknowledgements This project (031A247B) is financially supported by the Federal Ministry of Education and Research (BMBF) within the collaborative research project GlobE-RELOAD.

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