

# Sweetpotato Action for Security and Health in Africa



## Weevil resistant sweetpotato through biotechnology

### What is the problem?

Feed the people not the weevils; that is the aim of this project. Sweetpotato weevils are the most important pest to threaten sweetpotato productivity, marketability, and sustainability in areas with significant dry periods. Indeed, reports indicate that weevils can wipe out as much as 60 to nearly 100% of sweetpotato crops during periods of pronounced drought. This is particularly devastating during dry periods when sweetpotato is sometimes the only food available. To make matters worse, with climate change predictions for Sub-Saharan Africa (SSA) foreseeing an expanding dry season, the threat and impact of weevils may increase further.

Our previous experience has shown that conventional integrated pest management procedures are not widely adopted by smallholder farmers in SSA because it is extremely difficult to control field sanitation in a small-scale subsistence production system. In addition, the common practices of in-ground storage, piecemeal harvesting, and strip

harvesting mean that sweetpotato crops are exposed to weevils throughout a significant part of the year.

Extensive efforts to develop weevil-resistant sweetpotato through conventional breeding have failed in spite of considerable investment over the past 20 years. There is little farmers can do currently when weevil attack starts, other than to quickly try to harvest what is left of their crop.

### What do we want to achieve?

Varieties with weevil resistance can be achieved by combining breeding and biotechnology. Indeed, crops that express proteins from *Bacillus thuringiensis* (Bt), a bacterium known for killing insect pests, currently represent the “best-bet” for achieving sustainable weevil control under African smallholder conditions. Almost thirty years of research and development, and a decade of commercial use of other Bt crops, have demonstrated a very high record of success. The use of Bt, for example to control the bollworm in cotton and stemborers and rootworm



The Sweetpotato Action for Security and Health in Africa (SASHA) is a five-year initiative designed to improve the food security and livelihoods of poor families in Sub-Saharan Africa by exploiting the untapped potential of sweetpotato. It will develop the essential capacities, products, and methods to reposition sweetpotato in food economies of Sub-Saharan African countries to alleviate poverty and under-nutrition.

in maize, has resulted in both a significant reduction in insecticide use and increased yields. Farmers, including smallholders, have been the primary beneficiaries of the technology and in the case of Bt sweetpotato, women would gain back considerable time spent carefully removing weevil infected sections in roots prior to cooking.

🕒 **How are we going to make it happen?**

In 2004, under the original sponsorship of the Rockefeller Foundation, CIP facilitated the foundation for development of weevil-resistant varieties for SSA countries based on the Bt technology. Key to success was the identification of partners with complementary expertise including the National Agricultural Research Organization of Uganda (NARO) and Auburn University (AU) in the USA. In 2007, this group identified three distinct Bt proteins exhibiting weevil toxicity at levels similar to proteins expressed in commercial Bt crops. Soon after, weevil resistant genes were designed using genetic information from the sweetpotato crop itself in order to make 3 sweetpotato-like weevil resistance (WR) genes. These are now introduced into susceptible varieties with the intention of turning them into fully weevil resistant varieties. The best two WR genes will be used in combination to reduce the likelihood that weevils will develop resistance to the WR proteins. The most promising plants with full resistance will also be integrated into breeding programs to enable the development of new varieties that meet local farmer preferences and are adapted to the expected drier environment. At this point, it will also be possible to combine

these WR gene(s) with other weevil resistance components, such as those from the recently characterized variety New Kawogo. This will be achieved using conventional breeding techniques, drawing on the long-standing experience of Ugandan scientists in the national sweetpotato improvement program.



🕒 **Capacity Strengthening is Key**  
Lydia Wamalwa, a Ph.D. candidate from Kenya



🕒 **Biotech Wagabolige** (with a weevil-resistance gene) (credit M. Ghislain, CIP)



🕒 **Damage roots by weevils** (credit M. Smit)

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