

FY2019 FTFMS Performance Narrative

Project Summary

Late blight (LB) is the most devastating disease of potato worldwide. In Uganda and elsewhere in sub-Saharan Africa, LB is causing 10% to 60% yield loss. It is controlled by fungicides (5-15 sprays), which represents a cost of 100-300 \$/ha and exposes farmers and their families to toxic chemicals. Using biotechnology, scientists at the International Potato Center (CIP) have introduced 3 LB resistance genes from potato relatives into four varieties grown in east and central African countries. CIP and Ugandan scientists of the National Agricultural Research Organization (NARO) have consistently observed complete resistance to late blight disease of these biotech potatoes during several seasons in the field. Farmers adopting such biotech potato would increase profit by at least 40% or 450\$ / ha. CIP aims at deploying these bioengineered late blight resistant potatoes in African countries through partnerships with their National Agricultural Research Services (NARS) and the private sector where biosafety regulations authorize the commercialization of bioengineered varieties.

FY19 Performance

The insertion of the 3 resistance genes into the popular variety 'Victoria' was found to be complete and without problematic changes in the transgenic event Vic.172. An event-specific detection tool for this event was developed. Molecular characterization of the insertion site of events from the other three varieties, 'Desiree', Tigoni', and 'Shangi', led to the identification of candidate events with good insertions but we are yet to complete their full characterization. Tuber seeds of Vic.172 produced in Kenya were shipped to the NARO potato research station in Uganda where they were planted on March 19 in a confined field trial (CFT) site. Under natural infection, the conventional 'Victoria' potato plants were destroyed by late blight whereas all plants of Vic.172 remained completely unharmed. Yield was approximately 26 t / ha which was regarded as normal. All CFT activities were done by NARO staff with the presence of CIP staff and members of the Ugandan National biosafety committee.

Successes

The demonstration that the potato event Vic.172 had complete resistance to late blight and expected agronomic performance was the result of the collaborative work between the CIP team in Kenya, the lab of Dr. Suping Zhou at Tennessee State University in the US, and the NARO potato team lead by Dr. Alex Barekye in Uganda. In parallel, we have developed collaborations with the Kenya Agriculture and livestock Research Organization (KALRO) in Kenya, the Rwanda Agriculture Board (RAB) in Rwanda, and recently with the Ethiopia Institute for Agricultural Research (EIAR) in Ethiopia and the National Root Crops Research Institute Umudike (NRCRI Umudike) in Nigeria. Indeed, these countries have potential for adoption of the late blight resistant potato Vic.172. Field trials are needed in these countries, but if successful, it will multiply the target areas and small-farm beneficiaries significantly with modest additional investment.

IM Challenges

During the previous year, there have been clear signs of a high-level change in support to biotech crop commercialization in Uganda. Nevertheless, the new law establishing the pathway for commercialization was amended with overly restrictive clauses, although it was finally not passed. This led to a legal vacuum and strong Freedom to Operate uncertainties over the future of commercialization of biotech crops in Uganda. Like other CGIAR and public institutions with biotech crop projects, we have decided to put on hold the planned activities for commercialization. However, we will finish the regulatory trials in order to complete a primary regulatory dossier which can be, for the most parts of it, transportable to other countries where the 'Victoria' variety is adaptable.

Lessons Learned

The shift in political support to biotech crop commercialization which happened during the last year in Uganda, is a situation that has been encountered in several parts of the world previously. Hence, the product that is designed usually to fit the most promising target country must be available and useful to other countries in case the target country becomes overly restrictive. Fortunately, we focused on the variety 'Victoria' because it is also grown in Rwanda, Burundi, DR Congo, Kenya, and Tanzania. We also believe it may be suitable to Ethiopia or Nigeria, two countries with clear signs of political support to commercialization of biotech crops.

Description of Expected Activities

The activities in 2020 will consider:

- To continue the multilocational confined field trials in Uganda with Vic.172 and 'Victoria'.
- To collect the data for risk assessment to write a primary dossier for the event Vic.172.
- To establish a new collaboration and a work plan with EIAR in Ethiopia and possibly Nigeria while initiating the first activities: relevant permits, material transfer, confined field trial site, and seed multiplication.
- To train a female scientist from EIAR on genetic engineering of an Ethiopian potato variety to confer it resistance to late blight.
- To encourage the adoption of the 3R potato technology in Uganda, Kenya, Rwanda and Nigeria with the local authorities and other communications means.