



*Scientists from National Crop Resources Research Institute at the harvesting cassava field meant for trial and analysis of research work carried out in the Laboratory. Photo Credit: Lominda Afedraru*

## Ugandan scientists close in on gene-edited cassava

By Lominda Afedraru

**A**FRICAN researchers are optimistic that gene editing will help solve the continent's agricultural challenges such as infestation of cassava brown streak virus (CBSV) that is ravaging the crop in Uganda and other East African countries.

Cassava is the third most important food crop in the tropics, comprising 30 to 50 percent of all calories consumed in sub-Saharan Africa. But yields have not increased in the past 25 years, due to plant viruses that make the crop inedible.

The crop has had challenges being infested with CBSV and Cassava Mosaic Virus (CMV), which have seen its yield dwindle over the years.

However, scientists like Dr John Odipio of Uganda's National Crop Resources Research Institute (NaCCRI), see a solution in breeding cassava-resistant to the viruses using genetic modification.

Dr Odipio, who studied for his PhD in gene editing at the Donald Danforth Plant Science Center in St. Louis, Missouri USA, has come up with an extract using CRISPR technology to help the plants resist the disease and fight off the white flies that spread the virus from plant to plant.

Dr Odipio has given his extracts to his NaCCRI colleagues, who are going to start the cassava breeding process using gene editing in their laboratory.

NaCCRI researchers will test the process that Odipio refined in a hybrid cassava variety currently being grown by farmers across the country.

"The idea is to start gene editing technology research here in Uganda," said Dr. Henry Wagaba, an expert on the gene silencing phenomena in plants.

"It will be the first of its kind and will enable us to move forward. What we shall do is to silence some piece of gene in the Nase 13 cassava variety and understand how it works in order to develop a variety which is clean from CBSV."



*Scientists from the National Crop Resources Research Institute during the harvesting of cassava under field trials.*

*Photo Credit: Lominda Afedraru*

The team already secured an authorization permit from Uganda National Council of Science and Technology, as required and started the research work in February 2023.

Dr Odipio's research team in the United States is also willing to extend its knowledge to address key challenges affecting African cassava farmers, such as CBSV, CMV and weed control.

They have developed cassava varieties that can tolerate the application of herbicides, which will reduce the need for manual weeding often performed by women in Africa. They are also pursuing cassava varieties rich in quality starch that can be used in industrial applications and traded in the international market.

Research is also under way on potential gene edited lines that flower early, thus shortening the breeding cycle and allowing scientists to deliver improved varieties to farmers more quickly.

#### Gene Edited early flower breeding

Under field environment cassava does not flower at the same time as breeders would prefer especially when carrying out crosses. This makes them to take too long to develop a new variety. His technology will enable cassava to flower at the same time thereby saving breeders time for development of new varieties from ten years to six years or less.

The research will support timely development of climate-resilient varieties.

But Dr Odipio would like to see biosafety and regulatory systems in African countries updated to enable them to bring them up to speed with developments in scientific discoveries and create a friendlier environment for agricultural products bred using advanced technologies, including gene editing.

African countries have not yet taken a position on the regulatory framework of gene editing in the crop sector, said Arthur Makara, the commissioner in charge of outreach at Uganda's Ministry of Science, Technology and Innovation. But in the medical world, he noted, things are somehow different because products produced using gene editing are already in the market.

He said that regulations concerning gene editing will be approached on a case-by-case basis in African countries.

"This initiative of cassava gene editing is the first of its kind in Uganda," Mr Makara said. "In as far as a farmer accessing the gene-edited cassava variety is concerned, that is if the research is successful, this may not require following the current controversial GMO Law.

This is because scientists are aware that gene editing is not the same as GMO. This is a technology with a clear research path which does not involve the transfer

of genes from one organism to another. Secondly, the current GMO law is not yet signed by the president. It would therefore be speculative to say Uganda will follow the GMO law in releasing gene-edited products."

He said the Ministry of Science, Technology and Innovations had started a benchmarking discussion with other countries where gene editing is at advanced stages, including Brazil, Canada and the US. This will guide Uganda in considering whether to draft a new regulatory framework for gene-edited products or amend the current GMO law to include aspects of regulating gene editing.

Though GMOs have been the subject of intense opposition much of it financed by groups in Europe that has stalled their adoption in Africa, it's unclear whether activists will have the same influence on gene editing.

It is not possible for anti-GMO activists to block scientific innovations because science speaks for itself," Makara said.

Secondly, there are EU academic bodies with highly qualified scientists who have stood their ground, saying genetic engineering does not cause harm to human beings and other species in the environment. This therefore means those opposing these technologies cannot predict what will happen in the future regarding advancement of science and technology.