

## Gene editing key to sustainable agriculture in Africa, scientists say

**A**frica must update its regulations to accommodate the gene-edited crops needed to sustainably intensify agriculture to feed the continent's growing population, a new study says.

"Sustainable intensification of agriculture in Africa is essential for accomplishing food and nutritional security and addressing the rising concerns of climate change," write the authors of a [review article](#) published [May 12] in *Frontiers in Genome Editing*.

This is especially important for Africa, where the population is expected to double by 2050, making food security the continent's primary the main challenge.

The main global challenges facing agriculture are producing more food with the same or less land and water, improving nutrition and helping farmers adapt to climate change, the authors write.

"The world can only meet its future food needs by harnessing scientific agriculture innovation. The full potential of new breeding tools such as genome editing needs to be exploited in addition to conventional technologies," assert the authors, who are based at the International Institute of Tropical Agriculture (IITA) and Kenyatta University in Kenya and the International Maize and Wheat Improvement Center (CIMMYT) in Mexico.

"Genome editing has the potential to reduce inputs such as fertilizers, pesticides, etc., increase yields, improve nutrition and develop climate-resilient crops," the authors note. "Intensive efforts are underway; however, little has gone up to commercialization."

This is partly due to the lack of an enabling regulatory environment. While Nigeria and [Kenya](#) have [published national biosafety guidelines](#) for regulating gene editing, other African nations need to get on board to support the release and adoption of gene-edited plants currently under development on the continent, the authors say.

These include improved bananas, cassava, maize, sorghum, wheat and yam — foods that are both dietary staples for millions of Africans and an important source of income for smallholder farmers.



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Researchers are using gene editing tools to address serious problems facing these essential food crops. Their work involves conferring resistance to devastating plant diseases, pests and parasitic weeds; enhancing nutritional content; delaying ripening to reduce post-harvest losses; building resilience to climate impacts and unpredictable weather patterns, such as floods, drought and high temperatures; and improving grain quality and yield.

Though conventional breeding remains a valuable tool, gene editing offers the advantage of being able to achieve results more accurately, efficiently and quickly, the authors note.

“The CRISPR-based genome editing tool is considered as one of the powerful technologies for improving agriculture to feed the rapidly growing population,” the scientists write. “It can develop genome-edited crop varieties with no foreign-gene integration like those created through conventional breeding.”

Across the world, governments are choosing to regulate products developed through gene editing differently than those that are genetically modified (GMOs), which typically involves introducing genetic material from another organism.

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Chile, Brazil, Colombia, Paraguay, Ecuador, Honduras and Guatemala have all followed Argentina's example in determining that gene-edited crops with no foreign gene will not be subjected to GMO regulation, the authors note. Similarly, Australia will not regulate gene-edited products without foreign genes as GMOs.

Canada developed a product-based risk assessment framework based on the novelty of the products. The United States, on the other hand, regulates the characteristics of the genome-edited products and not the process to develop them.

"Genome-edited crops lacking any foreign gene and that do not pose a risk to other plants and genome-edited food showing no food safety attributes different from those of conventionally bred crops are not subject to regulatory evaluation" in the US, they write.

"Japan considers crop varieties developed using genome editing with no new DNA as non-GMO," the authors write. "In 2022, China and India also published a new guideline for genome-edited crops. Several other countries, such as Philippines, are developing regulatory guidelines for genome-edited products."

Nigeria was the first African country to develop national biosafety guidelines for regulating gene-edited products — both Nigeria and Kenya will review these products on a case-by-case basis.

South Africa, Burkina Faso, Ghana, Ethiopia, Sudan, eSwatini and Zimbabwe — countries that have governance frameworks for GMOs — have begun considering developing genome-editing policies. Some nations, such as Uganda, still lack a biosafety law.

"Many countries are still in the process of developing regulatory guidelines for genome-edited products. There is a need for the coordination of regulatory approaches globally," the authors note.

"Genome editing has a prominent role to play in improving agriculture in Africa," the authors conclude. "Many researchers are exploring the potential of genome editing in developing crop varieties for a better and more sustainable African agriculture. However, it requires adequate funding and enabling policies to release genome editing products."

The paper was authored by Leena Tripathi, Kanwarpal S. Dhugga, Valentine O. Ntui, Steven Runo, Easter D. Syombua, Samwel Muiruri, Zhengyu Wen and Jaindra N. Tripathi.

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