
BEST PRACTICE

Ensuring biosafety

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For thousands of years, developing improved crop varieties has depended on conventional plant breeding methods.

With developments in scientific research and technologies, it is now possible to “design” crops with improved characteristics within a shorter time and with more precision using biotechnology. Through transformation, genetic information (genes) can be transferred between distantly related species, which would not happen in nature (transgenes). This allows novel and unique characteristics to be incorporated into crop varieties. Through this technology it is possible to develop new crop varieties (genetically modified organisms, GMOs) with higher yield, adaptation to variable environments, resistance to pests and diseases, enhanced storage time, and improved nutritional values, among others.

Concerns have been expressed about the impact on human and animal health of these transgenes. Concerns also revolve on their possible movement from

the bioengineered crop to other cross-compatible crops, and in particular, to wild relatives growing in regions where the crop has its origin or center of diversity, and on the impact of products of transgenes with pesticidal activities on nontarget organisms. The concern is that transgenes could confer “fitness” on the crop’s wild relatives, thus making such plants develop into “super weeds,” especially when they become resistant to herbicides. There are also concerns that the protein in the transgenes could be allergenic to people. Outcrossing is a common occurrence between compatible plants and the degree of outcrossing depends on the crop species.

To regulate the release of GMOs to the environment in any country, a set of biosafety regulations are put in place. The International Biosafety Protocol (Cartagena Protocol) places emphasis on the transboundary movements of GMOs and offers a set of guidelines on their safe handling and use. It has been adopted by several countries, including 38 in Africa.



Cowpea plants in the IITA screenhouse. Photo by O. Adebayo, IITA

Biosafety is generally defined as “policies and procedures adopted to ensure the environmentally safe applications of modern biotechnology in medicine, agriculture, and the environment, so as to avoid endangering public health or environmental safety.”

IITA's research on genetic engineering is in consonance with the CGIAR's guiding principles on the application of modern biotechnology in the improvement of any of its mandate crops. We do not have a separate set of biosafety guidelines. The Institute has worked very closely with agencies of the Federal Government of Nigeria to establish biosafety guidelines for the country. The Federal Ministry of Environment is responsible for regulating the release of bioengineered products, and reports that a Biosafety Bill has been prepared. The document will soon be presented to the National Assembly for deliberation prior to being passed into law. With the existing biosafety guidelines that became operational in 2001, it is possible to carry out research on genetic engineering and test products of the technology under confinement in Nigeria.

Uganda and Tanzania are two countries where IITA is undertaking transformation research. In Uganda, work on transforming banana resistant to banana *Xanthomonas* wilt (R4D Review Edition 1) and nematodes is ongoing (see related story on pages 52–53). In Tanzania, transformation research on incorporating resistance to cassava brown streak disease is being undertaken with partners (see story on pages 16–18). Both Uganda and Tanzania are signatories to the Cartagena Protocol, which requires signatory countries to develop a regulatory framework and the capacity (in terms of people, expertise, and technology) to undertake risk assessments in developing and using GMOs.

The Government of Uganda recognizes biotechnology as a tool that can be used to help stimulate economic development and meet national goals for improving the standard of living for the poor.

Biotechnology is specifically included in the Poverty Eradication Action Plan as a component in the Program for the Modernization of Agriculture.

Recently Uganda's cabinet has approved its first National Biotechnology and Biosafety Policy after 8 years of deliberation. The policy provides objectives and guidelines for promoting and regulating biotechnology use in the country, and contains the guidelines on the legal, institutional, and regulatory framework. The guidelines cover tissue and cell culture, medical diagnostics, industrial microbiology, and biochemical engineering.

For the policy to be implemented, there must be a law. At the moment, a draft bill has been presented to Parliament. The commercialization of GM crops in any country requires this law.

Tanzania released its National Biosafety Framework in 2005. An Institutional Biosafety Committee addresses biosafety activities within any institution conducting genetic modification. The Division of Environment is currently the National Biosafety Focal Point, which is responsible for overseeing the review and approval of applications, and implementation of biosafety issues.

An interim biosafety regulatory process exists for permitting small-scale confined research/field trials of plant and plant products. Applications are reviewed by the Agricultural Biosafety Scientific Advisory Committee and the National Biotechnology Advisory Committee. The Tropical Pesticides Research Institute and the Plant Biosafety Office require risk management measures to ensure that the field trial does not adversely affect the environment or human health.

The first application using the interim measures was for the MARI-IITA project on cassava genetic transformation for virus resistance in Tanzania.

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