

LEAP-FROGGING IN AFRICAN AGRICULTURE: THE CASE OF GENETICALLY MODIFIED CROPS

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The Priority

Agricultural transformation is high on the agenda for African countries. In fact, agriculture is expected to be a major priority for the July 2014 summit of the African Union. This interest is building on a mood of economic optimism with the International Monetary Fund estimating that Africa's growth rate will rise to 5.4 percent in 2013 and 5.7 percent in 2014, whereas the global growth rate is expected to average only 3.3 percent in 2013 (IMF 2013).

African policymakers are starting to focus on agricultural innovation as a way to sustain this growth and help spread prosperity. On average, agriculture accounts for 30-40 percent of sub-Saharan Africa's overall GDP and employs 64 percent of the workforce (Juma 2011). The examples of leap-frogging through mobile technology provide African countries with inspirational models for leveraging agricultural biotechnology.

One misconception is that biotechnology is simply about the importation of genetically modified foods; rather, it is

about "building up the requisite capacity to diversify the technological options needed for long-term agricultural adaptation," (Juma 2012b). Biotechnology on its own will have little impact unless it is viewed in the context of system-wide improvements in agriculture. Now is the time for African governments to capitalize on the renewed interest in agriculture and invest in infrastructure, higher technical training and creation of larger markets.

A good place to start is with crops such as insect-resistant transgenic cotton as part of a larger goal to turn African agriculture into a knowledge-based entrepreneurial activity. The crop carries genes from the bacterium *Bacillus thuringiensis* (*Bt*) that enables it to resist pests, requiring fewer or no insecticides.

So far only four African countries—Burkina Faso, Egypt, South Africa and Sudan—grow transgenic crops out of a total of 29 worldwide. In 2014, it is expected that more African countries will announce plans to grow transgenic crops,

especially *Bt* cotton. Countries such as Cameroon, Ghana, Kenya, Nigeria and Uganda have ongoing biotechnology research and development programs (Adenle, Morris and Parayil 2013). They view entry into biotechnology as a way to expand their technological options for long-term agricultural transformation.

Why Is It Important?

In 2012, emerging economies overtook industrialized countries as the main adopters of transgenic crops by area. They are benefitting from income and environmental effects such as increased yields, fewer costs associated with reduced chemical inputs, and better soil quality due to no-till cultivation methods.

The potential for leap-frogging through biotechnology lies in its capacity to address specific local problems. One obvious example is the role of *Bt* cotton in suppressing pests while reducing insecticide use, leading to increased agricultural productivity. In Burkina Faso, for example, which grew 125,000 hectares of *Bt* cotton in 2009, rural households saw 18.2 percent yield increase over conventional cotton. Although the seeds were more expensive, farmers saved money on inputs and labor, resulting in net profits (Vitale 2010).¹

Another example is in Uganda, where researchers are using biotechnology to reverse the trend of *Xanthomonas* wilt, a bacterial disease that costs the Great Lakes region approximately \$500 million annually. By transferring two genes from green peppers, scientists developed *Xanthomonas*-resistant bananas (Namukawaya 2012). Work is also underway to develop vitamin A-enriched golden bananas.

In Nigeria, the insect *Maruca vitrata* destroys nearly \$300 million worth of blackeyed peas—a major staple crop—and forces farmers to import pesticides worth \$500 million annually. To solve the problem, scientists at the Institute for Agricultural Research at Nigeria's Ahmadu Bello University have developed a pest-resistant, transgenic blackeyed pea variety using *Bt* genes.

These examples illustrate how African countries can harness emerging technology to leap-frog into new agricultural production methods. The main barriers now lie in the existence of rigid regulatory systems and uncertainty over public acceptance of transgenic foods. The latter point can be addressed by focusing initially on industrial crops such as *Bt* cotton.

What Should Be Done in 2014

- **Encourage biotechnology champions:** The 2014 African Union summit offers an opportunity to galvanize political commitment to agricultural biotechnology. Leaders from countries that already grow transgenic crops could play a role in rallying more champions among their peers. Such high-level champions would play key roles in improving local and international policy environments for biotechnology (Juma and Serageldin 2007).
- **Promote agricultural innovation:** Biotechnology is only a starting point. The introduction of *Bt* cotton, for example, requires system-wide investments along the entire cotton value chain. This means that the adoption of biotechnology can serve as a trigger for investments in R&D, rural infrastructure, technical training and entrepreneurship.

There are two ways to foster institutional innovation. One is to strengthen research in existing agricultural universities and their linkages to farming communities directly. The other is to add a teaching component to existing agricultural research institutes focusing on the value chains of specific commodities. This would lead to the creation of agricultural research universities that can work closely with the private sector (Juma 2012a).

- **Create presidential offices for science and technology:** Too often the biotechnology decisions made in African countries are politically motivated and do not reflect the balance of scientific evidence. Creating offices of science and technology advisors to presidents or prime ministers would allow African leaders to act strategically and analytically, adopting agricultural biotechnologies when and where it makes sense to do so.

¹ For a more detailed analysis, see Vitale (2010).

Biotechnology on its own will have little impact unless it is viewed in the context of system-wide improvements in agriculture. Such offices would provide advice on how to capitalize on the renewed interest in agriculture and invest in infrastructure, higher technical training and the creation of larger markets. Preparations for the 2014 African Union summit are a unique opportunity for African agricultural sectors to embrace the catch-up in the adoption of agricultural biotechnology.

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