

Science Policy Reports

Florence Wambugu
Daniel Kamanga *Editors*

Biotechnology in Africa

Emergence, Initiatives and Future

Foreword by
Dr. Ismail Serageldin

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Science Policy Reports

The series Science Policy Reports presents the endorsed results of important studies in basic and applied areas of science and technology. They include, to give just a few examples: panel reports exploring the practical and economic feasibility of a new technology; R & D studies of development opportunities for particular materials, devices or other inventions; reports by responsible bodies on technology standardization in developing branches of industry.

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Editors

Florence Wambugu
Daniel Kamanga
Africa Harvest Biotech Foundation
Nairobi
Kenya

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Foreword

It is now almost 7 years since my colleague, Dr. Calestous Juma, and I authored a report, *Freedom to Innovate: Biotechnology in Africa's Development*, undertaken at the request of African heads of state and government. This main message in the Report of the High-Level African Panel on Modern Biotechnology was a call for regional economic integration to embody the building and accumulation of capacities in order to harness and govern modern biotechnology.

Did Africa heed our call to build the required capacity to harness and apply biotechnologies to improve agricultural productivity, public health, industrial development, economic competitiveness, and environmental sustainability (including biodiversity conservation) in Africa? Have African leaders demonstrated courage and firmness so that their footprints can guide future generations? The answers to these questions are not readily available; however, the book, a collection of papers, edited by my friend, Dr. Florence Wambugu, and her colleague, Mr. Daniel Kamanga, confirm that a lot is happening in Africa's biotech space.

Edited by Africans, with contributions by Africans, the book's unspoken message is that Africa refuses to be left behind. We know that the first century of the new millennium will not only belong to information and communications technology. Biotechnology, and its immense potential to contribute to human and animal health, agriculture and food production, manufacturing and sustainable development, will be an integral part of the arsenal required for Africa's development.

Many of the essays capture the fact that globally, the number of countries that cultivate genetically modified (GM) crops continues to increase. Africa – and more specifically, South Africa, Burkina Faso and Egypt – have joined fast-developing economies such as China, India and Brazil. I am glad to note that since our report, countries such as Kenya and Ghana have passed laws allowing the commercialization of GM crops. Many other countries are undertaking GM research, bringing to almost a dozen, the “African biotech countries”.

Africa can boast of a number of GM confined field trials (CFTs) for maize (insect resistance and drought tolerance), cotton (insect resistance and herbicide tolerance), sweet potato (viral and weevil resistance), banana (fungal resistance, bacterial wilt and nutrient enhancement), cowpea (insect resistance), and cassava and sorghum

(nutrition enhancement). However, there are still challenges related to strengthening national research systems, especially with regard to infrastructural and human capacity. More critical is the capacity by African countries to decide on how to use these technologies to improve national priority crops.

This book is therefore a clarion call for African leaders from African scientists. While there is no doubt that Africa has turned the corner, there is still need for courage and firmness when it comes to the GM technology. Fortunately, the urgent need to increase agricultural productivity and the increased acceptance of the technology gives African political leaders a window to move to the next level. The cost of not moving forward is too ghastly to contemplate.

Dr. Ismail Serageldin

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Chapter 1

The Importance of Political Will in Contributions of Agricultural Biotechnology Towards Economic Growth, Food and Nutritional Security in Africa

Florence Muringi Wambugu

Abstract Genetically modified (GM) crops or biotech crops, have been commercialized in both developing and industrialized countries since 1996. In 2012, 17.3 million farmers from 28 countries planted crops on 170.3 million hectares (420 million acres) of land, which was 6 % more area, or 10.3 million hectares (25 million acres) more, than in 2011. Breaking new ground, five European countries planted 129,071 ha of Bt maize in 2012. The global value of GM seeds in 2012 was US \$15 billion, with commercial grain from biotech crops being valued at about US \$150 billion per year. This was described as the fastest growing and adopted technology globally (James C, Global status of commercialized biotech/GM crops: ISAAA brief No. 44. ISAAA, Ithaca, 2012).

In 2012, developing countries—including China, India, Brazil Argentina and South Africa—grew about 52 % of the global biotech crops compared to the industrialized countries' 48 %. Of the 90 % of total farmers (17.3 million farmers), 15 million were smallholders from India and China (a record of 14.4 million in total for both India and China). Only four African countries (South Africa, Burkina Faso, Sudan, and Egypt) have commercialized GM crops, altogether planting only 2.9 million hectares, a very small part of the global or developing countries' average. However, it represents a 26 % increase compared to 2011. Africa's performance in adoption of GM crops for economic benefits is significantly low when compared to other developing countries, hence the need to objectively explore and discuss the underlying issues, while creating awareness on how the current status can be improved. (James C, Global status of commercialized biotech/GM crops: ISAAA brief No. 44. ISAAA, Ithaca, 2012).

Keywords Global food crisis • Agriculture • Africa • Biotechnology

F.M. Wambugu (✉)

Africa Harvest Biotech Foundation International (AHBFI), P.O. Box 642, Village Market
00621, Nairobi, Kenya

e-mail: fwambugu@afriaharvest.org

Abbreviations

AGERI	Agricultural Genetic Engineering Research Institute (Egypt)
AGOA	African Growth and Opportunity Act
Bt	<i>Bacillus thuringiensis</i>
CFT	Confined field trials
CGIAR	Consultative Group on International Agricultural Research
EMBRAPA	Brazilian Agricultural Research Corporation
GM	Genetically modified
IP	Intellectual property
NARS	National Agricultural Research Station
NGO	Non-governmental organisation
R&D	Research and development

Global Factors in Favor of Africa's Participation in Agricultural Biotechnology

The ongoing global crisis in food, energy, climatic change, and economic growth has raised the status of Africa as the new frontier of growth and investment for many foreign investors. The global crisis on food deficit in long-term national reserves, and the huge increase in prices of common goods on an annual basis, have opened a new wave in Africa of foreign agricultural investment for local and export markets. While this is being welcomed by African governments, who are facing the challenge of feeding their people, others are concerned about the long-term implications and are describing it as “land grab”. The relevance of this to African agriculture indicates an ongoing paradigm shift to viewing agriculture as big business, hence creating the opportunity for biotechnology applications for future growth.

The future growth of agricultural biotechnology in Africa is favored by population growth mainly of young people, most of whom are educated and technologically savvy in terms of knowledge of internet use and so on. Internet navigation skills often equip individuals with access to creditable online resources and debates, which inform and aid individuals to make decisions on biotechnology. Lack of access to and knowledge of such important information has been a prime factor in allowing misinformation, especially from European anti-biotechnology lobby groups. The major foreign investor in African agriculture currently is China, and this trend is likely to continue. Back home, China has invested greatly in agricultural biotechnology. Additionally, China is likely to utilize agricultural biotechnology for their local and foreign investments in Africa, and others are likely to follow suit; overall, Africa will benefit from deliberate technology transfer and from trickle down to the economy.

Future African farmers, whether small-holder or large-scale, are going to move from subsistence agriculture to farming, as a business embracing research-