



Economic Commission  
for Africa

# Strengthening Capacities for Biotechnology Uptake in Africa

An ECA Perspective

UN system-wide support to AU/NEPAD

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# **Strengthening Capacity for Biotechnology Uptake in Africa**

Biotechnology refers to any technique that uses living organisms or substances from living organisms to make or modify a product to improve plants or animals or to develop micro-organisms for specific uses. It represents a gradient of technologies ranging from traditional (such as those related to brewing, fermentation, baking, biological control, artificial insemination and embryo transfer, tissue culture) to modern biotechnology which involves genetic engineering. It has been identified as the leading technology of the 21st century with tremendous potential to solve problems not easily addressed by conventional means. This booklet examines ECA's coordinating role in strengthening the capacity for biotechnology uptake in Africa within the framework of the regional consultation mechanism.

## ***Opportunities***

Modern biotechnology provides a way forward in medicine and agriculture where earlier methods had been less successful. It "offers the only or the best tool of choice for more than half of the world's poorest people depending on agriculture and livestock left behind by the green revolution" (UNDP, 2001)<sup>1</sup>. It has immense potential for agriculture, industry, energy, health, trade, environment and natural resource management. Particularly, it can be a strong arm against intractable biotic and abiotic stressors (living organisms and non-living factors which have harmful effects on plants, such as viruses and droughts) that cause havoc in agriculture. Biotechnology provides hope for effectively combating devastating diseases such as malaria, HIV/AIDS and tuberculosis. Effective cleaning of pollutants in the environment in general, and in the mining sector, in particular, is being performed more effectively than ever through bioremediation. With biotechnology, reforestation, biodiversity conservation and modern biomass energy can now add value to the livelihood security of the poor living on marginal lands. Some of the benefits of modern agricultural biotechnology application as well as some of its threats are listed in Table 1.

In spite of its potential benefits, modern biotechnology requires discipline and determination to succeed. Political will (that goes beyond simple declarations and support) and impact-driven actions are needed. Legal frameworks, including safety and intellectual property legislation, must be in place. Regu-

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1 UNDP (2001), Human Development Report 2001: Making technology work for human development

latory agencies must be established and made functional. Adequate human, institutional and other capacities must also be in place along with sufficient financial resources. Demand-driven priority setting is required with the capability to transfer and apply the technology. In developing countries, including African nations, these technologies must be pro-poor.

**Table 1. Potential benefits and threats/controversies associated with modern agricultural biotechnology**

Potential benefits	Potential threats/controversies
<ul style="list-style-type: none"><li>• Higher crop yields</li><li>• Higher incomes</li><li>• Less use of chemicals (pesticides, herbicides) with reduced expenditures on inputs</li><li>• Less exposure of farmers to chemicals leading to improved farmers' health</li><li>• Control of abiotic factor</li><li>• Higher nutritional quality of foods</li><li>• Reduced pre- and post-harvest losses</li><li>• Longer shelf life</li><li>• Minimal exploitation of forests, grasslands, marginal lands, and swamplands for food crops</li><li>• Preservation of biodiversity</li><li>• Broader range of crops suited for marginal areas and consumed by poor people in tropical and semi-tropical areas (eg. sorghum, cassava, pearl millet)</li></ul>	<ul style="list-style-type: none"><li>• New allergens</li><li>• Antibiotic resistance</li><li>• New viruses</li><li>• New weeds/super weeds invasion</li><li>• Gene flow</li><li>• Gene erosion</li><li>• Possible undesirable effects on non-targeted organisms</li><li>• Use of terminator gene that prevents reproduction of seed and increasing input costs</li><li>• Monopoly on biotechnology research by a few powerful private firms</li><li>• Lack of scientific and financial support for GM crop research from countries prohibiting such technology</li><li>• Trade ban on GM export products</li><li>• Aggravation of the prosperity gap between North and South</li><li>• Exploitation of natural genetic resources without appropriate compensation</li><li>• Unresolved issues relating to intellectual property rights and farmers' rights</li><li>• Gene piracy</li></ul>

**Source:** Adapted from ECA 2002, *Harnessing Technologies for Sustainable Development*

### Challenges

Regardless of the tremendous possibilities that modern biotechnology holds, many people still view it as a dangerous and controversial tool. Developing the capacity to properly manage these controversies is probably the single most important challenge facing biotechnology development, transfer and application today. The controversies can be ethical, health-related, environmental, political or commercial, but they are more pronounced in the food and agriculture sectors than in any other sector. Controversies in other sectors include concerns over human cloning, utilization of the tool for criminal activities, loss of biodiversity, transgenic processes that cross natural and religious boundaries, and unknown long-term effects on human and animal health.

**Table 2: Global area of biotech crops in 2006: by country (million hectares)**

Rank	Country	Area	Biotech Crops
1*	USA	54.6	Soybean, maize, cotton, canola, squash, papaya, alfalfa
2*	Argentina	18.0	Soybean, maize, cotton
3*	Brazil	11.5	Soybean, cotton
4*	Canada	6.1	Canola, maize, soybean
5*	India	3.8	Cotton
6*	China	3.5	Cotton
7*	Paraguay	2.0	Soybean
8*	South Africa	1.4	Maize, soybean, cotton
9*	Uruguay	0.4	Soybean, maize
10*	Philippines	0.2	Maize
11*	Australia	0.2	Cotton
12*	Romania	0.1	Soybean
13*	Mexico	0.1	Cotton, soybean
14*	Spain	0.1	Maize
15	Colombia	<0.1	Cotton
16	France	<0.1	Maize
17	Iran	<0.1	Rice
18	Honduras	<0.1	Maize
19	Czech Republic	<0.1	Maize
20	Portugal	<0.1	Maize
21	Germany	<0.1	Maize
22	Slovakia	<0.1	Maize

**Source:** Clive, James (2006), Global Status of Commercialized Biotech/GM Crops: 2006

\* Fourteen biotech mega-countries growing 50,000 hectares, or more, of biotech crops

But these controversies have not prevented Genetically Modified (GM) agriculture from expanding as evidenced by the following facts:

- The agricultural biotechnology market is currently estimated at \$5.6 billion, and its major players continue to see the biotech industry as a growing business opportunity. China expects to gain US\$1 billion from **Bt (*bacillus thuringiensis*) Cotton** and US \$4 billion from **GM Rice** by 2010.
- Research continues at many companies and universities on what many consider the next breakthrough in agriculture: drought-resistant crops. Scientists have already developed an oral tuberculosis vaccine from a GM crop. Soybeans enriched in Omega-3 fatty acids, nutritional supplements which strengthen the body metabolism, will soon be available.
- Production of GM crops worldwide has increased sixty folds from 1.7 million hectares in 1996 to 102 million hectares in 2006. Farm-

ers have consistently increased their planting of biotech crops with the number of GM crop-producing countries increasing from six to 22 since then.

- Biotech crops are now planted in 22 countries (refer to Table 2) and the annual growth rate in planted acres remains in the double digits. These crops account for more than half of the world's soya crop by area, a quarter of its corn, and over a tenth of its cotton.

### ***Biotechnology-related capacity needs of Africa.***

Many international meetings have identified some biotechnology – related capacity needs of developing countries, including Africa. Among these are the first meeting of the Intergovernmental Committee of the Cartagena Protocol on Biosafety (December 2000), the International Conference on New Biotechnology Foods and Crops: Science, Safety and Society, organized in Bangkok (July 2001) by the OECD and the British Government, as well as the 'Conseil Ouest et Centre Africain pour la Recherche et le Développement'/ West and Central African Council for Agricultural Research and Development's (CORAF/WECARD) first stakeholders meeting on biotechnology/biosafety.

Areas that need to be addressed by capacity building activities as identified by the above-mentioned meetings are as follows:

- 1) Safe use of biotechnology, including a wider set of issues involving plant, animal and human health to which biotechnology may be able to make a significant contribution.
- 2) Research capacities through human resource development and appropriate funding.
- 3) Training for "society at large", including biodiversity education at all levels, with a special emphasis on advocacy and public/community awareness on conservation issues (including, but not limited to, bioprospection), biosafety and intellectual property.
- 4) Capacities for informed decisions/choices on:
  - Establishment of institutions, development of legislation and other regulatory mechanisms and measures related to biosafety;
  - Development and adequate use of methods on risk assessment; and
  - Development of measures and/or legislation on certification and labeling.
- 5) Capacities for full and effective participation in negotiations at international fora where biotechnology and biosafety-related issues are discussed. These fora are, among others, related to Codex Alimentarius, International Plant Protection Convention (PPC), Cartagena Protocol and Convention on Biological Diversity (CBD), Agreements on Sanitary and Phytosanitary Measures (SPS), Trade-

Related Aspects of Intellectual Property Rights (TRIPS) and Technical Barriers to Trade (TBT) under the World Trade Organization.

- 6) Adequate information and communication capacities, specifically related to:
- Identification of stakeholders and their information needs for decision making, including researchers, regulators, consumers and producers, each using information in different ways.
  - Access to reliable information by the scientific community and regulators, which is often impeded by limited access to the Internet. For this purpose, it is imperative that funding be made available to increase connectivity for countries to access scientific and technical information already available.
  - Provision of local-level information on ecological systems needed for risk assessment and for determining investment capacities.
  - Role of international organizations in providing valid data and in particular, using the Biosafety Clearing House setup under the Cartagena Protocol.
  - Validation of information through peer review.
  - Educating the media and expanding dissemination channels.
  - Economic market data, or "market intelligence", to determine whether investments might be viable in the long-run in the market place. Here, the specificity of each country in defining its information needs become critical.
  - Increasing regional inter-linkages in terms of information networks by using and expanding existing networks. Regional collaboration may be very useful particularly in developing networks on risk assessment methods and information.

### ***Contributions of ECA to strengthening capacity for biotechnology uptake in Africa***

ECA contributes to the efforts aimed at strengthening biotechnology-related capacities in Africa at two levels: (i) UN system-wide support and (ii) Direct support individual member countries. The contributions are in the following areas:

#### ***Coordinating the work of the UN system***

ECA spearheaded a new partnership among UN institutions to provide coordinated support for biotechnology uptake in Africa. In April 2003, a proposal for the creation of a forum to be called "Inter-Agency Partnership on Biotechnology for Africa's Development" or UN-Biotech/Africa, was developed. The new grouping comprised of many UN institutions involved in biotechnology-related activities in Africa, including ECA, WHO, UNESCO, WFP, UNIDO, FAO, UNEP and UNDP.

UN-Biotech/Africa brought about the coordination of policies, strategic approaches and actions among agencies and programmes of United Nations system in relation to biotechnology development, acquisition and diffusion in Africa. It has enhanced synergies between the UN institutions, enabling them to make greater impact and create an effective platform to exchange biotechnology-related information, experiences and perspectives.

ECA's initiative to create and implement UN-Biotech/Africa has been appreciated among member institutions and African policy makers. This initiative is in line with the fifth programme area (i.e. establishing enabling mechanisms for the development and application of environmentally-sound biotechnology) of Chapter 16 of Agenda 21 that was endorsed in June 2004 by the Ouagadougou Ministerial Conference.

### ***Strengthening biotechnology uptake efforts of African Countries***

#### *Advocacy and awareness building*

One of the most widely acknowledged biotechnology-related initiatives ever taken by the ECA, during 2002-2003, was the production and launch of an annual report with major focus on medical and agricultural biotechnologies. The report, "Harnessing Technology for Sustainable Development", was presented in September 2002 at the World Summit on Sustainable Development (WSSD). The most remarkable evidence of the impact of ECA's advocacy work regarding the report is the acceptance by Ministers of the Economic Community of West African States (ECOWAS) to work towards the creation of an "African Ministerial Conference on Biotechnology" as recommended by ECA at its Ministerial Conference in Ouagadougou in 2004. Currently, as part of its advocacy work, ECA is in the process of launching the UN-Biotech website and a quarterly UN-Biotech Newsletter.

#### *Organizing biotechnology training workshops*

ECA organized its first training workshop on **Intellectual Property Rights** (IPRs) relative to biotechnology, in collaboration with Michigan State University, University of Dakar, American Embassy in Senegal and the United States Agency for International Development. It was held from 3 March to 2 April 2004 in Dakar, Senegal. Its overall objective was to help West and Central African countries acquire literacy on matters regarding IPRs and to develop and implement related legal frameworks and guidelines needed for biotechnology development, transfer and application. Fifty-seven participants from Benin, Burkina Faso, Gabon, Niger, Mali, Senegal, Cameroon, Togo, USA, CORAF/WACARD and Inter-state Schools of Science and Veterinary Medicine attended the workshop. The workshop covered topics including *Introduction to Intellectual Property (IP)*; *National and International Treaties and Laws related to IPRs and Technology Transfer*;



*Public and Private Sector Perspectives on IPRs and Transfer of Technology; Management of IP; Day-to-Day Management of IPs at the University.* In January 2006, a training workshop on biosafety was held in Accra, Ghana; in March of the same year, another training seminar was held for the media on biotechnology-related matters in Addis Ababa, both with the collaboration of UNESCO and UNEP. Scheduled for late 2007 is a symposium on biotechnology and agricultural production systems in Africa.

*Technical assistance on identification of priority biotechnology capacity*

ECA has also been involved in and contributed to the deliberations of many biotechnology-related regional and sub-regional conferences, meetings and workshops providing needed technical assistance to countries. Some of these include the workshop on multi-national project for the formulation of the African Programme for the Development of Commercial Biotechnologies (Algiers, 12-16 October 2003); the 3rd Annual Conference on USAID-African Partnership in Strategies for Biotechnology in Africa (Ibadan, November 2003); and the Ministerial Conference on Harnessing Science and Technology to increase Agricultural Productivity in Africa: West African Perspectives (Ouagadougou, 21-23 June 2004).

In October 2004, ECA assisted the CORA/WECARD in the identification of biotechnology and biosafety-related research capacity needs of its 21 member countries. There was broad agreement that capacity-building in terms of developing human resources and the technology base must occur on a number of different levels. Improved research and development capacity were identified as high priority, along with better-equipped facilities, state-of-the-art tools like GPS (geographic positioning systems) and GIS (geographic information systems) for mapping biodiversity, and training of more scientists and technical people in key fields such as microbiology.