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focus

Biotechnology and Food Security

Food security from land and lab?

Rice, woman at work.
(Photo: UNESCO/Georges Malempré)

Rice seedlings in test tubes generated from protoplast culture.
(Photo: IRRI/L. Sayo)

Contents

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More food through biotechnology?

Increasing food production

Today, around 800 million people worldwide suffer from hunger. The United Nations estimate that the world's population will grow to reach 8.1 billion by 2030. Meeting global food requirements at that point will necessitate an increase in production by 50%. If natural resources continue to be used the way they are today, they will not suffice to fuel this increase. Along with a quantitative increase in food, its qualitative enhancement is likewise very important for effectively reducing famine and malnutrition – and thus illness and poverty. Can biotechnology make an appropriate contribution to improving the global food situation? Answers are controversial.

Biotechnology
Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

Green biotechnology
Agricultural applications of biotechnology.

Two applications of green biotechnology:
- ***Genetic engineering / modification***
Modifying genotype, and hence phenotype, by the introduction of a gene or genes into animal or plant cells, which leads to the transmission of the input gene (transgene) to successive generations.
- ***Marker assisted selection***
The use of DNA markers to improve response to selection in a population.

For more definitions of terms related to biotechnology, see FAO Glossary: www.fao.org/biotech/index_glossary.asp?lang=en

Green biotechnology today

"Biotechnology" is a very broad term. In the following it will be used exclusively referring to the application of *genetic engineering* in green biotechnology (see margin for definition). Biotechnological methods to assist traditional breeding and biotechnological applications in the health sector are not discussed in this publication.

Genetically modified (GM) crops have been commercially cultivated since 1996. Over the past years, their worldwide production has continually increased. By the end of 2005, GM crops were grown in 21 countries (see margin), and the official global area of GM crops totalled 90 million hectares, which amounts to approximately 5% of the area under cultivation. More than one third of the global area of GM crops is located in 11 developing countries. Currently, the most widespread GM crops on the market are genetically modified varieties of soy, maize, cotton, and canola. They are herbicide-tolerant and/or resistant to certain pests. An analogous GM rice variety was planted for the first time in 2005, in Iran.

GM crop countries 2005 (listed by size of GM crop growing area)
USA (55% of global biotech area), Argentina, Brazil, Canada, China, Paraguay, India, South Africa, Uruguay, Australia, Mexico, Romania, the Philippines, Spain; Countries with an area of less than 0.05 million ha: Colombia, Iran, Honduras, Portugal, Germany, France, Czech Republic.

Executive Summary of Global Status of Commercialized Biotech/GM Crops: 2005
www.isaaa.org/kc/CBTNews/press_release/briefs34/ESummary/Executive%20Summary%20(English).pdf
Bibliography: p. 13

Until now, GM crops have been developed predominantly by private multinational corporations. Yields are mostly used to produce animal fodder and textiles. A smaller share is processed into food. GM crop research takes place mainly in the North, but also in over a dozen developing countries. Research in the South investigates in a multitude of plants, concentrates on improving human food, and is largely based on public funding. The main goals are to improve the resistance of crops to insects and diseases, their tolerance of extreme climatic conditions, and their nutritional value.

Poorer nations turn to publicly developed GM crops
www.ifpri.org/pubs/articles/2005/naturebiotech.pdf
Bibliography: p. 14

Purpose of this publication

This issue of InfoResources Focus intends, in the first section, to provide an overview of the positions of selected international and Swiss actors on biotechnology and food security, and, in the second section, to show in what ways development cooperation is confronted with biotechnology issues.

Biotechnology: The landscape of positions

Challenges for the countries

A country primarily has to deal with the question of what causes its lack of food security. If biotechnology seems promising with regard to solutions, its use should be assessed based on an overall weighing of interests. This requires that ecological, economic and social viewpoints, opportunities and risks be taken into account and evaluated. Aspects of social policy and the opinions voiced by civil society play an important role in this process. A number of questions arise: Who are the winners and who are the losers when biotechnology is applied? How should applications be designed in order to benefit mainly small-scale farmers? Moreover, it is necessary to clarify several questions regarding safety and regulation:

- How do GM crops influence the safety and health of humans and animals, as well as the natural environment, including non-GM crops (cross-pollination)?
- Which laws and regulatory measures are necessary?
- Which complementary functions can public and private research actors have within the framework of national policy priorities?
- How can products or plant and animal components be examined for genetically modified characteristics?
- How can products with genetically modified components be labelled?
- How can compliance with regulatory measures be monitored, controlled, and enforced?

Biotechnological innovation is justifiable only if these questions have been answered and decisions and measures have been taken and implemented.

Regulatory processes and approval procedures involve several different government agencies of a given country. Environmental and public health agencies often take a critical position, their task being the protection of the environment and of human and animal health. By contrast, agricultural, trade and science agencies predominantly take a positive attitude, due, among other things, to the attractiveness of biotechnology as an opportunity for new investments, training, and the enhancement of research capacities.

International legal framework

The Cartagena Protocol on Biosafety is the most important international instrument in the field of biosafety. Among other things, it regulates transboundary movement of genetically modified organisms. The United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF) provide support in building up national safety regulations. The UN *Codex Alimentarius* contains standards of food safety, and the World Trade Organisation (WTO) influences trade in GM crops. Once a country has ratified international regulations and agreements, they define the framework for that country's national policies. This is the usual procedure in the countries of the South. However, there are also countries who define their national policy independently, without joining international agreements. One of these is the USA, which has not signed the Cartagena Protocol.

*The **Cartagena Protocol on Biosafety** is an international agreement defining international rules for transboundary movement of genetically modified organisms. The Cartagena Protocol is an outcome of negotiations on the United Nations Convention on Biological Diversity (CBD), forms a separate agreement, and entered into force in 2003. Until now (14 February 2006), 131 nations have signed the Cartagena Protocol or signified their intention to do so.*

www.biodiv.org/biosafety/

www.codexalimentarius.net
www.wto.org
www.gefweb.org

International positions

Developing countries and countries in transition

Many countries face the challenge of providing enough food for a growing population on the basis of limited natural resources that are increasingly exposed to environmental stress factors. These stress factors are partly triggered by overuse and partly a consequence of climatic change. In many countries, conventional varietal improvement and classical breeding methods have led to great advancements. Biotechnology is seen as a further instrument that may be able to contribute to achieving the necessary increase in plant-based food production.

However, the potential of biotechnology for solving food problems is assessed differently from country to country. Argentina, Brazil, China, India and South Africa have already adopted commercial cultivation of GM crops, and partly also implement comprehensive research programmes. The governments in these countries support biotechnology. In certain cases, this official support is due to agro-industrial pressure or takes the form of legalisation of uncontrolled planting of GM crops. Other developing countries are implementing biotechnological research programmes, some with the aim of rapidly commercialising GM crops, others based on the wish not to miss out on the opportunities offered by biotechnology (e.g. Egypt, Indonesia, Costa Rica). Several developing countries, particularly poor ones, clearly reject genetically modified food at this point. Many of them have doubts regarding the benefits and the safety of biotechnology. They are afraid of becoming dependent on multinational corporations, or fear to lose sales opportunities on the European market. In many poor countries the know-how with regard to biotechnology is very limited, and discussions on risks and advantages are virtually non-existent.

There are also countries where the government has taken a positive position towards biotechnology, while smallholder and environmental organisations strictly oppose it, arguing that its impacts on health and the environment are not sufficiently known, or pointing out the risk of uncontrolled cross-breeding with traditional varieties. In yet other countries, such as India and Brazil, smallholder organisations are both favourable and opposed.

EU and USA

The positions of the USA and the EU with regard to GM crops are diametrically opposed: the USA has the highest rate of GM crop cultivation worldwide, whereas the EU is very reserved. This latter fact was expressed in the four-year de-facto moratorium on new GM crop cultivation licenses in the EU, which expired only in 2003. The difference between the positions of the USA and the EU is rooted in divergent concepts of law. While the USA regulates product safety independently of the technology, through product liability, the EU has created specific separate regulations for biotechnology. These are embodied in a set of directives that are to be implemented by the member countries. In these directives, the EU applies the precautionary principle, which means that a new technology must be withheld from implementation until there is sound proof that it does not cause any harm. Contrary to this approach, the USA regards the precautionary principle as a barrier to technology and trade, and advocates the opinion that it prevents the development of an industry that could benefit the world's poorest.

*The **precautionary principle** does not have any precise definition. With regard to green biotechnology it can be interpreted as follows: If a particular application of GM crops potentially poses a substantial and irreversible threat to the environment or to human health, precautionary measures must be taken, even if certain interrelations have not scientifically been clarified with regard to causes and effects.*

In Europe, commercial cultivation of GM crops is currently taking place in Romania, Spain, Portugal, Germany, France, and the Czech Republic. In all of these countries, GM crops are still limited to very small areas. Food in the EU is allowed to contain genetically modified components. Foods containing more than 0.9% of genetically modified components must be labelled accordingly.

Food and Agriculture Organisation (FAO)

The State of Food and Agriculture 2003–2004
www.fao.org/docrep/006/Y5160E/Y5160E00.HTM
Bibliography: p. 16

In its "State of the World's Food and Agriculture Report of 2003–2004", the FAO advocates the opinion that the use of biotechnology in developing countries can increase productivity, and that this is of great significance in a time when primary resources are scarce. It is pointed out that until now, genetically modified food has not caused any diseases or damage to the environment. In 2005, the FAO Director-General took a more differentiated position (see quotation in margin). He demanded that efforts be made to ensure that developing countries benefit more from training in the basic sciences and techniques of biotechnological research, while continuing to have access to a diversity of sources of genetic material. In his opinion, this could be achieved by increasing public funding of national agricultural research systems and through dialogue between the public and private sectors.

"Certainly, genetic engineering can speed up conventional breeding programs (…). Genetic engineering could improve yields on marginal lands and reduce reliance on toxic chemicals in pesticides. It could also improve the nutritional content of food (…). But the so called Gene Revolution is primarily driven by the multinational private sector with a strong emphasis on commercial products for large markets in North America and Europe.
The resulting technologies are held under exclusive patents and are mostly sold commercially, contrary to those generated in the Green Revolution (…). Except for a few initiatives, there are no major public or private sector programs that tackle the critical problems of the poor or target crops and animals that they rely on."

Keynote address by FAO Director-General Jacques Diouf, Copenhagen, 6 June 2005, www.fao.org/english/dg/2005/den.htm

Consultative Group on International Agriculture Research (CGIAR)

CGIAR: *www.cgiar.org/impact/agribiotech.html*

CGIAR researchers advocate a pragmatic strategy. Where pressing problems cannot be solved with the means of traditional breeding, biotechnology could be one of many approaches to help. However, they emphasise that its use requires a rigorous weighing of risks. To this end, CGIAR specialists provide advice for national partners in issues of biosafety and social and environmental standards.

Greenpeace International

Greenpeace International: *www.greepeace.org*

Greenpeace International advocates the opinion that information about genetically modified components in the food chain is withheld from the general public due to commercial interests. Therefore, people are not in a position to avoid them even in countries that have labelling legislation in force. Greenpeace is against commercialising GM crops, arguing that there is not yet enough scientific knowledge about their impacts on the environment and mankind. The organisation demands that, in the meantime, genetically modified components be labelled and GM crops and seeds be separated from conventional crops.

ActionAid

ActionAid:
www.actionaid.org.uk/1044/gm_crops.html

ActionAid holds the opinion that the real reasons for hunger are political and economic drawbacks, such as poverty, unequal opportunities, and poor access to land, food, markets and resources. These problems cannot be solved with GM crops. ActionAid's greatest concern is that few multinational corporations share a monopoly in biotechnology, which gives them unequalled control over genetically modified seed and any seed systems involving GM crops. ActionAid claims not to oppose science and progress, but emphasises its conviction that food security can only be achieved

through poverty reduction, technologies adapted to local needs, the promotion of basic rights, biodiversity conservation, and support of informed choice and participation. Moreover, ActionAid is of the opinion that societies in poor countries have a right to public debates before having to decide on how to deal with GM crops.

Syngenta

Syngenta, one of the world's leading agro-industrial corporations, stresses the fact that, despite modern plant protection practices, around 40% of yields are lost worldwide due to pests, weeds and diseases. Until now it has been possible to keep the world's food supply in pace with global demands based on advances in agricultural technology. However, in view of forecast population growth and limited areas for cultivation, the pressure to increase productivity is continually growing. Furthermore, consumers demand higher food quality and more essential nutrients. Syngenta argues that in view of these challenges, all available methods and solutions, including biotechnology, should be put to use as effective tools.

Syngenta: *www.syngenta.com/en/about_syngenta/biotech_intro.aspx*

Switzerland's normative framework

Switzerland has one of the world's most restrictive regulatory systems covering GM crops and their release. Its implementation is ensured through long-term liability for damage related to biotechnological applications, and through comprehensive risk assessment. Additional control is exerted by environmental organisations, who have the right to appeal against the release of GM crops, as well as two federal ethics committees: the Swiss Ethics Committee on Non-human Gene Technology (ECNH) and the Swiss Expert Committee for Biosafety (SECB). With regard to commercial cultivation of GM crops, Swiss policy is bound to a five-year moratorium that was approved by Swiss voters in a national referendum in 2005. The moratorium does not exclude biotechnological research and importing of genetically modified foods. With these regulatory mechanisms, Switzerland has accumulated valuable experience in a complex field, which can be used to advise and assist developing countries in building up their own regulatory structures.

Swiss positions

Swiss Agency for Development and Cooperation (SDC)

The SDC is guided by the principle of strengthening local farmers and producers in their struggle to achieve food security and sovereignty within the framework of international commitments to biodiversity and biosafety. On this basis, the SDC has taken the following differentiated position: The acceptability of specific biotechnological applications should be assessed at the national level by means of an informed decision-making process. The objective is to ensure and encourage plant-biotechnological applications that are secure, sustainable and in accordance with development goals. The SDC supports partners in developing countries in building up local research structures, in carrying out risk assessments, and in establishing regulatory processes for genetically modified organisms. Decisions regarding a country's position on GM crops, however, must be made by the country itself.

Informed decision-making in the context of plant biotechnology for national application takes into account all available information from multidimensional risk-benefit-assessments (e.g. safety, economic, social, environmental and development relevant aspects), considers technology alternatives (including inaction) and is consistent with pertinent regulations and internal guidelines.

Green Biotechnology – An Orientation for SDC, Draft September 2005
This paper can be obtained from: Katharina.Jenny@deza.admin.ch
Bibliography: p. 14

Gene Technology and Developing Countries:
www.umwelt-schweiz.ch/imperia/md/content/ekah/publikationen/broschuere/e-entwicklung.pdf
Bibliography: p. 13

Swiss Ethics Committee on Non-human Gene Technology (ECNH)

The ECNH bases its position on the assumption that countries of the South have legitimate reasons for adopting other safety criteria than industrialised countries, since the risks a country faces vary according to its eating habits, cultivation methods, and climatic and ecological conditions. Therefore, the ECNH demands that developing countries and countries in transition decide independently about their approach to crop biotechnology, and that their sovereignty be respected.

Swiss NGOs:
Helvetas:
www.sfiar.ch/documents/helvetas_biotech_e.pdf
Berne Declaration:
www.evb.ch
Swissaid:
www.swissaid.ch/politik/d/politik.htm
Bread for All:
www.bfa-ppp.ch/aktuell/details.php?subnavi=communiques&id=76

Swiss NGOs

A majority of Swiss NGOs oppose plant biotechnology based on their views regarding development and environmental policies. In their opinion, agricultural corporations are the only beneficiaries of biotechnology, while small-scale farmers face higher seed prices without being able to rely on increased yields. Moreover, NGOs criticise that safety is not guaranteed and that patents prevent free accessibility for all, meaning that the new technology is not a public good. They hold the opinion that food security among small-scale farmers can best be improved by fostering access to fertile land, water, credits and knowledge.

Development cooperation: Areas of intervention

The following section presents selected areas where development cooperation is confronted with biotechnology issues.

Agricultural research

Food security in developing countries is increasingly in danger. The main problems are limited natural resources, their overuse in both intensive and extensive production systems, and the impacts of climate change. Research institutions face the challenge to rapidly achieve sustainable increases in productivity while at the same time preserving the ecosystems.
Potentials today are seen in breeding less demanding high-yield varieties for intensive agriculture, as well as salt-tolerant and drought-resistant varieties for rainfed agriculture. At the same time, soil and water resources in semi-arid and arid areas are to be used in a sustainable manner, and agricultural production systems are to be adapted to the new conditions brought about by climatic change and biotic stress due to viral diseases. Biotechnology is only one of many measures that come to mind when trying to achieve these goals. Until now, biotechnology is applied only to few commercial crops. If the poor – i.e. small-scale farmers – are to benefit from the technology, research must take more account of the consumer needs and regional agricultural problems faced by the less wealthy populations in developing countries, and focus on crops that have so far been neglected, such as pulses, tubers, and local vegetable and fruit varieties. Given that biotechnological processes are expensive and technologically demanding, building up decentralised high-level research capacities in developing countries cannot be a priority goal. On the contrary, the objective must be to ensure that the priorities of public international research are adapted accordingly; that knowledge, laboratory capacities and technology are made widely accessible as public goods; and that the capacity to establish and implement regulation is encouraged and made available. Considerably more expensive than research itself, regulation is the most costly aspect of biotechnology and represents the greatest obstacle for public research to effectively implement products.

Collaboration between Indian and Swiss research centres as an example of development cooperation in biotechnology:
The "Indo-Swiss Collaboration in Biotechnology" (ISCB) fosters collaboration between Indian and Swiss research centres in various areas of biotechnology. The programme is funded jointly by the SDC in Berne and the Government of India. The overriding goal is the establishment of research partnerships on an equal basis in order to produce poverty-oriented, sustainable results and products along the value chain.
In its approach to research questions, the programme focuses on development-relevant issues in the fields of agriculture and the environment, as well as the needs of small-scale farmers and the 'beneficiaries' concerned. Its main activities are geared towards developing technologies to increase the productivity of wheat and pulses, both of which are highly important for food security in India. The ISCB programme involves various areas of biotechnology, ranging from the development of a product enabling biological control of a chickpea pest to the development of molecular markers to improve breeding of fungus-resistant wheat. Genetic engineering is applied in cases where the potential for reaching the objective by means of conventional breeding is limited, e.g. to achieve resistance of the urd bean to a viral disease. Currently the ISCB programme involves 23 Indian and 13 Swiss research groups.

Detailed information on their projects is available at http://iscb.epfl.ch.

Information and the process of opinion formation

Promotion of public awareness and involvement of the public in decision-making processes regarding genetically modified crops and biosafety are highly important. The Cartagena Protocol takes account of this in Article 23. At the same time, in the form of the so-called "Biosafety Clearing-House", the Protocol provides a forum for information exchange between countries. However, access to this information is not guaranteed for people in developing countries, and its dissemination is further complicated by the fact that a large share of information on green biotechnology is available exclusively in English.

Cartagena Protocol:
www.biodiv.org/biosafety

Biosafety Clearing-House: *http://bch.biodiv.org*

Development cooperation can help to improve this situation by promoting public debates on GM crops. This can be done by supporting decision-mak-

ing processes, while at the same time respecting the sovereignty of developing countries. The aim is to place developing countries in a position to make their own informed choices based on public discussion.

Support in setting up guidelines

Ensuring biosafety and preventing arbitrariness and abuse with regard to GM crops requires guidelines and enforcement procedures that are adapted to the relevant national context. Many countries lack the know-how and resources necessary for establishing such measures, leading to a considerable need for capacity building. This need has been acknowledged by the international community and is recorded in Article 22 of the Cartagena Protocol.

By now, numerous projects have been launched in this field. They are funded through international financing mechanisms, such as the Global Environment Facility (GEF), but also by individual states or non-governmental sources. Project activities range from training decision-makers in biosafety to providing support in setting up institutions and in the concrete elaboration of laws, to promoting regional cooperation. Yet other projects aim to ensure the implementation of established guidelines and monitoring. The SDC, for example, is supporting a project in several developing countries to establish methods for assessing the environmental impact of GM crops.

GMO ERA Project: *www.gmo-guidelines.info*

Food aid

In August 2002, Zambia rejected a shipment of genetically modified maize that was intended as relief during a famine (however, this decision was revised in the beginning of 2006). The Zambian government justified its position at the time by pointing out its reservations with regard to the safety of such food, the lack of a regulatory framework, the danger of exchange of genetic material between GM crops and local varieties, and the related threat of losing export opportunities to the EU. This decision provoked great response around the world. The international debate was further fuelled by news about Angola and Sudan having been pressured to accept genetically modified maize as food aid.

In the meantime, the World Food Programme has established a practice according to which the sovereignty of the recipient country must be respected. Food aid involving genetically modified food is to be provided only upon so-called advance informed agreement by the recipient country, in accordance with Articles 7–9 and 11 of the Cartagena Protocol. Where appropriate, GM products are to be ground to prevent their use as seed. Moreover, the analytical capacities of recipient countries are to be encouraged and promoted, with the aim of placing them in a position to carry out their own context-specific analyses of GM food. Finally, delivery in kind is to be increasingly replaced by monetary aid, since the necessary food can often be procured within the region of the country concerned.

Need for a differentiated approach

When assessing green biotechnology and its potential contribution to food security it is important to differentiate. What are the interests behind its application? Who are the beneficiaries and who are the losers? The majority of commercialised GM crops so far have been developed by profit-oriented corporations for large-scale industrial agriculture. Until now, these crops have hardly contributed to food security for small-scale farmers in developing countries. Biotechnological applications must be adapted to each specific context. Environmental conditions, eating habits, and socio-cultural factors have a fundamental influence on whether the introduction of a crop makes sense.

Research geared towards improving the situation for poor small-scale farmers in a specific context could very well lead to positive results. It requires pragmatic approaches that respect the sovereignty of developing countries. The final decision on the development and cultivation of GM crops must be made by the countries concerned. However, these decisions should be made in an informed and transparent manner. When a country decides in favour of biotechnology, safety should be given a high priority.

Biotechnology is leading agriculture into new dimensions. Its use is a step that most probably cannot be reversed. The question of whether genetically modified and conventional crops can exist side by side remains controversial. Moreover, biotechnology may further promote the expansion of large-scale industrial production systems. Finally, control and safety in the use of GM crops poses great challenges, particularly in developing countries.

Development cooperation is faced with the question of how future food security can be achieved in view of population growth and limited natural resources. Conventional technologies of varietal improvement and new cultivation practices continually produce advances. Improvements in the access of small-scale farmers to fertile land, water, credits and markets would already considerably reduce hunger. In combination with other technologies, and in a form adapted to the needs of small-scale farmers, biotechnology could accelerate the process of achieving global food security. Its use should be based on the precautionary principle. However, as there can be no full guarantee of its harmlessness, careful weighing of risks and benefits will always be necessary.

Recommended reading

The following list features a documented and targeted selection of print documents and internet sites of relevance to "Biotechnology and Food Security". For easier reading they have been allocated to four rubrics:
Overview, Policy, Instruments, Case studies.
The documents are listed by title in alphabetic order and they are available online (accessed on 8 March 2006).

Deborah P. Delmer. 2005

Policy

Agriculture in the developing world: Connecting innovations in plant research to downstream applications

Proceedings of the National Academy of Sciences of the United States of America. Vol. 102, no. 44, 15739–15746. www.pnas.org/cgi/reprint/102/44/15739.pdf

According to the author, advances in green biotechnology offer great opportunities for agriculture in developing countries. However, she points out the lack of a system and incentives to adapt basic research results to the needs of farmers in developing countries. Contributions in this regard could be made both by public agricultural research and by the private sector.

Nicholas A. Linacre et al. 2005

Policy

Assessing the Environmental Impact of Biotechnology

International Food Policy Research Institute. Issue Brief No. 41. 4 p. www.ifpri.org/pubs/ib/ib41.asp

This publication takes a closer look at the great challenge posed by the need to meet the food requirements of a growing world population and, at the same time, promote environmental protection. The authors demand that not only economic and social impacts, but also environmental aspects be included systematically in plans, programmes and research priorities for GM crops.

DANIDA. Danish Ministry of Foreign Affairs. 2002

Policy
Overview

Assessment of potentials and constraints for development and use of plant biotechnology in relation to plant breeding and crop production in developing countries

Working Paper. 168 p. www.icsu.org/1_icsuinscience/GMO/PDF/danida.pdf

This Danish paper offers an overview of the potentials of plant biotechnology for developing countries, along with current applications, legislation and policies, questions of technology transfer and intellectual property, and existing research capacities. Furthermore, the document defines potentials and cornerstones for future collaboration with developing countries.

Steven Were Omamo and Klaus von Grebmer (Eds.). 2005

Policy
Case Studies

Biotechnology, Agriculture, and Food Security in Southern Africa

International Food Policy Research Institute / Food, Agriculture, and Natural Resources Policy Analysis Network. 297 p. www.ifpri.org/pubs/books/oc46.htm

An answer to the discussion on food aid involving GM crops, this book gathers contributions by many different specialists on the implications of green biotechnology in southern Africa. Emphasis is given to the importance of reliable information and awareness-raising, as well as dialogue between the various actors. Investments in biotechnology research and, even more important, in a convincing biosafety system, are regarded as crucial. According to the editors, developing countries will hardly be able to bypass green biotechnology. However, they should integrate it in their general development strategies.

Food and Agriculture Organization (FAO)

Overview

Biotechnology in Food and Agriculture

www.fao.org/biotech/index.asp?lang=en

This website collects all FAO information related to green biotechnology. It contains documents, electronic forums, events, news, and also specific information on individual countries. In addition, it provides a comprehensive glossary.

Clive James. 2005

Overview

Executive Summary of Global Status of Commercialized Biotech/GM Crops: 2005

ISAAA Briefs No. 34. International Service for the Acquisition of Agri-Biotech Applications (ISAAA). USA. 12 p.
www.isaaa.org/kc/CBTNews/press_release/briefs34/ESummary/Executive%20Summary%20(English).pdf

Every year, the ISAAA issues a report featuring the most important key figures with regard to commercialised GM crops around the world. The data include information on area covered and cultivating countries, as well as cultivated plants and their characteristics.

Swiss Ethics Committee on Non-Human Gene Technology. 2004

Policy
Overview

Gene Technology and Developing Countries. A contribution to the discussion from an ethical perspective

32p. www.umwelt-schweiz.ch/imperia/md/content/ekah/publikationen/broschuere/e-entwicklung.pdf

This document, also available in German and in French, examines the impacts of biotechnology on developing countries from an ethical point of view. The main issues addressed are food security, food sovereignty, biodiversity, and social peace. A majority of the authors are of the opinion that the quoted impacts are not yet clearly assessable. They recommend that public research and particularly context-specific biosafety research be promoted. At the same time they emphasise the importance of alternative solutions.

Swissaid. 2005

Policy
Case Studies

Genetic Engineering in Agriculture – a predictable catastrophe?

Documentation of a Symposium organised by Swissaid in Berne on 10 February 2005. 39 p.
www.swissaid.ch/news/e/documents/symposium_doku_e_000.pdf

At this symposium, NGO and government representatives from the North and from the South presented their experiences and opinions regarding the use of biotechnology in agriculture. Based both on political considerations and on concrete experiences, a clear majority of the contributors – among them, the Zambian Minister of Agriculture – assess biotechnology as negative. According to Swissaid's position paper, which is included in the documentation, biotechnology leads to concentrated production by large-scale enterprises, which in turn leads to a rise in production costs and jeopardises biodiversity.

Antonio G. M. La Vina. 2003

Policy
Instruments

Genetically modified organisms and the Cartagena Protocol on Biosafety: What is the stake for communities?

Working Paper No. 4: Globalization, Environment and Communities. World Resource Institute. 21 p.
http://pdf.wri.org/lavina_cartagena.pdf

This paper gives an overview of the Cartagena Protocol and of modern biotechnology in general. It mentions the risks that biotechnology harbours for local communities in developing countries, and describes how the Cartagena Protocol could be applied to the benefit of local people. According to the author, the Cartagena Protocol is an important step, even though it covers only a small fraction of the issues related to biotechnology. He demands that educational efforts be made in order to enable civil society to participate actively in the implementation of the Cartagena Protocol.

Alliance Sud. 2005

Policy

Gentechnologie bekämpft den Hunger nicht

Global+, Dokument 8. 16 p. www.alliancesud.ch/deutsch/files/D_PnDt8.pdf

In this paper, available in German and French, the Swiss Alliance of Development Organisations justifies its critical position with regard to GM crops. According to the authors, modern biotechnology aggravates the situation of small-scale farmers. Leading to concentration processes in agriculture and dependencies, it does nothing to solve the real problems faced by development countries. The argumentation is backed up with a negative report on experiences with GM cotton cultivation in India and a positive report on the potentials of organic agriculture.

Orton Liz. 2003

Policy

GM Crops – going against the grain

Action Aid. United Kingdom. 46 p. www.actionaid.org.uk/wps/content/documents/gatg_2462004_1524.pdf

This publication examines several critical questions raised in the debate on genetically modified food, such as whether GM crops contribute to poverty reduction, and whether they meet the needs of poor farmers. Based on experiences from Asia, Africa and Latin America, the report concludes that GM crops are more likely to benefit rich corporations than poor people.

Swiss Agency for Development and Cooperation (SDC). 2005

Policy

Green Biotechnology – An Orientation for SDC (Draft)

This paper can be obtained from: Katharina.Jenny@deza.admin.ch

In this paper, the Swiss Agency for Development and Cooperation presents its position with regard to green biotechnology. Informed decision-making can support developing countries in reaching decisions on issues related to green biotechnology. The paper states that the rapid development of knowledge and technologies continually produces new facts which must be taken into account in any debate on green biotechnology.

Kym Anderson and Lee Ann Jackson. 2004

Policy

Implications of Genetically Modified Food Technology Policies for Sub-Saharan Africa

World Bank Policy Research Working Paper 3411. 36 p. http://econ.worldbank.org/files/38750_wps3411.pdf

The authors of this paper analyse potential economic effects of cultivating genetically modified crops in Sub-Saharan Africa, taking into account breeds that are intended to enhance profitability, as well as breeds that are geared to improving quality for the benefit of consumers. Their economic model calculations have yielded positive results.

Lindsey Fransen et al. 2005

Policy

Instruments

Integrating Socio-economic Considerations into Biosafety Decisions: The role of public participation

WRI White Paper. World Resources Institute. 47 p. http://pdf.wri.org/fransen_lavina_biosafetywhitepaper.pdf

Green biotechnology raises many socio-economic issues, such as the distribution of its benefits, the role of public sector research, the impacts on the labour situation and the market, intellectual property rights, and ethical and religious questions. This paper examines how socio-economic effects of biotechnology can be analysed, and how the results of this analysis can be integrated into political decision-making processes. Public participation is considered particularly important. The authors conclude by formulating recommendations for the various stakeholder groups.

Bell Batta Torheim. 2005

Policy

Overview

International Discussions on Agricultural Biodiversity – An Introduction to Key Concepts

Development Fund. Norway. 78 p. www.u-fondet.no/graphics/Filbibliotek/pdf/Rapporter/Report_Agrobiodiv.pdf

This document discusses four topics that are closely linked to agrobiodiversity: intellectual property rights, access and benefit-sharing, farmers' rights, and GM crops. For each topic, a general outline is followed by a summary of the topic's coverage in international agreements, along with the positions of the Norwegian government and of NGOs. Positions with regard to GM crops range from cautious reserve to rejection.

G. J. Persley. 2003

Overview

New Genetics, Food and Agriculture: Scientific Discoveries – Societal Dilemmas

The International Council for Science. 58 p. www.icsu.org/2_resourcecentre/Resource.php4?rub=8&id=40

This document analyses fifty scientific reports on genetically modified foods and discusses shared as well as diverging viewpoints. Issues addressed include impacts on health and the environment, the regulatory framework, but also implications for developing countries and general ethical questions. The document contains an interesting commented bibliography of international and national studies on the topic.

J. I. Cohen. 2005

Overview

Case Studies

Poorer nations turn to publicly developed GM crops

Nature Biotechnology, Volume 23, Number 1, pp 27–33. www.ifpri.org/pubs/articles/2005/naturebiotech.pdf

This article presents the results of a study investigating the state of research on GM crops, as well as the regulatory and institutional framework, in 15 developing countries. The study reveals that many countries publicly support

research on a multitude of local crops. However, the implementation of field trials and subsequent commercialisation are still severely hampered by various difficulties related to approval procedures.

FAO. 2005

Policy

Public participation in decision-making regarding GMOs in developing countries: How to effectively involve rural people

Summary Document to e-mail Conference 12 of the FAO Biotechnology Forum (17 January to 13 February 2005)
www.fao.org/biotech/logs/C12/summary.htm

The participants of this e-mail conference agreed that rural populations should be involved in the debate on GM crops. However, they disagreed on the form that this involvement should take. Emphasis was placed on the importance of providing information that is balanced, sound, and adapted to the needs of rural people. Generally, participants were rather sceptical about the feasibility of a genuine participatory process, as well as its effectiveness, should it take place. Moreover, participants expressed the concern that commitments to international agreements might strongly influence national debates.

GreenFacts. 2005

Overview

Scientific Facts on Genetically Modified Crops

www.greenfacts.org/gmo/index.htm

This website offers compact answers to the most important questions related to GM crops. Answers are available at three different levels: summary, details and source. Furthermore, the site features a glossary and a list of useful links. The texts are based on the FAO report on The State of Food and Agriculture 2003–2004 (see below for bibliographic details).

Eliane M.G. Fontes et al. 2002

Policy

The Environmental Effects of Genetically Modified Crops resistant to Insects

In: Neotropical Entomology 31(4):497–513 www.scielo.br/pdf/ne/v31n4/a01.pdf

This scientific article points out several problems and open questions regarding the ecological impacts of insect-resistant GM crops. One problem, for example, is that the toxins introduced into the plants are constantly present in high doses. The impacts of GM crops on non-target organisms are still very little clarified, particularly for GM crops that were originally developed for moderate climates and are now applied in tropical zones. Exchange of genetic material between crops and other varieties and the development of resistances pose further problems. However, traditional agriculture has some very negative impacts on the environment as well. Benefits and drawbacks must therefore be carefully weighed.

Ehsan Masood. 2005

Overview
Case Studies

The GM Debate – Who Decides?
An analysis of decision-making about genetically modified crops in developing countries

Panos Report No 49. The Panos Institute. United Kingdom. 48 p. www.panos.org.uk/PDF/reports/gmdebate_report.pdf

In the introduction, this report offers a useful overview of the most important issues related to the development of GM crops and their significance for developing countries. This is followed by an analysis of decision-making processes and the public debate on biotechnology, based on five country case studies. The results show that the debate has become increasingly rigid. Political decisions have to be made based on unreliable scientific findings. Scientists often play an important role, as they are referred to by both supporters and opponents of GM crops. Transparent and unbiased information is important, but, in many cases, lacking.

Klaus Ammann. 2004

Policy

The role of science and discourse in the application of the Precautionary Approach (PA)

In: Molecular Farming, Plant-made Pharmaceuticals and Technical Proteins, Vol. 1, pp. 291–302.

The author discusses application of the Precautionary Approach in debates on GM crops. He criticises that, contrary to the original ideas behind it, the principle is interpreted in a very static manner and with an emphasis on negative impacts, thus serving to prevent the use of new technologies. Arguing in favour of a more solution-oriented approach, he also discusses social, cultural and philosophical aspects of the biotechnology debate.

FAO. 2004

Overview

The State of Food and Agriculture 2003–2004. Agricultural Biotechnology: Meeting the needs of the poor?

www.fao.org/docrep/006/Y5160E/Y5160E00.HTM

This report presents an overview of the various aspects of green biotechnology in developing countries. One important conclusion is that the new technologies do have a potential for benefiting poor small-scale farmers. However, in analogy to earlier technologies, the key question is how this potential, detected by scientists, can be tapped and transformed into appropriate applications for poor producers in developing countries. Another important message is that biotechnological applications only make sense if they are integrated into a comprehensive agricultural development strategy.

Nuffield Council on Bioethics. 2003

Overview

The use of genetically modified crops in developing countries

A follow-up Discussion Paper. 144 p. www.nuffieldbioethics.org/fileLibrary/pdf/GM_Crops_Discussion_Paper_2004.pdf

This report offers information about opportunities and risks of biotechnology, as well as the socio-economic context and possible use in developing countries. The report concludes with a presentation of the international legal framework. The authors consider that GM crops harbour a considerable potential for improving the situations in developing countries with regard to food, health, and the environment. They recommend that potential costs, benefits and risks be assessed separately from case to case.

Kasisi Agricultural Training Centre / Jesuit Centre for Theological Reflection. 2002

Policy

Case Studies

What is the impact of GMO's on sustainable agriculture in Zambia?

Research Study. Zambia. 21 p. www.jctr.org.zm/downloads/GMOreport.pdf

This study is a reaction to the debate on importing genetically modified maize to Zambia in the form of food relief. It criticises the advocates of biotechnology for praising GM crops as a means to enhance food security. According to the authors, biotechnology has several disadvantages, particularly for small-scale farmers: for example, while failing to increase income, it hinders free seed exchange, fosters industrial large-scale production, and may have harmful effects on the environment. Therefore, the authors recommend that GM crops remain prohibited for the time being, and at the same time be subjected to thorough examination, testing and debate at all levels.

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