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GLOBAL FORUM ON AGRICULTURAL RESEARCH  
FORUM MONDIAL DE LA RECHERCHE AGRICOLE  
FORO GLOBAL DE INVESTIGACION AGROPECUARIA

Document No: GFAR/00/17-03  
Distribution: SUB-PLenary 1  
Date: 15 May 2000

**GFAR - 2000**  
**May 21 - 23**  
**Dresden, Germany**

***Strengthening Partnership in Agricultural Research  
for Development in the Context of Globalization***

**GFAR AND BIOTECHNOLOGY ISSUES\***

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\* This paper has been prepared at the request of the GFAR Secretariat as a technical background document. It is solely the responsibility of the author (s), and does not necessarily represent the views of GFAR, nor of any of its stakeholders.

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## GLOBAL FORUM FOR AGRICULTURAL RESEARCH (GFAR) AND BIOTECHNOLOGY<sup>1</sup>

Biotechnology has a very broad meaning. The Convention on Biological Diversity (CBD) defines biotechnology as: "*any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use*". Interpreted in this broad sense, the definition of biotechnology covers many of the tools and techniques that are commonplace in agriculture and food production. Lately, biotechnology has been taken in a much narrower sense to encompass the application of DNA technology, genomics, modern reproductive techniques, almost all of which were developed in the last 30 years.

The applications of the "modern" biotechnology to agriculture include, among other techniques, the use of tissue culture and micropropagation for the production of disease free planting material and for the "in vitro, ex-situ" preservation of germplasm; the production of improved plants, animals and microorganisms either by the utilisation of the several types of molecular markers on marker assisted selection programs or by the utilisation of genetic engineering; the production of "recombinant" vaccines; the production of new diagnostic kits; the production of a range of molecules, enzymes, fibres, for industrial applications and the utilisation of the animal cloning technique for the production of animals.

Biotechnology offers a potential solution for many problems affecting crops, livestock, fisheries and forestry production in developing countries. National programmes should ensure that biotechnology benefits all sectors, including resource-poor rural populations, particularly in marginal areas where productivity increases would be more difficult to achieve.

### **Potentials and Problems:**

Biotechnology provides powerful tools for the sustainable development of agriculture, fisheries and forestry, as well as the agro industry. When appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnology can be of significant assistance in meeting the needs of an expanding and increasingly urbanised population in the next millennium.

#### Among the promises of Biotechnology, the following can be listed:

- More efficient breeding programs for plants (including trees) and animals (including fish), leading to faster and more targeted obtention of well adapted genotypes, with increased disease and insect resistance and resistance to some very difficult to handle environmental stresses.
- Obtention of crops with improved nutrient content.

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<sup>1</sup> Paper for presentation to the GFAR-2000 Conference, Dresden, Germany, May 21-23, 2000. Prepared by Dr. Maria José de Oliveira Zimmermann as resource person on "Biotechnology." This manuscript reflects the technical views of the author and is not necessarily the institutional position of FAO.

- Obtention of more efficient agents for biological control of diseases and insects.
- Obtention of more efficient vaccines against animal diseases.
- Creation of better diagnostic tools for animal and plant diseases.

However, one must also be aware of the concern about the potential risks posed by certain aspects of biotechnology, mainly the so-called genetically modified organisms, produced by genetic engineering. These risks fall into two basic categories: the effects on human and animal health and the environmental consequences. A science-based evaluation system is needed, that objectively determines the benefits and risks of each individual GMO, compared to the risks and benefits of other alternative ways of dealing with the problem. The science based evaluation calls for a case-by-case approach to each product or process prior to its release. The possible effects on biodiversity, the environment and food safety need to be evaluated, and the extent to which the benefits of the product or process outweighs its risks assessed. Careful monitoring of the post-release effects of these products and processes is also essential to ensure their continued safety to human beings, animals and the environment.

### **Issues for Applying/Introducing Biotechnology in Research Programs in Developing Countries:**

Biotechnology research requires skilled staff, backed up by well-equipped laboratories with proper working conditions, a constant supply of good quality water, a reliable electricity supply, and organised institutional support including timely delivery of reagents and access to Internet and other international networks. A minimal technology base is required even to adapt technology tried and tested elsewhere to local ecological and production conditions and to meet national obligations for biosafety, release of GMOs and sale of products derived from them. All of these aspects mean resources: biotechnology needs resources to be properly utilised.

Biotechnology research does not finish with a laboratory product. To have useful results it must reach the end user. Biotechnology research needs strong and organised outreach services and suitable institutions and infrastructures to facilitate its application. A variety of institutions may be required, depending on the technology.

Intellectual Property Rights regimes (IPRs) are critical for growth of the biotechnology industry and lack of patent protection in a country can limit access to the results of biotechnology originating elsewhere, blocking inward investment. The issues are complex, with implications for trade, technical investment and access to biotechnology outputs. In terms of research and development, several forms of partnership arrangements between public and private sector institutions are probably needed in order for developing countries to have access to biotechnology.

Adequate biosafety regulations, risk assessment of biotechnology products, mechanisms and instruments for monitoring use and compliance are needed to ensure that there will be no harmful effects on the environment or for people. Potential environmental hazards from new products of biotechnology, mainly involving GMOs, have raised public concerns. For the responsible adoption of biotechnology, adequate legislation and proper regulatory bodies for all aspects of biosafety are essential in each country.

Biotechnology is more than just a scientific issue. It is capable of engendering disagreement and controversy, highlighting moral and ethical concerns, which are difficult to resolve. These

concerns include or arise from uneasiness over the fact that biotechnology is seen by some to "interfere with the workings of nature and creation", and that it might involve risk-taking for commercial profit. However, in priority setting, all concerns must be clearly balanced, respecting ethical aspects but reflecting the actual and potential possibilities of increasing food supplies and alleviating hunger.

### **The Global Forum for Agricultural Research (GFAR) and Biotechnology:**

GFAR was created in reply to a felt need. It was felt at the time, that an organised forum involving all stakeholders was needed for Agricultural Research in order to provide a neutral unbiased platform for all stakeholders to exchange their views, discuss subjects of their interest, to establish partnerships and devise joint solutions to common problems.

Biotechnology is a new area of science and one where developing countries' National Agricultural Research Systems (NARS) are particularly weak. In all areas of research, GFAR can help NARS to establish partnerships, by facilitating access to information and by fostering information exchange.

In the specific case of biotechnology, the activities that can be undertaken by GFAR are in the following main areas:

- Partnerships, which can be of traditional type or of high risk high pay-off type, (for technology and knowledge development; for technology transfer and adoption; for capacity building)
- Activities on public awareness and policies (IPRs, Biosafety, for development and implementation of regulations and harmonisation of procedures).

In the present session of GFAR, four cases of successful research partnership are being presented; most of which do not deal directly with modern biotechnology:

1. Development and Use of Hybrid Rice Technology in India, which involved several Indian institutions from the public and private sector, together with IRRI, the China Hybrid Rice Research and development Centre, the University of Kyoto and members of IRRI/ADB project. The Indian Council of Agricultural Research, United Nations Development Program (UNDP), FAO, Mayco Research Foundation and the IRRI/ADB project funded it. As a result, more than 1,250,000 ha are now grown with hybrid rice in India.
2. PRECODEPA: Avances, Logros y Perspectivas del Programa Regional Cooperativo de Papa (Potato Regional Program). It is a research network in which the participants are the NARS of Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama and Dominican Republic, with technical support and participation of the International Potato Center (CIP) and financial support of the Swiss Agency for Technical Cooperation. It includes activities of integrated pest management, potato genetic improvement (breeding), seed production, industrialisation and processing, capacity building. As a result of that, a significant yield increase was achieved in the region.
3. CERAAS: The Regional Centre for the Improvement of Plant Adaptation to Drought. This is a research center that was created to help developing research and technology specific for drought conditions. The research center was established in Senegal with the support of CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) and the University of Paris, to attend the needs of member

countries of WECARD/ (CORAF) (West and Central African Council for Agricultural Research and Development). Several new technologies were produced as result of that work, which is still on going.

4. Development of Wheat Cultivars for Durable Resistance to Leaf and Stem Rust in the Nile Valley and Red Sea Region. It is a partnership co-ordinated by the International Center for Agricultural Research in the Dry Areas (ICARDA), involving the NARS of four countries (Egypt, Ethiopia, Sudan, Yemen) and two international centers, ICARDA and the International Center For Research on Maize and Wheat (CIMMYT), for solving the problem of leaf and stem rust in wheat in the Nile Valley and Red Sea. The network was initially supported by the Netherlands government and currently by the NARS of the region and the CG Centers. Resistant varieties have already been released in all four countries but the research still proceeds.

Two posters also present successful cases of research partnerships:

1. Coconut: Development of Methods for Clonal Propagation of Elite, Disease Resistant Palms by Somatic Embryogenesis
2. BIOBREES, a multi-partner, multi-donor collaborative programme on BIOtechnology for BREEDing and Seed technology for horticulture in Indonesia.

From the cases mentioned, some general lessons could be drawn:

- There is need for joint, adequate planning and monitoring, involving all partners since the conception of the project.
- Partners should be co-responsible for decisions and equally involved in the work at all steps.
- For successful adoption of research results, farmers (producers) and extension need to be involved in the project at all stages: shared responsibilities create shared ownership.
- Commitment and support of donors and government is needed.

Later in the afternoon, the new innovative proposals for Research Partnership will be further considered and discussed. In the case of biotechnology four proposals were identified as having a substantial component dealing with this new area. The proposals are the following:

1. Trait Discovery in Rice: A Role for the Public Sector, which deals with a new form of partnership designed to help achieving the completion of the functional map of the rice plant and its subsequent utilisation (functional genomics).
2. A Global Initiative to Exploit Biotechnology and Animal Genetic Resources for the Improvement of Livestock Productivity through Control of Trypanosomosis, which is for the production of vaccines and diagnostic kits and use of trypano-tolerant animals.
3. Developing a Common Vision for the Role of Biotechnology in Food and Agriculture, which aims at providing a forum for policy discussions in biotechnology.
4. PROCOCOS – Creation of a Global Research Programme for Coconut, which will also be discussed in the Commodity Chain working group. Its biotechnology component is for characterisation, preservation, exchange and breeding of coconut germplasm.