

BIOTECHNOLOGY IN THE GLOBAL ECONOMY: BEYOND TECHNICAL ADVANCES AND RISKS

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Agricultural biotechnology is the subject of extensive public debates in many countries. This article presents a summary of the results of the International Conference on Biotechnology in the Global Economy held in September 1999 at Harvard University. The article argues that many of the debates are a result of a governance crisis involving the failure to bring social institutions in line with advances in biotechnology. It proposes a set of measures for doing so. These include: promoting consultative processes; undertaking scientific and technical assessments; conducting research and training; reforming national and regional policies and institutions; harmonizing standards and sharing experiences; and facilitating technological cooperation with developing countries.

Key words: biotechnology; genetically-modified organisms (GMOs); globalization; international trade

Last fall the Harvard University Center for International Development and the Belfer Center for Science and International Affairs, hosted an International Conference on Biotechnology in the Global Economy. Over 200 participants from academia, civil society, industry, government, diplomatic missions and international organizations attended the conference. In addition, the United Nations Commission on Science and Technology convened its Panel on Biotechnology in conjunction with the conference. The conference examined a number of issues related to biotechnology in the context of globalization based on 16 background papers and 46 viewpoints and abstracts. Specific topics were addressed in nine sessions on: the evolution of the biotechnology industry; biotechnology in international trade; intellectual property rights; biotechnology and international relations; bioprospecting; biotechnology in developing countries; environmental aspects of biotechnology; biotechnology and human health; and ethics, social values and biotechnology.

The conference emphasized relationships between biotechnology and social institutions. It built on the premise that maximizing the benefits of biotechnology and minimizing its risks will require adjustments in existing institutions, including organizations, laws, regulations, administrative practices and social routines that vary significantly across the world's diverse cultures. In this paper, I synthesize some of the key points discussed in the conference.

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Emergence Of Biotechnology

Since their advent in the early 1970s, techniques for gene splicing and recombination have provided the basis for biotechnology's revolutionary promise to transform economic systems in unprecedented ways. The fact that this transformation is done through modifying living organisms has inspired awe as well as fear. Advocates of biotechnology have argued for approaches that support its rapid deployment, while critics have opposed its use, citing moral and economic concerns along with uncertainties regarding long-term health and environmental impacts. Between these two extremes are those who are interested in maximizing the benefits of the technology while minimizing its risks.

Initial efforts to bring the products of agricultural biotechnology to the market have been met with considerable opposition, especially in Europe. New agricultural production processes are often seen as threats to existing agro-industrial structures and their associated value systems. In addition, groups opposing genetically-modified (GM) crops and foodstuffs are drawing on environmental and human health concerns when challenging regulatory and marketing decisions. In other words, uncertainty now serves a political function. The issue therefore is not simply one of providing more information to reduce uncertainty, but rather one that requires a deeper understanding of the structural benefits and risks posed by the use of biotechnology. The debate about biotechnology must be couched in a broad context. At a minimum, the following issues must be simultaneously considered: rapid rates of scientific advancement; global competitiveness; institutional transition at national and international levels; and time.

Scientific Advancement (as a Source of National Competitiveness)

Molecular biology and related fields have developed a wide range of tools, products, and services that will have a remarkable impact on agricultural production processes in the coming years. These advances are being complemented by developments in other fields, such as information technology, to form new technological confluences. Linked to these changes, institutional arrangements have emerged that seek to use knowledge and technologies to achieve stronger international competitiveness.

New national systems of innovation have begun to promote the rapid commercialization of biotechnology products, and reforms have been introduced in intellectual property protection systems to extend ownership to biological innovations. This later development has contributed to the emergence of laws in some developing countries that seek to confer national control over genetic material. Growing international harmonization of intellectual property protection laws has resulted in the search for alternative regimes of resource rights in developing countries.

Global and Market Competition

These advances are taking place in an era of globalization and market liberalization that promotes greater competition among nations and regions around the world. The ability of any one country to compete effectively under this emerging global market is largely dependent on its technological capabilities. Many countries have formulated national policies over the last two decades based on the belief that biotechnology is a measure of international competitiveness. As a result, debates on the commercialization of biotechnology products cannot be separated easily from the larger context of competition among nations and between multinational corporations in the global market.

Within this context, current debates about biotechnology's impacts on economic structures, human health, and the environment are cast within the broader framework of market liberalization and its implications for existing patterns of agricultural production in different parts of the world. As a result, debates about biotechnology serve as a lightning rod for more fundamental concerns among nations regarding the prospects and risks of market liberalization.

Institutional Transition

New technologies emerge coupled to risks that are typically managed through social institutions ranging from government regulatory bodies to professional associations or industry self-regulation. The process of implementing new technologies evolves from an initially cautious approach to one of familiarity and greater acceptance of risk/benefit calculations based on increased understandings of a technological system. Social values found in different communities, nations, or regions play an important role in shaping technology management approaches. Developments in biotechnology, however, have not been matched by comparable advances in social institutions. Regulatory reforms have lagged behind in many countries, and the role and nature of government oversight has itself become the subject of considerable debate.

Not only has the scope of regulation come under fire, but also the relevance of many of the existing regulatory institutions is now in doubt. This is true at the national, as well as at the global level. Institutional flux has also created considerable uncertainty about the regulation of biotechnology. Sustained institutional reforms, especially those associated with market liberalization, have created perceptions of laxity in governance systems. Comparatively new institutions, such as the World Trade Organization (WTO), are still in their formative stages with regards to analysis and response to technological risks.

The process of institutional reform to accommodate emerging technologies does not necessarily require the creation of new structures. The first step would be to adjust existing institutions. It is equally important to ensure that institutions have competencies that match their regulatory tasks. For example, environmental institutions may not be well suited to the task of overseeing human safety aspects of biotechnology.

Social Adjustment

As demonstrated by past studies of technology implementation, social adjustments to emerging technologies take time. The adoption of new technologies involves product testing, impact assessments, and information dissemination, each of which requires time to be carried out. International harmonization, though intended to increase efficiency and speed implementation, can add to time frames, since participant countries still need to address internal political concerns.

Countries that take a pragmatic approach are more likely to shorten the time frame needed to commercialize products. But they are also open to criticism from advocates of precautionary approaches if products entail irreversible risks, such as the release of new organisms into the environment. This challenge is compounded if new technologies require the establishment of new regulatory institutions and capacities. The tension over time frames in a global setting often express themselves in narrow assessments of financial costs presented by delays for additional study or risk assessment and public debate.

The Way Ahead: Governing Biotechnology

The discussion above emphasizes that addressing many of the concerns about biotechnology falls under the domain of complex governance systems. Many of the concerns raised in debates on biotechnology are technical in nature. Underlying these concerns, however, are fundamental issues about governance, primarily related to control, equity, and choice. An illustrative set of activities dealing with both technical and governance issues is presented below.

Promoting Consultative Processes

A key step in seeking answers to some of the issues posed by biotechnology is to provide a wide range of forums for consultation, popular participation, and dialogue and exchange of ideas at different levels. Such consultations could be guided by research results and other scientific and technical inputs. Mechanisms, such as national, regional and global commissions, could play an important role in establishing a basis for broader participation in the management of emerging technologies. Many countries are already sponsoring such consultations in line with their systems of governance and cultural practices.

Undertaking Scientific and Technical Assessments

One of the key features of the current debate on biotechnology is the absence of consolidated assessments that provide balanced evidence on environmental or health impacts of biotechnology. Such assessments could be extended to other areas such as intellectual property rights and the impacts of biotechnology on developing countries. A peer-reviewed and transparent assessment process would provide a basis for dialogue and help to rebuild confidence between different stakeholders.

Conducting Research and Training

Research is an important aspect of this process. One area that requires specific research attention is how new technologies interact with existing social institutions (from theoretical as well as applied policy perspectives). Although this area has received much attention in innovation and science policy studies, much of the available information is not available to the public and little of it deals specifically with the social aspects of molecular biology. Another area that requires urgent research attention is the economics of agricultural biotechnology. There are promising signs that agricultural universities are starting to focus on this subject. Establishing a link with environmental economists would contribute to on-going debates on biotechnology's "value added".

Academic institutions can provide a useful basis for creating a new generation of policy makers and analysts that pay particular attention to the role of biological sciences in society. Training opportunities will contribute to improved understanding of the ramifications of biotechnology and enhance technology management capabilities.

Reforming National Policies and Institutions

A review of recent responses to public reactions to biotechnology shows that much of the policy and regulatory work needs to be carried at the national level. National responses will depend largely on the character of existing institutions. The first step is to explore the possibility of working through existing institutions, taking into account their jurisdictional competency. This

process may entail reconfiguring some functions of existing institutions. Where this is not possible, the option of creating new structures should be pursued.

Harmonizing Standards and Sharing Experiences

An equally important task is the harmonization of minimum standards and sharing of experiences on best practices. International harmonization of national and regional practices is an important aspect of resolving potential conflicts among nations and promoting efficiency in the functioning of regulatory regimes.

Facilitating Technological Cooperation

Many developing countries, especially those in the tropics, occupy a special place in the debate. They see themselves largely as potential recipients of biotechnology products from other countries. Yet this technology has the potential to face some of the challenges associated with reducing agricultural inputs, improving yields of traditional crops, adapting agriculture to marginal environments, diversifying production, and improving the nutritional content of foods.

Achieving these goals requires a significant reorientation of current patterns of technological development. In the absence of identifiable benefits, developing countries will continue to perceive this technology in terms of risks and the harm these may entail. To move beyond this narrow interpretation, these countries need to formulate policies and strategies that seek to maximize the benefits of emerging technologies and minimize their risks. Furthermore, technological cooperation has the potential to reduce international tension over access to genetic resources.

A Concluding Comment

Moving forward will involve mechanisms that provide practical measures on how to address these complex issues. Many of the issues raised above are being considered in a wide range of bilateral, multilateral and open forums. Much of the work to be done must address concerns about “governing biotechnology”, not just solving specific technical problems.