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Science, politics, and the GM debate in Europe

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Abstract

Europe today stands at a crossroad, facing challenges but also opportunities. In its intent to make Europe a leading technology-based economy by 2010, the European Commission has identified biotechnology and genomics as fields for future growth, crucial for supporting the agricultural and food processing industry. Since first commercialization in 1996, GM crop areas have grown at double-digit rates, making this one of the most rapidly adopted technologies in agriculture. However, in contrast to other world areas and despite European Commission support, Europe has found itself 'bogged-down' in a polemic between opponents and supporters of plant biotechnology. As a result, planted areas have remained small. This stalemate is due to a lack of political leadership, especially at the Member State level, all the more surprising in light of European early development and competitive advantage with crop biotechnology. This situation proves once again that, for cutting-edge innovations, a solid science base alone is not sufficient. Acceptance or rejection of new technologies depends on interlinked political, economic, and societal factors that create a favorable or unfavorable situation at a given time. This article will look at GM crops in Europe and the role science and politics have played in the introduction of crop biotechnology.

Keywords: Plant biotechnology; Genomics; Research and development; Politics; Europe

1. Vision 2010: Europe as a leader in technical innovation

Today, Europe faces many challenges of political, economic, and social nature. At a time of intense competition from other world areas, the European Union (EU) is reshaping itself, expanding and continuously adapting its legal and environmental framework.

In a recent publication (European Commission, 2004), European Research Commissioner Phillippe Busquin restated the EU's March 2000 Lisbon European Council objective of becoming the "*most competitive and sustained knowledge-based economy by 2010*." One of the key elements to achieving this is maintaining and building on the EU's scientific and technological diversity and excellence, acting as a magnet for top researchers and innovative companies that would otherwise develop their activities elsewhere.

Two fields identified as crucial in this context, not only by the EU but also by individual Member State governments (see Boxes 1 and 2), are biotechnology and genomics.

Box 1—Tony Blair at the European Bioscience Conference (November 2000)

"The science of biotechnology is likely to be to the first half of the 21st century what the computer was to the second half of the 20th century. Its implications are profound, its potential benefits massive... Britain is well placed to keep our lead in Europe. I want to make it clear: we don't intend to let our leadership fall behind and are prepared to back that commitment with investment."

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Box 2—Edelgard Bulmahn, German Minister for Education and Research (November 2003)

"Biotechnology is one of the most innovative fields of the 21st century. We expect that, from now to 2020, biotechnological methods will be involved in about half of all important innovations."

Applied to crops and food singly and in combination, these technologies will determine the future competitiveness of Europe's agricultural and food processing industries. This is of no small importance given that the agri-food industry is the leading industrial sector in the EU. It represents a €600 billion annual turnover, utilizing a fifth of the Union's land. It is also the continent's third largest employer, with 2.6 million jobs (excluding farmers) mainly in small to medium-sized enterprises (SMEs) (CIAA, 2004).

Let us therefore take a closer look at plant biotechnology and the increasing role it plays in Europe.

2. What is plant biotechnology?

Biotechnology can be defined as the application of biological knowledge and techniques to develop products. The term encompasses classical methods used for plant and animal breeding, for example, fermentation and enzyme purification. It also refers to newer biotechnological methods to modify the genetic material of living cells so that they produce new substances or new functions.

Since the 1980's, biotechnology has been applied to plants, in particular crops, as a new method of breeding which helps add or switch off particular genes to improve crops in ways not possible with classical systems. At the outset, this was a response to farmer demand for simpler and more efficient methods of cultivation. The first genetically modified (GM) crops therefore carried agricultural traits, mainly tolerance to specific herbicides or resistance to a number of pests. For certain types of crops, this new technology represented the opportunity to move from chemical-based pesticide control systems to more sustainable biological methods, replacing older technologies with more environmentally friendly ones.

As research progresses, many new traits are being worked on, including crops with enhanced nutritional profiles (e.g., increased levels of essential amino acids or vitamins, improved oil composition) or increased resistance to environmental stress (e.g., drought, heat or cold). Promising advances are also occurring in the medical field, with plants being used as substrate for the production of pharmaceutical products (Cockburn, 2003).

3. The rapid adoption of plant biotechnology worldwide

The benefits of GM crops are numerous; ease of use for the farmer, decrease in the amount of pesticides needed for weed or insect control, lower energy use and possibility to adopt soil-preserving conservation tillage techniques are just a few examples. This was recognized early on by farmers and GM crops became one of the most rapidly adopted technologies in the history of agriculture. Since their first commercialization in 1996, planted areas have grown steadily at double-digit rates, reaching 67.7 million hectares worldwide in 2003 (James, 2003). Today, seven million farmers, approximately one third from developing countries, cultivate GM crops in 18 countries. More than 99% of plantings occur outside of Europe, where only Romania, Spain, Bulgaria, and Germany grow GM plants, on surfaces reported at around 50,000 hectares or less in 2003 (Table 1).

Table 1
GM crops planted worldwide in 2003 (in million hectares)

Country	GM crop area	% of total	Country	GM crop area	% of total
USA	42.8	63	Uruguay	>0.05	<0.07
Argentina	13.9	21	Mexico	<0.05	<0.07
Canada	4.4	6	Bulgaria	<0.05	<0.07
Brazil	3	4	Indonesia	<0.05	<0.07
China	2.8	4	Columbia	<0.05	<0.07
S. Africa	0.4	1	Honduras	<0.05	<0.07
Australia	0.1	0.1	Germany	<0.05	<0.07
India	0.1	0.1	Philippines	<0.05	<0.07
Romania	>0.05	>0.07			
Spain	<0.05	<0.07	Total	67.7	

Source: James, 2003.

4. Regulation of GM plants

Worldwide, strict regulatory frameworks are in place in many countries to ensure that all candidate GM crops are evaluated according to the latest standards of scientific knowledge for impacts on human health, animal health, and the environment before authorizations for marketing are granted. There is a high level of international harmonization (König et al., 2004); the safety assessment is extremely rigorous and varies only slightly from country to country (Jaffe, 2004). It involves a case by case basis analysis, taking into account the crop, the trait and the region of intended commercialization. In contrast, new crop varieties developed by conventional breeding methods (these include not only traditional hybridization but also embryo rescue, chemical or ionizing radiation-induced mutation and protoplast fusion for example) are not extensively tested before commercialization.

Assessments of the GM crops currently on the market have uncovered no adverse health or environmental effects. Also, there have been no validated adverse findings during their consumption over the last 8 years (UK GM Science Review Panel, 2003, 2004).