Paper

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INTRODUCTION

Since 1998, European governments have maintained a de facto moratorium preventing the planting and import of GMOs not previously authorised. This decision was reached because of public concerns about the health and environmental impact of biotechnology.

In 2004, the situation has changed dramatically. The issues raised by the use and the planting of GMOs seem to be more complex, including of course, health and environment, but also the economic effect for land managers and the food chain. At the same time public opinion is now better informed about biotechnology and is not as drastically opposed as it was previously. Political opinions now also seem to be more nuanced:

- *The Commission recently released a communication "Stimulating new technologies for sustainable development" (January 2004) which includes biotechnology.*
- *The European Union adopted a Directive proposed by DG Environment on labelling and traceability of GMOs.*
- *Meanwhile the European Council (or the European Commission) will decide in the first half of 2004 on the import and use of two types of genetically modified maize. When this decision is made, the moratorium will come to an end.*
- *The European Food Agency Authority was created in 2002 to provide independent scientific advice on all matters linked to food and feed safety.*
- *In March 2004, the UK government agreed that British farmers will be allowed to grow GM maize, following the example of Spain.*

Even if the EU is considered to have the world's strictest legal framework regarding biotechnology, present and future Member States as well as Candidate Countries, already grow GMOs at commercial levels. Refined and processed products sold in the EU already incorporate GM ingredients.

It is timely for ELO, which represents the interests of European rural entrepreneurs, to launch a debate on the opportunity that agricultural biotechnology offers in terms of health, environment, research and economic impact.

ELO has always been ready to debate "hot" issues concerning the future of Europe's rural world. Regarding the CAP reform, ELO has adopted a proactive approach, impartially analysing the Commission proposals, criticizing some of the provisions and proposing alternatives. As it did in the CAP reform debate, the organisation wants to take the lead and invite all stakeholders to consider the use of GMOs and the legal framework. The EU should not miss the opportunity of a technological revolution but has to weigh its cost and benefits.

Developments

Biotechnology is not a new technology and has been applied for thousands of years in, for example the production of bread and beer. In 1944, the function of DNA was discovered and in 1953, Crick and Watson identify its structure. In the early 1990's transgenic plants (genetically modified) were first grown commercially.

The plant varieties produced using genetic modification or engineering are often called “GM crops” and “GM food” contains ingredients derived from GM crops. Modern biotechnology is applied to manufacturing processes in:

- Pharmaceuticals – Red biotechnology
- Food and Agriculture – Green biotechnology
- Industrial processes – White biotechnology

In Europe, the first GMO plants were produced in the late 1980s in Belgian and German public laboratories and the first biotech crop (tobacco) was tested in the field in 1985 in Belgium. In 1997, France was the first European country to authorise the commercial planting of a transgenic variety of maize, resistant to the corn borer (pyrale). Meanwhile, in the United States, the first genetically modified plants (virus resistance tomato and potatoes) were produced in 1987 and in 1994 the first genetically modified food plants with commercial potential, tomato Flavrsavr™, were put in to the market. In the EU, only Spain started planting GM crops on a significant commercial scale.

In the United States, Brazil and Argentina, GM crops were widely planted: consequently these countries lead the worldwide market in the production of GM crops. In Europe, the technology suffered from opposition based on perceived negative public opinion. The debate on GMOs was based not only on scientific arguments but primarily on ethics and moral beliefs. Public opinion tends to rely less on scientific facts, but rather on media presentation. This delicate position explains the ambiguity that marks the history of transgenic plants in Europe.

The worldwide cultivation area of transgenic plants in 2003 amounted to approximately 67.7 million hectares (ISAAA[1]), which represents approximately **25%** of the worldwide arable land (FAO).

2003 is the seventh consecutive year of double-digit growth in terms of biotech crops planting, representing an increase of 15% compared to 2002. **7 million farmers in 18 countries now plant biotech crops**; up from 6 million in 16 countries in 2002. ISAAA predicts that within the next five years, 10 million farmers in 25 or more countries will plant 100 million hectares of biotech crops. The global market value of biotech crops is expected to increase from approximately $4.5 billion this year to $5 billion or more by 2005.

Spain is the only country in the EU to plant significant acreage of biotech crops with 32 000 hectares of Bt maize, an increase of 38% from 2002, 6,6% of the total area of maize planted. About 50% of the Spanish maize area suffers from the European corn borer. In February 2004, 9 varieties of Bt maize were approved for cultivation, adding to the 7 already approved by the Spanish government.

This position leaves the EU in a very uncomfortable situation compared to its international competitors. From the legal and market point of view, the EU situation is increasingly unsustainable.

POLITICAL AND REGULATORY SITUATION

The main legislation under which crop field trials, and placing on the market of genetically modified organisms (GMOs) that have been authorised in the EU, is Directive 2001/18/EC of the European Parliament and Council (deliberate release of genetically modified organisms).

[1] International Service for the Acquisition of Agri-biotech Applications (ISAAA)

Directive 2001/18/EC, puts in place an approval process on a case-by-case assessment of the risks to human health and the environment. This must be done before any GMO or product consisting of or containing GMOs, can be released into the environment or placed on the market.

Products derived from GMOs, such as food products and ingredients (for instance paste or ketchup from a GM tomato) are not covered by this horizontal Directive. They are covered by the Regulation on Novel Foods and Novel Food Ingredients (Regulation 258/97, 27 January 1997). This will be replaced by two new Regulations, both applicable from mid April 2004:

- a Regulation on GM food and feed (Regulation 1829/2003)
- a Regulation on traceability and labelling of GMOs and the traceability of food and feed products produced from GMOs (Regulation 1830/2003).

At this stage (March 2004) 18 GMOs have already been authorised in the EU for commercial production and products from 16 GMOs have been approved for use in food products and can be marketed in the EU. Among the 16 are: 1 GM soy and 2 GM maize and processed foods derived from *inter alia* 7 GM oilseed rape, 4 GM maize and oil from 2 GM cottonseeds. Since October 1998, no further authorisations were granted.

Until the entry into force of the new Regulation on GM Food and Feed, there has been no EU legislation governing the specific use of material derived from GMOs in feed. Eight GMOs are authorised in accordance with Directive 90/220/EEC for the purpose of use in feed; these are four maize varieties, three rape varieties and one soya variety.

A positive decision from the Regulatory Committee on dissemination of GMOs into the environment, on 18 February 2004, would have ended the moratorium on new GM foods in the EU, which has been in place since 1998. The import and processing of NK603, the genetically modified maize variety produced by Monsanto, was not authorized by EU Member States. This particular variety of maize has been modified to increase its tolerance to a herbicide, and the application is for import and processing only, not for cultivation.

For the GM sweet corn variety Bt-11, in spring 2004 this will be submitted to the Council, which will then have to adopt (or reject) it with a qualified majority. If no decision is taken, the file goes to the Commission, which will most probably adopt the proposal. If the Commission's proposal is adopted, the GM maize (which received a favourable assessment from the European Food Safety Authority (EFSA) in November 2003) would be allowed for import after 18 April 2004, when new EU rules on GMO traceability and labelling enter into force. It would also require authorisation for food uses under the new EU GM Food legislation. This shows that the Commission is quite favourable to the lifting of the moratorium.

Germany is the first country that presented a proposal (February 2004) that foresees establishing a register of land planted with GM crops, with access to the public. The proposal also includes: rules about civil responsibility of GMO producers, strict surveillance measures, detailed rules for specific crops and a code of good practices for coexistence.

It is important to recognise that if legislation were to be introduced regarding the liability of land managers using GM, then it can reasonably be argued that, on equity grounds, the same principles should apply to non-GM (including organic) land managers, whose activities might have an (adverse) impact on GM crops producers.

In February 2004, at the first Conference of Parties to the Cartagena Protocol on Biosafety, in Kuala Lumpur, the 87 member states of the Protocol agreed to develop rules by 2008 on complaints and compensations with regard the international carriage of GMOs (liability). The group will specify the rules applicable in terms of insurance and assessment of damage caused to biodiversity.

PUBLIC OPINION

Public perception concerning the use and the planting of GMOs plays a key role in the acceptance of biotechnology at political and consumer levels. The release of GMOs into the environment for commercial farming and the use of GM products in processed food and feed is still a controversial subject in the EU. Nevertheless, overall public opinion regarding GMOs tends to be becoming more and more neutral and positive (KRC Research annual survey of 3,500 people in 5 countries in 2001, 2002 and 2003).

Public perception is highly influenced by information presented by the media. In the 1990's, environmentalist lobbies had an inordinate influence on the media and consequently consumers perception of biotechnology. It was difficult for EU citizens to access sufficiently diversified information sources to address their desire for balanced neutral information. Environmentalist groups directed their communications towards the public, raising fears about the new technology.

Emotion and tradition influence eating habits. Many people saw this unfamiliar technology as a scary, risky business, and had little experience with which to judge the new world of genetically engineered products. Reading and viewing the media, they felt disturbed and insecure and they felt that is a lack of credible understandable information on the subject. As with any new technology, biotechnology applications must be carefully screened and assessed. This was the purpose of the new regulatory framework set up by the Commission.

The number of Europeans who say GM crops and food are not safe has declined, and scientists increasingly have given their clear support to GM crops underlining that the genetic modification of plants and genes is neither new nor does have negative health impacts. The addition of a new or different gene using techniques of recombinant DNA to an organism does not create any new risk compared to the modification of organisms by traditional methods.

82% of consumers think they "should have the choice to buy or not GM food". They trust the ability of European authorities to design regulations which serve the public interest. European legislation on GMOs is renowned to be one of the strictest in the world.

In fact, despite the moratorium put in place in 1998, lots of refined products sold in the EU already incorporate GM ingredients, ex.: chocolate, beer, soya milk, vegetal oils, margarines, cheeses, etc. What gets forgotten is that the production and processing of even the most familiar food products is changing all the time, addition of GM ingredients is just the latest way of doing so. This is due to new nutritional and physiological developments, social and consumer demand changes and economic and technical advances.

SAFETY AND HUMAN HEALTH

Safety and human health concerns are increasingly less controversial - this was not the case in the 1990's - as demonstrated by the recent statement of the British Medical Association (BMA). This paper has to address this concern even if the scientific community seem to agree on the harmlessness of the approved GMOs.

The perception of GM food depends of the quantity and quality of available information. During the 1990's this information was monopolised by environmentalists leading to opposition against the utilisation of GM for food and feed. It seems that no food product produced using recombined DNA techniques or using traditional methods, exists without any risk. But we ought to consider perceived risks (by public opinion) and virtual risks (risks with no precise scientific certainty or when scientists don't agree with each other).

Regarding perceived risks the European Commission, the European Food Safety Authority, and various EC scientific committees and almost all relevant national bodies have issued reports that state unequivocally that authorised GM foods are just as safe as conventional foods. They state that the products that reach the customer are "at least as safe as conventional foods".

To ensure the safety of consumers, GM foods and ingredients are certainly tested more stringently than almost any other foodstuff. No scientific accepted report shows any danger to human health. When we compare with organisms modified by traditional methods, the security of these products already on sale is assured by the present regulations. Biotechnologists tend to say that this new genetic tools offer more precision and flexibility.

Regarding the worries related to the possible existence of allergic potential, no test exists that can tell us that proteins from known resources can create any allergy. The usual procedure to do this is to compare the structure of the GM proteins with the proteins that we know that are allergic. In some countries it is already obligatory to include on the labels that contain the eight more common allergenic (milk, eggs, wheat, fish, sea food, dried fruits, peanuts and soya). At EU level it will be compulsory as from end of 2004.

In relation of virtual risks, GM producers, government agencies, independent organisations and others keep studying and developing GM crops and their different interactions.

ENVIRONMENT

One of the main issues concerning the introduction of GMOs in farming practices is their impact on the environment. Over the last couple of years environmental concerns have removed health issues. Concerns about the effects of GMOs in nature have been at the top of the agenda of activists and politicians and widely reported in the media.

Because of specific traits (insect resistance, herbicide tolerance) it is feared that resistant insects and resistant weeds could appear after a few years not only in fields but also in the wild. The cultivation of GM crops, because of cross-pollination, could lead to the transfer of its genes to classical plants grown nearby as well as wild flora. Possible "gene-stacking" in the same kind of plant could lead to a "super resistant" species which therefore could not be properly treated. Because cross-pollination occurs in both directions, from conventional to GM plants and the other way around, in the case of herbicides resistance plants, these genes could be transmitted to neighbouring crops of the same variety. All these aspects are potential risks that producers have to assess.

Cultivation of GM crops requires the respect of new specific farming practices to avoid insect and weed resistance and more generally to be sustainable.

Up to now and after 7 years of commercialisation, there is no evidence that **insects** have developed **resistance** to insecticides because of the use of insect resistant GMOs. Studies in the USA and in Spain over 200 insect specimens showed that none of them have ever developed resistance.

Nevertheless potential risks do exist. These risks could be dealt with through the creation of so called “refuge” areas were non GM crops are cultivated (GMO free areas) and the identification of new genes. In addition, a full range of good farming practices such as: crop rotation, time of planting, management of field margins and elimination of weeds can minimise possible gene transfer.

These measures and particularly refuges, allow some insects to not develop resistance to the trait of the GM plant. Therefore genetic diversity is maintained in the area, drastically reducing the potential risk of insects developing resistance. On the contrary, insect resistance traits can bring environmental improvement by reducing the amount of insecticides needed. Therefore the effect on soil and underground water stocks is positive.

The more frequently an herbicide is used, the more likely it is that **resistance** to it emerges in the **weeds**. The growing of herbicide tolerant crops, in combination with an insufficiently diversified use of chemicals, could lead to herbicide tolerant weeds. This phenomenon already exists in classical agriculture and should be addressed by changing agro-chemicals used and growing crops in rotation. This reduces the likeliness of resistance.

It is the same phenomenon with the survival of herbicide tolerant crops during the next growing season. These unwanted plants can be treated with a new herbicide to which they are not resistant. Herbicide resistant traits should allow farmers to better control the growing of weeds and to better dose the amount of chemicals needed. Less spraying is necessary because weeds can be treated later and so there is no need for preventive and repeated treatment on the same surface. It should therefore reduce the overall amount of chemicals spread.

Cross-pollination, both with wild species and conventional crops is often brought into the debate. Cross-pollination with wild species could lead to gene transfer of GM genes to conventional or organic crops. This could make them, at least partly, GM, which is particularly undesired if these crops are grown under certification.

New farming practices have been developed to respond to these risks: introduction of buffer zones (10 to 15 metres) planted with non-GM plants to prevent pollen move to neighbour fields resulting in unwished cross-pollination.

It is in fact quite difficult to design a global scheme. The danger of such “genetic drift” differs greatly depending on the regions and on the plants. It means the practices must be adapted with a case-by-case evaluation. Still risks exist, particularly for organic crops which must be certified. This could be addressed by creating non GM regions, but which impact will this have on the price of land or on the structures of farms?

In the case of plants that are high-risk because there exist many similar varieties in the native flora; like carrots; alfalfa, wild grasses; species have been developed in which the pollen no longer can transfer new genes. Spain will be the first EU country to publish the recommendations for plants coexistence; this was announced by the director of the Spanish Vegetal Variety Office of the Agriculture Ministry in February. Like Spain, most European countries are developing measures for the coexistence of GM, traditional and ecological crops.

Cross-pollination with wild species could also create new herbicide resistant weeds. The applicable herbicide is simply rendered non-effective. If the hedgerows are not sprayed with herbicides, herbicide tolerant weeds have simply no survival advantage over other plants. Herbicide resistance in itself is not a new phenomenon.

Regarding the tolerance to herbicides, "gene stacking" (compilation of several resistance genes in the same kind of weed) could be seen as a new issue if GM crops become widespread. Nevertheless the large range of herbicides presently known makes improbable the creation of universal resistance; in any case not more likely than a resistance brought by the use of present insecticides.

The introduction of GM has lead to debates about new environmental issues like the creation of resistance, cross pollination, gene stacking, etc. To address these, farmers and governments have to adopt practices to eradicate or minimise them. At the same time GM could bring environmental advantages such as the decrease of use of chemical substances reducing the pollution impact in soil properties and underground water stocks. Minimising tillage work benefits soil structure and reduces farming inputs in energy consumption, a benefit for air quality with the reduction of the production of CO2.

ECONOMIC IMPACTS

The Commission has adopted a more and more positive approach towards biotechnology – which will most likely result in the lifting of the moratorium on GMOs. Apart from environmental issues, European entrepreneurs must also analyse the economic impact of the growing and use of GMOs. Visibility is the key for economic decisions. It is expected that, after the approval of GM maize for cultivation in the UK (March 2004), other European governments will start moving forward with approvals for cultivation as well. However, it is difficult to judge which countries will move forward how and when.

The evolution of GM in Europe takes place within the specific context of the CAP reform, as rural entrepreneurs fear for their revenues as well as for the price of their land. It is clear that the adoption of a single decoupled payment, based either on historic reference or a regional average price per hectare, framed with a budgetary discipline, won't lead to an increase of payments.

Rural entrepreneurs are looking for diversification of their activities as well as renewal of their practices to face the new rules and the progressive opening of the EU market to the international market.

Approved GMOs, as long as the principle of their growing and their use in food and feed products has been accepted by public opinion, could be an option.

By reducing the amount of chemicals sprayed on the field and the number of sprayings, GMO's could also reduce the cost of inputs (agro-chemicals, fuels, use of machinery) (NCFAP[2]). At the same time GMOs offer the possibility to grow more biomass on the same area, therefore increasing the profitability of each hectare. A more standardised product can also be favourable to the mechanisation of farm works.

On the contrary, growing GMOs also means to develop new practices with specific requirements and constraints (refuges, buffer zones) which could lead to extra costs. It seems nevertheless, looking at the progression of the GMOs crops (since 1998, farmers growing maize have achieved an average yield increase of 6,5%) that the combination is profitable.

What about the price of GM products on the market?

A recent work conduced by Groves (2003), Consumer Watch, GM foods and the Institute of Grocery Distribution suggest that about three-quarters of consumers do not consider the

[2] National Centre for Food & Agriculture Policy (NCFAP)

issue of whether food is derived from GM crops or no as important, with only a small minority (13%) expressing a strong desire to avoid GM food. It is actually the case in the USA where soya beans and maize, both for GM and traditional seeds are mixed and sold together.

The EU estimates that the overall wider biotechnology (medical, agricultural and industrial) market in Europe could be worth over €100 billion by 2005. GMOs could offer a competitive advantage as their traits can bring a higher nutritional value, better flavour etc. that can be seen as a competitive advantage.

The adoption of biotechnology crops worldwide could boost the overall income of all regions worldwide by $316 billion a year by 2015, according to an OECD-AGLINK designed economic model forecast produced by the Australian Bureau of Agriculture Resource Economics (ABARE).

In Spain, from the economic point of view, the volume of billing companies dedicated to biotechnology on 2002 is about 122 million euros, which represents 0,0175% of the gross domestic product (GDP) on market prices. Even if this amount is not very significant, the estimative for the increase of billing on 2003 are of 0,0266% of the GDP on market prices, reaffirming the important role that biotechnology can represent on the Spanish economic future.

The economic impact of GMOs is not solely focused on their price on markets. On the one hand, by growing GMOs, entrepreneurs take the risk of polluting close traditional crops which therefore could not be sold under their initial label, loosing their competitive advantage. Is the grower of GMOs liable and to which extent? This is yet to be determined in Europe.
On the other hand, can a traditional crop cross-pollinate a GM crop which therefore will not be 100% GM? Does the crop lose its labelling of GM?
For example: in the production of Waxy corn or high erucic-acid rapeseed, the farmer experience on growing specialty crops show us that is possible to preserve a good coexistence level with neighbour crops, maintaining a high quality standard.

When a farmer wants to grow rice for selling the seeds, he must certify the purity of the species he sells. If different kinds of rice have been grown before on the same land, certifying the rice seeds is impossible. Growing GMOs lead to the same problem. Can a land where GM crops where grown be brought back to organic farming? If no what impact on the price of this land which has lost some of its potentialities?

CONCLUSIONS

For the last 8 years GMOs farming has been growing in North and South America, and now in Asia. Worldwide cultivation of GM crops in 2003 is approximately 25% of the world arable land (accurate 67,7 million hectare).
Rural entrepreneurs and parties to food and feed chain need to discuss GMOs issues at European level.
Since 1998, the European Union has imposed a moratorium on the use, including the growing, of GMOs. Despite of this a lot of ingredients derived from GMO's are incorporated into EU products and are present in our markets.

This precautionary attitude (the moratorium) has a twofold effect:

- The European Union is now far behind its competitors in terms of research, experience and maybe competitive advantage;

- At the same time it gives landowners and rural entrepreneurs the time to ascertain that the decision to grow GMOs will not be a bird decoy.

All studies converge to demonstrate that approved GMOs are innocuous for human health. As for any farming practice, GMOs cultivation will have new impacts on our territories, some positive such as the reduction of cultivated surface thanks to the increased profitability of GM crops and the reduction of inputs, some potentially risky because of cross-pollination, both in adjacent fields and in the wild.
Our capacity to predict the ecological impact of the introductions of new species, including GMOs, is still far from precise, and the used data to evaluate the possible ecological impacts have serious limitations. So there is a present need to act by evaluation stages.

At the macroeconomic level it seems obvious that the economic impact of GM crops is positive by allowing growing of production with less input costs. But at individual level, even if the overall value produced increases, it is not certain that the price of GMOs, their impact on the price of land will secure the revenues of rural entrepreneurs.

GMOs have always been a controversial debate in the EU. Today, the present trend seems to show that more GMOs could be accepted in the EU. Some Member States already grow them and most of food and feed include GMOs.
Liability legislation will be introduced in a near future, as it was agreed on February 2004 by the Cartagena Protocol. We have to remember that on equity grounds same principles should be apply to non-GM and GM land managers.
The challenge for European landowners and land entrepreneurs is now to open the debate so that the "old continent" does not fall behind its competitors. M. LAMY wants to open the EU boundaries; M. FISCHLER wishes to reduce the overall budget affected to agriculture.

M. FISCHLER, in March 2004, at the Sofia conference on Enlargement, stated the position of the Commission concerning GMOs.
There is no heavy push from the Commission to liberalise the use and the planting of GMOs but specific directives have been designed to meet three principles:

- Security for the European citizen thanks to a high level screening before acceptation of new GMOs by the Commission;
- Freedom for consumers to buy (or not) products with GMOs thanks to the labelling of GM products;
- Freedom for farmers to grow (or not) GM plants with the principle of traceability.

Therefore there is no more ground, according M. FISCHLER, for a moratorium at national level.

Once more we insist on the need for creating a debate on the opportunity that agriculture biotechnology offers in terms of health, environment, research and economic impact. Some questions are still open:

- Are GMOs economically viable for farmers depending on the size of their estate?
- At what level do they create an impact on the European environement?
- What are the good practices of GMO planting?
- What is the liability of the GMOs growers towards the non-GMOs growers?
- What is the state of the land after several years of GMOs growing?

It is time for rural entrepreneurs to decide on the tools they need to meet the requirements of the future markets and to face the new rules of the CAP.

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