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THE GROWTH OF TRANSGENIC CROPS IN THE U.S.A.: WHAT IT TELLS US.

At the beginning of the 1980s, it was possible to consider biotechnology as breaking new ground in the field of innovations. It represented a new technological paradigm based on a better exploitation of living matter and making it possible to contribute to more sustainable agriculture. But the very initial transgenic crops, designed to be herbicide tolerant, have often been perceived to be disappointing by a public expecting a decrease in pesticide use and not its continuation with herbicide tolerance. In Europe, GMOs are considered risky and of limited interest by a large proportion of people. Nevertheless, they have enjoyed a boom in certain countries like the United States. How can we explain this expansion? What sort of assessment can be drawn from nine years of transgenic crops? To avoid generalities, the case of the herbicide tolerant soybean will be set out in more detail.

A favourable context in the United States

In 2004, 81 Mha (million hectares) of transgenic plants were cultivated in the world, including 47 Mha in the USA, of which 60% were soybean. For this crop, GMOs accounted for 56% in the world and 85% in the USA. There are several factors explaining this expansion in the New World. Indeed, the adoption of innovation in agriculture is linked to a combination of economic, social, agronomic, institutional and cultural factors. In the USA, the rapid growth of biotechnology has been encouraged by the national context: a strong faith generally prevails in progress, business and innovation (see frame). Biotechnology has generally been

favourably received, while the general public seems to know rather little about GMOs. The fairly positive reception seems to be linked to trust in innovation and progress which is generally higher in the US than in Europe. Moreover, biotechnological growth has received continuous support from the government, from professional associations, many scientists, scientific associations and learned societies that released generally favourable or supportive statements. Thus, unlike the situation in France or in most of Europe, in the USA there has not been any feeling of uncertainty or confusion due to turnarounds in positions accompanied by the impression of a cacophony.

The USA shows more enthusiasm than Europe towards innovation

The survey results on the perception of science and technology (in the USA: surveys made within the context of the National Science Foundation, in the EU: Eurobarometer polls) show quite different levels of trust. Thus, in 2001, the assertion “science makes our way of life change too fast” gets the approval of 38% of people questioned in the USA, but 61% of those in the EU. Moreover, the proportion of people who think that change is too quick has increased in Europe but not in the USA.

Conversely, the assertion “the benefits of scientific research outweigh any harmful effects” meets with an approval of 72% of Americans against 50% of Europeans, while the ratio of people expressing their disagreement is 10% in the USA against almost 25% in the EU.

So, in the USA, the question of the use of biotechnology in agriculture has remained a rather technical subject, generally of little interest to the public even if some associations have brought it up more largely in terms of societal choice. Indeed, there is a growth in organic farming as well as some worries about productivism, but, as far as the latter is concerned, at a much lower level than in France. This gap between the two countries also corresponds to different expectations concerning agriculture which is considered, in the USA, as an economic sector that must innovate just like any other. GMOs are considered to be a competitive factor and to be part of general progress. Lastly, in the USA, the relationship with food is often different from in Europe, with a greater sensitivity for practicality.

Moreover, in the USA, the legislative process and the governmental policy are more influenced by lobbies and less by public opinion. The public's expectation concerning state regulation also seems lower than it is in France, and these past years, there has been quite a good level of trust towards the agencies in charge of food safety. Lastly, the biotechnology industry has carried out an active strategy.

The case study of the herbicide-tolerant soybean

What factors can explain that farmers have rapidly adopted the herbicide-tolerant (HT) soybean? It leads to a new way of weeding: when the associated global herbicide –the glyphosate– is sprayed, all the weeds are destroyed but the crop is not affected because it has received a glyphosate

tolerant gene. One of the first interests for farmers is that it simplifies the weeding, at least in the short term, and leaves time for other production or activity. Moreover, the HT soybean is well suited to cultivation in narrow rows and, above all, to soil conservation practices where tillage is reduced and soil kept covered by mulch or living plants. These soil conservation practices are increasing as they limit erosion and somewhat shorten working time. Indeed, interaction between the various productions and techniques must be taken into account.

Considering the variation in seed costs, weed-killer costs and harvested soybean prices between farms over a given year and, above all, from one year to another, it is difficult to put an accurate figure on the economic differential between HT soybean and the conventional one. Transgenic seed is usually a little more expensive, but the cost is generally compensated for by the lower expense of herbicides. In addition yields are also similar, thus conventional soybean and HT soybean have similar economic margins, sometimes a little higher for HT soybean. Furthermore, the latter offers a certain advantage if one takes into account the better association with conservation tillage and the opportunity costs gained from reduced work time. Several aspects must indeed be considered when assessing the results of a transgenic crop. One cannot make a global and definitive assessment of GMOs in general. Such work must be carried out selectively according to the transferred gene, the crop, its context and other possible choices, with a multi-criteria approach and over a rather long duration.

The risks of/in risk assessment

In France the precautionary principle is often mentioned. But the real dangers or advantages may prove different from those usually put forward and many factors may modify the hierarchy of future risks. So, many points must be borne in mind:

- As to the risks attached to GMOs, considering the prevailing economic mechanisms which induce constraints of quick financial profit, it is necessary to differentiate clearly between what pertains to GMOs themselves from what is linked to the way they are currently directed and used. For example, increased commodification, patents or concentration of firms are

not the result of GMOs themselves, but of the economic system.

- The impacts of techniques are not fixed *a priori*, but depend on the objectives given to them, on the directions of their applications and on the conditions of their use. *I.e.* the impacts depend on the way the techniques are implemented, regulated, and utilized, and so on the socio-economic, cultural and institutional context. Hence, what is at stake is innovation governance – in the widest sense of the term.
- Transgenic crops and biotechnology applications are in the starting blocks. Now, a new technological wave cannot be judged on its very first products. Indeed innovations evolve strongly as a result of scientific and technical advances, users' reactions, firms' strategies and regulations. It is, therefore, impossible to foresee the impacts of future applications of genetic engineering just by watching present-day effects: they depend on what will be done with them.

Agriculture holds an outstanding ecological position: carbon dioxide capturing thanks to photosynthesis and creation of simple or complex organic molecules, food and renewal resource production, etc. It could, therefore, play an important role in improving the sustainability of human activities. But it would have to be given the means and capacity. So, for a country like France, it may prove very hazardous to ignore a scientific and technical field which could experience important advances and which is expanding elsewhere. It thus seems essential for public research to work in the field of biotechnology and genetic engineering. There are several justifications for such development, among which: (i) the requirement that one has the capability to assess and evaluate processes used elsewhere, and of products reaching our borders, (ii) the necessity of carrying out research work different from that run by private firms, whose work is oriented towards quick marketing because of constraints on profitability, (iii) lastly, the interest and the potential contributions of this kind of research that could participate in the development of more sustainable agriculture, e.g. with larger possibilities in breeding and in the knowledge of the functioning of living matter. Thus, in this area, the precaution seems to be to develop research work in order to leave the door to the future open.

Sylvie Bonny, INRA SAE2, UMR Economie Publique, Grignon, France

For more information

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