

## Genetically modified crops: hope for developing countries?

The current GM debate widely ignores the specific problems of farmers and consumers in the developing world • *by Luis Herrera-Estrella & Ariel Alvarez-Morales*

For many people in the First World, genetically modified crops have become the latest incarnation of evil biotechnology, which sacrifices humans and the environment for the sake of revenues and shareholder value. On one side of the heated discourse are people who firmly believe that GM crops pose a threat to human health and biodiversity. On the other side are mainly scientists who are convinced that genetic engineering of plants represents a technology with

mental groups, usually exerted through irresponsible journalism, has led to a serious deterioration of public confidence in scientists and governmental regulation institutions. Destruction of test sites by the most radical environmentalist groups, proposed moratoria on transgenic crops and food retailers refusing to sell transgenic food products are just some of the manifestations that have sprung from the adamant opposition against GM technology. Unfortunately, this has happened

ment and consumers in developed countries, critics of GM crops block a technology that could be of immense benefit for the majority of people in the Southern Hemisphere. Any serious attempt to discuss and make long-term decisions regarding GM plants must therefore take into account the facts about poor countries that, so far, have been largely ignored by opponents of this technology.

The human population is growing and it is growing faster than anticipated. Last March, the UN published its latest estimates, which project the world's population to be 9.3 billion in 2050—400 million more than previously estimated. To feed all of these people and thus prevent famine, upheaval or civil war, more and better food is needed, at least for the majority of people on this planet who need it most. Opponents of GM crops claim that feeding the poor is only a matter of better distribution. But inadequate distribution occurs even in developing countries that are net exporters of agricultural products. Thus, to ensure that food is

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enormous potential for increasing food production in an environmentally benign way. This controversy has to some extent degenerated into a sterile, even hysterical debate, where important facts are largely ignored and where relatively few new ideas are introduced in order to find ways for using this technology in the safest possible manner.

The opposition to GM crops is in part due to the fact that most consumers in the First World have not yet seen any direct advantages of products derived from this new technology, be it lower prices or improved nutritional quality. Given the apparent lack of benefit, many consumer associations and environmental groups think it is unjustified to accept any possible risk to the environment that might come from the use of GM crops.

Furthermore, many critics trust neither industry nor regulatory agencies, which they regard as allies of the chemical industry and biotechnology companies. The propaganda from some non-govern-

without an open, sensible and serious discussion of the scientific, economic and political facts.

Most scientists would consider transgenic crops as safe as, or even safer, for the environment than comparable products obtained through traditional breeding. However, some scientific journals have published negative reports about the safety of GM crops, such as the potentially harmful effects of pollen from insect-resistant corn on the larvae of the monarch butterfly (Losey *et al.*, 1999). This publication, as well as its exaggeration and manipulation by environmentalists, has increased the public pressure on the regulatory authorities of various countries to prohibit or delay the use of GM crops.

But while environmental and consumer advocates in the First World fight against the worldwide use of GM crops in agriculture, hundreds of millions of people in the Third World are malnourished. And while trying to protect the environ-

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available to everybody, local food production in poor countries must increase. This will also benefit the economies of these countries and reduce their dependence on the industrialised world.

Farmers in general are neither in favour of, nor against GM crops. They adopt whatever technologies promise them lower

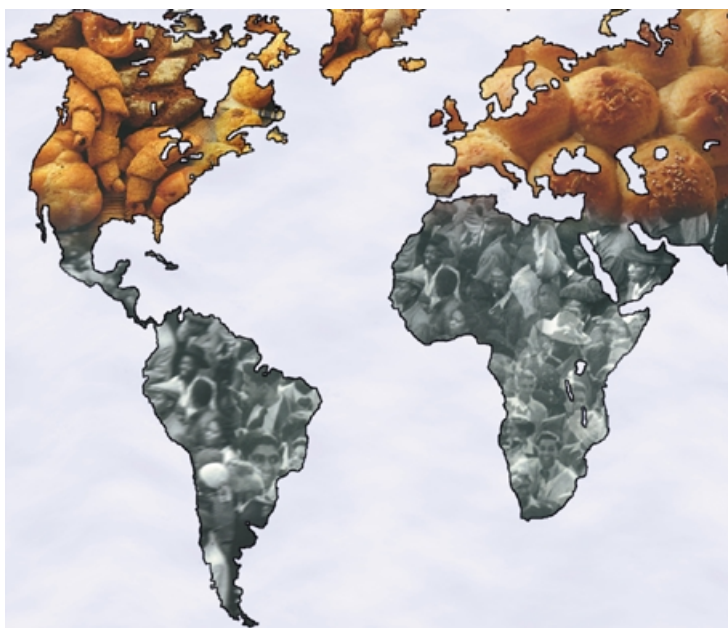
production costs, increased productivity or products of higher value. Indeed, GM crops have been used not only in the USA but also in Argentina, China and Mexico, showing that farmers in developing countries benefit from their cultivation.

The potential benefits and risks of a new technology should be assessed only by comparing it to the technology it will replace. It is futile to judge a technology in isolation.

Another important point often left out of the debate is how to make sure that new technologies help people in developing countries. Some people argue that GM technology is controlled by large multinational companies and thus will never be used by small farmers. Consequently, instead of condemning and blocking GM crop technology, government-funded institutions and non-governmental organisations should find ways to ensure that the knowledge is transferred to developing countries.

Non-governmental organisations insist that the voice of the public at large, as

Alleviation of hunger cannot depend on a single technology.



Over the next 50 years, humankind's greatest challenge will be to ensure sufficient food production on a global scale. This means eventually increasing agricultural productivity in tropical areas where crop yields are significantly lower than in temperate climate zones. Here, losses due to pests, plant diseases and

environment at risk. Tropical forests are irreplaceable regional and global ecosystems that contain more than 90% of plant and animal species. But more than 11 million hectares of forest are cleared every year by farmers searching for more productive land. Indiscriminate conversion of tropical forest into agricultural land will have far greater ecological impact than the use of GM crops or any other technology (Fedoroff and Cohen, 1999).

Without having access to GM technology, the only alternative for Third World countries to increase food production would be to use more fertilisers, insecticides and herbicides—certainly not beneficial to the environment either. Furthermore, most farmers in poor countries simply cannot afford these chemicals that have been developed for large mechanised farms in the First World. GM technology has already demonstrated that it has the potential to increase food production while decreasing production costs. For virus-, insect- and herbicide-resistant plants, an average increase in yield of 5–10%, up to 40% saved on herbicides and savings of US\$ 60 to 120 per acre on insecticides have been reported (James, 1998).

But such resistant plants, despite their impressive economic and environmental value, will have only a limited impact on global food production. Most GM crops currently available on the market were developed with the aim of reducing production costs in agricultural areas that already have high productivity levels, or

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opposed to only scientists, should be heard and taken into account. Certainly, everybody agrees with this position. However, one wonders which public these organisations refer to. Do they represent public opinion in developing countries? Do they really know the problems and needs of small farmers in developing countries?

Many people assume that GM technology is meant to replace traditional breeding and that it will solve all current agricultural problems. It is important to understand that solving the problem of food production for a growing population without harming the environment will require the concerted use of traditional breeding and organic farming, as well as GM crop technology, each being used to solve specific problems and needs.

poor soils are exacerbated by climatic conditions that favour the proliferation of insect pests and disease vectors. In addition, post-harvest losses in tropical areas are higher than elsewhere due to fungal and insect infestations, as well as the lack of appropriate storage facilities. Despite efforts to prevent such crop losses, pests destroy more than half of the world wide food production. Insect damage, the majority of which occurs in the developing world, is responsible for around 15% of the world's pre-harvest food losses. Future food production will be further impaired by the global marketplace as developed countries eliminate subsidies for the production of basic staples such as cereals, meat and dairy products.

Furthermore, doing nothing to help feed a growing population also puts the

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of increasing the final value of the product, for instance, by improving oil quality. So far, plant gene transfer technology and research on transgenic plant varieties have been driven by the potential market value of the desired trait, determined by

farmers in the USA and Western Europe. Because biotechnology companies have to make considerable investments to develop, test and commercialise transgenic plants, this is understandable. But in terms of global food production, it will be

approved only if there is negligible or very low risk, and that such a finding may still be subject to confirmation or modification through the collection and analysis of field data. On the other hand, NGOs and the public should accept a decision by the

been designating monuments as belonging to humankind, which must be preserved not only for the benefit of the locals, but for the entire world. Perhaps new technologies that could solve fundamental problems of human well-being should be given a similar status, to ensure that they reach everybody who needs them.

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necessary to ensure that GM technology is made available to developing countries where researchers can create or vary crops adapted to local conditions. This would also help to facilitate the survival of small farms and their cultural traditions in these countries.

Agriculture in tropical and subtropical regions faces specific problems that are different from those that limit food production in the First World. Since many of these problems are common to many countries and affect a wide spectrum of crops, potential solutions that can be applied to different plant species are urgently needed. Unfortunately, this is not considered as a research priority in developed countries, and little is being done to address these problems (Herrera-Estrella, 1999). It is also unfortunate that most developing countries do not have the resources to invest in the biotechnology needed to increase their agricultural productivity within the time frame required to cope with the increasing demand for food.

Even when there is a clear benefit arising from GM technology in a poor country, its application is often vulnerable to opposition from advocates of environmental or consumer groups. A possible solution would be the medium- and long-term monitoring of transgenic releases to investigate potential harm to the environment. This is already being implemented or planned by the USA and Japan (Reichhardt, 1999; Saegusa, 1999). The scientific community is already supporting the view that release of GM plants should be

regulating authorities to release GM crops after extensive monitoring has shown no damage to, or negative influence on the environment. Furthermore, monitoring would also help to detect potential environmental harm early in the process, and thus allow authorities to ban traits that are responsible for the harm.

It is a shame that in today's world (in which global food production could be sufficient to feed every member of society, independent of religious, political or geographical situation) many thousands of people starve to death and nearly 800 million are malnourished (Fedoroff and Cohen, 1999). How will we cope with the increasing demand for food if a few major companies control the technology and small farmers in poor countries do not fall into the category of potential consumers? Fortunately, multinational companies have shown an increased interest in donating technology to developing countries, and some technology transfer is already under way (Qaim, 1998).

To ensure safe and sufficient food production, political and economic decisions by governments and companies, rather than technological limitations, will determine how successfully we can feed a growing population in poor countries. In order to make wise decisions, an international body should be created to ensure that the necessary technology reaches the places where it is needed and to deal with the political, economic and social problems associated with technology transfer. UNESCO has

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