Biotechnology: What benefit for world food supply?

Biotechnology is a broad concept. Genetic modification (GM), which intentionally transfers the genetic material of an animal or plant across the natural species barriers, is just the tip of the biotechnology iceberg. There is no doubt that biotechnology has been and still is one of the most outstanding technological aids to the human race. It increases yields, adapts crops and livestock to human needs and allows more sustainable management of the natural environment. The breeding of new plant varieties and animals, simple or marker-assisted selection techniques, tissue culture techniques and genome technology are all striking examples of technological progress in agriculture which can be highly sustainable.

GM technology, which adds or replaces genes with those of other species, is more difficult to assess. The crudeness of the transfer methods, the low level of scientific knowledge on the interaction between individual genes and the necessary manipulation of protein molecules – the impact of which can be problematic – pose a potential threat to human and animal health and the environment, making these new organisms very controversial. The problems are aggravated by legal, socio-cultural and economic issues of formidable proportions.

Scepticism towards the cost-benefit ratio of gene-transfer technology has increased because – although heavily promoted for almost 30 years – its commercial success has so far been limited to two basic applications: herbicide tolerance (HT) and insect resistance (produced by inserting the Bacillus thuringiensis gene, Bt). Moreover, GM technology is largely restricted to animal feed and industrial feedstocks (cotton). There is virtually no genetically-modified food available on the market. It therefore appears to offer no advantage as far as world food supplies are concerned. Perceptions could radically change when the 2nd generation of "green genetic engineering" – such as nutrient-enriched foods and drought-resistant varieties – becomes commercially available. But the 2nd generation is a long time coming. The number of applications for field trials of genetically engineered food for human consumption is in fact falling. New variety applications using Bt and HT technologies still dominate the products about to be launched onto the market. Bioenergy crops and pharmaceutical crops have recently been introduced, greatly increasing the risk of outcrossing and technical contamination. Their genes have no place at all in food plants.

The main objection to this technology is its immense cost to society. It is not simply a matter of technology development. A genetic invention must also go through a complex licensing procedure under a specially introduced genetic engineering legislation, regulating the release for trials. Society needs an effective legal protection system for intellectual property rights over plants, and varieties, testing facilities, scientific capacities, commissions and monitoring systems. If the release also involves a requirement to label foods in order to guarantee traceability, freedom of choice for farmers and identity preservation, then the externalised costs to society virtually explode. Such costs must be attributed to the private technology when commercialised. If this is done, the picture can change completely, making the advantages appear far less convincing.

It is not enough to merely prove through field studies that GM technology has led to farmers using fewer chemicals. Or to an increase in income. Or, by benefitting farms of all sizes, has helped to promote small farmers and fight poverty. The key question remains: Is it worth the expense? Are there no cheaper ways of promoting agriculture which achieve at least comparable results, but which are less risky and controversial?

Competetive alternatives to transgenetics do exist – within both biotechnology and conventional agronomy. The enormous potential of cell and tissue culture and genome analysis in conventional plant breeding can be tapped without incurring the costs and risks associated with genetic engineering. For this reason such processes, unlike GM, are not burdened with strict regulatory constraints and social reservations. They make conventional breeding very efficient. Add to this the entire spectrum of site-specific, agro-ecological methods and the basic innovations in cultivation methods which can be taken to improve neglected varieties, overcome bottlenecks in soil fertility and improve soil management practices. The world simply does not need genetically modified organisms.

Dr Rudolf Buntzel
Commissioner for
World Food Matters of the
Protestant Church Development
Service (EED)
Bonn, Germany
rudolf.buntzel@eed.de