GMO – For Profit and Humanity

The fear of biotechnology can be slowly changed to a more positive awareness that, with strict controls, the science will ultimately become a cornerstone for sustainable food production and health improvement.

by Henk Hoogenkamp

People have always used technology to make life easier and safer, and change worldwide is accelerating in the 21st century. There is "classic," or agriculture-driven change, like cultivating seeds and domesticating animals, and there is technology-driven change, like the development of innovative renewable energy sources, sustainable manufacturing, bio-infused food production, digitalization and computerization.

Agricultural civilization preceded the technology-driven era by several millennia, but technology-driven inventions have overpowered agricultural domination since the Middle Ages. Nevertheless, modern industry that utilizes non-renewable energy sources will ultimately be superseded by a new kind of fundamental technology: A clear and concise understanding of living organisms– modern biotechnology.

Biotechnology is presently in the Stone Age, comparatively speaking. Despite the current controversies, its application to food production has only scratched the surface. Biotechnology will eventually enable us to utilize renewable energy sources and address consumer needs with recyclable products, so as to provide the world's rapidly growing population with ecological sustainability. Biotechnology has the potential to make cleaner, cheaper and more flexible food production when managed carefully with ethical and economic concerns while leaving fewer "fingerprints" in the areas of waste production and chain management.

Our imaginations cannot fully comprehend the magnitude of the changes ahead, such as biodegradable plastics being grown rather than manufactured from non-renewable components. Other remarkable developments are soybeans genetically turned into "coffee" beans and tropical fruits used to grow vaccines to inoculate poverty-stricken millions in developing countries in desperate need of medicines. These and other remarkable developments are right on the horizon.

Transformative Impact

Biotechnology typically involves the use of recombinant DNA technology, which requires inserting specific genes or gene combinations from a variety of sources. Modern biotechnology is more precise and predictable than traditional techniques, and it is only at the early stages of commercialization. The truth is that most biotech companies first targeted industrialized, large-scale farmers in search of profitability. The next step must provide economic and ecological benefits for those

GM Foods Groups by Composition

– Food containing GMOs, such as tomatoes or soymilk made from GM soy.

– Food containing active or live GMOs, such as protective mold cultures in dry-fermented sausage or lactobacilli bacteria in yogurt.

– Food containing inactivated GMO-based ingredients or trace elements, such as amino acids, enzymes and vitamins.

The Advantages of Biotechnology

– Improved agricultural sustainability
– Reduced use of pesticides
– Reduced phosphorus emissions
– Improved nutritional food quality
– Improved feed quantity and quality
– Reduced harvesting and processing costs
– Higher performing raw materials and functional ingredients
– Significantly reduces the need for irrigation water

often neglected countries experiencing water shortages, hunger and famine. Eventually, biotechnologies will likely supercharge and transform farming in both industrialized and developing countries to achieve top-line growth. This is evident, as each year some 250,000 to 500,000 of children still suffer from eye defects and blindness, not to mention the millions more suffering from deformed skeletal structures, and anemia due to vitamin A deficiency. Genetically engineered "golden rice" is rich in the beta-carotene that the body converts to vitamin A. Other examples of biotechnology include:

- The development of foods without life-threatening allergenicity.
- The availability of fruits and vegetables with longer shelf lives.
- Foods with fewer anti-nutrients and more heart-healthy fat.
- Vegetables and fruit with vaccines delivery systems.
- Gene insertion to trigger production of bioavailable iron in foods as a tool to tackle anemia.
- Pesticide-resistant harvests.

Likewise, the ability to precisely add various traits to food crops will have a profound impact on agriculture. Crops can be made to be drought-tolerant or to produce their own internal "pesticides," thus increasing yields. However, the biggest advantage of biotechnology is its potential to provide greater health and wealth to many tropical areas of the world, especially those with extreme poverty and hunger. The Western world should no longer tolerate the fact that half of the planet is devoid of the very basics taken for granted in developed countries. Biotechnology, together with the completion of the human genome project, is a powerful tool to address inequalities in wealth, health and food.

Regardless of this, however, it is absolutely necessary to first achieve some consensus. The potential negative effects of biotechnology need to be avoided or eliminated, ideally by a transparent and honest dialogue among scientists, economists, business leaders, religious leaders, environmentalists, farmers, and the public. Only then can the "dark side" of biotechnology with the selective use of human genes, be converted to a positive, enabling science to bring humanity to a new, unprecedented quality of life.

The IP Dilemma

People who have a deep-rooted mistrust of biotechnology should be part of the dialogue; hence, their views and opinions should be taken seriously. The fear of biotechnology can be slowly changed to a more positive awareness that, with strict controls, the science will ultimately become a cornerstone for sustainable food production and health improvement. It can be a way to significantly bridge the gap between food excess in some countries and starvation elsewhere.

One of the current drawbacks of GM (genetically modified) crops is the intellectual-property constraint. Countries in Africa are little more than an afterthought, with American biotech companies obviously seeking out more lucrative markets in Europe, North America and Japan. This is demonstrated by the many court cases involving intellectual property rights for genetically modified traits. African food staples, such as cassava, sorghum and millet, received little attention from biotech companies that invested in commercial crops such as soy and corn for affluent countries.

If the public withdraws its support for GM foods, support for science will also wane. This looming danger must be avoided. Even the ag-biotech industry now agrees that the present range of GM crops should benefit all countries, farmers, consumers and the environment. Often, the food industry fails to clearly communicate to the public the advantages of this new technology. The challenge for regulators, scientists, and multinational food company management is to clearly communicate consumer advantages like better taste, more nutrition and lower prices.

Consumer Embracement

Biotechnology is here to stay; however, it would be wiser to engage consumers in a meaningful discussion about the impact of this breakthrough technology to allay people's fear of the unknown. Most people now realize that the world has come to a junction, and clear decisions must be made concerning regulations on GM foods. Instead of a regulatory patchwork, there needs to be a strong societal consensus about biotechnology, one based ideally on widespread acceptance of its application to biology, while safeguarding the public interest.

Nevertheless, biotech should not be introduced before consumers are ready to accept it because people fear

BASF Discontinues Nutritionally Enhanced Corn Activities

BASF Plant Science is continuing to strengthen its focus on plant biotechnology solutions to achieve higher yield in plants. BASF will expand its fungal resistance research platform by adding corn as a target crop. At the same time, research activities in Nutritionally Enhanced Corn will be stopped and the European approval processes for potato products will be discontinued.

BASF will continue to focus on the development of crops that deliver higher yields and improved resistance to stress conditions. A key component of these activities in plant biotechnology is an industry leading collaboration with Monsanto for key row crops such as soybeans and corn. Both companies have jointly developed the first genetically modified drought tolerant corn, Genuity DroughtGard Hybrids, which received approval for cultivation in the US at the end of 2011 and was in Monsanto's Ground Breakers trials in 2012. The full commercialization is expected in 2013/14.

The new research and development activities for fungal resistant corn will be located at BASF Plant Science's global headquarters in Research Triangle Park (RTP), North Carolina. Field testing sites will be located in North Carolina and in the Midwest region of the United States.

As part of a continuous review of the project portfolio for strategic fit and attainment of project milestones, BASF Plant Science will no longer pursue research and development activities into Nutritionally Enhanced Corn in the United States. The company will also discontinue the pursuit of regulatory approvals for the Fortuna, Amadea, and Modena potato projects in Europe because continued investment cannot be justified due to uncertainty in the regulatory environment and threats of field destructions.

The discontinuation of the Nutritionally Enhanced Corn activities will result in the closure of six BASF field sites in Olivia, Minnesota, Henderson, Nebraska, Weldon and Sycamore, Illinois, Estherville, Iowa, and one of two sites in Ames, Iowa. In total, around 40 positions will be eliminated.

the unknown. Anti-biotech environmentalists and activists have frightened people about the alleged dangers of GM foods, fueling an anti-science mentality and cleverly capitalizing on the break between traditional plant breeders and molecular biologists. That has created a backlash that will take years to heal. Regulatory policy, however, should be based on sound science rather than simply satisfying the often-hidden agenda of special-interest groups or extremists, whose only motives seemingly block progress.

The public's image of GM foods will improve when consumers clearly see the benefits of biotech, such as lower pricing, improved taste, added convenience, better nutrition, and the incorporation of disease-fighting capabilities in food.

Legislation Impact

Biosafety protocols for GMOs are now being put into place to show the international community that consumer concerns about health and safety are being taken seriously. Legislation regulating the use of GMOs is already in place in some countries. Still, there are no binding international agreements covering liability in the event of accidents leading to environmental or human health damage. Obviously, countries with vested interests in the success of GMOs would rather accept differing national legislation, than agree on universal restrictions. In an effort to speed up the biotech approval process, the European Commission favors individual EU countries to embrace, restrict or ban cultivation of genetically modified crops. Member States need more flexibility to organize the coexistence of genetically modified crops. The EU currently authorizes GMOs on a case-to-case basis, but opposition by member countries can generally slow down or deny approvals.

New rules on the labeling of genetically modified food came into effect in Europe in 2004. Under the new European Commission regulation on GM food and feed, all ingredients that contain or consist of GMOs or contain ingredients produced from GMOs need to be labeled as such. A threshold of 0.9 percent will apply to the accidental presence of GM material, below which labeling of food or feed is not required. There will also be a 0.5 percent threshold for the presence of GM material that has not been approved for use in the EU, provided it has a favorable safety assessment from EU scientific committees. The regulations will not apply to food produced using GM processing aids, such as cheeses or products from animals fed GM-containing animal feed. Risk assessment of GM foods will be centralized through the European Food Safety Authority. If granted, authorization will be for 10 years, after which companies will have to apply for a renewal.

Biotech's Future

Despite the successes of biotechnology, much needs to be done by both biotechnology companies and government regulators to implement strict protocols that will protect consumers and the environment. It is obvious that ecological risks must be intensively researched. Once GM microorganisms that are "foreign" to an ecosystem are released, they cannot be recaptured. The current debates over the safety of the food system have already resulted in new regulatory protocols in both the US and the EU.

With farmers using genetically altered seeds, it has been a slow but probably unavoidable process that genetically engineered crops may be finding their way into organic and natural foods. A claim on food labeling that the product "contains no GMOs" can only be understood as an indication, with little assurance that the products have actually been tested. Hence, it is increasingly difficult to assure 100 percent GM-free foods. A threshold is usually put in place, which guarantees that the primary components and/or ingredients contain no more than 0.9 percent of biotech material.

It can be expected that the problem of GM contamination in organic and natural foods will increase. In 2013, well over 90 percent of US corn, canola and soybean acreage will be planted with biotech seed. That translates into most foods containing at least some compounds from these GM crops, including soy lecithin, soy protein, cornstarch, corn syrup and vegetable oils. The same will happen with the rapidly growing harvest of sugar beets, not to mention genetically engineered wheat and other crops soon to be introduced. Many new GM crops, such as coffee, apples, peppers, strawberries, mangos and tomatoes will soon be available and will offer specific advantages to consumers. For example, these GM crops might contain heart healthy oil to reduce cholesterol as well as increase the amount of available antioxidants and phytochemicals, such as vitamin E and carotenoids. Another major benefit will be the removal of allergenic proteins from plants, which will subsequently improve nutritional suitability, as well as the quality of life for millions of people.

Labeling Considerations

Genetic engineering technology has certainly gained substantial ground in modern food production. In the developed world, about 70 percent of all processed foods contain some GM-related components; ingredients or additives, especially when the use of enzyme and fermentation technologies developed through genetic science are included. In the end, consumers will need to make informed decisions about the risks and rewards of agricultural biotechnology. Clearly, GM benefits must be coupled with the assurance of minimal risk to humanity.♦

Henk Hoogenkamp is the author of "Rice Bran Protein." For more information: www.henkhoogenkamp.com