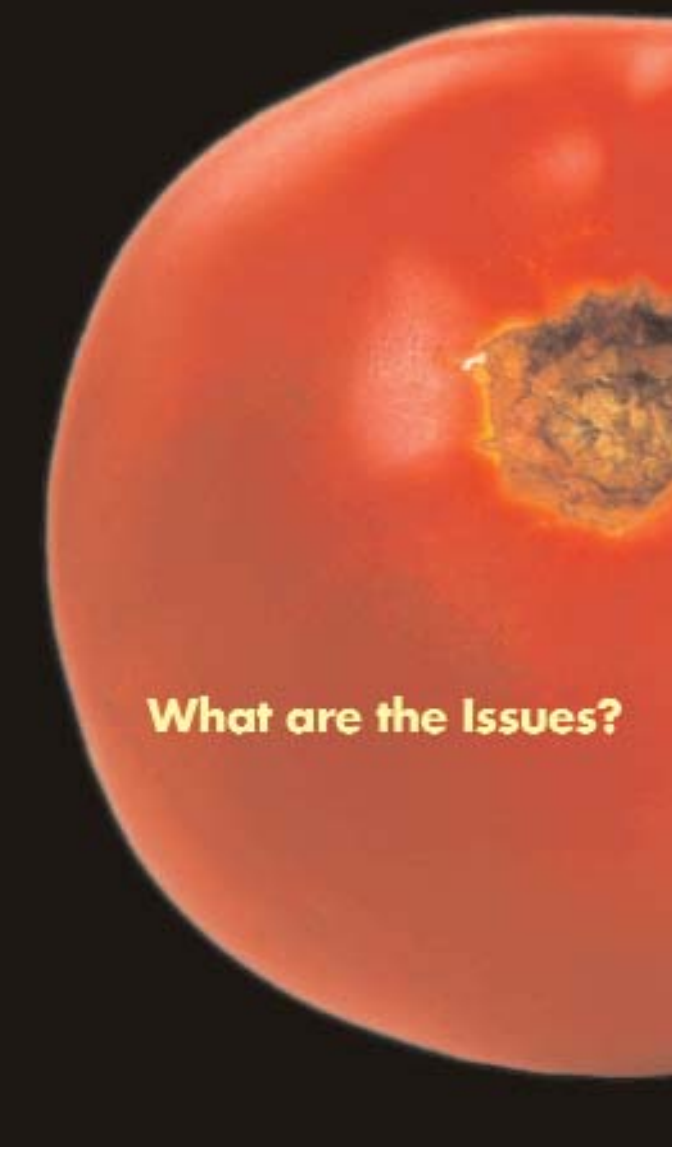
Agricultural Biotechnology



What are the Issues?

This brochure is brought to you by a group of U.S. agricultural schools, known as state or land grant colleges and universities. Our goal is to make information on agricultural biotechnology available to the public and to participate in the dialogue about the benefits and risks of this new technology, which fast is becoming a part of our everyday lives.

As teaching, research and extension institutions, we are convinced that some products developed through biotechnology can provide benefits to our food system and the environment. Furthermore, we believe that the risks and benefits of any technology, including biotechnology, should be evaluated through research.

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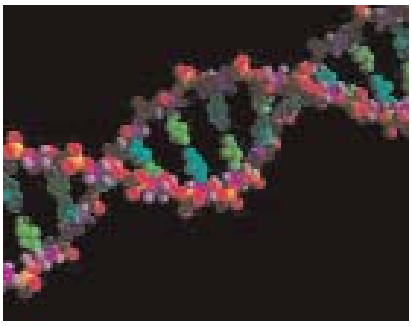
There is considerable public discussion on agricultural biotechnology, and it is important for the public to become informed about the issues. What are the food safety issues, the environmental issues and the social issues? How is biotechnology different from more traditional methods? This brochure provides answers to some of these questions.

What is biotechnology, and why is it being used in our food supply?

Agricultural biotechnology is really a collection of scientific techniques, including genetic engineering, used to improve plants, animals and microorganisms. Throughout history societies have been concerned with having a safe and abundant food supply. Our ancestors learned to improve their crops and livestock by breeding them to be hardier and provide more food. As a result, most of our crops and farm animals now look and taste different than they did centuries ago. Today, crops and livestock can be modified even more precisely through biotechnology.

What is genetic engineering?



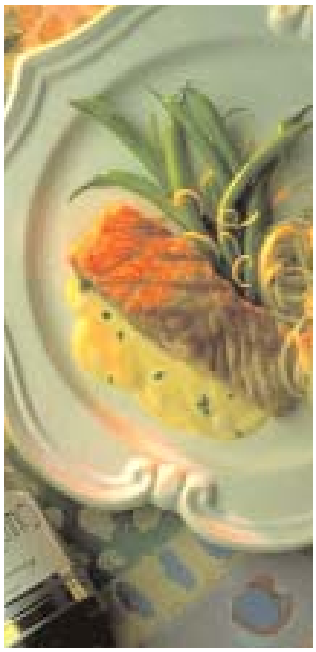
All living things — including the fruits, vegetables and meat that we eat — contain genes that provide the instructions that tell the cells how to function. That information and many important traits are passed from generation to generation through genes, which are made of a large molecule called DNA, shaped much like a spiral staircase or "double helix." Every living thing contains DNA. Scientists do genetic engineering by cutting and moving snippets of DNA from one plant, animal or microbe to another in a process called gene splicing. Unlike traditional crossbreeding techniques that simultaneously introduce many genes (including unwanted genes), genetic engineering uses just the gene for a specific desirable trait.

How long has genetic engineering been used in agriculture and food production?

The first food products of biotechnology — an enzyme used in cheese production and a yeast used for baking — appeared on the market in 1990. Since 1995, farmers in the United States have been growing crops that are genetically engineered. You'll sometimes hear these referred to as biotech crops or GMOs (genetically modified organisms). In 2001, an estimated 5.5 million farmers grew biotech crops on 130 million acres in about 15 countries, led by the U.S., Canada and Argentina. Virtually all of the biotech crops on the market today were developed to reduce crop damage by weeds, diseases and insects.

What are the goals and potential benefits of agricultural biotechnology?

Scientists who use genetic engineering techniques for food production have the same goal as traditional breeders — making our food supply safer for consumers and the environment and less expensive to produce. Adding a new gene to a crop plant may benefit growers and consumers. This technique is being used to produce crops that are less vulnerable to insects, diseases and weeds. In the future, scientists hope to develop crops that can be used to create new materials or energy sources, provide more nutrients, treat diseases or serve as vaccines to prevent diseases.

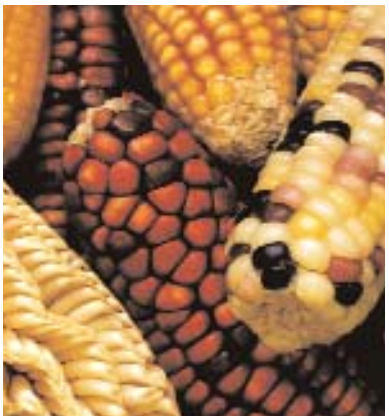


Are there potential risks associated with agricultural biotechnology?

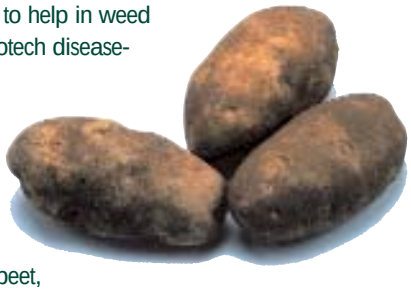
As technology advances, it is important that scientists and regulatory agencies assess the impacts of both new and existing technologies for farmworker and consumer safety and for any environmental effects on plants, animals and water systems. Some areas of risk-assessment considered with our present biotechnology crops include the potential for genes moving from genetically engineered crops into wild plants; pests eventually developing resistance to pest-resistant crops; introducing allergy-causing compounds or changing the nutritional composition in foods. These are the same types of concerns that should be evaluated with traditional methods of producing our food and fiber. Research conducted at land grant universities, like those that produced this brochure, is critical to this evaluation process.

Which foods might contain ingredients made from genetically engineered plants?

If you eat the same foods as most Americans, you probably are consuming some foods from biotech crops. Because genetically engineered corn, soybean and cotton have been so widely planted by farmers, about 60 percent to 70 percent of all processed foods now contain at least one ingredient from a genetically engineered plant. Some of these ingredients may contain the DNA or protein from the biotech crops, while other common ingredients such as corn syrup, soybean oil and cottonseed oil are identical to ingredients from non-biotech crops.



In the U.S. in 2002, it is estimated that more than 70 percent of the soybean crop, over 30 percent of the corn crop and about 70 percent of the cotton crop will be genetically engineered for pest control. In Canada, more than half of the canola is genetically engineered to help in weed management. Biotech disease-resistant papaya and squash also are available. Biotech varieties of potato, tomato, rice, flax, sugar beet, sweet corn, melon and radicchio are approved for use in the U.S., but are not currently on the market.



How can consumers be sure that biotech food products are safe to eat?

The U.S. Food and Drug Adminstration (FDA), Environmental Protection Agency (EPA), and Department of Agriculture (USDA) have established regulations that govern the production and consumption of foods produced through biotechnology. These agencies work with university scientists and other individuals to develop the data to ensure these regulations are based on sound science. All available evidence to date shows that foods from biotech crops are as safe as foods from non-biotech crops. The U.S. food supply is among the safest in the world, but that doesn't mean it is 100 percent safe. Nothing is. For example, the U.S. government attempts to ensure the highest possible level of food safety, but there still have been outbreaks of illness due to contamination or spoilage of our traditionally produced foods.

What about dairy and meat products?

No genetically engineered fish, cows, pigs, sheep, chickens or other food animals are on the market as of the publication of this brochure. However, livestock routinely eat feed made from biotech crops. More than 70 percent of the cheese on the U.S. market is made with a genetically engineered enzyme, replacing an animal-derived enzyme. And milk is commonly obtained from cows treated with a biotech version of a naturally occurring hormone called bovine somatotropin (bST), which is used to increase milk production.

Why aren't biotech foods labeled?

In the U.S., food labels reflect composition and safety, not the way the food is produced. Presently biotech foods do not require labeling because they have been judged to have the same nutritional content as similar non-biotech foods and no changes in allergens or other harmful substances. Additionally, some ingredients, such as oils derived from biotech crops, are identical to those from non-biotech crops. Future biotech products are expected to have improved nutritional value, and will be labeled to that effect.

If biotech foods were required to be labeled, the labeling would not be based on nutritional quality or safety, but on the way those foods were produced. Should the method of production require labeling? Conventionally produced agricultural products do not require labels describing how they were produced. If a product is certified as organic it may be labeled as such for marketing purposes, but such a label does not mean that the product is safer to eat or that it was grown in a safer manner. It is estimated that foods certified to be biotech-free would cost more because the product would have to be tracked from the field to the market. And it would be far more complex to certify processed foods, which may contain dozens of ingredients. Each of those ingredients would have to be traced to confirm that it did not come from a biotech crop. It is unclear how biotech products would be set apart in a complex food system and who would pay for the additional costs. The fundamental question is whether labeling would help consumers make an informed choice about the safety or nutritional value of their foods.

What if I don't want to eat foods made with biotech ingredients?

You have that option. You can purchase food products that meet certified organic standards. These products don't allow the use of genetically engineered foods or processing aids. In addition, the FDA is considering voluntary labeling standards to assist manufacturers who choose to label their foods as being free of biotech ingredients. These standards would be designed to make sure the labels were truthful and not misleading. The FDA views the terms "derived through biotechnology" and "bioengineered" as acceptable, whereas it does not accept the terms "GM free," "GMO," or "modified" for labeling. These standards are being developed so consumers can have the option to purchase non-biotech foods, not because biotech foods are unsafe or any less healthy.

What other products are genetically engineered?

The food industry has used genetically engineered bacteria and yeasts for more than 20 years to produce vitamins and nutritional supplements. Biotechnology also has produced medicines to treat a number of human health problems, including arthritis and heart disease. Virtually all insulin used to treat diabetes is now produced by biotechnology. Genetic engineering is commonly used in the production of detergents, textiles, pulp and paper, leather, metals, fuels and minerals.

What are the effects of agricultural biotechnology on the environment?

The environmental benefits of biotech crops vary by region and crop. They may include substantial reductions in traditional pesticide use and improved soil conservation practices. University scientists are comparing many of the short- and long-term impacts of biotechnology and alternative technologies. For example, they are studying how non-pest insects and plants are affected and the potential for pests to become resistant to various methods of control. Likewise, university scientists are examining the potential for pollen from biotech crops moving to other crops, and are trying to determine what impact, if any, such pollen transfer might have.

Public involvement

Production of a safe and sufficient food supply, grown in an environmentally responsible fashion, is essential for humanity. Like any technology, agricultural biotechnology will have economic and social impacts in the U.S. and other parts of the world. Agricultural biotechnology is just one thread in the complex tapestry associated with modernization and other aspects of an increasingly interconnected world. As biotechnology continues to evolve, factual and open public discourse is vital in order to define the role it will play in society.