USDA United States Department of Agriculture

The average American consumes more than 6 pounds of peanuts and peanut butter products each year

Home | About USDA | Newsroom | Agencies & Offices | Help | Contact Us | En Español

Search

Go

All USDA

Advanced Search
Search Tips

My USDA

Login
Customize | New User

Browse by Audience

Information For...

Browse by Subject

Agriculture
Education and Outreach
Food and Nutrition
Laws and Regulations
Marketing and Trade
Natural Resources and Environment
Research and Science
Rural and Community Development
Travel and Recreation
USDA Employee Services

Agriculture

Biotechnology

Frequently Asked Questions about Biotechnology

1. What is Agricultural Biotechnology?

Agricultural biotechnology is a range of tools, including traditional breeding techniques, that alter living organisms, or parts of organisms, to make or modify products; improve plants or animals; or develop microorganisms for specific agricultural uses. Modern biotechnology today includes the tools of genetic engineering.

2. How is Agricultural Biotechnology being used?

Biotechnology provides farmers with tools that can make production cheaper and more manageable. For example, some biotechnology crops can be engineered to tolerate specific herbicides, which makes weed control simpler and more efficient. Other crops have been engineered to be resistant to specific plant diseases and insect pests, which can make pest control more reliable and effective, and/or can decrease the use of synthetic pesticides. These crop production options can help countries keep pace with demands for food while reducing production costs. A number of biotechnology-derived crops that have been deregulated by the USDA and reviewed for food safety by the Food and Drug Administration (FDA) and/or the Environmental Protection Agency (EPA) have been adopted by growers.

Many other types of crops are now in the research and development stages. While it is not possible to know exactly which will come to fruition, certainly biotechnology will have highly varied uses for agriculture in the future. Advances in biotechnology may provide consumers with foods that are nutritionally-enriched or longer-lasting, or that contain lower levels of certain naturally occurring toxicants present in some food plants. Developers are using biotechnology to try to reduce saturated fats in cooking oils, reduce allergens in foods, and increase disease-fighting nutrients in foods. They are also researching ways to use genetically engineered crops in the production of new medicines, which may lead to a new plant-made pharmaceutical industry that could reduce the costs of production using a sustainable resource.

Genetically engineered plants are also being developed for a purpose known as phytoremediation in which the plants detoxify pollutants in the soil or absorb and accumulate polluting substances out of the soil so that the plants may be harvested and disposed of safely. In either case the result is improved soil quality at a polluted site. Biotechnology may also be used to conserve natural resources, enable animals to more effectively use nutrients present in feed, decrease nutrient

Related Topics

- Animal Health
- Animal Production
- Aquaculture
- Biotechnology
- Conservation
- Crop and Livestock Insurance
- Crop Production
- Data and Statistics
- Disaster and Drought Assistance
- Farm Loans
- GovBenefits.gov
- Homeland Security
- Marketing Assistance
- Organic Certification
- Outreach Programs
- Plant Health
- Price Support
- Weather and Climates

runoff into rivers and bays, and help meet the increasing world food and land demands. Researchers are at work to produce hardier crops that will flourish in even the harshest environments and that will require less fuel, labor, fertilizer, and water, helping to decrease the pressures on land and wildlife habitats.

In addition to genetically engineered crops, biotechnology has helped make other improvements in agriculture not involving plants. Examples of such advances include making antibiotic production more efficient through microbial fermentation and producing new animal vaccines through genetic engineering for diseases such as foot and mouth disease and rabies.

3. What are the benefits of Agricultural Biotechnology?

The application of biotechnology in agriculture has resulted in benefits to farmers, producers, and consumers. Biotechnology has helped to make both insect pest control and weed management safer and easier while safeguarding crops against disease.

For example, genetically engineered insect-resistant cotton has allowed for a significant reduction in the use of persistent, synthetic pesticides that may contaminate groundwater and the environment

In terms of improved weed control, herbicide-tolerant soybeans, cotton, and corn enable the use of reduced-risk herbicides that break down more quickly in soil and are non-toxic to wildlife and humans. Herbicide-tolerant crops are particularly compatible with no-till or reduced tillage agriculture systems that help preserve topsoil from erosion.

Agricultural biotechnology has been used to protect crops from devastating diseases. The papaya ringspot virus threatened to derail the Hawaiian papaya industry until papayas resistant to the disease were developed through genetic engineering. This saved the U.S. papaya industry. Research on potatoes, squash, tomatoes, and other crops continues in a similar manner to provide resistance to viral diseases that otherwise are very difficult to control.

Biotech crops can make farming more profitable by increasing crop quality and may in some cases increase yields. The use of some of these crops can simplify work and improve safety for farmers. This allows farmers to spend less of their time managing their crops and more time on other profitable activities.

Biotech crops may provide enhanced quality traits such as increased levels of beta-carotene in rice to aid in reducing vitamin A deficiencies and improved oil compositions in canola, soybean, and corn. Crops with the ability to grow in salty soils or better withstand drought conditions are also in the works.

The tools of agricultural biotechnology have been invaluable for researchers in helping to understand the basic biology of living organisms. For example, scientists recently identified the complete genetic structure of several strains of *Listeria and Campylobacter*, the bacteria often responsible for major outbreaks of food-borne illness in people. This genetic information is providing a wealth of opportunities that help researchers improve the safety of our food supply. The tools of biotechnology have "unlocked doors" and are also helping in the development of improved animal and plant varieties, both those produced by conventional means as well as those produced through genetic engineering.

4. What are the safety considerations with Agricultural Biotechnology?

Breeders have been evaluating new products developed through agricultural biotechnology for centuries. In addition to these efforts, the United States Department of Agriculture (USDA),

the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA) work to ensure that crops produced through genetic engineering for commercial use are properly tested and studied to make sure they pose no significant risk to consumers or the environment.

Crops produced through genetic engineering are the only ones formally reviewed to assess the potential for transfer of novel traits to wild relatives. When new traits are genetically engineered into a crop, the new plants are evaluated to ensure that they do not have characteristics of weeds. Where biotech crops are grown in proximity to related plants, the potential for the two plants to exchange traits via pollen must be evaluated before release. Crop plants of all kinds can exchange traits with their close wild relatives (which may be weeds or wildflowers) when they are in proximity. In the case of biotech-derived crops, the EPA and USDA perform risk assessments to evaluate this possibility and minimize potential harmful consequences, if any.

Other potential risks considered in the assessment of genetically engineered organisms include any environmental effects on birds, mammals, insects, worms, and other organisms, especially in the case of insect or disease resistance traits. This is why the USDA's Animal and Plant Health Inspection Service (APHIS) and the EPA review any environmental impacts of such pest-resistant biotechnology derived crops prior to approval of field-testing and commercial release. Testing on many types of organisms such as honeybees, other beneficial insects, earthworms, and fish is performed to ensure that there are no unintended consequences associated with these crops.

With respect to food safety, when new traits introduced to biotech-derived plants are examined by the EPA and the FDA, the proteins produced by these traits are studied for their potential toxicity and potential to cause an allergic response. Tests designed to examine the heat and digestive stability of these proteins, as well as their similarity to known allergenic proteins, are completed prior to entry into the food or feed supply.

To put these considerations in perspective, it is useful to note that while the particular biotech traits being used are often new to crops in that they often do not come from plants (many are from bacteria and viruses), the same basic types of traits often can be found naturally in most plants. These basic traits, like insect and disease resistance, have allowed plants to survive and evolve over time.

5. How widely used are biotechnology crops?

According to the USDA's National Agricultural Statistics Service (NASS), biotechnology plantings as a percentage of total crop plantings in the United States in 2004 were about 46 percent for corn, 76 percent for cotton, and 85 percent for soybeans. NASS conducts an agricultural survey in all states in June of each year. The report issued from the survey contains a section specific to the major biotechnology derived field crops and provides additional detail on biotechnology plantings. The most recent report may be viewed at the following website: http://usda.mannlib.cornell.edu/reports/nassr/field/pcp-bba

For a summary of these data, see the USDA Economic Research Service data feature at: http://www.ers.usda.gov/Data/BiotechCrops/

The USDA does not maintain data on international usage of genetically engineered crops. The independent International Service for the Acquisition of Agri-biotech Applications (ISAAA), a not-for-profit organization, estimates that the global area of biotech crops for 2004 was 81.0 million hectares, grown by 8.25 million farmers in 17 countries - a significant increase over 2003 when 67.7 million hectares were grown by 7.0 million

farmers in 18 countries. The 2004 increase of 13.3 million hectares is the second highest annual increase of biotech crops on record. ISAAA reports various statistics on the global adoption and plantings of biotechnology derived crops. The ISAAA website is http://www.isaaa.org

6. What are the roles of government in agricultural biotechnology?

Please note: These descriptions are not a complete or thorough review of all the activities of these agencies with respect to agricultural biotechnology and are intended as general introductory materials only. For additional information please see the relevant agency websites.

Regulatory

The Federal Government developed a Coordinated Framework for the Regulation of Biotechnology in 1986 to provide for the regulatory oversight of organisms derived through genetic engineering. The three principal agencies that have provided primary guidance to the experimental testing, approval, and eventual commercial release of these organisms to date are the USDA's Animal and Plant Health Inspection Service (APHIS), the Environmental Protection Agency (EPA), and the Department of Health and Human Services' Food and Drug Administration (FDA). The approach taken in the Coordinated Framework is grounded in the judgment of the National Academy of Sciences that the potential risks associated with these organisms fall into the same general categories as those created by traditionally bred organisms.

Products are regulated according to their intended use, with some products being regulated under more than one agency. All government regulatory agencies have a responsibility to ensure that the implementation of regulatory decisions, including approval of field tests and eventual deregulation of approved biotech crops, does not adversely impact human health or the environment.

The Animal and Plant Health Inspection Service (APHIS) is responsible for protecting U.S. agriculture from pests and diseases. APHIS regulations provide procedures for obtaining a permit or for providing notification prior to "introducing" (the act of introducing includes any movement into or through the U.S., or release into the environment outside an area of physical confinement) a regulated article in the U.S. Regulated articles are organisms and products altered or produced through genetic engineering that are plant pests or for which there is reason to believe are plant pests.

The regulations also provide for a petition process for the determination of nonregulated status. Once a determination of nonregulated status has been made, the organism (and its offspring) no longer requires APHIS review for movement or release in the U.S.

For more information on the regulatory responsibilities of the EPA and the FDA please see:

http://usbiotechreg.nbii.gov/roles.asp

http://www.fda.gov

http://www.epa.gov

Market Facilitation

The USDA also helps industry respond to consumer demands in the United States and overseas by supporting the marketing of a wide range of agricultural products produced through conventional, organic, and genetically engineered means.

The Agricultural Marketing Service (AMS) and the Grain Inspection, Packers, and Stockyards Administration (GIPSA) have developed a number of services to facilitate the strategic

marketing of conventional and genetically engineered foods, fibers, grains, and oilseeds in both domestic and international markets. GIPSA provides these services for the bulk grain and oilseed markets while AMS provides the services for food commodities such as fruits and vegetables, as well as for fiber commodities.

These services include:

1. Evaluation of Test Kits: AMS and GIPSA evaluate commercially available test kits designed to detect the presence of specific proteins in genetically engineered agricultural commodities. The agencies confirm whether the tests operate in accordance with manufacturers' claims and, if the kits operate as stated, the results are made available to the public on their respective websites.

GIPSA Link: http://151.121.3.117/biotech/rapidtest.htm

AMS Link:
http://www.ams.usda.gov/science/TSB/Biotechnology.htm

2. Proficiency Program: GIPSA evaluates the performance of laboratories conducting DNA-based tests to detect genetically engineered grains and oilseeds, provides participants with their individual results, and posts a summary report on the GIPSA website. AMS is developing a similar program that can evaluate and verify the capabilities of independent laboratories to screen other products for the presence of genetically engineered material.

3. Identity Preservation/Process Verification Services: AMS and GIPSA offer auditing services to certify the use of written quality practices and/or production processes by producers who differentiate their commodities using identity preservation, testing, and product branding.

GIPSA Link:
http://151.121.3.117/programsfgis/inspwgh/pvp/pvp.htm

AMS Link: http://www.ams.usda.gov/fv/ipbv.htm

Additional AMS Services: AMS provides fee-based DNA and protein testing services for food and fiber products, and its Plant Variety Protection Office offers intellectual property rights protection for new genetically engineered seed varieties through the issuance of Certificates of Protection.

Additional GIPSA Services: GIPSA provides marketing documents pertaining to whether there are genetically engineered varieties of certain bulk commodities in commercial production in the United States.

USDA also works to improve and expand market access for U.S. agricultural products, including those produced through genetic engineering. The Foreign Agricultural Service (FAS) supports or administers numerous education, outreach, and exchange programs designed to improve the understanding and acceptance of genetically engineered agricultural products worldwide.

1. Market Access Program and Foreign Market Development Program: Supports U.S. farm producer groups (called "Cooperators") to market agricultural products overseas, including those produced using genetic engineering.

2. Emerging Markets Program: Supports technical assistance activities to promote exports of U.S. agricultural commodities and products to emerging markets, including those produced using genetic engineering. Activities to support science-based decision-making are also undertaken. Such activities have included food safety training in Mexico, a biotechnology course for emerging market participants at Michigan State University, farmer-to-farmer workshops in the Philippines and Honduras, high-level policy discussions within the Asia-Pacific Economic Cooperation group, as well as numerous study tours and

workshops involving journalists, regulators, and policy-makers.

3. Cochran Fellowship Program: Supports short-term training in biotechnology and genetic engineering. Over the past several years, the program has provided education and training to over 200 international participants, primarily regulators, policy makers, and scientists.

4. Technical Assistance for Specialty Crops (TASC): Supports technical assistance activities that address sanitary, phytosanitary, and technical barriers that prohibit or threaten the export of U.S. specialty crops. This program has supported activities on biotech papaya.

Research

USDA researchers seek to solve major agricultural problems and to better understand the basic biology of agriculture. Researchers may use biotechnology to conduct research more efficiently and to discover things that may not be possible by more conventional means. This includes introducing new or improved traits in plants, animals, and microorganisms and creating new biotechnology-based products such as more effective diagnostic tests, improved vaccines, and better antibiotics. Any USDA research involving the development of new biotechnology products includes biosafety analysis.

USDA scientists are also improving biotechnology tools for ever safer, more effective use of biotechnology by all researchers. For example, better models are being developed to evaluate genetically engineered organisms and to reduce allergens in foods.

USDA researchers monitor for potential environmental problems such as insect pests becoming resistant to Bt, a substance that certain crops, such as corn and cotton, have been genetically engineered to produce to protect against insect damage. In addition, in partnership with the Agricultural Research Service (ARS) and the Forest Service, the Cooperative States Research, Education, and Extension Service (CSREES) administers the Biotechnology Risk Assessment Research Grants Program (BRAG) which develops science-based information regarding the safety of introducing genetically engineered plants, animals, and microorganisms. Lists of biotechnology research projects can be found at http://ars.usda.gov/research/projects.htm for ARS and at http://www.csrees.usda.gov/funding/brag/brag.html for CSREES.

USDA also develops and supports centralized websites that provide access to genetic resources and genomic information about agricultural species. Making these databases easily accessible is crucial for researchers around the world.

USDA'S Cooperative State Research, Education and Extension Service (CSREES) provides funding and program leadership for extramural research, higher education, and extension activities in food and agricultural biotechnology. CSREES administers and manages funds for biotechnology through a variety of competitive and cooperative grants programs. The National Research Initiative (NRI) Competitive Grants Program, the largest CSREES competitive program, supports basic and applied research projects and integrated research, education, and/or extension projects, many of which use or develop biotechnology tools, approaches, and products. The Small Business Innovation Research Program (SBIR) funds competitive grants to support research by qualified small businesses on advanced concepts related to scientific problems and opportunities in agriculture, including development of biotechnology-derived products. CSREES also supports research involving biotechnology and biotechnology-derived products through cooperative funding programs in conjunction with state agricultural experiment stations at land-grant universities. CSREES partners with other federal agencies through

interagency competitive grant programs to fund agricultural and food research that uses or develops biotechnology and biotechnology tools such as metabolic engineering, microbial genome sequencing, and maize genome sequencing.

USDA's Economic Research Service (ERS) conducts research on the economic aspects of the use of genetically engineered organisms, including the rate of and reasons for adoption of biotechnology by farmers. ERS also addresses economic issues related to the marketing, labeling, and trading of biotechnology-derived products.

Last Modified: 10/06/2005

USDA Home | Site Map | Policies and Links
FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | FirstGov | White House