UNIVERSITY OF FLORIDA
EXTENSION
Institute of Food and Agricultural Sciences

The Benefits of Biotechnology[1]

Jeffrey Burkhardt[2]

Research and development of new technologies is usually carried out with general goals in mind. In the agricultural sciences, these include increasing the efficiency and profitability of farming and ranching, improving the nutritional value of foods, and enhancing their flavor and appearance. Food and agricultural biotechnologies (mainly genetic engineering) have given scientists new tools to achieve these goals and have even expanded the opportunities of agricultural science to set new goals (e.g., finding substitutes for coal and oil as energy sources). We may not achieve these new goals any time soon, but they are part of what scientists see out on the horizon.

With these goals in mind, scientists design each product of biotechnology to bring benefits to particular groups of people. We can talk about biotechnology's benefits in terms of “generations” of products. The first generation, including those products currently on the market, was intended primarily to benefit farmers. These products include Roundup-Ready® crops, designed to reduce tillage and the need for multiple applications of herbicides; Bovine Somatotropin (bST), intended to increase the efficiency of dairy production; BT crops with reduced need for pesticides; and bioengineered crops, trees, and ornamentals that are resistant to diseases, more tolerant of heat or cold, and able to withstand drought conditions or floods. While these improvements should ultimately benefit consumers in the form of lower or more stable food prices, the primary beneficiary is the farmer or rancher. Hardier plants translate into higher yields, and reduced need for herbicides and pesticides means lower costs. Farmers in some areas have already noticed the benefits of certain bioengineered crops.

The second generation of food and biotechnology products, currently in its final stage of research and development and expected to be on the market in five to ten years, is expected to be of more direct benefit to consumers. These products include fresh fruits and vegetables that have extended shelf lives and meat products that are lower in fats and cholesterol. More important, biotechnology's second generation includes products that are richer in necessary vitamins and minerals (e.g., bioengineered rice with enhanced vitamin A content and vegetable oils with cancer-fighting vitamin E). Other products include wheat and peanuts that are modified so they do not cause allergic reactions in some people. Scientists refer to foods engineered to include disease-preventing or disease-curing genes as “nutriceuticals”; these are among the most directly beneficial products of the second generation of biotechnology.

1. This is EDIS document FE 346, a publication of the Department of Food and Resource Economics, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. Published June 2002. Please visit the EDIS website at http://edis.ifas.ufl.edu.
2. Jeffrey Burkhardt, Professor, Department of Food and Resource Economics, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

The third or future generation of biotechnology products is now only in its basic research phase; nevertheless, these products hold great promise for benefits a decade or two from now. Besides nutriceuticals, scientists foresee a wider range of uses for biotechnology, from agricultural to industrial products. Some go so far as to envision a “bio-based society” where industrial building materials are produced from plants and animals (e.g., “bio-steel” harvested from proteins in the milk of genetically-modified goats). Another benefit in the coming bio-based society may be the replacement of our dependence on fossil fuels. Scientists envision biotechnology giving us the ability to create unlimited sources of energy from organic waste such as yard trash and harvested plant stalks.

The beneficiaries of biotechnology range from farmers to consumers, by increasing the efficiency and profitability of agriculture, enhancing human and animal health, protecting the environment, and improving the conditions of the poor in developing nations. Indeed, there is, and will be, a role for biotechnology in improving every dimension of our lives.

Resources

http://pewagbiotech.org

http://www.biotech-info.net