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Research, Education,  
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## Initiative for Future Agricultural Food Systems (IFAFS)

# Social and Economic Impacts of Biotechnology

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**Biotechnology has the potential to substantially increase agricultural productivity, influence markets, and in some cases invent new uses for traditional crops. However, concerns accompany these potential benefits. A group of scientists from Virginia examined the benefits, costs, and risks associated with agricultural products arising from biotechnology research. >>**

With funding from USDA's Cooperative State Research, Education, and Extension Service (CSREES), George Norton and colleagues at Virginia Polytechnic Institute focused their study on two crops: tobacco and rice. They chose tobacco because research is underway to discover pharmaceutical uses for the crop. Rice was chosen because it is the subject of a large biotechnology program, with significant implications for U.S. producers, as well as for producers and low-income consumers in the developing world.

Norton's team assessed the costs and benefits of biotechnologies using economic models. Analyses for tobacco focused on three pharmaceutical products: glucocerebrosidase (an enzyme for treating Gaucher Disease), human serum albumin (used as a substitute for blood plasma during surgery), and secretory IgA antibody (important in preventing tooth decay). The project team determined that pharmaceutical companies and patent holders would benefit from biotechnology research in tobacco crops, but the outcome for farmers and the public would be limited.

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Right: Rice field in Vietnam.  
Credit: George Norton



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Above: Women weeding rice in the Philippines.

Credit: George Norton

### References

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A world trade model was used to project the economic consequences of Asia and the United States implementing biotechnology to adopt cost-reducing genetically modified rice. The model considered the potential impacts of insect-, drought-, and herbicide-resistant genetically modified rice technologies. Projected total benefits from these three technologies was around \$2 billion per year, but varied regionally; Asian countries benefited from genetically modified rice, while the United States experienced a small net loss.

Using a telephone survey, the project team assessed the perceived social impact from genetically modified crops, specifically insect-resistant rice and pharmaceutical-producing tobacco. Results suggest most people had strong feelings, positive or negative, toward biotechnologies. Willingness to support genetically modified crops varied with the levels of benefits—consumer support was greater for plant-based pharmaceuticals than for genetically modified food products.

Focus groups in the United States, the Philippines, and Bangladesh elicited stakeholder views or concerns about the potential benefits and costs of obtaining pharmaceutical products from genetically modified crops. The focus group also interviewed tobacco manufacturers, tobacco and rice producers, private biotech firms, environmentalists, government regulators, clergy, students, World Bank representatives, university and government researchers, and

**IFAFS was authorized to establish a research, extension and education competitive grants program to address agricultural genomics, food safety, value-added products, biotechnology, rural resource management and farm efficiency and profitability.**

consumers. The project team found most citizens of Asian countries were unaware of biotechnology risk or benefit. U.S. farmers are open to the idea of genetically modified crops, but fear a backlash that could negatively affect crop prices.

Educational materials and fact sheets with more details about project findings are available at [www.agecon.vt.edu/biotechimpact](http://www.agecon.vt.edu/biotechimpact).

This project provides beneficial information about the public's view of genetically modified agricultural crops in the United States and abroad. It also explored impacts on these crops of U.S. policies and regulations, and provides greater clarity on the appropriate roles of the public versus the private sector in biotechnology research and development.

CSREES funded this research through the Initiative for Future Agricultural and Food Systems program. Through federal funding and leadership for research, education and extension programs, CSREES focuses on investing in science and solving critical issues affecting people's daily lives and the nation's future. For more information, visit [www.csrees.usda.gov](http://www.csrees.usda.gov). ■