INTRODUCTION OF A NEW ISSUE PAPER FROM CAST--IMPLICATIONS OF GENE FLOW IN THE SCALE-UP AND COMMERCIAL USE OF BIOTECHNOLOGY-DERIVED CROPS: ECONOMIC AND POLICY CONSIDERATIONS. David R. Gealy, Kent J. Bradford, Linda Hall, Richard Hellmich, Alan Raybould, Jeffrey Wolt, and David Zilberman, United States Department of Agriculture–Agricultural Research Service, Dale Bumpers National Rice Research Center, Stuttgart, AR, Seed Biotechnology Center, Department of Plant Sciences, University of California, Davis, CA, Alberta Agriculture, Food and Rural Development/University of Alberta, Edmonton, Canada, United States Department of Agriculture–Agricultural Research Service, Corn Insects and Crop Genetics Research Unit, and Department of Entomology, Iowa State University, Ames, IA, Product Safety, Syngenta, Berkshire, United Kingdom, Biosafety Institute for Genetically Modified Agricultural Products, Iowa State University, Ames, IA, and Department of Agricultural and Resource Economics, University of California, Berkeley, CA.

This paper reviews the concept of gene flow—the successful transfer of genetic information between different individuals, populations, and generations (to progeny) and across spatial dimensions. The paper also discusses the relatively limited situations in which gene flow is likely to cause economic problems in the production of commercial biotech crops. Gene flow is presented in the context of an associated phenomenon, adventitious presence, in which unwanted substances unavoidably make their way into the production, channeling, and marketing system of grain and crop products.

Because reproductive biology differs markedly among crop species, so does the potential for outcrossing and subsequent gene flow. Economically or environmentally significant gene flow into weedy relatives of these crops often is limited because of restricted geographical overlap of the crop and weed regions or because the weedy relatives are not exceptionally competitive or invasive.

Numerous useful traits are being imparted into biotech (transgenic) and nonbiotech crops. Most of these traits are likely to have little impact on the dynamics of gene flow, especially outside of agricultural fields. Precommercialization procedures that take into account the specific trait being introduced will help to insure that impacts of gene flow remain low. Where trait characteristics warrant, a variety of production practices can be used to mitigate gene flow, and novel genetic/molecular containment technologies are being developed to accomplish similar goals.

The economic consequences of gene flow from biotech crops may differ in crops produced for seed (to be planted) vs. crops produced for commodity uses (to be consumed or woven into textiles), or in traditional vs. niche marketplaces. Approaches to minimize potential negative impacts are discussed.

Potential risks and benefits of maintaining or altering the existing safety and regulatory mechanisms are addressed in the context of public policy considerations. These considerations include the potential benefits of establishing thresholds for unapproved biotech substances in any commodity and for approved biotech substances in a commodity labeled as nonbiotech. Existing regulations are costly and can discourage development of beneficial products. Regulatory approaches that consider benefits and costs more holistically may facilitate improved development of these technologies.

To date, there have been no major health or environmental setbacks due to gene flow from biotech crops; in fact, these crops have led to significant, documentable improvements and, in some instances, decreased environmental risks. Education addressing the realistic advantages and challenges of continued development and commercialization of biotech crops, as well as nonbiotech crops, will be a key to public understanding and discourse related to future policy toward biotech crops.

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