GENETICALLY ENGINEERED PLANTS FOR THE BIOECONOMY:
WILL THEY MAKE IT INTO THE FIELDS?

by Saharah Moon Chapotin

Scientists are developing genetically engineered crops for the bioeconomy. But how can we ensure that these crops will find their way into the fields?

We have been hearing a lot lately about biofuels, cellulosic ethanol and switchgrass, as part of a larger initiative to move away from a petroleum-based economy and towards a bioeconomy based on plant materials. The bioeconomy promises affordable renewable fuels and a chance to simultaneously reduce our dependence on foreign oil imports and limit our carbon emissions. Biorefineries could produce energy from plant biomass and also use plant materials in the production of plastics and chemical products, possibly without generating the environmentally harmful synthetic chemicals and waste products that usually accompany these manufacturing processes. Plants themselves could be made to produce valuable products such as pharmaceuticals and chemical precursors. The bioeconomy would create new markets for agricultural products and expand economic opportunities in rural America.

This all sounds so promising as to be almost utopian, but a number of studies have determined that replacing the current petroleum-based economy with a bioeconomy is within reach. Politics and economics notwithstanding, bioeconomy goals cannot be met without significant technological developments, such as those in biomass processing, biorefinery design, and feedstock enhancement.

Almost every projection for the bioeconomy assumes that genetically engineered plants will play a significant role in increasing agricultural productivity, and the research necessary for their development is well underway. At small start-ups, large companies, and government and university labs around the country, scientists are harnessing modern molecular tools to develop new crops for the bioeconomy. For example, at a hearing of the House Agriculture Committee last June, the CEO of Ceres, Inc. described his company's efforts to develop high-yielding energy crops with improved processing characteristics and reduced input requirements.

But how long will it be before these crops are commercially available? In the 1980s, when genetically engineering plants became possible, the rapid and widespread adoption of new crops was expected. Yet twenty years later, many of the envisioned applications have not materialized, and most of the genetically engineered crops commercially available incorporate just two traits, insect resistance and herbicide tolerance. The delays in the deployment of new genetically engineered crops are attributed to a combination of complex regulatory procedures, opposition, and limited market acceptance. These factors have especially limited the ability of small companies and public researchers to deploy new crops, particularly those destined for small or niche markets, including crops not intended for food.

At BIGMAP, we are concerned with ensuring that the research activities intended to increase biomass productivity get translated into actual crops that farmers can plant in their fields. A successful bioeconomy would bring benefits to our environment, to national security and to our economy, but it cannot go forward without increased and enhanced biomass production and processing which will rely, in part, on genetically engineered feedstocks. An ongoing BIGMAP project aims to identify and outline potential regulatory and safety issues that could arise with some of the envisioned crop-trait combinations. We hope to ease the deployment of safe and effective crops for the bioeconomy that are welcomed by consumers, environmentalists, and industry alike by encouraging and assisting crop developers to anticipate how their product will fare in the regulatory process and whether it will gain acceptance by the public and consumer and industry groups.

Many major genomics projects, public and private, continue to generate genes that have the potential to make novel contributions to the bioeconomy. BIGMAP's activities include early consideration of biosafety issues to help regulators, technology developers, and the public better understand and address questions of safety.

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