APAC Agricultural Policy Analysis Center
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PolicyPennings by Dr. Daryll E. Ray

Is Bio-pharming Tobacco a Pipe Dream?

One of the factors driving the research into the production of pharmaceutical products using genetically engineered plants is the high cost of producing these compounds using conventional techniques. The equipment conventionally used to produce the proteins, called "biologics," from which the pharmaceutical products are derived is very expensive to construct and operate. By contrast, producing these biologics using genetically modified plants could be much less expensive, and production could easily and quickly be scaled up or down to meet demands.

Tobacco is an ideal plant to use for the production of biologics because its genetic makeup is well known and tobacco is not a food crop. In fact, some scientists have referred to tobacco as the white mouse of the plant world. In addition, tobacco can be harvested before the plants reach maturity, reducing the risk of the genetically modified genes escaping into the environment. Another advantage of tobacco is that it yields a large amount of plant matter, or biomass, per acre with the biologic being contained in the biomass rather than in the seeds.

With the recent dramatic decline in U.S. tobacco production and the changes that are taking place in tobacco marketing, attention has turned to the negative impacts these changes are having on tobacco dependent communities. Could biotech tobacco destined for pharmaceutical products be the silver bullet traditional tobacco farmers and their communities are looking for? A joint biotech impact study conducted by Virginia Tech, Virginia State University, the University of Tennessee, North Carolina State University and the International Rice Research Institute, found the answer to be both yes and no.

The "yes" part of the study's findings is that several pharmaceutical applications of biotech tobacco are pretty far along the research chain and appear to have marketable potential. One such application is using biotech tobacco to produce human serum albumin (HSA), a blood volume replacement product useful in surgeries and other treatments. Another potential application is development of "personalized medicines", where, for example, genetic information obtained from an individual's cancer cells would be used to tailor a cancer treatment specific to that particular patient and their ailment. Yet another potential application is producing proprietary antibodies, called "plantibodies," using biotech tobacco.

But the "no" part of the study's findings is that—at least for the foreseeable future—bio-pharming tobacco is likely to be a niche market. It has been estimated that bio-pharming tobacco might take up about 2.5% of the area historically dedicated to tobacco production. At this size, bio-pharming may make a difference for some farmers and a few communities, but it is unlikely to serve as a replacement for the recent loss of about 50% of the economic activity historically generated by conventional tobacco production.

Another problem is that while the need for tobacco dependent communities to find a replacement for declining tobacco production is now—or last year—commercial scale bio-pharming is probably 10-15 years in the future.

One potential bright spot for tobacco dependent communities is that producing biologics in tobacco would likely require at least intermediate processing in pretty close proximity to the production and harvest location. Because, in tobacco, the biologic would be produced in the bulk plant matter and not the seed, transportation to a processing facility becomes a significant issue. Some processing in local communities could provide a potential source of employment.

For more information on this and other topics concerning the impacts of growing biotech crops visit the project's website at www.agecon.vt.edu/biotechimpact .

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