

Policy Pennings by Dr. Daryll E. Ray

# Bio-pharming

For most farmers, the mention of biotech crops brings to mind Bt corn and cotton and herbicide resistant soybeans. The biotechnology in these cases affects input traits because it reduces the amount of inputs (herbicides or pesticides) that a farmer has to use to grow the crop. Biotechnology can also be used to modify what are called “output traits”, where the output of the plant or animal is modified.

One of the best known examples is “Golden Rice” in which the rice has been modified to provide increased amounts of provitamin A (the compound needed to synthesize vitamin A). Vitamin A deficiency is a major problem in some developing countries.

One class of output traits that has generated significant interest is pharmaceutical compounds. Scientists have discovered that by applying the tools of biotechnology to various crops they can develop plants that will produce desirable pharmaceutical compounds. When this technology is applied to commercial crops like tobacco and rice, the resulting process is cleverly termed “bio-pharming” or just pharming.

Beginning in 2001, researchers at Virginia Tech, the University of Tennessee, North Carolina State University, Virginia State University and the International Rice Research Institute undertook a four year research project under USDA’s IFADS program to “inform and sharpen public debate on the benefits, costs, risks, and tradeoffs associated with agricultural biotechnologies, using rice and tobacco as examples.”

At the time the project was initiated, tobacco growing was undergoing a dramatic change with demand for US-grown tobacco declining. One of the questions was

whether or not growing tobacco to produce pharmaceuticals would have a positive impact on tobacco dependent communities. At that time, tobacco was already the subject of research programs to identify pharmaceutical uses for the crop. One of the advantages of tobacco over a crop like corn is the fact that it is not used as a food crop.

Rice was chosen because rice is a staple crop for areas of the world in which poverty and malnutrition are significant issues. Depending upon the output trait bred into it, the resulting rice could either contain traits to alleviate malnutrition or include traits that would make rice growing more productive under a wider range of growing conditions.

We have been following the progress of this research undertaking with great interest. Who wouldn’t recognize the irony in a potential use of tobacco plants to produce a cancer-curing protein (the same tobacco plants that are now a primary input in manufacturing what some health advocates refer to as “cancer sticks”)? As this research effort wraps up, we’d like to share some of the findings about bio-pharming with you over the next few weeks.

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