6b

Comment on Hurley: *Bacillus thuringiensis* resistance management: experiences from the USA

Rick Welsh[#]

In this comment I will deviate from the standard discussant format utilized thus far and not focus on the limitations of the paper or model. Terry does us the favour of doing a good job of laying these out in the paper and based on discussions with Terry and his presentation we know that he has undertaken the research required to begin to address the limitations. Also, there is an old adage of "don't bite my finger, look where I am pointing". So in that spirit I will focus on the issues the paper raises and hopefully this will stimulate a discussion of the implications of the paper. In general I found the paper helpful, primarily because of the introduction of producer behaviour and its measurement into the project of managing environmental risks from transgenic crops.

There are some significant implications of this approach. For instance, David Ervin and I argue in our paper (Environmental effects of genetically modified crops: Differentiated risk sssessment and management) that risk-assessment frameworks should be differentiated. We looked at type of genetic modification as the basis for the differentiation. Before reading Terry's paper, we were struggling with incorporating regional or geographic variation into our model. However, Terry has shown that there is another layer of complexity to incorporate potentially. This is also a point made earlier by our discussant (Willem Stiekema). At first, incorporating farmer behaviour into risk assessment seems problematic. However, current insect-resistance management (IRM) plans often rely on speculative assumptions about pest life cycles and new information is emerging continuously. Also risk assessment of the spread of disease among humans relies on research into expected human behaviour. So there are precedents.

Another issue raised is how the extensive literature on technology adoption in agriculture can inform Terry's work on IRM. There is a long history of measuring adoption of technology in economics, sociology and anthropology. A variety of variables have been found to be important in this regard, depending on the situation: farm structure, education, age and even membership in certain cultural groups. It would be interesting to discern if that literature informs this issue.

Finally, Terry's main argument is that regulatory policy is one-sidedly informed by entomology and especially the ecology of insects, and that an effective IRM policy has to be more balanced in favour of the type of information and theory social scientists can provide. He also suggests that ignoring this type of information requirement can lead to inaccurate assessment of IRM policy. I agree with Terry on this point but I also believe that this is a long-standing problem. Social scientists have been making this type of argument to the biological scientists for a long time and about a variety of environmental regulatory issues.

[#] Clarkson University, P.O. Box 5750, Potsdam, NY 13699-5750, USA. E-mail: welshjr@clarkson.edu