WSSA Liaison to EPA-OPP (Office of Pesticide Programs)

Interim Report to the WSSA Board of Directors

Quarter 4, 2016

October 25-27

I visited the offices of EPA-OPP in Arlington, VA on October 25 – 27 and visited with personnel from the Registration Division (RD), the Biological and Economic Assessment Division (BEAD), Ecological Fate and Effects Division (EFED), and the Field and External Affairs Division (FEAD). A major objective of this visit was to host Greg Kruger from the University of Nebraska who gave a seminar to the EPA OPP staff on application technologies. This seminar was very well attended and the number of questions posed to Greg precluded him covering all his material. Plans were made for Greg to return in March or April of 2017 to give a second seminar, especially focusing on the relationship of droplet size to herbicide efficacy. During the visit, Greg also met with members of the divisions mentioned above.

Included among the questions posed by the EPA staff were:

Can drift reduction technologies be used to allow herbicide applications at higher wind speeds?

What would the best management practices for reducing drift of herbicides used for roadside/railroad/and other noncrop applications given that the equipment used for these applications is very different from that used for row crop treatments. Should these BMPs be addressed on herbicide labels?

What is the relationship between spray pattern distribution measured on water sensitive paper under field conditions and the actual field performance of herbicides?

December 6-8

I visited the offices of EPA-OPP in Arlington, VA on December 6-8 and visited with personnel from the Registration Division (RD) and the Biological and Economic Assessment Division (BEAD).

The major topic of conversation at EPA concerned the Agency's proposed resistance management plan framework. While the public comments on the proposal were still being assessed, one assumption is that the final structure of the plan will still include a provision for reporting new cases of suspected and confirmed herbicide resistance. EPA is looking for ideas on how to make growers more aware of herbicide resistance and how to get the information on these reports out to the user community. Plans were made to bring these questions to groups at the WSSA meeting in February.

A major late addition to the plans for this visit was representing WSSA at a public meeting entitled "Forum of Scientific Society Leaders on GE Crops" organized by the National Academies of Science (NAS). The forum was specifically organized to receive public comments from scientific societies on the NAS's recent report on "Genetically Engineered Crops: Experiences and Prospects". I represented the WSSA on a panel chaired by Carol Mallory-Smith commenting on Chapter 4 of the report "Agronomic

and Environmental Effects of Genetically Engineered Crops". Lee Van Wychen had previously identified the following areas to focus the WSSA comments on (pages in parentheses refer to where the topic is found in the report):

- Changes in Herbicide Use Due to Herbicide-Resistant Crops (pg 85)
- Resistance Evolution and Resistance Management for Herbicide-Resistant Crops (pg 87)
- Genetically Engineered Crops, Milkweed, and Monarch Butterflies (pg 95)
- Dispersal of Genes from Genetically Engineered Crops to Wild Species (pg 97)
- Herbicide-Resistant Crops, Reduced Tillage, and Ecosystem Processes (pg 98)

The following are my notes for which my remarks were made:

The Weed Science Society of America (WSSA) appreciates the opportunity to comment on this important report. We would like to acknowledge the hard work of the committee charged with preparing the report and Dr. Carol Mallory-Smith for bringing weed science expertise to the discussions. Before specifically addressing some aspects of the report, we would like to make some comments that help place the report in context for weed management concerns. As the report notes, 2016 marks the 20th anniversary of the first truly successful genetically engineered crop, glyphosate resistant soybeans. These 20 years are the last part of the approximately 70 years when herbicides, because they are so effective and economical, came to serve as the primary tool for weed management in many crops. The dominance of herbicides is based on one simple characteristic; they selectively control undesired plants while leaving desirable plants unharmed. Unfortunately, during the first 40 years of this period, all the current herbicide mechanisms of action were discovered, no new herbicide MOA has been introduced for the past 30 years. Genetic engineering helped counter this very troubling fact by extending the selectivity of old herbicide chemistries into additional crops. However, it is not a fundamentally different approach to weed management than was being practiced already but it did increase the diversity of herbicides available for use in the GE crops, which can yield multiple benefits. In addition, while we refer to GE herbicide resistant crops in a generic sense, the vast majority of experience and information is from glyphosate resistant crops, in particular the tens of millions of acres of soybeans, cotton, and corn where this technology was used. What's more, the broad-spectrum systemic activity of glyphosate, combined with its very favorable toxicological and environment risk profile, makes it very unique such that it has been called a once in a century discovery by Steve Powles. Therefore, making predictions from glyphosate-tolerant crop experience to other herbicide tolerant crops will be difficult, if not impossible. Each herbicide tolerant crop trait-herbicide combination will have its own benefits and challenges. In addition, herbicide tolerant crops like Clearfield wheat and Inzen sorghum are being created using non-GE approaches.

In regards specifically to the report and, in particular Chapter 4 Agronomic and Environmental Effects of Genetically Engineered Crops, the WSSA is in general agreement with the findings with small exceptions.

The WSSA agrees that simply expressing herbicide use in terms of kilograms per hectare is not a useful approach for determining changes in human or environmental risk from herbicide use. As the report points out and a recent publication by Osteen and Fernandez-Cornjeo emphasizes, other factors such as crop acreage and relative use rates complicate this approach. Likewise, the Environmental Impact

Quotient does not improve upon the kilogram per hectare approach. In a publication in preparation, Andrew Kniss shows that assessing acute and chronic LD50 values can provide a much more informative picture of changes in human health risk from herbicide use.

The continued evolution of herbicide resistance and its management is of global concern for the WSSA, not just in relation to HT crops. This is particularly true in light of the fact no new herbicide MOAs have been introduced for more than 30 years which means we need to protect all available herbicide chemistries from loss due to resistance. The WSSA has and continues to invest significant people and monetary resources into educational and other programs to combat this problem. Of course, because evolution in response to selection pressure is expected to occur, all management efforts are designed to delay, but not prevent, resistance from happening. While we agree that further research is needed to adapt BMPs to different crop and localized conditions, and to determine the relative impact of each BMP including in relation to economic cost, we also believe that much progress could be made by the expanded adoption of current best thought BMPs by farmers. Incentives, as mentioned in the report, could help this but we have come to appreciate that a greater understanding of the community, bringing in expertise from the social and economic sciences, is key to moving adoption. It is also worth exploring incentives to industry for discovery and stewardship of new herbicide chemistries. Two recent publications in the journal Weed Science suggest this. The recent efforts of the EPA to require resistance management plans as part of herbicide labeling and to hold registrants, industry, responsible for monitoring and reporting the success of this effort, even to the point of limited time registrations, is an experiment that bears watching. If there is a silver lining to the attention given to herbicide resistance because of glyphosate resistance, it is to highlight the need for more diversity in our weed management systems beyond herbicides and herbicide mixtures. This is an area where more investment needs to be made to develop systems that can be sustainably adopted by farmers.

As the report indicates, more research is needed to understand the threats to populations of the iconic Monarch butterfly. Many factors beyond any decline in milkweed populations could be contributing to this including habitat fragmentation, degradation of the overwintering sites, and other threats to the fall migration. We need clear guidance on the importance of milkweed to any Monarch population decline.

It is worth noting that, prior to any association with Monarch declines, milkweed populations were really not encouraged in crop fields. As a perennial weed, the expansion of reduced tillage systems may actually help it. So, while the work of Hartzler is instructive and is being used by others, it only represents data from one state and should be expanded. We need a wider estimation of milkweed populations within and outside of crop fields even if only to establish a baseline against which to measure efforts to increase these populations.

The WSSA is pleased the finding of the report that, although gene flow from a GE crop to related wild plant species has occurred, no adverse environmental impact has been demonstrated from this fact. The WSSA continues educational programs to counter the widely spread idea that resistant weeds have evolved due to the movement of the resistant genes from the GE crops. Many associate the term “superweed” with glyphosate-tolerant crops and the suspected transfer of resistance genes from these crops to weeds. The Oxford Dictionary, for example, is one of many online resources to define the slang

term “superweed” as “a weed which is extremely resistant to herbicides, especially one created by the transfer of genes from genetically modified crops into wild plants.” As the report states, overreliance on herbicides with a single mechanism of action to control certain weeds has led to the selection of weeds resistant to that mechanism of action.

We are a little surprised that the committee did not find a stronger relationship between GE crops and adoption of reduced tillage. Personal communications from experts in cotton growing areas would indicate that GE crops, glyphosate tolerant cotton, were instrumental in allowing development and use of successful reduced tillage systems. Conversely, with the advent of glyphosate resistant weeds, tillage has been reintroduced into some of the cotton systems. In the Midwest, there is the perception that glyphosate tolerant crops reduced the use of secondary cultivation for weed management. This is a debatable development for diversity in weed management practices but would indicate less soil disturbance. However, in regards to corn and soybean, effective weed management systems were already available before GE crops in many areas to allow the practice of reduced tillage. What is of more concern is whether herbicide resistance will cause a movement back to more tillage.

Overall, the WSSA sees this a very positive report and hopes it will greatly influence the discussion regarding further use of this technology in agriculture.