

**Written Statement of Philip W. Miller on behalf of Monsanto Company
for the September 30, 2010 hearing of the Domestic Policy Subcommittee
of the US House of Representatives Oversight & Government Reform Committee**

Chairman Kucinich, Ranking Member Jordan and Members of Subcommittee, thank you for inviting me to testify on matters relating to modern agricultural technologies.

I work at Monsanto, a company 100 percent focused on agriculture. We develop improved seed through advanced breeding as well as biotechnology. We work with others to build cropping systems that help farmers produce more bountiful harvests on each acre, with plants that can protect themselves from many pests. We enable weed control within conservation tillage systems that reduce soil erosion, water loss and carbon emissions.

Using these tools, American farmers reach unparalleled levels of productivity to feed and clothe more people with every acre. They are driving the U.S. economy, while helping to meet the demand for food, fuel and fiber that is increasing with global population and income levels.

Our company has a three-pronged commitment to improve sustainable agriculture: We will do our part to help farmers double yields in our core crops of corn, cotton and soybeans between 2000 and 2030, while producing each bushel or bale with one-third fewer resources (such as land, water and energy) in aggregate. And, just as importantly, in so doing we will help farmers to earn more and improve the lives of their families and rural communities.

We made this commitment in recognition that we are privileged to work in an amazing industry – agriculture – that is at the heart of some of our planet’s biggest challenges, ranging from hunger, malnutrition and rural poverty to land degradation, water scarcity and climate change.

By the end of this day, the world will have 210,000 more people than the day before who are in need of food, fiber and fuel from agriculture. Experts have suggested that the requirements of food production over the next 50 years will exceed the production we have achieved in the past 10,000 years, cumulatively. Irrigated crop production accounts for 40 percent of the world’s food supply; however, with global water use growing at twice the population rate, farmers are becoming more challenged to secure enough water for their crops. In the face of these challenges, the agricultural sector needs to focus on farm management practices and technologies that can improve productivity while conserving natural resources and minimizing the global footprint of agriculture. Monsanto is committed to helping farmers become more productive and sustainable each year.

Agricultural innovation has provided farmers with improved agronomic practices, advances in crop breeding, and novel traits through modern biotechnology to increase yields and profits.

Farmers utilize a wide range of technologies on the farm to maximize yields while minimizing the risk of crop failure.

Controlling weeds is paramount in maintaining and improving crop productivity. Unlike insects and diseases, which occur in some years and not others, weeds are ubiquitous. They return every year from millions of seeds, tubers or rhizomes, deposited in the soil annually from weeds that survive in the field, fence rows, and irrigation ditches, and spread from field to field on planting, crop treatment and harvesting machinery.

In the 1930's, farmers relied on deep plowing and tillage for weed control but excessive tillage caused devastating soil losses due to wind erosion and run-off. The invention and commercialization of synthetic chemical herbicides over the past 60 years has offered growers new tools for controlling weeds.

The herbicide glyphosate, introduced in the early 1970's, expanded the weed management options available to farmers. Glyphosate controlled a broad spectrum of weeds more effectively than combinations of herbicides used previously, resulting in improved weed control for farmers and improved farm management and profits. However, because glyphosate killed nearly all leafy green plants, it had to be used in ways so that it did not come into contact with crops. Glyphosate controls more than 300 annual and perennial grass and broadleaf species, providing the widest spectrum of control compared to any other herbicide. Farmers quickly recognized the benefits of glyphosate herbicides.

In 2000, Monsanto's US patent on glyphosate expired. Today, farmers in the United States have several choices of generic glyphosate herbicide products. Monsanto continues to sell Roundup® brand glyphosate herbicide products.

In 1996, the Roundup Ready® system (seeds modified to be tolerant to glyphosate and which allowed the use of glyphosate for weed control in the crop) was first introduced in soybeans. The Roundup Ready system was attractive to farmers because it offered superior crop safety, and the use of a familiar and proven herbicide that was active on a broad spectrum of annual and perennial weeds (grasses and broadleaves). In Roundup Ready soybeans, glyphosate sprayed once or twice in a season after the crops and weeds emerged provided a level of weed control and ease of use that surpassed other options.

The same was true for glyphosate tolerant corn, cotton, and canola that were commercialized in the late 1990's. Importantly, in addition to the benefits provided in weed control, the Roundup Ready system has made the adoption of conservation tillage practices feasible on many more farms. Conservation tillage contributes to the long-term sustainability of farming practices. Before the Roundup Ready system was introduced, the environmental benefits of conservation

tillage, including low-till and no-till practices, were documented but adoption by growers had been limited, in part, because they could not get acceptable weed control without tillage in many instances. The use of herbicides and in particular glyphosate for weed control instead of extensive plowing and tillage has significantly reduced the loss of topsoil due to soil erosion, improved soil structure with higher organic matter, reduced runoff of sediment and fertilizer, reduced on-farm fuel use, reduced CO₂ emissions, and increased carbon sequestration in soil.

Over the past 20 years, the number of corn, soybean and cotton acres in conservation tillage has nearly doubled to a total of 82 million acres in 2008. Farmers have consistently indicated that Roundup Ready technology has been a critical innovation allowing them to shift to conservation tillage. In 2001, a survey by the American Soybean Association (ASA) of its members revealed that the adoption of Roundup Ready technology was the primary reason farmers reduced tillage in soybean production.

The topic of herbicide resistance in weeds is of interest to the Subcommittee. A herbicide resistant weed will survive an application of a herbicide that will normally kill the weed. Within a weed population, individual plants with resistance to a particular herbicide and/or herbicide class can occur naturally. Such biological variability is not caused by use of the herbicide. Subsequent use of the herbicide merely selects for those plants that already have the resistance.

Weed resistance to herbicides is not new. Guided by continuing research, new strategies to manage herbicide resistance have been developed and continue to evolve. Monsanto, other companies, universities, government agencies, and crop commodity groups are working to provide farmers with the most up-to-date recommendations and to educate them on the importance of adopting practices to manage herbicide resistance.

There are inherent differences among the herbicide classes. Some herbicide classes are more prone to resistance than others. The first instance in the United States of a weed being determined to have resistance to a herbicide occurred in 1957 when spreading dayflower in Hawaii was found to be resistant to the herbicide 2,4-D. Although resistant weed populations have been known for over 50 years, 2,4-D is still widely used around the world and is an ingredient in products familiar to consumers such as Weed B Gone. The first weed displaying resistance to glyphosate was annual ryegrass discovered in Australia in 1996. In 1998, ryegrass resistant to glyphosate was observed in California where glyphosate was being used for weed control in orchards.

Today there are 19 weed species worldwide with confirmed resistance to glyphosate, 10 of which are present in the U.S. This compares to 107, 68, and 37 species with confirmed resistance to the three other major classes of herbicides (ALS inhibitors, PSII (triazines) and ACCase inhibitors, respectively) used by many farmers growing soybean, cotton and corn in the U.S. As with glyphosate, farmers continue to use these products because they provide significant value in

their weed management programs. As weed resistance occurs, farmers adjust their weed management practices. The best way to manage weed resistance on a particular farm depends on the particular circumstances on that farm.

Weed resistance is an herbicide issue, not a biotech crop issue, and is dependent on how herbicides are used. Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the Federal Government's Coordinated Framework for regulating biotechnology-derived products, EPA is the agency charged with analyzing the potential environmental impacts from the use of a pesticide. Specifically, EPA must evaluate whether the use of a pesticide in accordance with instructions on its label will result in "unreasonable adverse effects [to humans or] the environment." EPA balances the risks and benefits of pesticide products when applying this standard to determine whether to register a particular pesticide for a specific use.

Before an herbicide is authorized for a particular use, including over the top of a herbicide-tolerant crop, EPA must register that use in accordance with FIFRA. Since its introduction in the 1970's, EPA has regulated the use of glyphosate and for over fifteen years, EPA has registered glyphosate for use over the top of Roundup Ready crops.

EPA recognizes and has addressed weed resistance as an issue requiring attention. The Agency has issued guidance to pesticide registrants concerning weed resistance management information on pesticide labels. This guidance instructs registrants on information to provide to farmers regarding the mechanism of action of the herbicide and recommendations on practices to implement for delaying herbicide resistance. Monsanto follows EPA's guidance on its glyphosate labels and goes beyond EPA's specific guidance in providing recommendations to farmers.

Monsanto is actively evaluating and reevaluating herbicide resistance in order to refine further the best proactive management practices. Over the last 5 years Monsanto has invested more than \$30 million dollars in collaboration with academics in the U.S. alone to study developments in resistance to glyphosate and improve management practices. EPA, USDA-ARS, and others in industry are also devoting resources to actively address herbicide resistance.

Today there is broad agreement among public and private sector scientists on practices that can minimize the potential for additional weeds developing resistance to herbicides. These practices were highlighted in a National Research Council Report issued in April. A summary of these best management practices is published on the Herbicide Resistance Action Committee (HRAC) website (www.hracglobal.com) and the Weed Science Society of America (WSSA) website. Experts recommend using multiple herbicides to provide more than one mechanism of action. Using multiple mechanisms of action reduces the likelihood of a resistant weed population developing because there is a low probability that a particular weed within a population would

have resistance to both mechanisms of action. In addition, farmers may choose to use mechanical and/or cultural techniques in addition to, or in place of, herbicides. In many cases a proactive weed management program, in fields where no resistant weeds are present, will be identical to the weed control practices that a farmer would employ to control resistant weeds. The specific program employed will depend on the particular circumstances on that farm.

Even in locations where there are glyphosate resistant weeds, glyphosate continues to provide significant benefits to farmers and continues to be recommended by academics and extension agents as a key component in weed management systems. Glyphosate provides a foundation for economical and effective weed control in a diversified weed management program.

The need for proactive management of weed resistance continues to be addressed in many diverse venues. Weed scientists have learned from over 30 years of research that there is more than one way to manage herbicide resistance. University and industry experts believe that the best way to influence grower behavior is through intensive training and education programs. Monsanto, university/cooperative extension services, and other companies have devoted significant time and resources to grower/retailer education and training programs. Other organizations are also involved. For example the National Association of Conservation Districts and USDA's National Resources Conservation Service (NRCS) have brought together weed scientists and soil conservation officials from the south, southeast and mid-west to explore opportunities to further expand outreach to farmers on the need to implement best management practices for weed resistance. As growers are educated, more and more of them are adopting diverse weed control practices.

The Weed Science Society of America, in particular, has been active in coordinating activities of the scientific community regarding farmer education programs. Farm publications have also focused on the issue, raising awareness and serving as a means for public and private sector scientists to promote best management practices. These efforts are also leading more farmers to adopt diversified weed management programs on their crop acres.

In addition to farmer education and training about on-farm weed control practices, many companies are investing in the development of new weed control tools for farmers. At Monsanto, some specific technologies under development include new formulations of existing herbicide products and the development of new herbicide tolerant traits for soybeans and cotton plants that will provide additional options for weed control practices.

For example, Monsanto has been in the process of developing crops tolerant to dicamba because the ability to use dicamba in the Roundup Ready system would give growers more weed control options and flexibility. With dicamba tolerant soybean, for instance, the grower has the option to use dicamba as an effective weed control treatment prior to planting and can then plant soybeans without further delay. Furthermore, the ability to use glyphosate and dicamba together

throughout the growing season enables growers to manage resistant weeds and improve control of tough broadleaf weeds.

After more than 40 years of use there are four plant species with populations that are resistant to dicamba in the U.S. and Canada, and 5 worldwide. Dicamba is a member of the auxin family of herbicides.

Proper stewardship of dicamba in dicamba tolerant crops is imperative, and includes attention to guarding against the development of weeds resistant to dicamba and minimizing off-site movement of dicamba. To address weed resistance, we will continue training growers on the importance of a diverse weed management program and will only recommend the use of dicamba in combination with other herbicides. It is well known by scientists and farmers that off-site movement of pesticides occurs. Monsanto is aware of the concerns regarding the off-site movement of dicamba and is working with multiple stakeholders to address this issue. We are also working with other companies to develop improved dicamba formulations that reduce the potential for off-site movement.

Monsanto has a shared interest with farmers in effective weed management and in conservation tillage systems that are sustainable. The proactive adoption of best management practices based on the principle of diversity in weed management will improve weed control, help ensure that conservation tillage systems are sustainable, and that the economic and environmental benefits are fully realized. As we educate farmers, more and more are adopting diverse practices.

As I stated at the beginning of these remarks, Monsanto is 100% focused on agriculture. If the farmer doesn't succeed, Monsanto doesn't succeed. We are committed to developing seed and trait systems that provide farmers with effective, affordable, convenient, and sustainable agricultural solutions, including weed control. We recognize that proactive and diverse weed management practices are needed to preserve the benefits of the Roundup Ready system. To support best practices for sustainable weed management, Monsanto is broadly engaged in education and outreach efforts. We're also involved in public and private sector initiatives committed to sustaining the farmer and environmental benefits of herbicide tolerant crops and conservation tillage systems. And, Monsanto will continue to invest in research to provide our customers with products and recommendations that make them successful and promote sustainable agriculture.