

RETHINKING ROUNDUP: STOPPING THE RISE OF GLYPHOSATE RESISTANT WEEDS

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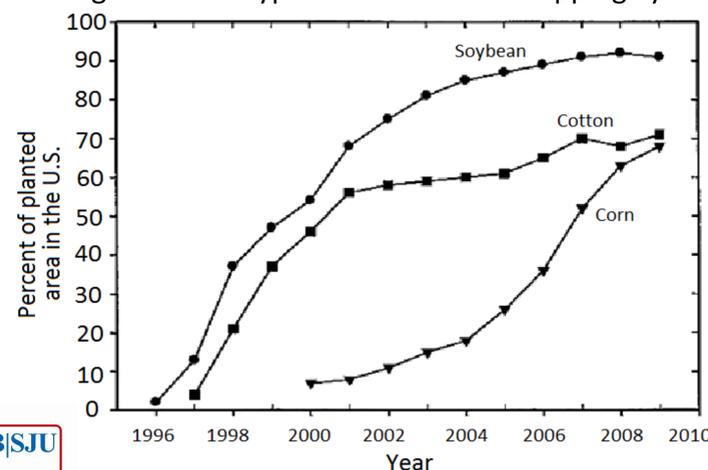
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Abstract: Over the past decade, weeds have steadily been developing a resistance to the herbicide glyphosate, the main component in Monsanto's Roundup, caused by overuse and misuse of the herbicide. Glyphosate has been the number one tool in weed management for conventional farmers for two decades now due to the introduction of the "Roundup Ready" cropping system. Glyphosate is cost effective and safer for the environment than competing herbicides. Without glyphosate, there will be many consequences for the environment, the livelihoods of conventional farmers, and global food production. The solutions are not presently clear to farmers, therefore they are hesitant to limit their use of glyphosate. What can be done to prevent glyphosate resistant weeds? In order to stop the rise of glyphosate resistant weeds, conventional farmers need to recognize that the problem exists, then be able to identify the consequences and long-term side effects the problem creates, and finally adopt the best solution to combat glyphosate resistant weeds. An awareness program that educates conventional farmers on the problem would help them achieve these three tasks.

Consequences if glyphosate resistant weeds continue to develop:

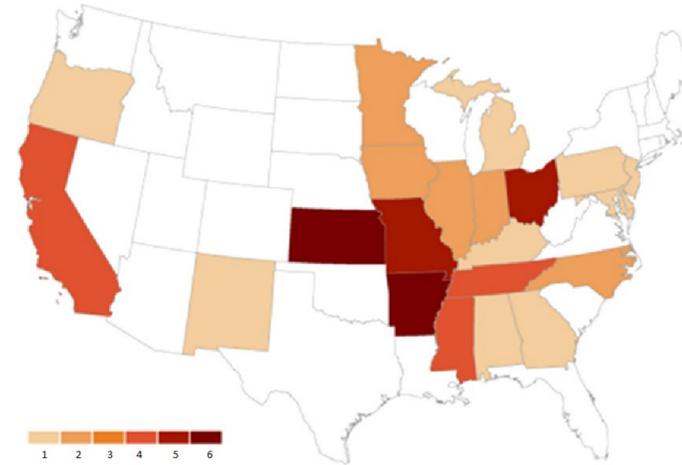
- Loss of topsoil due to increased tillage
- Increased use in fossil fuels caused by more frequent tillage
- Fuel and herbicide expenses will increase
- Farmers will resort back to more harmful herbicides
- Crop yields will decrease due to rise in weed species
- Decrease in global food production as a result of lower crop yields

Increasing Trend of Glyphosate Resistant Cropping Systems



Glyphosate Resistance in Crops and Weeds, ed. Vijay K. Nandula (Hoboken, NJ: John Wiley & Sons, 2010), 168.

Number of glyphosate resistant weed species in each state.



<http://www.nytimes.com/interactive/2010/05/03/business/weeds-graphic.html?ref=energy-environment>

Methods: Personal interviews were conducted with conventional farmers, as well as agronomists and herbicide dealers, to learn first-hand how and if glyphosate resistant weeds are impacting the farmers within the tri-state area of Minnesota, North Dakota, and South Dakota. These interviews provided direct knowledge to the problem and insight into whether or not farmers in the area are aware of glyphosate resistant weeds. An in-depth literature review was conducted to gain background knowledge on the issue, as well as to gain perspective on whether or not the problem was recognized nationally, and even globally. Recent case studies, farm journals, and scholarly literature published by experts in the field were consistently consulted for information surrounding the problem of glyphosate resistant weeds.

Barriers Preventing Farmers from Taking Action

Cost	It is less expensive to use glyphosate. Glyphosate costs approximately \$2/acre, whereas a tank mix costs upwards of \$18/acre.
Denial	Some farmers do not think the problem exists because they do not notice glyphosate resistant weeds in their own fields.
Time	Other methods include a combination of tillage and numerous herbicide applications costing the farmers more time.
Relying on others to solve problem	Some farmers believe chemical companies will come out with a solution before the farmer needs to change their methods of weed control.



Glyphosate resistant *Palmer amaranth* in "Roundup Ready" soybean field.

Options Already Available to Farmers:

- Alternative herbicides such as Dicamba and Liberty Link
- Traditional weed management strategies such as crop scouting, crop rotation, and seasonal planting
- Integrated weed management practices. This combines the use of various herbicides with other non-chemical techniques for weed control, such as proper crop-rotation

Solution: A nation-wide awareness program needs to be implemented that will educate farmers on the problem, consequences, and solutions involved with glyphosate resistant weeds. It is necessary to start right at the source and get in touch with conventional farmers. The program will be funded by each state's agricultural research budget. Minnesota, in particular, will use the Agriculture Utilization Research Agency to provide the funds necessary to each county's extension service agency. The county extension services should then create awareness by starting slogan programs, field days that include plot tours, and individual farm visits to discuss the issue with conventional farmers. Integrated weed management will be the solution encouraged throughout the program. Incentives will be provided by the program to the farmers who implement the options available (listed above) to prevent glyphosate resistant weeds. It will be left to the farmers to ultimately decide if they will cooperate or not. Conventional farmers need to become educated on the issue before any measures are taken, because without their support, there will be no fight against glyphosate resistant weeds.



Conventional farmer sprays glyphosate to soybean field.