

## My view

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Members of WSSA face challenges, opportunities, and decisions that may be the most demanding in the discipline's history. The choices WSSA and its members make will not be easy. Significant innovations in weed management will always be based on how well we understand the past and recognize long-term issues and future needs. We can make tremendous progress in weed management as technology advances, if adequate resources and personnel are provided.

Before we attempt to predict the future, we must learn from history. Initially, weed control was managed by individuals because fields were small and weeds were destroyed by hand-weeding and hand-tillage. Slash and burn agriculture permitted several years of relatively weed-free crop production, and after weeds invaded, land was abandoned. Thus, weed removal and weed avoidance were practiced, and these practices still exist. Cultivation to remove weeds using animal and mechanical power brought us to the 20th century.

Crop production specialists before 1940 were improving such weed management methods as crop rotation, weed-free seedbeds, quality seed free of weeds, proper planting rate and date, narrow-row crop production, crop competition, precision tillage, biological weed control, and nonselective and selective herbicides. Weed management research was done at Land-Grant Universities, but it was part of crop production, plant biology, or plant ecology research. There was no discipline of weed science.

The 1945 introduction of phenoxy herbicides put selective weed control in the public spotlight. Crop production specialists and newly hired public weed scientists recognized the potential of selective herbicides and, because of limited manpower and resources, they neglected other weed management methods. Entrepreneurs recognized the profit incentive and weed management needs of administrators of noxious weed control laws (i.e., some of our earliest weed scientists) and farmers for herbicides. Industry personnel are expected to concentrate on herbicides, but when public sector scientists also did, a lopsided weed management system was created. We have witnessed five decades of introducing and expanding use of selective herbicides, increasing levels and sophistication of weed management in ever expanding areas, reducing labor and cultivation, decreasing soil erosion by reduced and no-till production systems, increasing quality crop products, and expanding the acreage a single farmer could manage. Farmers became so dependent upon herbicides that they would ask, "What is this weed and what can I spray to kill it?"

Public and private weed scientists can look at what they have accomplished and realize they have played an important role in a continuing agricultural revolution. During this period, concerned citizens began questioning the use of pesticides because of possible acute or chronic effects on wildlife, food safety to humans, loss of farm jobs, migration to cities by displaced farm workers, water quality, survival of alternative agriculture systems, rapid growth in world population due to pesticide control of vector-spread diseases and an expanding food supply, and other environmental concerns. These concerns led to regulations to address the public's questions, but these risk-reducing regulations were time consuming and costly. Thus, weed science research and education efforts were often channeled into projects to validate current herbicide practices as opposed to developing new technology in an era of decreasing funding for research and education.

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We have witnessed decreasing support for weed management at Land Grant universities and a loss of USDA weed scientists.

Currently, we observe decreasing research and education due to reduced funding of public weed scientists from private and public sources, many pesticide companies merging or abandoning weed control, larger acreage farmers receiving much of their information from herbicide dealers or private consultants, biotech companies acquiring seed companies to expand market share, increasing numbers of small acreage farmers supporting themselves with off-farm jobs, fewer large farms, and a loss of optimism and satisfaction by our farmers. We need to evaluate what should occur to provide the weed management knowledge needed for future agricultural production systems.

There are no perfect weed control methods, so we must rely on several strategies. Our predictions for future development of weed management are:

1. If alternative weed management technologies of preventive, cultural, mechanical, biological, and integrated methods are to be developed and implemented, it will be done by public weed scientists.

2. Integrated weed management projects among disciplines, universities, and private companies will increase because of resource constraints and the need for broader expertise to solve crop production challenges.

3. Industry will continue to develop herbicides because of the profit incentive. Fewer companies will be involved but their level of scientific innovation and sophistication will increase. Technology will become more targeted and environmentally benign.

4. Biotechnology will change weed management. Herbicide-tolerant crops will continue to expand and move into minor crops, but increased education will be needed for public acceptance of these products.

5. Weed competitive crop variety technology will expand much like host resistance for plant disease control.

6. Large-acreage, specialized farms will continue to evolve, and they will be willing to pay for weed management advice. Part-time farmers will demand more specific weed management information from public weed scientists.

7. Public universities will continue to tailor their educational programs to evolving employment needs, meeting increased educational demand for distance learning, and emphasizing alternative weed management methods.

8. The patient-doctor-pharmacist model will develop as a farmer-consultant-pesticide supplier relationship.

9. Technology will continue to reduce labor requirements and provide higher levels of weed control to growers by expanding use of integrated weed management.

10. Worldwide food needs will bring new weed management strategies to the forefront.

Never in the history of weed management have so few public and private weed scientists working cooperatively done so much for so many to increase crop yields and reduce labor needs for weed control. It has taken five decades to develop present-day herbicide technology, and alternative methods will be even more difficult to develop. Thus, publicly supported weed scientists must work on alternative methods of weed management and introduce them into present weed control systems. Privately supported weed scientists will continue to develop herbicides and other weed management methods that offer a profit incentive. However, the number of full-service pesticide companies will decrease to fewer than 10 worldwide.