

My view

Robert L. Zimdahl

Weed Research Laboratory, Colorado State
University, Fort Collins, CO 80523;
rzimdahl@ceres.agsci.colostate.edu

During my academic career, I have met many people who, upon learning that I was a professor, would often ask, "What do you teach?" Now, it is the right question and I am eager to answer. Early in my academic career, I thought it was the wrong question, because I wanted to talk about my research and the importance of weed control. What I wanted to tell people was not the stuff they were asking about. I began to wonder if I had the right stuff. In 1979, Tom Wolfe writing about the Apollo astronauts let me know I did not and told me what the right stuff was. "The world was divided into those who had *it* and those who did not. This quality, this *it*, was never named, however, nor was it talked about in any way." Some had *it*, the right stuff; most did not.

I knew some of my weed science colleagues had the right stuff. They, in Wolfe's words, had "the moxie, the reflexes, the experience, the coolness" to think of and answer questions about weed control that most weed scientists thought were the right questions. For me, they were the elite, those who had the right stuff to acquire resources and organize people to ask and answer the right question. Now, in the twilight of my professional life, I still believe some of those superb colleagues had the right stuff, but I am no longer sure they had the right question.

The most important question of my early years in weed science was, "What is the identity of the problem weed?" The second question was, "How can it be controlled," which included asking, "What herbicide will be most effective for controlling the weed, selectively?" These are good questions and they are still asked frequently. They are not the most important question. It is my view that their persistence in our discipline has, at once, enabled weed science to make important contributions to agricultural productivity while obscuring the right question. The questions we have been asking have been consistent with the dominant production paradigm of modern agriculture. Acceptance of this paradigm by weed science has placed increasing production as a high, if not the highest, value, and most weed scientists regard employment of all appropriate modern technology to achieve and maintain profitable production as prudent and correct. The conviction is that the highest level of production or weed control that can be achieved profitably is the best level. The paradigm includes an unexpressed, fundamental assumption of the unqualified right of humans to transform, control, and dominate nature to achieve production of food, which is essential for life.

We manipulate the natural world to produce food, and weeds are an inevitable part of food production, but the emphasis on control has obscured the right question, which is: "Why is the weed where it is?" That is to say, what is it about the production system or the way we practice agriculture that allows a specific weed or weed population to be

so successful? The right question is a systemic, holistic one that accepts transformation of nature as a necessary prerequisite to food production but rejects domination of nature. Transformation of nature may yield weeds, an undesired result. Weed control is not bad or forbidden when the right question is asked. But it is subsumed under vegetation management. The right question, a question of applied ecology, is compatible with the quest for sustainable agriculture and holistic understanding, because it is derived from ecology, a discipline that studies the principles that regulate distribution and abundance of species in communities. Weed scientists, myself included, have asked how a certain density and duration of weeds affects crop yield. We have asked these questions to gain an economic answer to a production question. How many weeds are required to reduce crop yield more than the cost of weed control? When we know that answer, we ask how to control the weeds selectively and profitably. The right question will not forbid asking what to do, but it demands that research begin with a *why* question rather than a *what* question. A *why* question leads toward development of a foundational theory to guide weed science. *Why* does something happen? *What* questions are fundamentally empirical and their answers reveal what to do, but not necessarily why a particular course of action is best or why it should be taken. Control questions, those that ask what to do, frequently yield short-term solutions and do not lead to what Berry (1981) calls "a ramifying series of solutions," which are in harmony with the larger patterns in which they are contained. Until the right questions are asked and we understand the characteristics of our production system (the larger pattern) that create opportunities for weeds to succeed, we will continue to develop and recommend employment of short-term solutions to weed problems. Weed science and successful, sustainable agriculture systems are, or should be, derived from studies in applied ecology. Experiments designed to ask *why* questions based on the ecological principles that regulate the abundance and distribution of weedy species in disturbed, cropped environments will be asking the right question for weed science and for sustainable agriculture.

The number of manuscripts in the weed biology and ecology section of this journal has increased. That may indicate that our colleagues are basing their research on the right questions. But Forcella (1997) reminds us that the "role of weed biology is to facilitate weed management." Biological and ecological knowledge is necessary but not sufficient to create successful, sustainable (these should be regarded as synonyms) weed management systems.

Literature Cited

- Berry, W. 1981. *The Gift of Good Land: Further Essays Cultural and Agricultural*. San Francisco, CA: North Point Press, p. 137.
Wolfe, T. 1979. *The Right Stuff*. New York: Farrar, Strauss, Giroux, p. 24.