Agricultural science and organic farming: Time to change our trajectory

When the term *organic farming* was first used (ca. 1941; Paull, 2014), it was as a response to the introduction of synthetic fertilizers and pesticides to farming (Watson et al., 2008). Its founders believed that these materials were not compatible with the “natural” ways of farming and so should not be used (this assumes that agriculture is natural; see Denison and McGuire, 2015).

In their place, organic farming stresses the maintenance of the soil fertility and quality by application of organic amendments and the use of diverse crop rotations. However, because these practices are also used on nonorganic farms, the prohibition of the use of synthetic fertilizers and pesticides is what defines organic farming (MacKerron et al., 1999). Thus, this prohibition became central to the development of formal organic standards (IFOAM, 2014; USDA, 2015).

There are no perfect solutions in agriculture. We make decisions based on the trade-offs between the benefits of using any specific tool and its detrimental effects.

... Each synthetic pesticide is evaluated, as required by law, based on its unique characteristics. Over the past 75 years, research has found many uses and rates of many of these materials beneficial, and so their use is allowed. Some chemicals were banned completely, while others had restrictions placed on their uses, rates, and timing, implemented through pesticide labels. We also developed new synthetic chemicals that were effective at lower rates, that were more pest-specific, and that stayed active in the environment for much shorter times. Similarly with fertilizers, improved materials and methods of application, new formulations, reduced rates, improved soil tests, and precision application methods have been developed. Although the process is not perfect, with both fertilizers and pesticides, science built on science, leading to improvement over time (Fernandez-Cornejo et al., 2014).

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While the science of fertilizers and pesticides advances, organic farming’s judgment of these materials remains rigid. The range of differences in these materials, from dangerous to benign does not matter, nor do rates or specific uses. Neither are the trade-offs weighed for the most common synthetic fertilizers and pesticides. The arbitrary nature of the prohibition is such that "synthetic substances are prohibited … unless specifically allowed and non-synthetic substances are allowed … unless specifically prohibited." (USDA Agricultural Marketing Service, 2017)

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It could be argued that in 1941, farming without synthetic fertilizers and pesticides was a reasonable approach. However, after more than 75 years of scientific advancement, it is no longer reasonable. The rule-forming bodies for organic farming have not conducted any rational, compound by compound, evaluation of the risks and benefits of all synthetic fertilizers and pesticides, nor have they considered the
existing evidence for lifting the ban on specific rates or uses of prohibited materials.

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It is time for the agricultural science community to review its current trajectory regarding organic farming. While our current direction is troublesome for agricultural scientists, for students, and for the public, continuing it would be perilous. ... Those of us in the agricultural science community must make a choice: either continue on this current trajectory or remain true to the ideals of science. I believe it is time to change course.

[Note: This is a condensed reprint of an article first published in 2017. It is presented here in the hopes it will stimulate debate on this critical question.]

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