

My view

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Long ago, our predecessors began experiments that have survived to this day. They were established to study various aspects of cropping system, e.g., fertilizers, liming, and crop rotations. These experiments have, with increasing age, become long-term experiments (LTEs are by our arbitrary definition > 20 years old) and a “cultural heritage” in agronomic research. But why has there been so little interest in LTEs among weed scientists? There are several reasons for this, the main ones being that these studies require a long-term financial and intellectual commitment and that experiments are normally terminated when the primary questions have been answered. Another reason for lack of scientific enthusiasm for LTEs is related to inherent experimental design problems: the initial question might not be relevant today; poor experimental design makes statistical evaluation dubious or impossible; replications are few or even absent; or alterations in management have occurred (new cultivars or new herbicides).

Therefore, we ask if LTEs are scientifically useful? Experience has shown that some LTEs can provide new insights despite their lack of experimental rigor (see Literature Cited). The reason is that some questions in crop and soil science can only be answered if we work on a time-scale longer than a few years. Long-term experiments can provide important information and address questions not possible to evaluate by other means. There is certainly no lack of questions in weed science that require a long-term perspective! For example: effects of reduced tillage, fertilizer, and crop rotations on weed flora.

Maybe the research paradigm in weed science today, i.e., a hypothesis-driven approach with experiments designed to address a well-formulated hypothesis, does not permit exploratory studies? We think it is important to realize that although some types of studies provide data that are more powerful in establishing causal relationships and suffer less from bias than others, the less powerful types of studies are by no means useless. In medical research, one often distinguishes between observational and experimental studies. In the latter group are randomized control trials, where treatments are allocated at random to patients (i.e., the type of experiment most familiar to weed scientists). This method is the ideal in medical research but can, for practical, economic, or ethical reasons, only be used to address some questions. Instead, various other study designs have been

developed (e.g., case-control trial, cohort studies), and everyone knows that the design must be considered when evaluating a report.

We advocate a similar attitude in weed science: the “gold standard” is a properly replicated experiment designed to evaluate a well-formulated hypothesis. However, other, less powerful but nonetheless important, information can be produced in exploratory studies such as weed surveys, or obtained by evaluating poorly designed experiments or from imposing questions on data from experiments already in progress. These types of studies are justified when dealing with long-term effects (e.g., evaluating LTEs), or when initiating a new line of research and learning about a system.

Today, with increasing labor costs and reduced research budgets, LTEs are being terminated in Sweden and elsewhere. If we want them to survive, we have to make more use of already running LTEs for interdisciplinary research projects and in undergraduate education.

Who creates the LTEs of tomorrow? Most LTEs in progress today were not intended to run for decades, but slowly emerged as well-kept experiments worth continued management. With the present research paradigm, experiments are designed to answer specific, short-term questions. Hence, tomorrow we have the answer, and it is not likely that an experiment will survive long enough after that to become a unique cultural heritage worthy of continued support. But assuming that funding is provided, how could we actively design an LTE? For practical reasons, the experiment should be simple to execute and flexible enough to allow for future alterations. Finally, the question addressed must be of long-lasting interest; otherwise, the experiment is doomed to be short lived.

Literature Cited

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