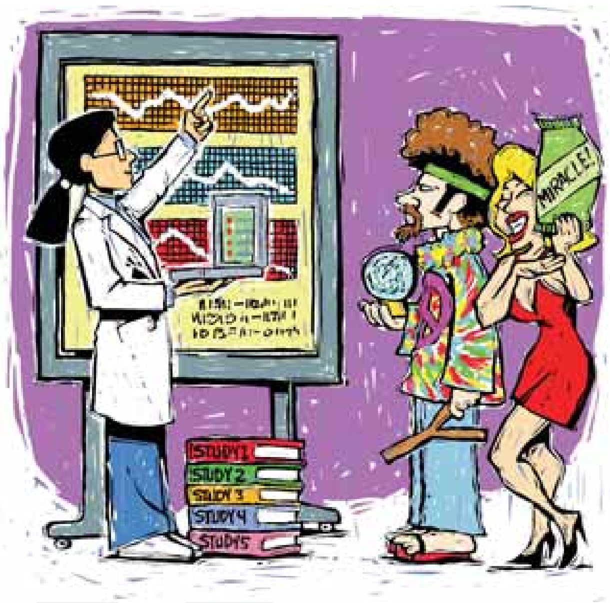
"How Do You Know That?" – The Need for Scientific Evidence



In most countries, crop protection chemicals are evaluated for environmental safety and efficacy, and new crop varieties are tested in standardized comparisons. This gives growers and advisors confidence about the inputs they use or recommend.

Fertilizers are evaluated for their environmental safety and their potential hazard in manufacture, distribution, and handling. While important for the industry, there is rarely any requirement to present scientifically valid data on product efficacy—or simply—does it work?

Sir John Bennet Lawes and Sir Joseph Henry Gilbert developed superphosphate and wanted to test the efficacy of this "new" product along with a suite of other mineral—as opposed to organic nutrient sources. To do so, they established the Broadbalk long-term fertilizer experiment at Rothamstead. That was in 1843, and that particular experiment has allowed science to track the impacts of mineral fertilizers over time.

Over the years, organizations such as the Tennessee Valley Authority through its National (and now International) Fertilizer Development Centre have developed new fertilizer products such as ammonium nitrate and triple superphosphate that would produce high quality and reliable nutrient sources to produce food. This work has been critical in expanding the tool box of products for growers.

These developments are based on a clear understanding of soil science and crop agronomy, with testing regimes put in-place to evaluate these products. In the past two decades, there have been many "alternative" fertilizer products coming onto the market. These may be in response to new markets such as the organics industry, or by those searching for strategies to unlock nutrients bound in the soil. Some are also the inevitable "snake oil".

When checking on the claims of a product, the first and most important thing is the evidence the supplier has about the crop response. This evidence should be done in a scientifically credible way using methods that are explainable and reproducible.

Appropriate controls – every fertilizer experiment should have a nil treatment (no added fertilizer) and a standard practice. Without these checks, there is no indication if the new product actually did anything, or if it was better than current practice. Comparisons should be done at least on a nutrient-to-nutrient basis where similar amounts of the nutrient are applied so the comparative efficacy is clear.

Replicated – the treatments are repeated so that the information collected can be statistically compared. Without that, the effects of the treatments cannot be distinguished from luck.

Randomization – the treatments should be randomized in such a way that one is not necessarily in the same place in each replication. Often treatments will be blocked together so that paddock trends can be accounted for in the analysis.

Repeated – one trial in one year at one site does not give proof of a response. Has the trial been done on relevant soil types, in appropriate regions, and on the same test crop?

Compared statistically – a replicated trial will have an average (or mean) and a measure of error for that mean. The error term gives a range of "normal" values so that the ranges of different treatments can be compared. Means are significantly different when these ranges do not overlap at a particular probability.

Scientists start with the premise that there is no difference among treatments, and design experiments to test this. Endorsements and product testimonials are no substitute for good experimental design and robust statistical analyses.

Objective fertilizer choice demands that good science be used to support decisions by growers and advisors. When presented with product claims, Dr. Jim Virgona of Charles Sturt University in Australia reminds us to ask "How do you know that?" It is up to those who are marketing to provide scientific evidence to keep our farming systems sustainable and productive.

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