Interpreting Research Results

by the Editors

SCIENCE

For any crop input or method, a couple trials show yield increases, a few show essentially nothing, or perhaps some yield decreases. How to interpret? You could average them all out. Another way is to plot the cumulative distribution of results. A nice example of this was compiled by soil scientist Doug Edmeades of New Zealand:

Figure 1 shows 'responses' to spraying with pure water over a large number of trials. You wouldn't expect such a small amount of water (about 20 gallons/acre) to have any effect on the crop, and it doesn't—the yields are distributed around zero (the blue line) with roughly an equal number of positive and negative 'responses,' which are actually due to what scientists call experimental error or random variability (some of the subplots are naturally higher or lower yielding than others, plus other transient variations occur, and these don't always get averaged away despite 4 or more replications in a randomized design). Most of the 'responses' (positive or negative) are relatively close to zero, but a few are farther away. Statisticians call this a 'normal distribution.'

Figure 2 shows responses to P fertilizer in New Zealand over a number of trials. Again, a range of results, but nearly all are on the positive side of the blue line (zero). Thus, we should conclude that P fertilizers are effective at enhancing yield for the pasture plants in these soils.

Figure 3 is a pooling of 810 trials for 28 products (15 derived from seaweed, 4 from fish waste, 5 of vegetable origin, 2 from animal product, and 2 generic products), all of which were marketed as enhancing crop yield. When plotted, the results show a pattern similar to Figure 1—a clustering around zero, demonstrating the products were ineffective, i.e., the products didn't contain sufficient nutrients or plant growth stimulants to provide any yield benefit when applied as directed. The results were further examined by product and crop type, again with normal distributions around zero. Edmeades summarizes: "There was no evidence to support the conclusion that at least some product-types or products were effective on some crop-types, crops, or cultivars."

Keep this in mind the next time you see 'scientific' results for a product. Are all the trials shown, or are some omitted? If someone else conducted a study, could they confirm the results? Science demands a lot of evidence. Of course, in the business world there is potentially a high opportunity cost to bear while waiting for evidence to accumulate. Management must sometimes go on limited evidence, or perhaps on mere intuition. Just be aware that not all that is claimed may necessarily be true.

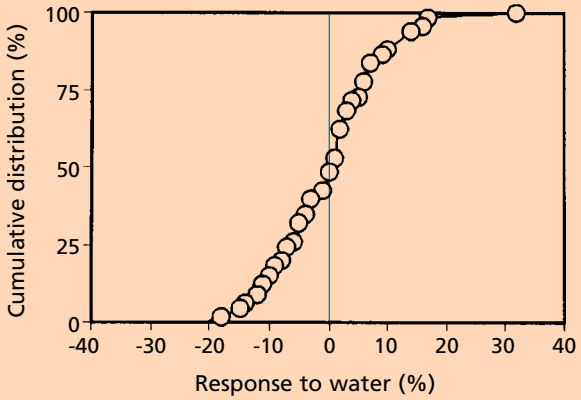

Fig. 1. Frequency distribution of crop responses to water (225 L/ha) expressed as the increase or decrease (%) relative to control. Source: D.C. Edmeades, 2002, The effects of liquid fertilisers derived from natural products on crop, pasture, and animal production: a review, *Austral. J. Agric. Res.* 53: 965-976 (data from Wadsworth, 1987).

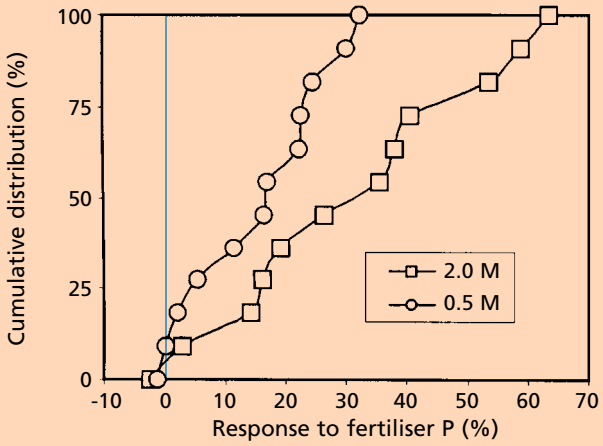

Fig. 2. Frequency distribution of pasture responses to triple superphosphate applied at 2 rates (0.5 and 2.0 times maintenance, M) expressed as the increase or decrease (%) relative to control (no fertiliser). Source: Edmeades, 2002 (data from Sinclair *et al.,* 1994).

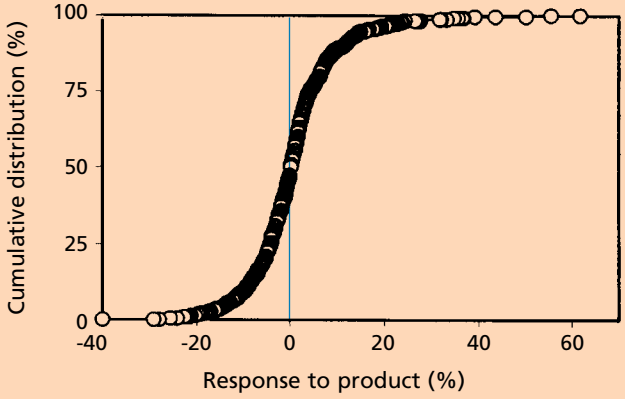

Fig. 3. Frequency distribution of crop and pasture responses (*N*=810) to all liquid fertilisers expressed as the increase or decrease (%) relative to control (no liquid fertiliser). Source: Edmeades, 2002.