

# Fact or Fiction: Who is telling the truth and how to tell the difference?

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## AIMS

In most farm budgets fertiliser is normally the largest item of discretionary expenditure. How a farmer spends the fertiliser dollar can and does have a major impact on the financial bottom line. The fertiliser industry is also large in terms of total revenues and profits and hence there is strong motivation to 'get a piece of the action'. There are now many players in the fertiliser market.

We also live at a time when the dominant political philosophy is 'laissez faire'. People in western democracies want their governments at arms length and preferably not interfering with their desire to make a buck. Thus, were possible government rules and regulations are abandoned in favour of 'caveate emptor'—let the buyer beware! There are no rules to control the behaviour of the various players.

Making matters worse, at least for the farmer, science itself is under threat. There was a time when science was the authority and that authority was based on evidence. Truth was defined by the balance of the evidence. This has been eroded by post-modern philosophy: now the truth is defined by opinion—what you feel is your truth. And, importantly Political Correctness demands that all opinions must be given equal weight, irrespective of the balance of the evidence. It is this environment which nurtures and encourages belief in things like organic farming and homeopathy which are not evidence based but belief based. They both depend on dogma.

The consequence of all these modern forces is that farmers today are inundated with information, much of it unsolicited, contradictory and of dubious quality. Not surprising farmers are very confused. Who do they believe and who can they turn to?

In this talk I want to give you some tools that I hope will enable you to tell fact from fiction, and to lessen the risks of legal action by those who may feel threatened by what I have to say I make my motivation clear.

**“Those who are fortunate enough to have chosen science as a career have an obligation to inform the public about voodoo science.” Robert Park**

**“The special responsibility of scientists is to inform the world of its choices.” Robert Park**

## WHAT IS SCIENCE?

There are two common questions I get from the public about science and they indicate to me that we (i.e. scientists) must do more to enhance science literacy in society.

- 1) Scientists are always arguing—who am I to believe? This is normal, healthy and essential for science to progress. Science is about testing ideas against the evidence and scientist must debate and argue and test again. As more and more evidence come to light we can have more and more confidence that we are getting nearer the truth. This is best seen in hindsight. For example we all now agree that the sun is the centre of the solar system, that the earth is not flat and that atoms are not solid. But these were matters of public debate in their time resolved only by getting enough evidence. A problem for the public arises when new areas of science emerge and the subsequent scientific arguments spill into the public arena (e.g. climate change, stem cell research).
- 2) “If science is so good how come scientists do not know everything?” Science will never know everything for the simple reason that everything question has not been asked and every conceivable experiment has not been done. Science evolves raising new questions and new techniques develop so that new types of measurements can be made the important point is that the more mature the science the more confident we can be.

- 3) “You have not tested product ‘A’ so how can you say it does not work?” As science develops theories are formulated and then tested and if they stand the test of time (i.e. more and more evidence) we say we have a law. Some common ‘laws’ which are useful in the science of fertilisers are: a) Liebig’s Law of the minimum; b) the principle of cause and effect; and c) there are 16 nutrients required for plant growth. By applying such laws to a given product we can deduce whether a product will be effective or otherwise.

By making use of our knowledge of science—what it is, how it should be conducted and what scientific laws to apply—we can construct a list of tests that can be applied to information about fertiliser products to help us decide what weight to place on the available evidence.

## TESTS FOR SCIENCE?

### *Test 1 (Plausibility Test)*

In this test we apply the Principle of Cause and Effect. Things do not happen by chance. If there is an effect there must be a cause. This universal principle applies also to nature and hence to soils and plants. Related to this we must ask the question: what is the mechanism by which this product works, or is claimed to work, and is it plausible? Be very cautious if the mechanism claimed for the product defies a well established principle of science.

### *Test 2 (Credibility Test)*

Examine the advertising and promotional information you are given about a product or service. If you detect one or a combination of the following, the product or service is not likely to be credible.

- a) Is the product/service promoted on the basis of a doomsday message? “We are ruining our soils, polluting our water, poisoning our stock, endangering human health.”
- b) Does the company literature suggest a conspiracy? “You cannot trust the Universities or the Department of Agriculture—they are in the pocket of the big fertiliser companies.”
- c) Is the product/service promoted solely on testimonials?
- d) Is the product/service promoted because it is natural or a very old practice only recently rediscovered?
- e) Is the product/service so new and exciting that it is ahead of science or beyond science or requires a new paradigm of understanding?
- f) Is the product/service developed by a lone genius, overlooked by science?

### *Test 3 (Evidence test)*

This test is in essence the ‘acid test’—where is the evidence?

- a) What are the specific claims made for the product/service?
- b) Beware of products/services for which very general non-specific claims are made.
- c) Beware of products/service which make multiple claims.
- d) Where is the evidence for the claim(s)? Is it published in a reputable peer reviewed science publication?
- e) If it is not published in the scientific literature ask who conducted the research. Is there a conflict of interest? Were the trials properly designed and conducted? Get it checked by an independent scientist.
- f) Is there supporting evidence for the product/service such as other trials by other independent agencies in other countries?
- g) Ignore anecdotal evidence (testimonials).
- h) Soils vary—a product may work in some situations and not in others!  
“The only antidote to pseudo science is science itself.” Carl Sagan

#### *Test 4 (Common Sense test)*

Use your common sense when the salesman calls. Ask the obvious question: If what you are told is true and it is indeed a good product/service and the claimed benefits are true then every farmer would be using the product and service? Apply Test 2 as you listen to the answer.

"If it sounds too good to be true it probably is." Dr J Roche

#### *Test 5 (Reality Test)*

Many products and services are sold on basis that we are destroying our planet, our soils and our health. Many today believe that science is the cause of these dilemmas. So let us remind ourselves how successful science and its close cousin technology have been. We live longer now than at any time in our history, we grow more food than at any time on our history and our food is abundant and healthy. This is clear evidence not of destruction but of science and its success.

**Paper reviewed by:** Bill Bowden