Agro Services International

Plant Nutrition Research: Re-Inventing the Wheel

Dr. Terrence Fullerton

Why do we study Agricultural Science? This may seem a strange question coming from an Agricultural Scientist, but it is one that has disturbed me for quite a while.

My very first job working as a science technician in a food processing company is where I first saw science at work. When a technical problem occurred, my supervisor would give the following simple instructions:

1. This is a problem
2. The principles of science tell us that this is what causes the problem
3. This is the proven solution to the problem
4. Solve the problem.

When I chose to pursue studies in soil chemistry, I had a clear aim: to develop skills which I can use to improve crop production in the region. Over the last ten years, I have slowly realized that this is not the way in which the discipline is practiced by some scientists. It seems that the following is the approach commonly used:

1. This is a problem
2. The principles of science tell us that this is what causes the problem
3. This is the proven solution to the problem
4. We need to study the problem.

Too many Agricultural Scientists seem to be interested in only conducting research, but not actually using the information to improve crop production. We therefore now have libraries full of reports in the various Ministries and other institutions, but agricultural practices remain backward.

Let me give a few examples:

- One hundred and fifty years ago, it was discovered that all plants need phosphate to grow.
- More than fifty years ago, experiments proved that phosphate applications dramatically improved sugarcane production in South Trinidad.
- Numerous experiments conducted all over the world have shown that soil analysis can be used to accurately predict phosphate needs of crops.
- Almost thirty years ago, a team of Caribbean scientists conclusively proved that soil analysis can be used to predict phosphate needs in this region.
- In 1994 to 1996, we were able to consistently increase sugarcane production by more than 30 per cent on forty (40) fields using soil analysis to apply balanced fertilizers, including phosphates.

In 1997, I presented these findings to a group of sugarcane scientists who concluded that we do not have enough

information to recommend the use of phosphates.

Although the principles have been known for one hundred and fifty years, and it was proven to work in sugarcane in Trinidad fifty years ago, and modern diagnostic methods show that it is needed, and it was recently shown to work in forty fields, some are not convinced. They say that we need to do more research.

Another example:

The productivity of rice in Guyana and Suriname is low by world standards. While the yield in these countries is around 3.5 to 4.0 tons per hectare, rice yields in Australia and California can be as high as 8 to 10 tons per hectare. As would be expected, scientists are concerned about this, yet some do not seem to be able to see the obvious.

- Theoretical calculations suggest that applying the fertilizers traditionally used in rice should eventually lead to phosphorus and potassium deficiencies.
- Research in other rice producing countries has shown that these deficiencies do in fact develop and require the use of NPK fertilizers to solve them.
- Nutrient-removal calculations suggest that these problems should now be occurring in Guyana and Suriname.
- The rice plants in Guyana and Suriname are now showing symptoms of these problems.
- A recent survey of farmers in Guyana shows that those who use NPK fertilizers obtain double the yields of those who use only urea.
- Experiments in Suriname have shown substantial responses to the use of phosphorus fertilizers.
- Analysis of several hundred soil samples in Suriname has shown that phosphorus deficiency is widespread while potassium levels are generally low.

All of the available data clearly points to plant nutrition as the main problem in rice production, yet attempts to improve fertilizer use still meets resistance from some scientists.

At a recent regional meeting on rice production, scientists from other regions explained how they were applying soil analysis to select NPK fertilizers which result double the rice yield of the Caribbean region. Some still refuse to follow this approach, but rather conduct research to investigate the same productivity problems.

The productivity of sugarcane in Barbados is also low and again, fertilizer use is the main problem.

- Barbados has limestone based soils
- Research has shown that multiple nutrient deficiencies occur on practically every limestone based soil on earth.
- Soil analysis has shown that there are multiple nutrient deficiencies in Barbados.
- Plant analysis has shown nutrient deficiencies
- Symptoms of some of these deficiencies are clearly visible in the fields.
- These symptoms were positively identified in Barbados during the 1960’s.

- In other countries with limestone based soils, the application of fertilizers to correct these deficiencies has produced dramatic increases in yield in sugarcane.
- Recent experiments have clearly produced responses to these nutrients in sugarcane in Barbados.

A logical summary would be:

We know the problem
We know the solution
Let's solve the problem.

What has been the response of too many scientists? We need to establish more of the same trials.

Why is this approach being taken? A common answer from the scientists is that what works in one country may not work in another. There is some truth in that statement. For example, limestone applications are needed on the acidic soils of St. Lucia, but not on the alkaline soils of Barbados.

However, we seem to forget that the principles of plant growth are the same no matter where you go. Potassium is needed for high sugar production in sugarcane grown in Brazil. And in Barbados. And in Guyana. And in Trinidad. And in Australia. And in every country where sugarcane is grown.

Phosphorus deficiency in rice causes the same problems in Guyana as in India. Magnesium deficiency in sugarcane causes the same problems in Barbados as in Florida.

The principles of plant nutrition are the same everywhere. In every country, and in fact in every field within a country, there are different problems, therefore no one solution can be applied everywhere. However, if we understand the fundamental principles and apply them intelligently, we can choose appropriate production methods for each area without constantly researching and rediscovering what has been known for generations.

I do not know of any other field of science which takes this "re-research everything " approach.

Yes, research is still needed, but it should be used to find answers to the unknowns.

Civil engineers do not establish trials to determine the properties of materials whose properties are already known, they use this knowledge to construct bridges and other structures.

Doctors do not establish experiments to determine if a particular treatment can cure a disease if this information is already available, they use this knowledge of medical science to cure patients.

We need to stop establishing trials to determine if phosphorus should be applied to a crop growing on a phosphorus deficient soil. We must stop re-inventing the wheel and start to provide the farmers with sound scientific advice.

205 East Michigan Avenue
Orange City, Florida, 32763
Tel 386 775 6601 Fax 386 775 9890
E-mail agro@bitstorm.net
www.agroservicesinternational.com