

healthy soils case study

SOIL MONITORING



Long Term Soil Health Monitoring A 27-year Darling Downs grower case study

Soil health

Monitoring the soil nutrient status is highly recommended to manage soil fertility and avoid nutritional stress of cotton crops.

Soil testing is an important tool for fertiliser management decisions each year. Usually, soil tests are taken, results are examined and the fertiliser decision is made. At this point, most soil test results sheets are filed away in a bottom drawer and forgotten about in much the same way as old income tax files. However, monitoring changes in soil fertility over time is just as valuable as using soil test results to indicate fertiliser requirements. Long term monitoring provides reassurance that cropping systems are sustainable and soil health indicators are heading in the right direction.

There are some cotton research experiments that report 10 to 15 years of soil data trends but soil data sets spanning 20 years or more in irrigated cotton are very rare in Australia.

The aim of this case study is to encourage growers to keep their soil test data over a long period of time, so they can demonstrate their farming practices are sustainable with some quantitative data.

Why act?

Since the early 1980s Geoff Hewitt has been monitoring his cotton and grain crop nitrogen nutrition with soil tests on the Darling Downs, near Macalister, in Queensland. His aim is to maintain and improve the soil fertility of his farms, whilst increasing cotton and grain yields.

Soil tests are used as one of the many tools to assist in fertiliser decisions. Not



“Long term monitoring is like checking the gauge of your petrol tank. The numbers go up or down but you always know how you are travelling”

Murray Boshammer, Senior Agronomist with Total Ag Services of Dalby with cotton grower Geoff Hewitt on Geoff's property, Armour, near Macalister on the Darling Downs in Queensland

every field is tested each season but there is a program in place to test two to three fields per year. Over time, a detailed picture of soil health trends is built up across the farm.

Geoff says, “It is reassuring to know we are doing the right thing or when things don't work out, we can see the correction take place in time”.

Figure 1



Soil samples taken from the area of relatively untouched grassland in Figure 1 provide a useful soil health comparison with sampled fields

What is science saying?

Murray Boshammer, Senior Agronomist at Total Ag Services in Dalby, has been working with the Hewitts on their crop agronomy and has compiled 27 years of soil testing data for each field into a series of spreadsheets for long term monitoring.

Soil testing is done after harvest of each crop. Over the years soil testing laboratories have changed and when this happens split samples are sent to both the old and new laboratory so that comparisons can be made with historical data.

Soil samples have also been taken in nearby grassland, right under a 60 year old fence line (Figure 1). The grassland has never been fertilised, cropped nor grazed heavily and provides a useful comparison of soil in its natural condition.

More information on soil nutrient sampling for cotton can be found on the Cotton Catchment Communities CRC soils website in the nutrition section. <http://www.cottoncrc.org.au/content/Industry/Publications.aspx>.

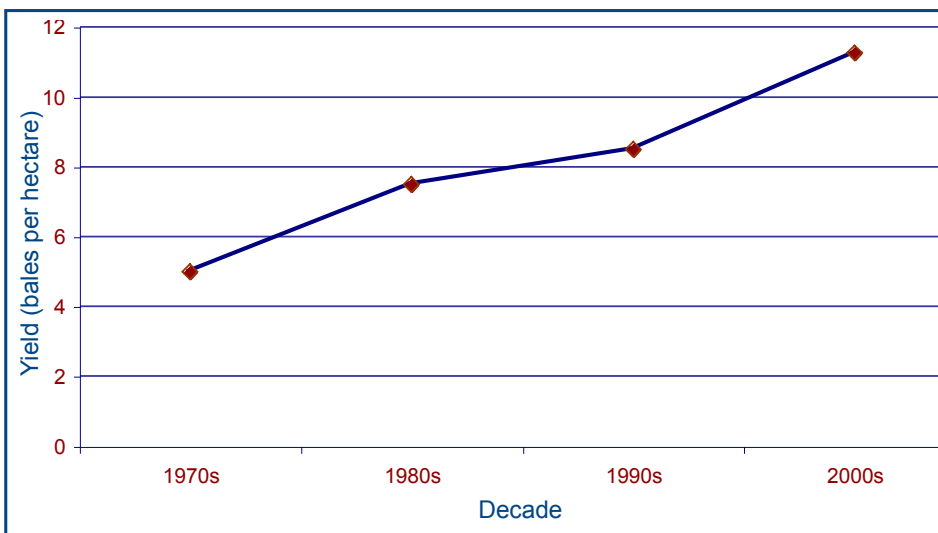
The solution

“Every farmer should use backhoe pits to monitor soil structure”

Backhoe pits are used to monitor soil structure, which is in excellent shape. Crop rotations, cow manure, controlled traffic and minimum tillage have been key strategies to improve soil structure. When it comes to tractor time, it is a case of less is best, and no longer are 4WD tractors ploughing hectares of land.

In terms of nitrogen application, anhydrous ammonia has not been used for nine years.

Figure 2



“Soil tests are used as a guide to make fertiliser decisions. The decision is made on a combination of experience, trials, soil tests and gut feel”

Geoff Hewitt

The graph in Figure 2 shows cotton yield per hectare since Senior Agronomist, Murray Boshammer, began soil testing on Armour

Improvements in technology over the years mean nitrogen application techniques have become much more uniform, which has been very beneficial for the cotton.

These days, fertilisers are applied in split applications consisting of a combination of up-front fertilisers and side dressing. About 160 kilograms of nitrogen per hectare as urea, 80 kilograms per hectare of Starter Z for phosphorus and zinc and 30 to 40 kilograms per hectare of potassium sulphate are commonly used. Phosphorus, potassium, sulphur and zinc are applied using variable rate technology, which is beneficial in fields with variable soil types.

Feedlot manures have been used for about 15 years at a rate around 10 tonnes per hectare. The manure has helped to reduce fertiliser needs but one of its main problems is the variable amount of nitrogen it contains. This ranges from 1.6 to 3.2 per cent, which makes it challenging to fine-tune crop needs.

On some fields poor quality bore water was used, but this practice has ceased as the soil data was showing that it was not a sustainable practice.

“A flat line is a good result when it comes to looking at the long term soil trend data. The data can be erratic but, over time, when combined with our experience, good sense can be made of most numbers”

Geoff Hewitt

The graphs in Figure 3 show the levels of carbon, phosphorus, potassium and EC over the monitoring period

Figure 3

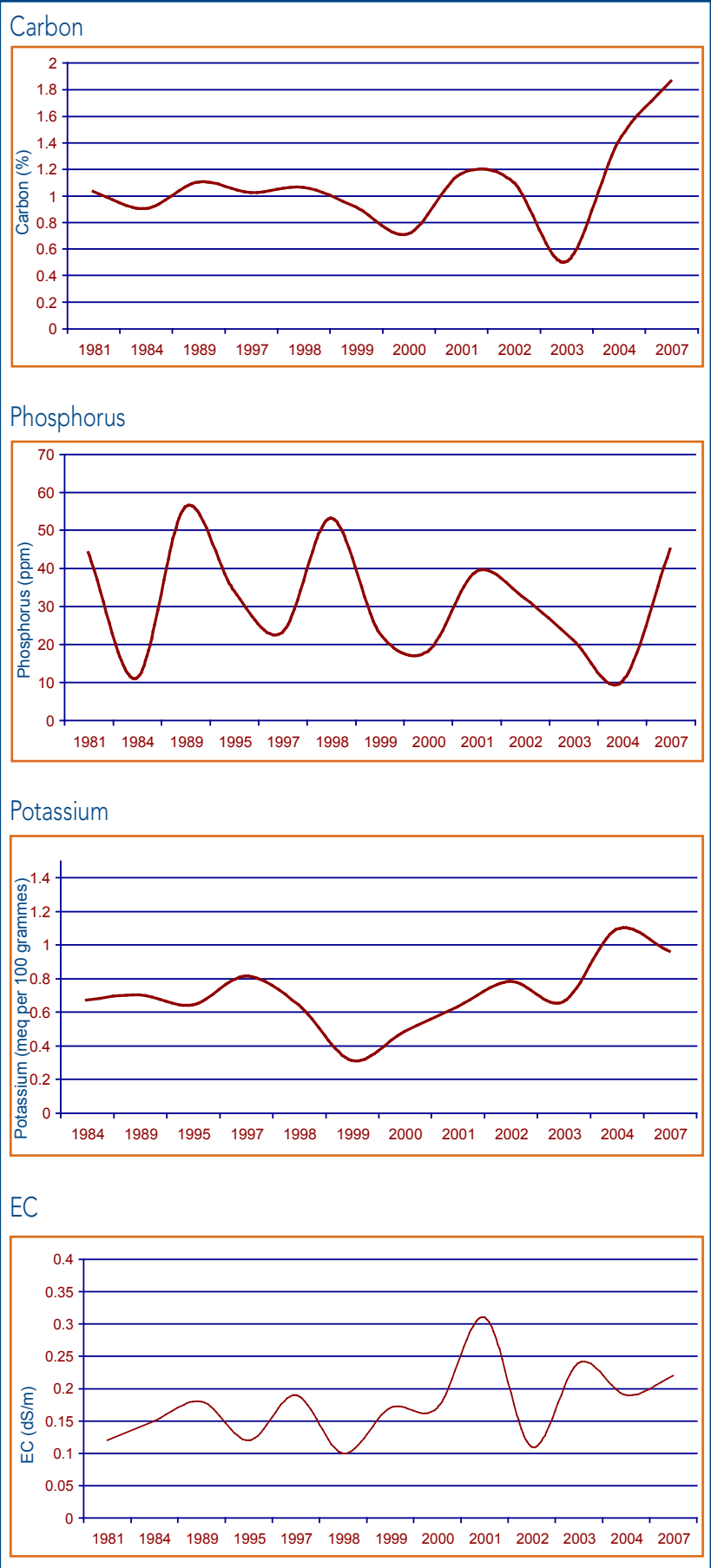


Figure 4



Armour has self-mulching cracking grey soils, found in many Australian cotton growing regions.

Soil health monitoring is an important part of maintaining and improving the soil's fertility and – the bottom line – improving cotton and grain yields

The future

In the last 12 months fertiliser prices have tripled and it is now very difficult to secure enough fertiliser when it is needed. The future will include fine tuning site sampling and targeted variable rate applications of nutrient inputs with the use of global positioning systems technologies.

According to Geoff and Murray the key is adaptive management and using a variety of the options that are available.

Acknowledgements

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (May 2008). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate adviser.