

A carbon positive cotton farm...

Measuring Keytah's carbon footprint

ANY farm which brands its product as Good Earth Cotton and describes it as the most ethical cotton on earth better have some good arguments to back up the claims. Not only does the Statham family's Sundown Pastoral Company have some good arguments, but they also have plenty of scientific evidence as well.

A Carbon Emissions Audit conducted by Dr Francois Visser found that their Gwydir Valley property Keytah was carbon positive in 2017-18. This means that the production of cotton and other crops actually reduced carbon emissions in the atmosphere – the farm acted as a giant carbon sink, absorbing more carbon than it released. But Dr Visser urges caution when interpreting the results. "Soil carbon levels can change with environmental conditions," says Dr Visser, "and the drought conditions in the subsequent two years are likely to have had an adverse effect. Follow-up measurements will tell us the extent of that effect."

Of course, being carbon positive is good for the environment, and the financial implications haven't been lost on David Statham, who is investigating options to sell the resulting carbon credits as a lucrative sideline to take advantage of the positive results of a farming philosophy which has been in place for many years.

Almost all the carbon positive status comes from the sequestration of carbon because of the sustainable farming practices employed on Keytah and the associated properties. The

audit found that the carbon content of the irrigated cotton soils increased from around 0.5 per cent to 0.75 per cent between 2013 and 2017. That might not sound like much, but in terms of total carbon taken out of the atmosphere, it is huge.

"Mother nature does most of the heavy lifting," says David, "we just give her a helping hand. Approximately half of all carbon that is extracted from the atmosphere is done through the process of photosynthesis. But not all the carbon dioxide that plants suck up for photosynthesis is needed for food. The excess goes down through their roots and feeds organisms that live in the soil. Carbon from the roots and leaves from dying plants are also captured in the soil and is added to the carbon sink. Carbon is the main organic soil component that makes our soil fertile and helps soil retain water."

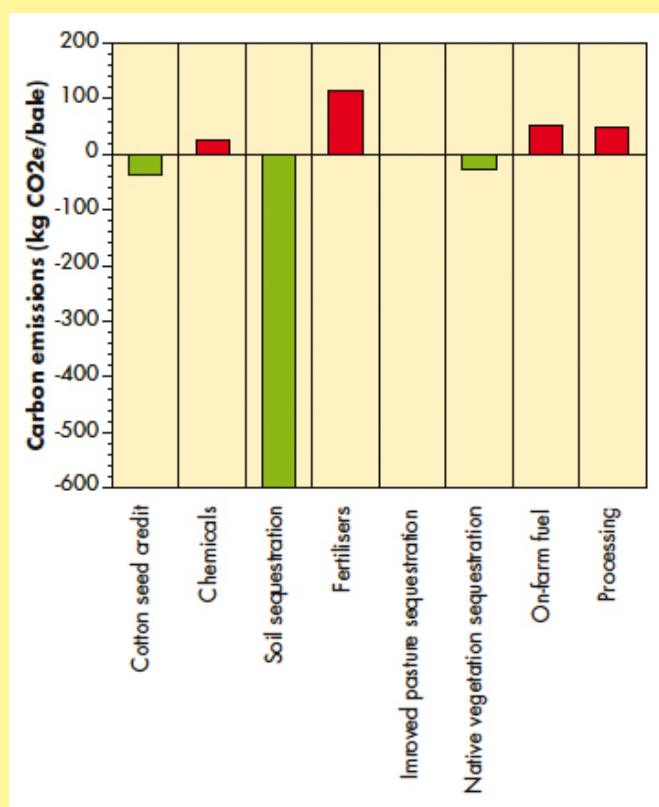
The Keytah philosophy doesn't involve sacrificing yield for environmental benefits – quite the reverse in fact. An emphasis on developing and nurturing new technology has meant that Keytah often acts as a showpiece for field days highlighting new techniques, especially in relation to water use and energy efficiency. The farm has been producing average yields of around 14 bales per hectare over many years and the higher yields per hectare actually make the most efficient use of land, resources and water. And they produce plenty of excess residue which can be returned to the soil to increase soil carbon levels.

Farming for healthy soil

Some of the practices used on Keytah to produce the carbon positive result include:

- Minimum tillage;
- Use of controlled traffic and permanent beds;
- Returning organically compacted waste to the soil;
- Using modern zero tillage precision planters;
- Introduction of bankless irrigation;
- Environmentally sound crop rotation practices; and,
- Strategic use of cover crops.

FIGURE 1: Keytah carbon



Keytah often acts as a showpiece for field days highlighting new techniques.

“Cotton fibre is sustainable, renewable and biodegradable,” says David “which it an excellent choice as an environmentally-friendly fibre throughout its entire product life cycle.”

Other environmentally sound practices include:

- Extensive use of solar and renewable energy across the supply chain;
- Maintaining clean river systems and monitoring every drop of water used; and,
- Protecting native wildlife and dedicating land to native vegetation.

Keytah is not the only cotton farm to use most or all of these practices, but they have taken it a step further by auditing their farming techniques and using benchmarking data alongside scientific data to measure their environmental impact.

The carbon footprint

In 2019, a Carbon Emissions Audit looking at the 2017–18 season was finalised on Keytah by Dr Francois Visser of Carbon Friendly Pty Ltd. The audit looked firstly at the whole-farm footprint of all operations and secondly, the greenhouse gas emissions of the irrigated cotton production from the “farm to the ship” including growing, ginning, transport and warehousing.

These studies included estimation of carbon emissions and sequestrations from:

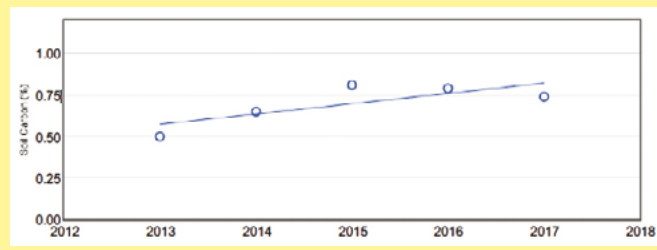
- On farm emissions from fuel use, direct soil N₂O emissions, atmospheric deposition, leaching and runoff from fertiliser, and soil carbon emissions;
- Fuel emissions from transport of fertiliser, chemicals, seed, bales and gin-trash to the farm;
- Fuel, fertiliser and chemical (insecticide, herbicide, growth regulator, adjuvant and fertiliser) production emissions;
- Seed production emissions;
- Off farm emissions from ginning, transport and warehousing at port;
- Carbon sequestration/offset from an off-farm woodlot;
- Native vegetation credits per type of vegetation;
- Agisted cattle emissions including pastures; and,
- On farm electricity emissions.

In addition, the studies were repeated with cattle production components replaced by native vegetation. This was undertaken to investigate the benefits of returning the agisted cattle



A new bankless channel layout on Keytah.

FIGURE 2: Soil carbon measurements irrigated cotton



production land back to native vegetation (forest) as the recent practice has been to no longer agist cattle.

Summary of Results

Whole farm assessment

The carbon footprint outcome for the Keytah operation as a whole, including cattle, was minus 29,390 tonnes of CO₂ equivalent (TCO₂e). Note that a minus figure is good and this “negative-emission” result means that the farm is climate positive or a carbon sink, as opposed to a source of carbon emissions. In a “what if” result, if the agisted cattle were replaced with native vegetation the result would be even better.

With some Australian carbon credit prices in the \$15-20 per tonne range, that level of sequestration could have significant value. As we edge towards commitments to net-zero emissions by the major parties, the price of carbon credits is expected to rise substantially. And in a complex market, more pricing opportunities are likely to develop, both here and overseas.

Cotton only – from farm to port

The Keytah irrigated cotton carbon footprint at port for the 2017–18 season was minus 421.4 kg CO₂e per bale. This is a climate positive outcome resulting in a “carbon-neutral” cotton crop at the point of export (see Figure 1).

It includes all emissions from production (chemicals, fertiliser, fuel etc), ginning, transport and storage.

Keytah irrigated cotton emissions (with shared farm credits)

This result is dominated by the soil carbon sequestration that resulted from the on-farm practice changes that were introduced. The emissions between the farm and the ship included ginning which produced 47.1 kg CO₂e, transport to port and warehousing in Brisbane.

In carbon accounting language, the total farm also had some accumulated carbon credits because of the extent of native vegetation and an “offset” woodlot investment which are included in the calculations.

Increase in soil carbon

The auditors used 2013 as a base year because farm records showed that soil carbon levels had been fairly stable for a few years previously. Over the next four years, the percentage of carbon in the soil increased by 0.062 per cent each year, which is equivalent to 1255 kg CO₂e per hectare per year (see Figure 2).

The auditors warn that there is inherent variability of soil carbon testing and there is no guarantee that future results will produce such a high carbon-negative result.

But they conclude that cotton production at Keytah in the 2017–18 season showed a considerable carbon-negative result of 421 kg CO₂e per bale of cotton lint delivered to port in Brisbane. This ‘bank’ of carbon credits per bale should go a long way in offsetting any subsequent emissions per bale associated with shipping and downstream processing.