

Carbon farming for productivity in Western Australia

Nikki Dumbrell¹

¹West Australian No-Tillage Farmers Association (WANTFA)

Climate change in Western Australia

Since 1910 and even more so since 1950 Australia has experienced an increase in average land surface temperature of 0.9°C, average maximum daily temperatures have increased by 0.8°C and overnight minimums have increased by 1.1°C (Bureau of Meteorology and CSIRO, 2014). The southwest of Australia has followed a similar pattern to the rest of the continent.

As well as changes in average temperatures, there have been changes in temperature extremes. From 1957 to 2004, across Australia there has been an increase in hot days (35°C or more), an increase in hot nights (20°C or more), a decrease in cold days (15°C or less) and a decrease in cold nights (5°C or less) (Alexander et al., 2007). The area experiencing and frequency of exceptionally hot years (defined as the hottest 5 percent of the past 100 years) has been increasing rapidly. For example, from 1968 to 2007 exceptionally hot years occurred over 10-12 percent of the area in each dominant Australian farming region. This is about twice the expected long-term average (Hennessy et al., 2008). On top of this seven of the 10 warmest years of our record have occurred since 1998 (Bureau of Meteorology and CSIRO, 2014). It is these extremes that are most concerning when we consider future impacts of climate change in our agricultural systems.

When it comes to rainfall, the southwest of Western Australia is one of the most vulnerable regions in the face of climate change. Since 1970 we have observed a 17 percent decrease in average winter rainfall in the south-west of Australia. Since the 1990's early growing season rainfall across much of the south-west of Australia has been very much below the long term average. This decrease in rainfall over the south-west has been observed at the same time as increasing rainfall over the Southern Ocean. This is indicative of a southward movement of rain-bearing systems as a result of changes to atmospheric and ocean circulation.

What are the consequences of climate change for crop yields in Western Australia?

The most important impact of climate changes on many West Australian farmers will be decreases in average crop yield as a direct or indirect result of changes in climate conditions. The extent of change in yields is uncertain but projections based on climate and crop responses to climate changes indicate a reduction in wheat yield in the range of 0 to 15 percent for much of the wheatbelt (Farre et al., 2007). Yield decreases will be dependent on soil type, geographic location and the extent of any changes that actually occur.

Carbon farming

Carbon farming practices are those that enable the capture and storage of carbon from the atmosphere in vegetation and soil and/or reduce greenhouse gas emissions (namely carbon dioxide, nitrous oxide and methane) from agricultural soils and livestock. Adoption of carbon farming practices is one option to help farmers to mitigate and adapt to climate change. Mitigation involves actions that are intended to reduce the magnitude of our contribution to climate change. Adaptation actions are those undertaken to reduce the adverse consequences of climate change, as well as to make the most of new opportunities. Adaptation will be important in order to maintain productivity.

Information and summaries included in the Field Day Booklet for the Carbon Farming Workshop in Cunderdin on 25 September 2014 continued

Practices that help to maintain or even increase soil carbon include:

- conservation tillage, most ideal is zero-tillage cropping practices
- crop residue retention (stubble retention)
- allowing and assisting the regrowth of native vegetation
- eliminating or reducing the frequency of fallow in rotations
- shifting from annual to perennial pastures and crops
- improved grazing management by using relatively intensive rotational grazing

Practices that can help to reduce nitrous oxide emissions:

- variable rate technology
- controlled traffic farming (to reduce compaction)
- enhanced efficiency fertilisers

Practices that can help to reduce methane emissions from livestock:

- Feed additives
- Grazing of shrubs that have anti-methanogenic properties
- Selecting livestock with genetic traits for high reproduction rates and high productivity (feed conversion efficiency)
- Early weaning of livestock (to reduce emissions intensity per unit of output)

Co-benefits of carbon farming practices

Carbon sequestration in agricultural soils provides obvious public benefits by contributing to climate change mitigation but, it can also offer production benefits to the implementing farmer. Increasing soil carbon content can help to improve soil structure, reduce erosion, improve soil moisture retention, and increase plant available water and nutrient storing capacity ([Desjardins et al., 2005](#), [Lal, 2004](#)). In turn, these benefits may increase farm productivity ([Turner and Asseng, 2005](#)). Or help to reduce input costs. Likewise, returning land to native vegetation has many benefits aside from promoting carbon sequestration. Establishing areas of native vegetation on farmland can contribute to reduced salinity, improved water quality and improved ecosystem service provision ([George et al., 2012](#), [Perring et al., 2012](#)).

Carbon Farming Initiative

The Carbon Farming Initiative (CFI) is a voluntary offsets scheme designed to encourage Australian farmers and land managers to reduce greenhouse gas emissions and store carbon in soil and vegetation. Under the CFI the sequestration or reduction of one tonne of carbon dioxide (or equivalent) emissions using an approved methodology is rewarded with the allocation of a carbon credit that can be sold in a voluntary market. Projects to reduce emissions or sequester carbon (and earn credits) must be based on an approved methodology such that the project will not result in any adverse environmental or social impacts. The approved methodologies have undergone rigorous analysis before being added to the policy framework as methodology determinations that can be adopted by farmers and land managers.

The methodologies are listed on the Department of Environment Climate Change website: www.climatechange.gov.au

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The CFI may undergo changes if the Direct Action plan and Emissions Reduction Fund become policy. For more information on the transition of policies refer to the mycfi website: www.mycfi.com.au

It is also important to consider your opportunities and barriers for participation in any carbon farming policy.

Below are a series of questions to ask yourself when thinking about participation...

1. Have I got the infrastructure opportunity?
2. What changes, if any do I have to make to increase my opportunity?
3. How do these changes affect my existing business?
4. Are the changes more profitable and sustainable than my existing set up?
5. Do I understand the rules, regulations and economic levers involved?
6. What technical and professional support do I need to develop a plan?
7. What resources do I have and what do I need to acquire?
8. What external resources and support do I need to implement a plan?

WANTFA is working to provide farmers with knowledge about carbon farming practices that can fit into West Australian system, are profitable, and help farmers to mitigate climate change and adapt to an increasingly variable climate. Local trials of some new technologies or techniques are in place in Western Australia, we are working to keep you up to date on these trials and interpret what they mean and how they might work!

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