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SOUTHCOAST NATURAL RESOURCE MANAGEMENT

land

PERMANENT ENVIRONMENTAL PLANTINGS FOR CARBON BENEFITS
- A FITZ-STIRLING PERSPECTIVE -

SUB-REGIONAL PROFILE

AREA: Fitz-Stirling (corridor of agricultural/reserve land between Fitzgerald River & Stirling Range national parks).
LOCATION: Eastern part of Shire of Gnowangerup & western part of Shire of Jerramungup.
AVERAGE ANNUAL RAINFALL: 456 mm
LAND USES: Mixture of remnant vegetation in nature reserves plus vegetated & managed remnant vegetation for conservation with neighbouring broad-acre agriculture.
SOIL TYPE: Wide ranging.
WHY HERE?: The Fitz-Stirling area is a focal point for the ambitious Gondwana Link project which aims to conserve & restore landscapes on a regional scale. This area will provide the South Coast community with a unique opportunity to see how best practice revegetation is undertaken & managed for long term benefits, including potential carbon benefits.
SPECIALIST PRACTITIONER: Justin Jonson, managing director, Threshold Environmental.

NUTS & BOLTS

- Permanent Environmental Plantings (PEPs) are an eligible activity under the Australian Government's Emissions Reduction Fund (ERF) for generating Australian carbon credit units (ACCUs).
- Research undertaken in the Fitz-Stirling area has highlighted sufficient capacity to establish PEPs for carbon sequestration with a range of variables requiring attention to maximise biomass production.
- Determining carbon sequestration potential of PEPs is technically demanding & complex.
- Motivations to establish PEPs will exist where farmers identify potential increases in agricultural productivity & enterprise profitability, for nature conservation purposes, or to meet aesthetic and altruistic objectives in addition to potentially attracting ACCUs.
- Additional co-benefits of PEPs for carbon may include:
  - Reductions in spray drift, shade & shelter for livestock.
  - Reduction of wind & water erosion, groundwater recharge control & the potential alleviation of dryland salinity.
  - Enhancing farm and broader landscape biodiversity.

In April 2015 the Australian Government held its first carbon auction. The average price per ACCU was $13.95 AU/t CO2-e and the standard contract period seven years (Clean Energy Regulator, 2015).

Over the years, the main focus of many natural resource management and Landcare projects across the South Coast has been revegetation and the protection of remnant bush.

In a carbon farming environment, can permanent environmental plantings (PEPs) attract an economic value and provide incentives for further revegetation and conservation works on private properties across the South Coast landscape?

Justin Jonson is a revegetation specialist who's managed the establishment of 4.5 million trees and shrubs over the past five years, primarily in the Fitz-Stirling.

Justin is passionate about nature conservation and through his practical experience and knowledge at executive and ground level, believes commercial drivers, such as the carbon market, are critical to achieving broader scale environmental outcomes in the future.

He has undertaken numerous carbon sequestration studies on the South Coast (including Chereninup Creek Reserve and Peniup) which are providing encouraging results. He has also developed allometric equations (used to determine how much carbon is in carbon is in a tree) relevant to the region and has recently teamed up with CSIRO scientists in the recalibration of the FullCAM model, a key government modelling tool that most people will use to quantify ACCU generation by PEPs.

Managing director of Threshold Environmental Justin Jonson prepares a biodiverse seed mixture prior to direct seeding. Pic: Threshold Environmental.

CARBON SEQUESTRATION AT CHERENINUP

Chereninup Creek Reserve was a broad-acre farm of 877 ha until purchased by Bush Heritage Australia in 2003. That same year a 70 ha cleared paddock was revegetated using local native species.

Research undertaken by Justin in 2010, found the amount of carbon sequestered to that point (revegetation then six and a half years old) was significant, considering relatively low rainfall and marginal soil types, at a site average of approximately 31.7t CO_2-e ha-1 (tonnes of CO_2 equivalent per ha).

The mean annual yield for the plantings was calculated to average 4.5 t CO_2-e ha-1 yr-1 over the first 6.5 year term *(Jonson, 2010)*. This site has also provided good carbon growth over time as shown in *figure 1. (page 3)*. Variations in yield across the site were attributed to landscape position, soil type, stem densities and species composition. For instance, *plot 2c* (unthinned) was located in a water harvesting position in the landscape and showed the greatest carbon sequestration found in the study.

Highly successful germinations of direct-seeded *Melaleuca acuminata* prompted research into the possible effects of competition and growth rates.

In this study, plots with the highest stem densities had the largest carbon yields, *table 1 (page 3)*.

However it's still believed that competition for water resources and a highly stress-tolerant flora will ultimately result in a locking up of growth and carbon sequestration capacity in the future *(Jonson, 2010)*.

TABLE 1

Seedling counts for total seedlings, eucalypt and understory species and quantified carbon values at Chereninup Creek Reserve for 100 m2 plots, measured February 2010 *(Jonson, 2010).*

Note: In plot identification 'c' represents control and suffix 't' represents plots that were thinned of *Melaleuca accuminata.*

Plot	Total seedlings	Eucalyptus	Understorey	Total stems/ha	Approx CO_2 sequestered (CO_2-e [t^{-1} ha^{1}])
1c	109	31	78	10,900	25.6
1t	47	14	33	4,700	19.5
2c	167	78	89	16,700	55
2t	45	27	18	4,500	34.4
3c	114	85	29	11,400	34.4
3t	79	40	39	7,900	21.7

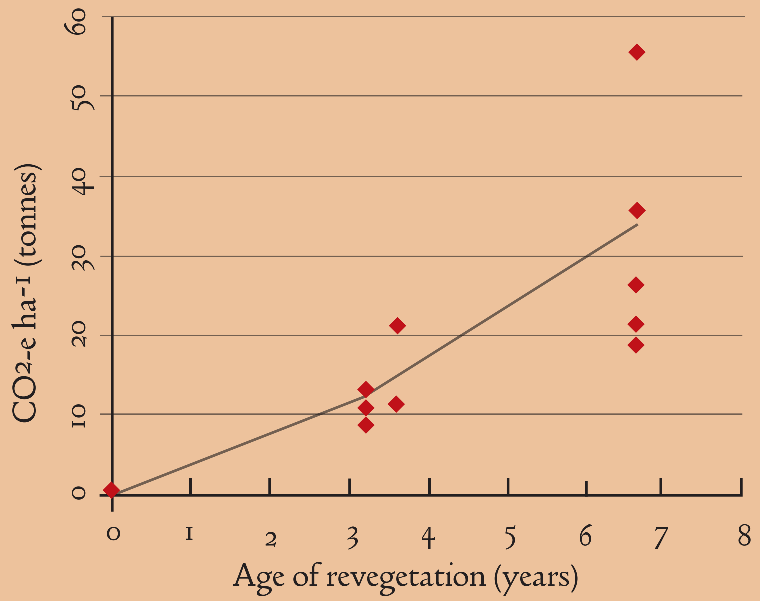

FIGURE 1.

Carbon growth curve for Chereninup Creek Reserve revegetation *(Jonson, 2010).*

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This site has also provided good carbon growth over time.

FACTORS INFLUENCING BIOMASS PRODUCTION AT PENIUP

Peniup is a 2,406 ha former agricultural property co-purchased in 2007 by Greening Australia and Bush Heritage Australia.

It is one of the first carbon-funded ecological restoration projects in Australia with Greening Australia, at the time of purchase, pursuing the emerging Australian carbon market with vigour and managing to secure early funding from commercial companies seeking voluntary carbon offsets *(Jonson, 2010 and Freudenberger, 2015).* Revegetation of the property's cleared areas occurred in stages with extremely thorough planning and implementation. In 2008, 250 ha were direct seeded with different native seed mixes, depending on soil type and landscape position and with reference to surrounding tall eucalypt woodland and mallee remnants to achieve economic (carbon market), ecological and evolutionary objectives *(Jonson, 2010).*

FACTORS INFLUENCING BIOMASS PRODUCTION AT PENIUP (Continued)

Seedlings of yate *(Eucalyptus occidentalis)* were planted where they once naturally occurred to ensure carbon sequestration outcomes given this species has the highest local carbon carrying capacity *(Jonson, 2010).*

In 2013, 42 permanent plots were surveyed to investigate what finer scale factors influence biomass variability and hence, carbon sequestration capacity.

A key finding was that vegetation association was the primary driver of biomass variation.

Stem density and greater species richness explained a significant amount of biomass and there was some evidence for the role of nitrogen-fixing species in determining biomass variability.

Of particular interest was the impact of Eucalyptus species, which on average accounted for 80 per cent of the biomass despite only constituting 33 per cent of the stems *(Perring, Jonson, et al, 2015).*

Variation in biomass, both within and among vegetation associations as observed at Peniup, obviously has implications for carbon accounting practices and cost-benefit analyses in carbon farming, as well as highlighting the need for detailed planning of PEPs to ensure biomass production is maximised.

THE SCIENCE OF ASSESSING CARBON SEQUESTRATION POTENTIAL

In 2011 Justin developed allometric equations to predict tree biomass from tree dimensional measurements in order to improve the estimation of carbon sequestered and stored in the Fitz-Stirling area.

A variety of tree dimensions were found to be well correlated for above ground, below ground and total biomass with diameter at breast height having the most consistent correlation across all species analysed.

The study also looked at the ratio of below ground biomass to above ground biomass (root: shoot ratio) which generally decreased as the overall size of the individual increased.

On average 56 per cent of total tree biomass was found in the live branches and main stems with only 17 per cent found in leaves and shoots *(Jonson and Freudenberger, 2011).*

This study highlighted the complexity and technically demanding procedures involved in determining the carbon sequestration potential of PEPs. The science behind the determinations involves a large number of interrelated variables to ensure an accurate estimate of the carbon carrying capacity.

The development of species-specific allometric equations is both impractical and inefficient and the study found that generic or multi-species approaches to estimating biomass are justified. The generic equations developed at Peniup are likely to have direct application to the measurement of carbon in low rainfall woodland ecosystems across south-west Western Australia *(Jonson and Freudenberger, 2011).*

Justin points out that with the Peniup research "critical allometric equations are presented for the measurement of carbon sequestered in environmental plantings, providing land managers, consultants and carbon brokers the tools required to calculate higher yields than those forecast by generalised models."

Justin collecting biomass data from mature yate trees for Greening Australia in 2013. Pic:Threshold Environmental.

KEY CHALLENGES & RISKS

As with all farming systems, the farmer is responsible for managing the risks associated with PEP establishment and ongoing management, as well as being involved in the highly complex, technical and changeable carbon market.

Thorough research, investigation and understanding is critical. Points to be aware of include:

- Dry woody biomass is 50 per cent carbon (a modelling standard).
- ERF contracts are for three to 10 years.
- Obligation for 100 year permanence of the vegetation stand or 25 years with a percentage of ACCUs being relinquished.
- Government funded environmental plantings are not eligible to earn ACCUs. An ERF project must be in 'addition' to activities already underway.
- ERF projects must not have started prior to being registered.
- Dealing with carbon brokers & other third parties.

CARBON AS AN INCENTIVE FOR ESTABLISHING PEPs

Justin acknowledges that with the current market value for ACCUs (less than $20/t CO_2-e), there is little to no convincing economic incentive for farmers to replace profitable agricultural production systems with plantings for carbon.

He is actively tracking global trends and predictions relating to climate change and feels that ultimately when it comes to implementing carbon farming.

"Farmers are the innovators so the opportunity for integrating carbon into their systems will likely be born from their thinking," Justin said.

"Capturing excess water resources and turning them into woody biomass in the form of timber and nature conservation plantings, to buffer and shelter their production areas, is likely how best practice carbon farming will be integrated into current production landscapes," he said.

Ultimately, the decision to implement PEPs for carbon specifically, will be governed by an acceptable carbon price.

Justin suggests a forward thinking, proactive farming business seeking to strengthen resilience and potentially enter into the carbon market in the future could:

- Register a project with the ERF, but don't try to measure or sell the carbon in the short term, as this will forgo your right to those plantings in the short term, should you choose another party. Remember the carbon rules of additionality and newness are critical to access the carbon market via the ERF.
- After successfully registering a project, plant up areas of your farm with your own funds specifically for the purpose of gaining carbon payments down the track.
- Target marginal and unproductive land but be mindful of carbon sequestration potentials. Then wait and see what happens with an international market for carbon offsets.
- If the carbon market did grow to reach an acceptable figure, there would be large financial gains available for farmers who established plantings early. Shell currently applies a carbon price of $40US/t CO_2-e in its business models *(The Economist, 2013)*. In the meantime, farmers get all of the co-benefits of those trees on their land.

"*Farmers are the innovators, so the opportunity for integrating carbon into their systems, will likely be born from their thinking.*"
- Justin Jonson, 2015.

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FURTHER INFORMATION
For more information about this and other Climate Action Farming projects please visit: www.climateactionfarming.com.au.

For information on agricultural trials in WA go to: www.agtrialsites.com.

A series of short *Climate Action Farming* films can be viewed on the South Coast NRM YouTube channel.

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