Growing Southern Gippsland

FIELD DAY- Becoming a carbon cocky – carbon farming in a changing climate – soil, trees and accounting.

You are invited along to this exciting field day on carbon farming in a changing climate and the opportunities for Southern Gippsland farmers.

Field day topics include:

- Soil carbon sequestration-what and how?
- Multi story farming- integrating trees and pasture
- Emissions auditing- Prom Country Cheese case study
- Introducing the LOOC-C- using a tool to identify carbon sequestration opportunities
- Demonstration of soil coring methodology for baseline and monitoring

The Growing Southern Gippsland project is funded through the Victorian Centre for Climate Change Innovation, Bass Coast Landcare Network, RMIT University and Federation University Australia.

Carbon Farming in a Changing Climate
Chris Alenson November 2019

"….. a 15% increase in the world's terrestrial carbon stock (forests, woodlands, swamps, grasslands and farm soils) would remove the carbon fossil fuel pollution generated since the industrial revolution". **The Wentworth group of concerned scientists (2009)**

Introduction

The prospect of Global warming became increasingly discussed in scientific circles during the 1970's and 1980's along with ozone depletion and acid rain. In the space of 50 years in the discussions on sustainable agriculture a new very confronting issue affecting every aspect of agriculture is now facing scientists and land managers.

Shifting crop production, reduced soil fertility, earlier crop maturity, decreased water supplies and rainfall patterns are issues being reported on along with agriculture's major contribution to climate change through greenhouse gas emissions. It is reported that agriculture including vegetation removal is responsible for about 24% of greenhouse emissions.

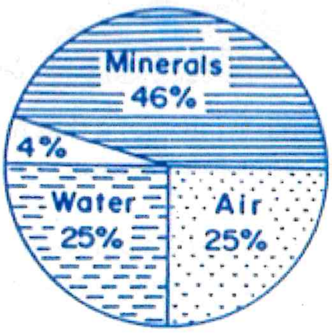
Across the world over cultivation, over grazing and the removal of vegetation is causing a decline in soil organic matter and a concomitant decline in soil fertility, and in many areas ever increasing desertification. A recent United Nation's report suggests that 43% of the world's population live in areas suffering from major land and soil degradation.
The drought in Northern NSW with the recent dust storms seen across Eastern Australia is evidence of this world trend of land degradation.

When organic matter declines in a soil, not only does production decrease but the ability to mobilise nutrients and store water also decreases and erosion occurs.

Soil fertility

A fertile soil has such characteristics as a good physical structure that allows the entry of oxygen and water, adequate humus content and an abundant array of macro and micro organisms that assist in cycling of organic matter, the mobilisation of nutrients and the control of disease-causing pathogens.

This fertile soil is more than just an anchoring point for the roots of a crop but a living ecosystem that performs a myriad of functions.



The pie chart indicates a productive silty loam with a volume composition of **46% mineral matter, 25% water, 25% air and 4% organic matter and biota**.

Although organic matter in this diagram occupies only a small percentage of its composition (4%) it is probably the most important phase responsible for driving nutrient cycling through its biological functions and creating the sponge-like characteristics that stores water and oxygen.

It is considered that 75% of our major soil groups in Australia have less than 1% organic carbon, a major impediment to maximising crop production. Across Gippsland and Bass Coast, producers are more fortunate with soil organic matter ranging from 6-10%.

Organic matter and the Carbon Cycle

Soil organic matter is made up of decomposed plant and animal material including microorganisms. Organic material is manufactured by plants through the process of photosynthesis utilising carbon dioxide from the atmosphere and water.

On death the organic matter is returned to the soil along with soil organisms and the renewal process recommences. It is this cycle of life where carbon is taken from the atmosphere that soil scientists are trying to optimise to store carbon deeper in the soil profile and reduce the increasing carbon dioxide levels.

Organic matter on decomposition provides a well-balanced, slow release source of nutrients. It is composed of plant foods, carbohydrates (sugars, starch and cellulose), proteins and lignins, gums, resins and other organic compounds. Physically it provides a balance between free draining pores for aeration and small water retentive pores. Organic matter varies from soil to soil and consists of about 60% carbon. As organic matter has variable composition it is difficult to measure so carbon is used as the measuring yardstick.

The benefit of increasing soil organic matter and carbon

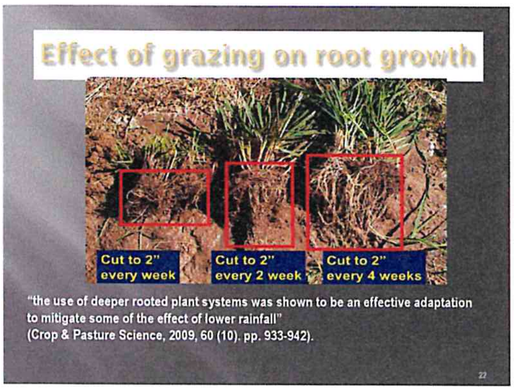
- Improved soil health
- Increased production and crop quality
- Increased water storage
- Increased cation exchange
- Increased soil binding properties preventing erosion
- Increased farm incomes
- Increased farm values
- Reduced carbon dioxide levels in the atmosphere

How do we increase organic matter and carbon in the soil?

Grazing stock on the land requires careful consideration of the rotations ensuring that pastures are not grazed beyond 60mm in height allowing leaves to remain to speed recovery and growth through photosynthetic processes. Research is indicating that heavily grazed pastures under a changing drier climate are indicating reduced soil carbon levels.

A mixed pasture with deeper rooting perennials such as cocksfoot, clovers, tall fescue and prairie grasses not only improves the soils physical characteristics but the deeper rooting, allows carbon storage at depth. Research is indicating that mixed pastures with legumes may play an important role in reducing methane emissions from livestock.

The diagram above illustrates the effect of root pruning (livestock grazing) and the return of root residues to the cycling process. The deeper the root penetration of the pastures the greater chance of storing carbon.



The effect of grazing at various time intervals can be seen in root volume and their depth.

Cropping farmers should ensure that soil exposure is minimised and that cover crops, stubble or green manures are retained and utilised to return organic matter to the soil that would otherwise be oxidised. No till or conservation tillage is an important strategy in retaining valuable organic matter.

Horticulturalists that regularly cultivate the soil stand to lose valuable organic matter. Rotations where green manures are utilised along with the use of legumes and composts will return organic matter to a soil and re-build the fertility.

Regenerative agriculture

With its management emphasis on building soil organic carbon and soil fertility, protecting a farm's biodiversity aspects, and growing mixed deep rooting pastures this form of agriculture is rightly attracting considerable attention. The benefits for profitable production and longer-term health of the property is an attractive proposition. Regenerative agriculture encompasses all the strategies that have underpinned sustainable or alternative agricultural systems with a renewed emphasis on sequestering carbon dioxide through soil and plant systems.

Summary

Soil organic matter is the largest reservoir of carbon that interacts with the atmosphere and given that grazing land occupies two thirds of the planet's landmass the opportunity to increase carbon storage is immense. Building organic matter and carbon in pasture soils is very much about a well managed stock rotation while the addition of organic soil amendments also increases these major soil building attributes. It is essential f

The science tells us that climate change is already affecting our weather patterns with increased drought across many of our agricultural areas. Agriculture is both a sink for carbon dioxide but also responsible for emissions of Greenhouse gases. We must reverse the trend of emissions and look to sequester more carbon dioxide. Increasing soil organic matter and carbon will not only increase productivity but also increase the soils ability to store moisture and provide increased resilience. Producers contemplating adopting these systems of agriculture must ensure that base line measurements of soil carbon are undertaken by reputable laboratories and that remedial management strategies are well discussed with knowledgeable advisers in this area.

References

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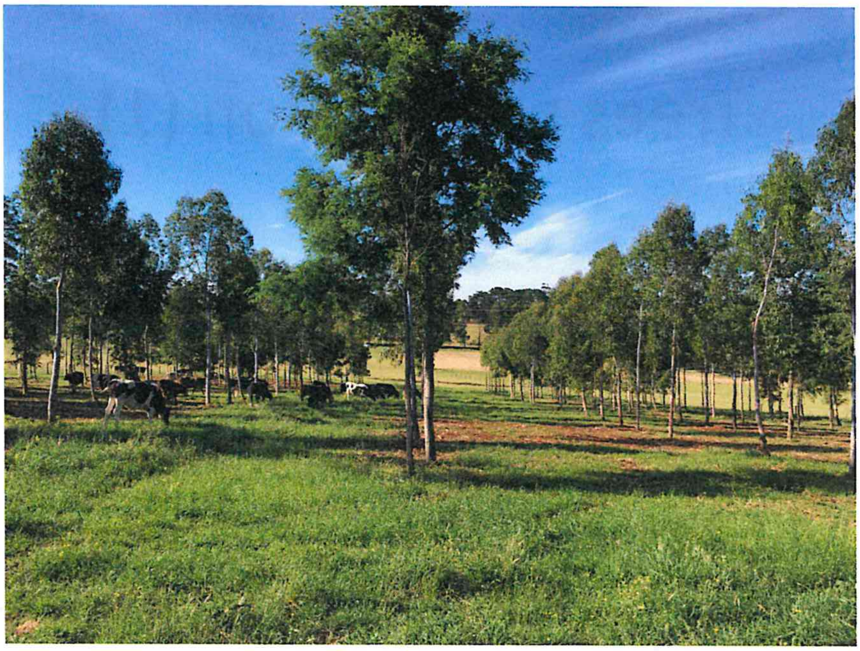
https://grdc.com.au/resources-and-publications/all-publications/publications/2013/07/grdc-guide-managingsoilorganicmatter

Why does Managing Soil Organic Matter --- Matter?
https://grdc.com.au/resources-and-publications/groundcover/groundcover-issue-128-may-june-2017/why-does-soil-organic-matter-matter

Soil Sequestration under Pastures in Southern Australia
https://www.dairyingfortomorrow.com.au/wp-content/uploads/Final-Soil-Carbon-Sequestration-in-Aust-dairy-regions-report-feb-10.pdf

A-farmers-guide-to-increasing-Soil-Organic-Carbon-under-pastures.pdf
https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0014/321422/A-farmers-guide-to-increasing-Soil-Organic-Carbon-under-pastures.pdf

Soil organic matter and carbon sequestration in pastures https://futurebeef.com.au/knowledge-centre/soil-organic-matter-and-carbon-sequestration-in-pastures/



Carbon and Multi Storey Farming

Clinton Tepper

www.justaddtrees.com.au

Background

- Forest Scientist since 1995.
- Farm 147 acres – beef, lucerne and trees.
- Africa
- Just Add Trees
- Multi storey farming
- Waiver

Trees and Carbon (1)

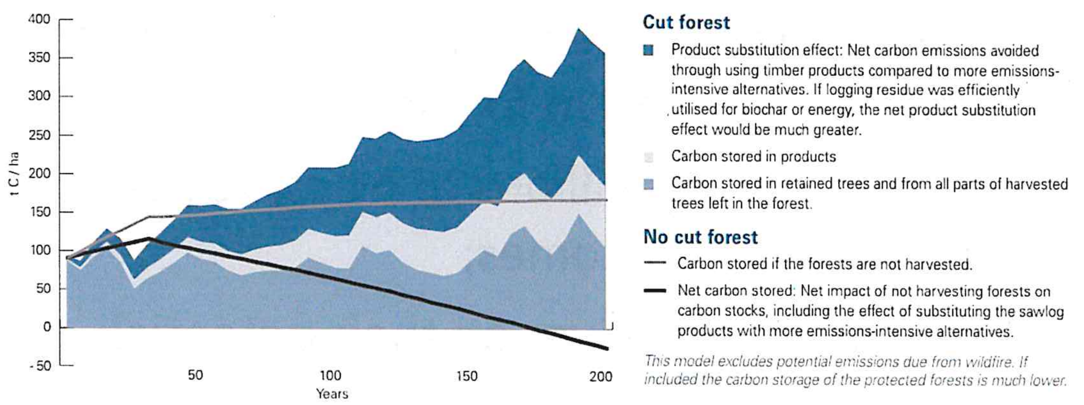
- Photosynthesis
  $6CO_2 + 6H_20 \rightarrow (\text{light energy}) \rightarrow C_6H_{12}O_6 + 6O_2$
- 35% water and 65% solid dry mass
- 50% of a trees dry mass is carbon (C);
- 20% of tree biomass is below ground;
- 1 tonne of C = 3.67t of CO_2 equivalent (CO_2-e);
- Trees sequester C at maximum rate when they are growing fastest;
- Carbon stored in wood is only released when burnt or decaying

Trees and Carbon (2)

- Species choice matters;
  - Higher density timbers store more carbon
  - Dying trees emit carbon
  - Durable wood products store C for longer
  - Sawn wood products bias
- Trees require management for best climate outcomes
  - Growth makes management necessary
  - Without management the equation changes substantially

Management case study

Carbon under the current harvesting regime in a representative North Coast native forest



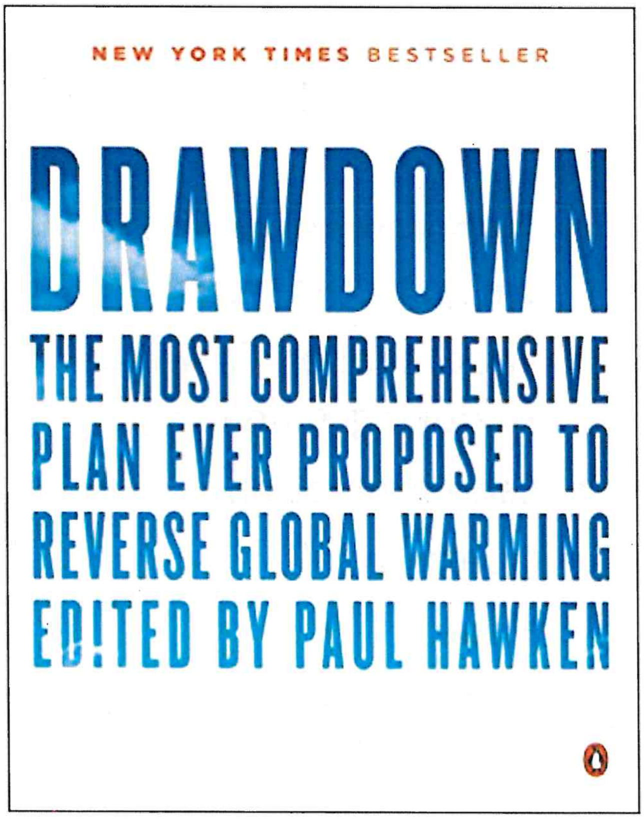
Perspective

Book published 2017 rankings of solutions (1-100) to reverse global warming:

9 – Silvopasture)
11 - Regenerative Ag
14 – Tropical staple (food) trees)
15 – Afforestation (timber plantations)
17 – Tree Intercropping
28 – Multi strata agroforestry
35 – Bamboo

Trees combined with agriculture dominate top 20

Consensus that integrating trees with agriculture is superior to either by themselves.



Before any of this

- Journey
- Forestry experience in state forests, industrial plantations and farm forestry
- Est. and mgt. of millions of trees, >50 species for a range of outcomes;
- Many failed to deliver on their potential;
- Beyond Subsistence and Africa

The value of a tree

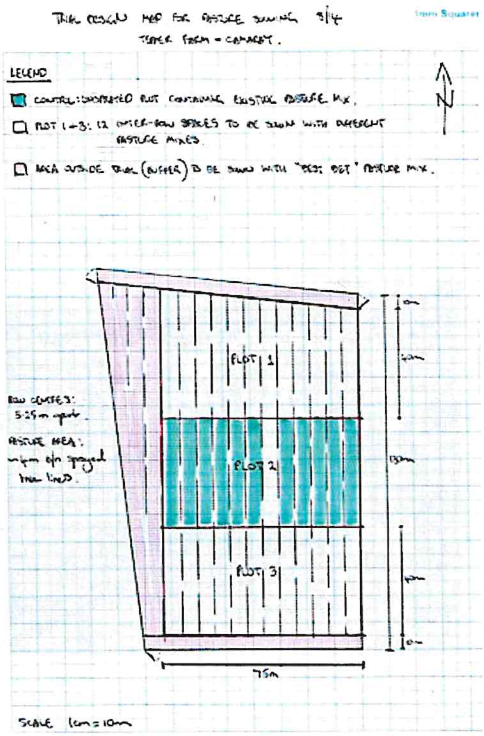
- "When times are hard we go to the trees"
- Food, timber, firewood – cooking & heating
- Land protection
- Quality of life
- Hope
- Multi purpose benefits - amplified

Camaray Farm – poor resilience

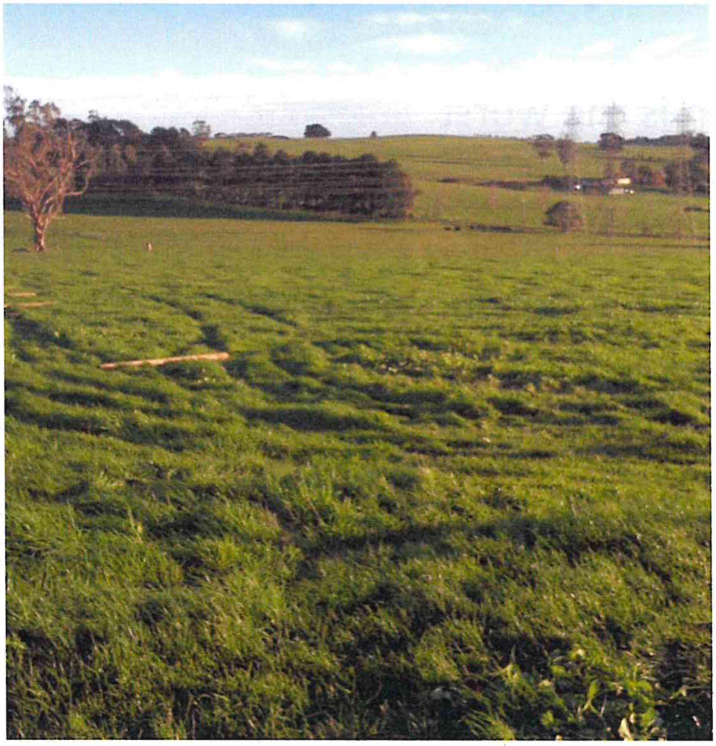
- "Autumn is the worst time on the farm"
- Our mgt led to poor resilience
- 3 to 4 months min. growth
- Feeding out thru autumn and winter

An opportunity

- WPCLN Demonstration site project
- "Alternative designs for optimizing holistic values of farm tree plantings"
- 140*80m site
- 3 plots
- 3 species mixes
    - silvertop/silver wattle
    - silvertop/spotted gum
    - spotted gum/silver wattle
- 13 inter-row spaces
- Assessment



June 2014



3 months post planting

15 months post planting

Crops and pasture in trees

Triticale at 4 months

Brome blend Dec 15

Crops and pastures

Oats Dec 2015

Lucerne Dec 2105

Grazing at age 19 months

- (Sept 15 – April 16) one of 3 driest periods ever
- Setaria and brome offering excellent fodder
- Silver wattle fodder
- Trees > 3metres tall, no damage
- Valuable drought reserve
- Grazeable windbreak or productive firebreak!

3rd sowing

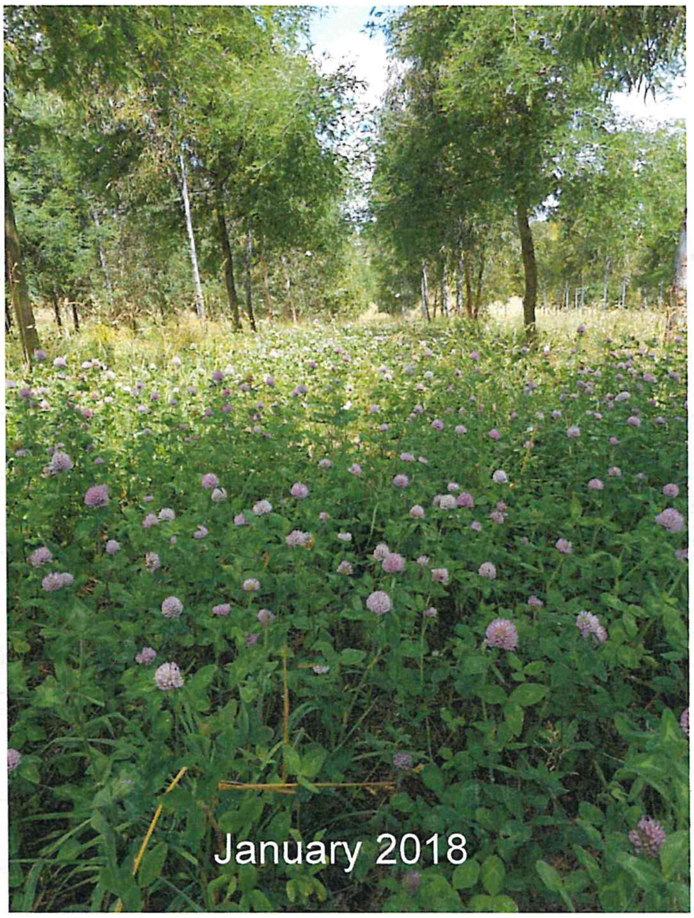
Result – 3rd sowing

Results 5th sowing -
Nov 17

Results 5th sowing


November 2017

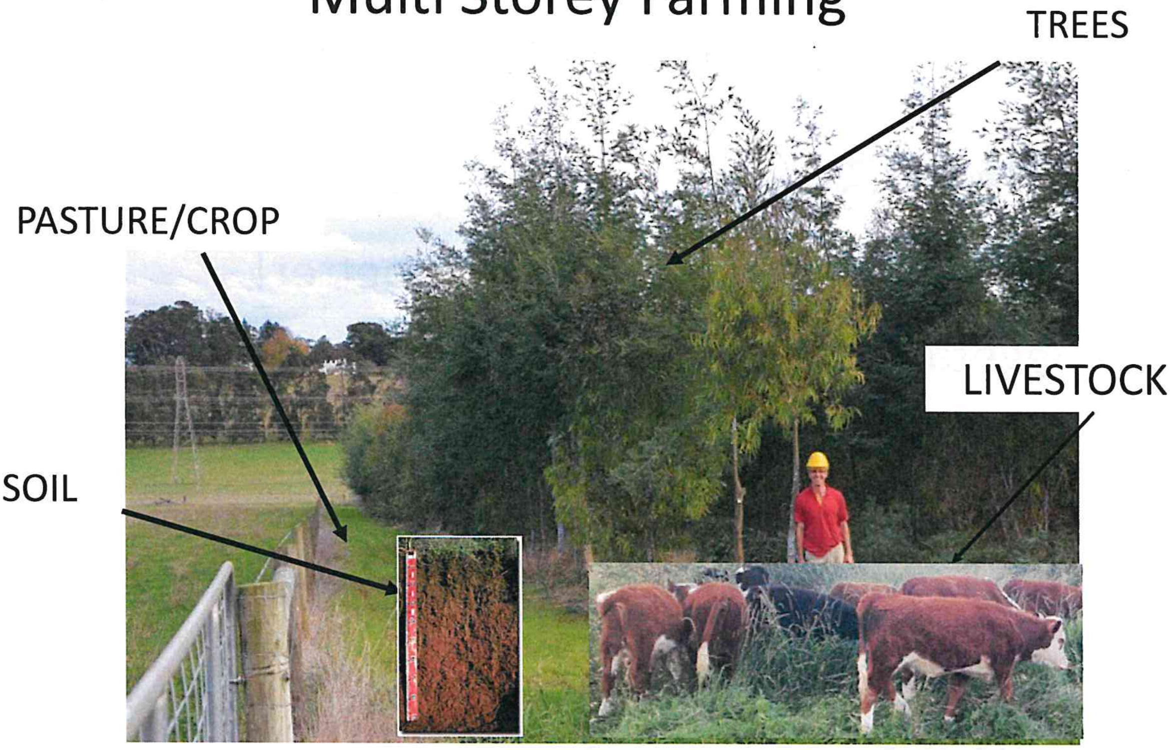

22 December 2017



January 2018

Grazing late December 2018

Multi Storey Farming



Results - Trees @ age 4.9 yrs

- Stocking ~200 stems per ha
- Excellent diameter growth
- 14-17cm dbh,
- Height growth below average
- Exposure
- Silvertop best growth
- Spotted gum best form
- Observations
- Silver wattle requires active mgt
- Advantage of improved seed
- Growing timber, fodder and meat products simultaneously

The value of a tree

- Part of the staff!
- Micro climate change for the better!
- Vegetative and product diversity
- Improved system resilience - genetics of perennials
- Deep roots - accessing more soil mineral and water
- Beneficial soil impacts

Soil results at age 4.4 years

- Preliminary
- Action occurring at 10-30cm layer
  - Total organic matter (+17%)
  - Total N (+25%) (legumes)
  - Total Organic C (+25%)
  - Labile Carbon (+45%)
  - Carbon t/ha (+25%). +6.3% over 0-100cm
- Carbon results consistent with other projects

www.justaddtrees.com.au

Lets go operational!

Early Jan 2016 - pasture

27 Dec 2018 - lucerne

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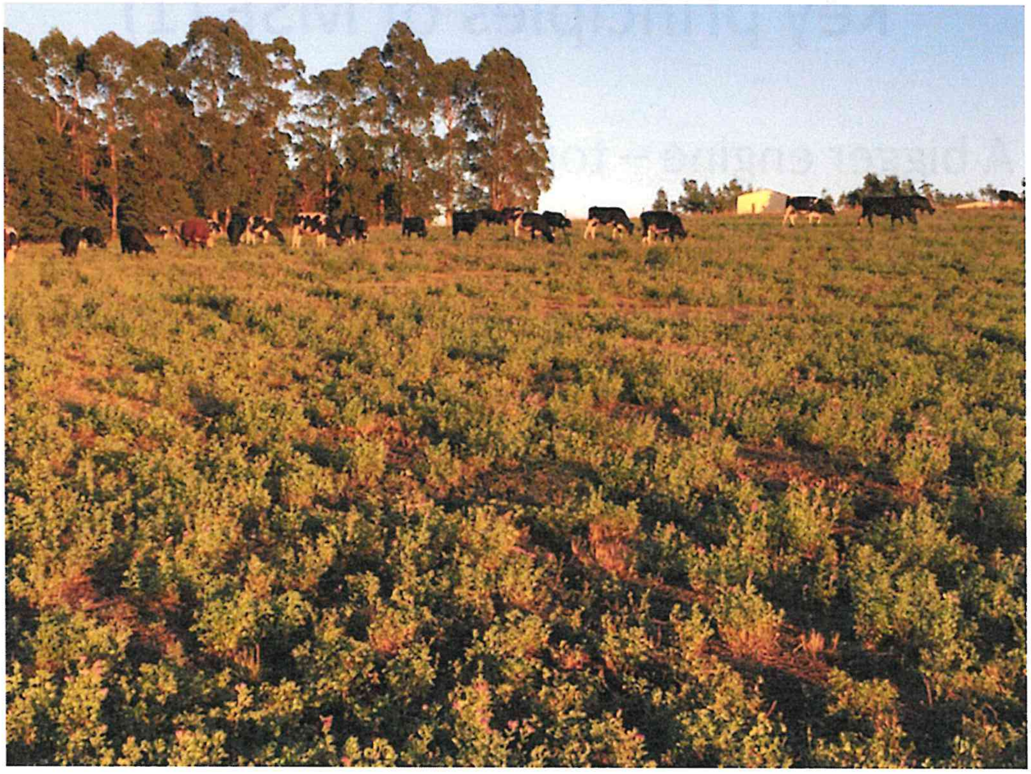
www.justaddtrees.com.au

2 April 2019



www.justaddtrees.com.au

Lucerne production around trees

www.justaddtrees.com.au

Key principles of MSF (1)

- A bigger engine – top to bottom;
- True integration through intelligent design;
- You don't have to be big to be successful;
- Think and aim beyond your generation;
- Design to meet your capability;
- Continuous/dynamic management;

Key principles of MSF (2)

- Don't sell trees short;
- Micro-climate change;
- Biomass retention
- Crops and pastures before trees;
- Know and look after your soil first
- Weed control

Advantages

- Early income generation
- Income planning
- Value adding to farm plantings
- Grazeable windbreak and shade areas
- Ecosystem development – mulching
- Carbon farming – above and below ground
- Fire protection
- Improved resilience
- Microclimates
- Aesthetics

Conclusion

•Carbon farming outcomes can be improved by considering multi-storey systems;

•Integration of trees in an informed way improves farm resilience

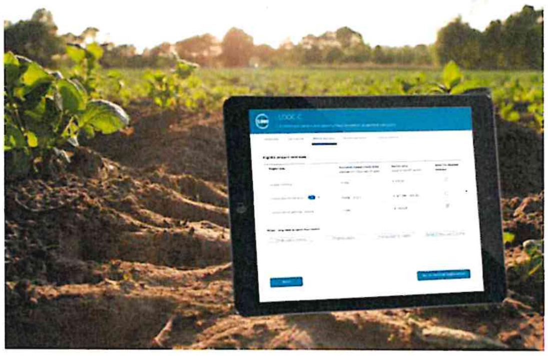
Resources

- http://www.wpcln.org.au/wp-content/uploads/2018/07/Multi-Storey-Farming-case-study-report.pdf
- Practical Landcare Guide – Multi Storey Farming http://www.wpcln.org.au/wp-content/uploads/2018/05/MSF-Brochure_Print.pdf
- www.justaddtrees.com.au
- How is carbon stored in trees and wood products – https://forestlearning.edu.au

DIGISCAPE FUTURE SCIENCE PLATFORM
www.csiro.au

LOOC-C: Landscape Opportunity and Options for Carbon abatement Calculator

Digiscape Future Science Platform



Our Digiscape Future Science Platform is changing the way agricultural decisions are made in Australia. Digiscape's Greenhouse Gas (GHG) carbon project aims to alleviate some of the challenges facing Australian agricultural producers in participating in the national carbon market.

Helping the land sector realise abatement potential with LOOC-C

We're giving producers information to assess potential to implement carbon farming projects on their land. Pronounced 'Look-see', LOOC-C is a software tool that allows you to quickly assess the GHG abatement options for a specific land area, including estimates of abatement quantity such as Australian Carbon Credit Units. By supporting an assessment of specific paddocks or farm areas, LOOC-C helps producers discover and evaluate their options for participating in a project through the Emissions Reduction Fund.

How LOOC-C works

Use your browser to connect to https://looc-c.farm/. Then, use the map interface to select a paddock area and answer a few questions about how the land is currently being managed. LOOC-C supports discovery of two types of methods that use a set of accepted emission factors broadly known as soil-carbon and vegetation methods. LOOC-C estimates GHG abatement via an emission factor database and GHG emission modelling consistent with FullCAM. The application provides a list of carbon project type, estimates of Australian Carbon Credit Units, and possible co benefits and disbenefits that a project may generate.

Be part of the product development process

The first version of LOOC-C is being launched at the end of 2019. We are interested in hearing about your experience using the application and if it helps start the conversation of carbon farming options and its potential for your farm.

Send your comments to looc-c@csiro.au .

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w research.csiro.au/digiscape

AGRICULTURE VICTORIA

Prom Country Cheese
Calculating the Carbon Footprint

Nick Dudley Meat and Wool Services and Land Heath
SE Region

Economic Development, Jobs, Transport and Resources

Prom Country Cheese

- Burke and Bronwen Brandon

- 76.93 ha
- Sheep and cattle form meat
- Sheep for milk

- 14.4 ha revegetation

- Cheese production
- 6,900kg from own milk
- 4,600kg from imported milk
- 69,000L milk processed

Economic Development, Jobs, Transport and Resources

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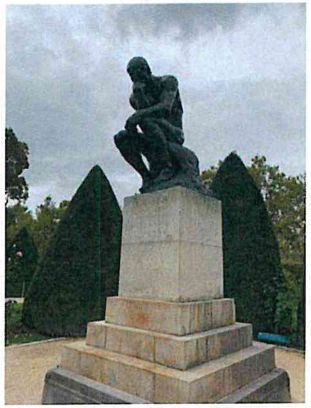
Why do you want to assess your carbon footprint?

- Industry concerns
- Market advantage
- Personal concerns
- Starting point - assessing where you are at.



What is meant by Carbon Footprint

Definition

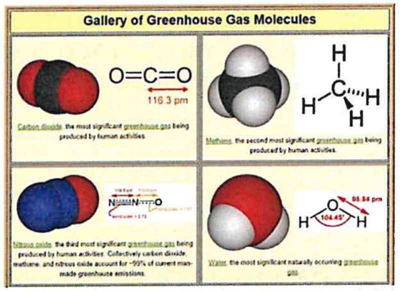
A carbon footprint is historically defined as the total emissions caused by an individual, event, organization, or product, expressed as carbon dioxide equivalent.

Representation

AGRICULTURE VICTORIA

Greenhouse gases – some basics

Greenhouse Gas	Symbol	CO_2 Equivalent (CO_2e-)
Water Vapour	H_20	-
Carbon dioxide	CO_2	1
Methane	CH_4	25
Nitrous oxide	N_20	298



1 tonne of CO2e

- Approx. 510 cubic metres
- Driving 6000km with a diesel car
- 4300kwh power consumption
- Return flight to Singapore form Melbourne (single passenger)

Something else to be aware of

- 1 tonne of C equates to 3.67t CO_2e
- If we sequester C into soil or trees we need to keep this in mind!
- Every tonne of C sequestered is 3.67t CO_2e

- The biggest source of mistakes: **C vs. CO2**. ... The atomic weight of **carbon** is 12 atomic mass units, while the weight of **carbon dioxide** is 44, because it includes two oxygen atoms that each weigh 16. So, to switch from one to the other, use the formula: One ton of **carbon** equals 44/12 = 11/3 = 3.67 tons of **carbon dioxide**.

Economic Development, Jobs, Transport and Resources

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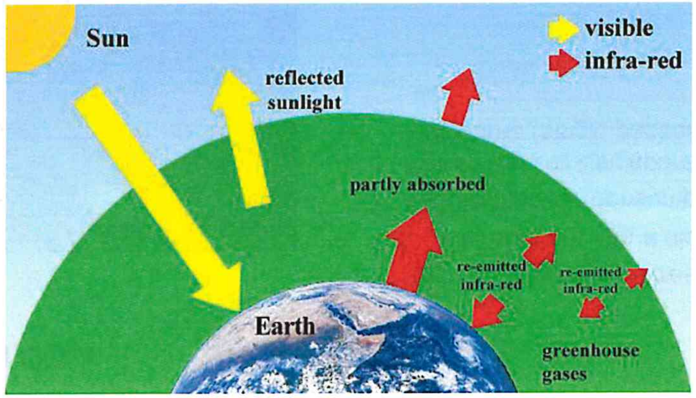
What Greenhouse Gases Do!



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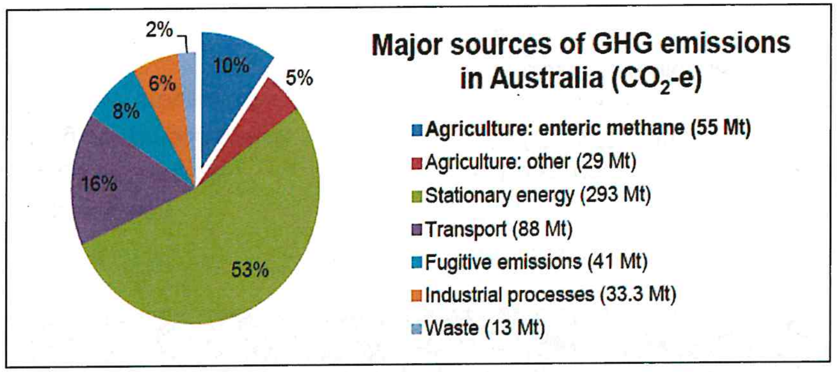
GHGs in Agriculture



Current Scenario – Prom Country Cheese Farm

FARM OUTPUTS

Meat production
- 25 Cattle
- 40 Wethers
- 100 lambs
- 30 ewes

Milk production
- 6900milk solids
- lites

FARM INPUTS CREATING GHG EMISSIONS

Fuel
- Petrol cars / utes / quads 1420L/yr (10% personal?)
- Tractor 600L / yr (used mainly for mulching in Spring / Summer), and odd jobs with loader. No tilling, fertiliser spreading, haymaking or sowing.

Electricity
- 7870 kwh (house and dairy with solar input

Fertiliser
- Lime 88t (5 years)
- Aussie Compost 120t (one off)
- Pig Manure 12t
- 58,000L whey recycled back onto farm plus waste water through worm farm.

Current Scenario – Prom Country Cheese Business

FARM OUTPUTS

Cheese production

- 6,900kg from our milk
- 4,600kg from imported milk
- 69,000L milk processed

BUSINESS INPUTS CREATING GHG EMISSIONS

Fuel

- Petrol cars / utes / quads 2000L/yr (10% personal?)
- Courier $11,500/yr for shared trip to Melbourne region weekly c10,000l/yr

Electricity

- 25713 kwh with solar input

CALCULATING EMISSIONS on Farm
What's available

- FarmGAS (static GHG calculator)
- Sheep-GAF and Beef-GAF (static GHG calculator)
- GrassGro (dynamic GHG modelling tool)
- FullCAM (vegetation modelling tool)

CALCULATING EMISSIONS on Farm Issues

- Different systems give different results
- Uncertainties associated with agricultural estimates are high as:
  - most of the research on methane and nitrous oxide loss are based on studies conducted in the northern hemisphere; their direct application to Australian agriculture is questionable and requires local research before industries can be held accountable for their emissions;
  - national inventories rely accuracy of input data like animal numbers and nitrogen fertiliser use, and
  - biological systems are inherently variable and by definition and national inventory method can only integrate and approximate using available data.

Eckhard 2005

What can we do to do manage emissions

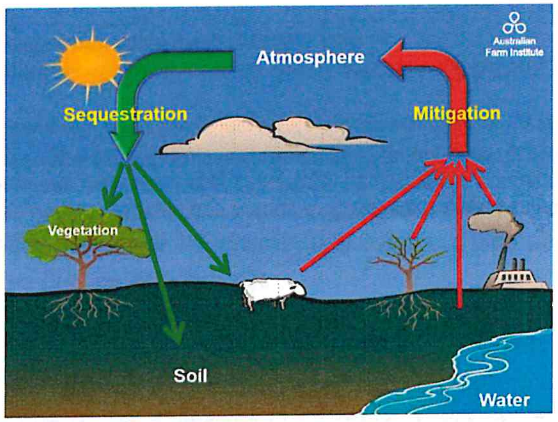
Mitigation
(Reducing or avoiding emissions)

- Feed additives and supplements
- Better quality feed (rotational grazing v set stocking)
- Genetics and breeding (EBVs)
- Herd /flock management (eg. Early weaning, extended lactation, early finishing)

Sequestration
(capturing emissions)

- Building soil carbon
- Vegetation carbon capture
- Put more on the sheep's back!

Balancing the Carbon Cycle



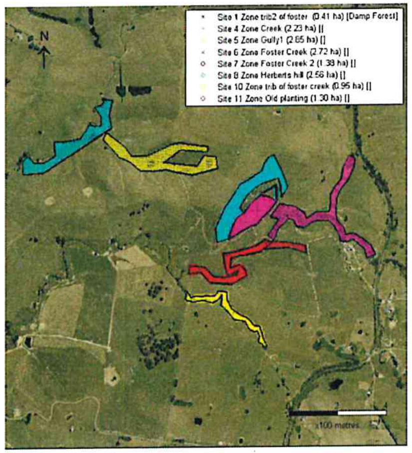
Soil Carbon –opportunity for sequestration

Depth (cm)	TOC (Mg/ha)	POC (Mg/ha)	HOC (Mg/ha)
0-10	42.5	11.5	17.9
10-20	29.7	4.3	14.0
20-30	19.4	2.0	10.5
0-30	91.7	17.8	42.4

- Previous investigations during the SCARP project
- 90 farms in Southern Gippsland
- TOC range (30-212 TOC)
- If we could increase by 20 tonnes/ha
- 20x3.67 = 73.4tCO_2e?
- NOW FOR THE DEBATE?

Vegetation: Sequestration

- 14.4ha plantation
- Damp forest EVC could reasonably expect much higher C sequestration than predicted by the model



AgVIC Resources

- Agriculture Victoria website has a range of information
  http://agriculture.vic.gov.au/agriculture/farm-management/
- The Fast Break and Very Fast Break still operating. Seasonal climate risk information.
  http://agriculture.vic.gov.au/agriculture/weather-and-climate/newsletters/the-fast-break-victoria/the-fast-break-victoria-may-2018

Further reading:

- https://www.scoopnest.com/user/NOAAClimate/509719646883160065-teachingclimate-this-gallery-depicts-chemical-properties-of-8-greenhouse-gas-molecules
- https://www.greenvehicleguide.gov.au/Vehicle/ViewMatchingVariants?vehicleDisplayId=27436
- https://www.mla.com.au/globalassets/mla-corporate/blocks/research-and-development/01200075-program-fact-sheet_nlmp_final.pdf
- http://www.makingmorefromsheep.com.au/_literature_150063/MLA_Greenhouse_Gas_Red_meat
- https://www.agric.wa.gov.au/climate-change/reducing-livestock-greenhouse-gas-emissions?page=0%2C0#smartpaging_toc_p0_s1_h2
- https://www.greenvehicleguide.gov.au/pages/Help/FAQ#lifecycle

Questions

Soil Carbon Sampling.

Soil has tremendous potential to sequester carbon, by taking CO_2 from the atmosphere and putting it in the soil. It has been projected that sequestering additional carbon in Australia's soils could contribute 30-40% of the country's emission reduction targets. Building carbon in soils is not only beneficial from an environmental mitigation perspective, but increasing soil organic carbon can improve farm productivity and resilience through increased water holding capacity and can even provide an additional income source through selling carbon credits. Increasing soil carbon levels should be seen as 'the cherry on the top' rather than the driving reason for making changes in farm management practices. The decision to actively build soil carbon levels should be based on the ability to increase production returns at the farm gate through improved soil performance resulting in a more resilient and productive enterprise.

Selling carbon from soil is not easy. There are different markets that farmers can access which include; Australian Government carbon credits scheme, voluntary markets where companies and consumers are directly purchasing carbon credits from farmers through marketplaces such as Nori or carbon aggregators. Farmers can also sell direct to buyers through voluntary schemes. Farmers can also work together to pool or 'aggregate' their carbon credits and sell them in larger lots which may reduce costs.

There are many rules relating to the sale of carbon credits and each market has their own set of rules that must be met. These rules should be robust and designed to provide independence, rigour and confidence for both the buyers and sellers. Farmers need to be informed of the rules so they know what their obligations are.

Whatever pathway a farmer uses to sell carbon credits, they should use the same methodology to obtain baseline soil organic carbon levels, as then it can be directly compared with future measurements.

Simplified steps to take a soil sample for carbon (additional steps are required for ERF & other programs)

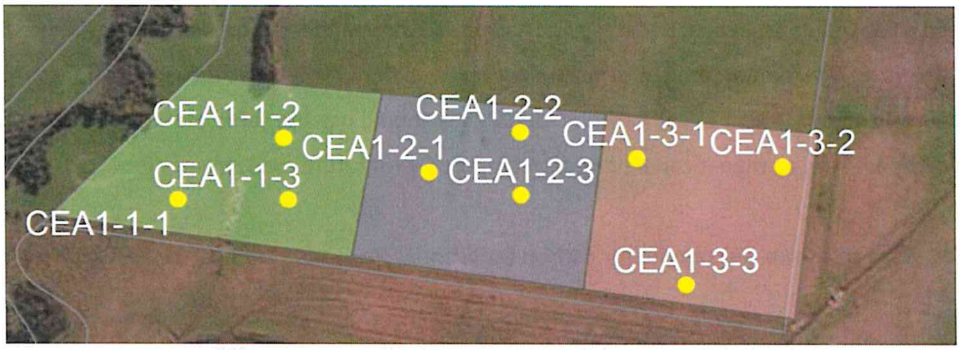
1. Determine the area you want to sample (this can be quite involved depending on which program you are involved in – as with all soil testing keep similar soil type/topography together)
2. Find someone with a suitable soil corer that can core to a minimum of 30cm depth & a width of 38mm. A hydraulic soil corer is best as this creates a solid core of soil (unlike an auger). Some farmers sample to a depth of 100cm so that they capture deeper root zone
3. Collect enough soil samples to get an accurate sample (number will depend on program)
4. Cut any long grass where the corer enters the soil
5. Core is taken to determined depth & removed from the coring tube

Soil sampling with hydraulic soil corer

6. Coring hole is measured to check for depth (as some soils can compress in the coring tube)
7. Soil sample is measured for depth and volume, photographed, GPS referenced, coded & separated into the correct lengths for analysis

Soil core with coding, GPS reference, date etc

8. Individual cores can be sampled, or soils from the same depth/area can be consolidated together
9. Soil is posted to an accredited laboratory
10. Soil sampling GPS points are uploaded into a GIS mapping program with a map produced



Soil coring sites uploaded into GIS mapping system

11. Laboratory tests for total carbon %, moisture, gravel, wet weight and oven dry weight
12. Bulk Density is calculated using the lab results & the field test data
13. Total soil carbon is calculated through a complex set of equations based on the laboratory & field data

Farmer	Date	SAMPLE ID	Labile Carbon	Moisture	Gravimetric water content on the air dry soil	Air Dry Mass	Oven Dry Equivalent Mass **	Gravel Content	Total Organic Carbon		Bulk Density		Soil Organic Carbon (each depth)	
		Composite Sample ID	%	%	g water/g oven-dry mass	Mass of sub-sample composite	(g)	Stones and Organic Matter > 2mm	LECO CNS2000 Analyser %	Averge Actual Layer Thickness	No. Cores in Composite	Bulk Density	Soil Organic Carbon	TOTAL SOC T/Ha
[redacted]	21/10/2019	Sth 1.2abc 0-10cm	0.30	6.3	0.004	957	953	7.6	1.21	10.00	6	1.40	16.88	
	21/10/2019	Sth 1.2abc 10-30cm	0.25	5.5	0.006	2102	2089	6.3	0.98	20.00	6	1.54	29.94	97.43
	21/10/2019	Sth 1.2abc 30-100cm	0.05	5.0	0.016	7182	7070	7.4	0.49	70.00	6	1.48	50.61	
[redacted]	21/10/2019	Nth 4. 1abc 0-10cm	0.44	14.2	0.013	1111	1097	10.9	2.32	10.00	6	1.61	37.02	
	21/10/2019	Nth 4. 1abc 10-30cm	0.31	12.2	0.019	2104	2064	9.7	1.76	20.00	6	1.52	53.24	184.52
	21/10/2019	Nth 4. 1abc 30-97.5cm	0.09	17.8	0.032	7635	7397	17.2	0.87	67.50	6	1.61	94.26	

Soil Carbon results

14. Soil carbon results are recorded and forwarded to those who require it

References;

1. A Farmers Guide to the soil carbon sequestration methodology vs.2; Carbon Farmers of Australia https://www.carbonfarmersofaustralia.com.au/wp-content/uploads/2018/03/Soil-Carbon-method-for-Landholders .pdf
2. Increasing soil carbon under the Emissions Reduction Fund; Australian Government Department of the Environment and Energy http://www.environment.gov.au/system/files/resources/24cf7e41-feeb-4fa8-a42a-1220d3b0d946/files/fs-increasing-soil-carbon-erf.pdf
3. Can grapegrowers become the heroes of climate change? May 24th, 2019 https://winetitles.com.au/can-grapegrowers-become-the-heroes-of-climate-change/