



Soil Carbon Workshop for Research, Policy and Industry/Market Stakeholders

5th May 2010

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Reducing emissions should be good for farmers,
good for business.

1. Reduced fuel / fertiliser use
2. Improved feed conversion
3. Improved soil health

How can we create incentives to achieve this?

Don't build a high cost system for a low value market.



- Voluntary C market is low (\$0-10). Needs to also have low project and admin costs.
- A low cost carbon offset system will be one that builds on from existing systems and practices.
 - Existing markets and trading products
 - Existing farming practices
 - Existing technology
 - Existing soil testing
 - Existing financial systems
- Additionality definition – a limited definition means we can only use non tried and fringe approaches

Precedent markets



Agricultural offsets (including soil C) are already traded in Nth America

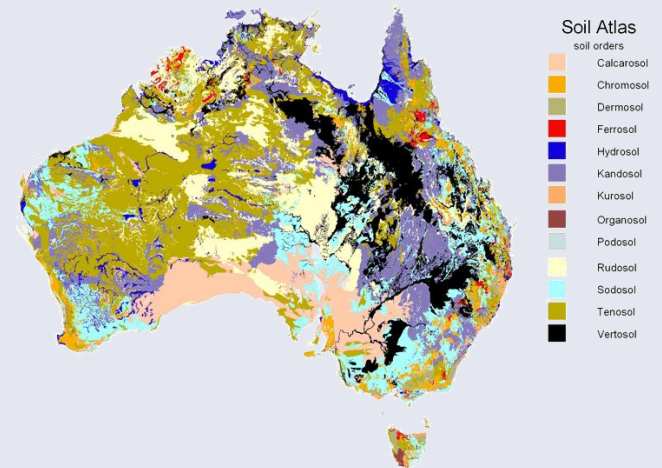
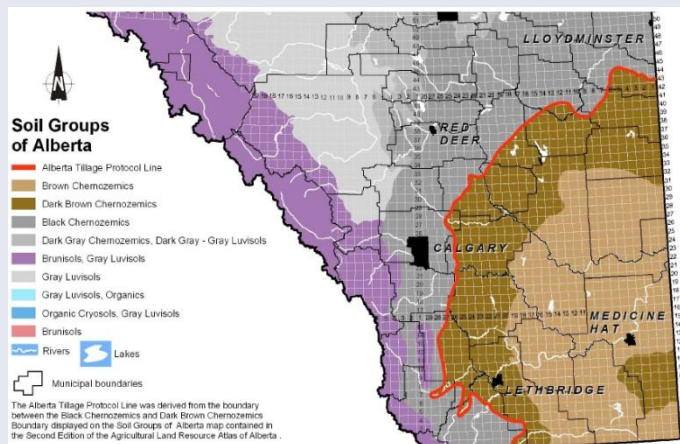
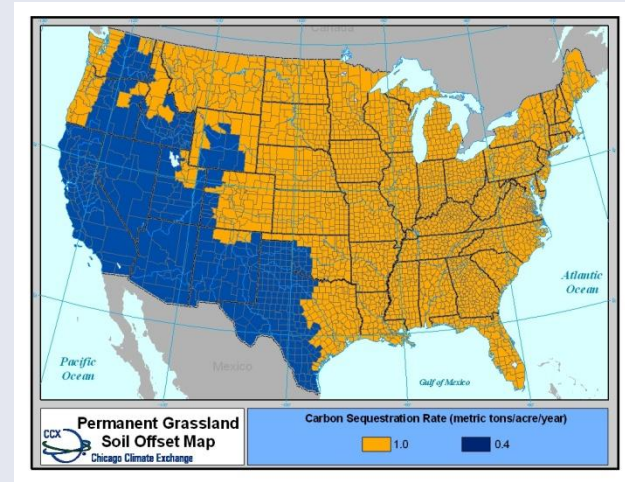
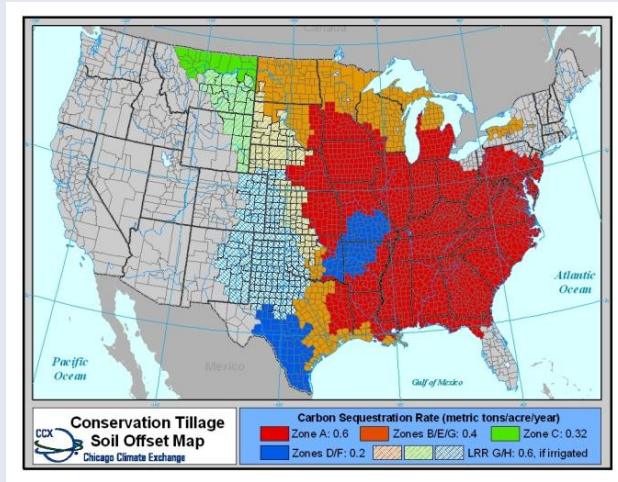
- Alberta Offset

- ~ 35 protocols already developed or under development – sectoral CDM type approach. Government backed. Based on ISO standards.
- reduced / no tillage protocol
 - Century model used for developing coefficients
 - differential credit rates between “Parkland” and “Dry Prairie” soils
- Registry in place – industry has developed accounting systems
- Regulated price (C\$15 / t) – of this growers get about 40% (~C\$6/ t)

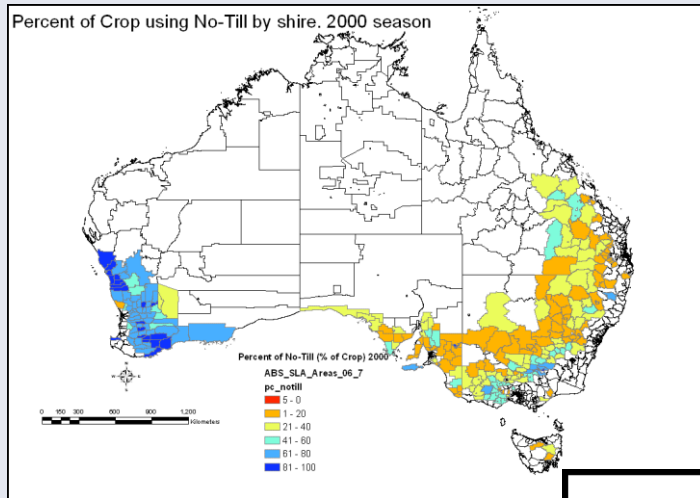
- CCX

- voluntary market
- exchange developed protocols and accounting framework (with institutional support – USDA, Universities)
 - Conservation tillage
 - Grass conversion

Differential approaches



Tillage practice survey - GRDC Farming practices database



Regional differences in existing practices

Should soil C contracts be based on practices or outcomes? Practices could lead to perverse outcomes – eg herbicide resistance.

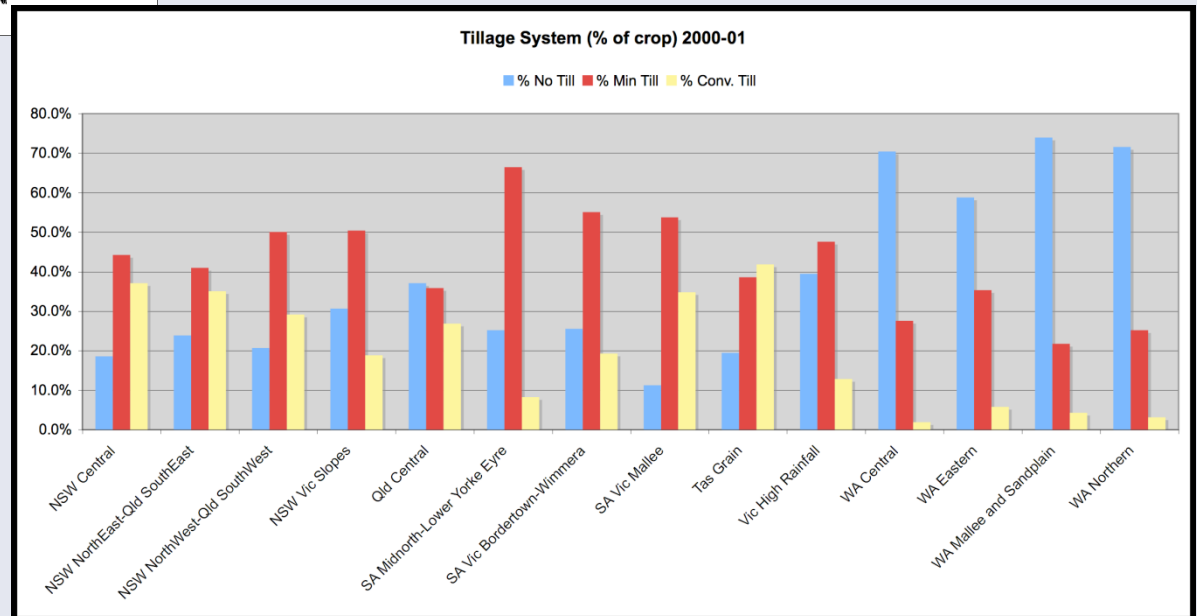
How do we recognise existing good practice?

- Dont want to encourage bad practice

Nth American approach is practice based but additionality is the existence of a contract.

IE - is the practice required by regulation or law?

Yr 2000 baseline





AgreView

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- Profiling The Past
- Monitoring The Present
- Forecasting The Future
- Managing Outcomes
- Reports
- Performance Indicators
- Advanced Functionality

Geography

Point : BRISBANE +

Region : Brisbane (C) +

All Regions

Track n Trace

Year : 2007

Cumulative : Off

Labels : Off

Parameter : Total Rainfall

Submit

User Tips

Viewer Tab
Use tab controls to change the viewed map / image, and to turn on/off vector overlays.

Viewer Table Chart Animation Document

Tab Controls

Current Season

- Commodity Prices
- Commodity Stocks
- Crop Condition Alerts
- Input Costs
- Pasture Condition Alerts
- Track n Trace
- Vegetation Track and Trace
- Volumetric Allocations
- Water Storage Status

Productive Capacity

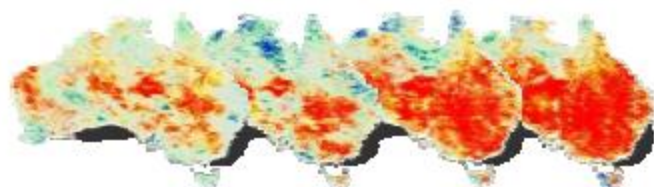
2000 Landsat Image

Location: 152.09,-27.21

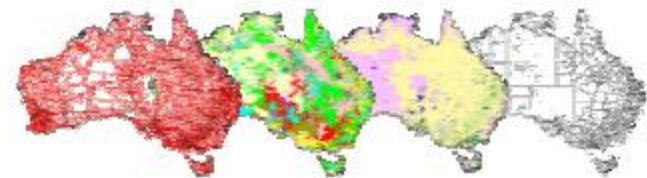
- Soils
- Topography
- Land surface
- Land use
- Climate
- Production
- Livestock (some)

Profiling, Mapping, Monitoring, Predicting and Forecasting

Satellite Imagery



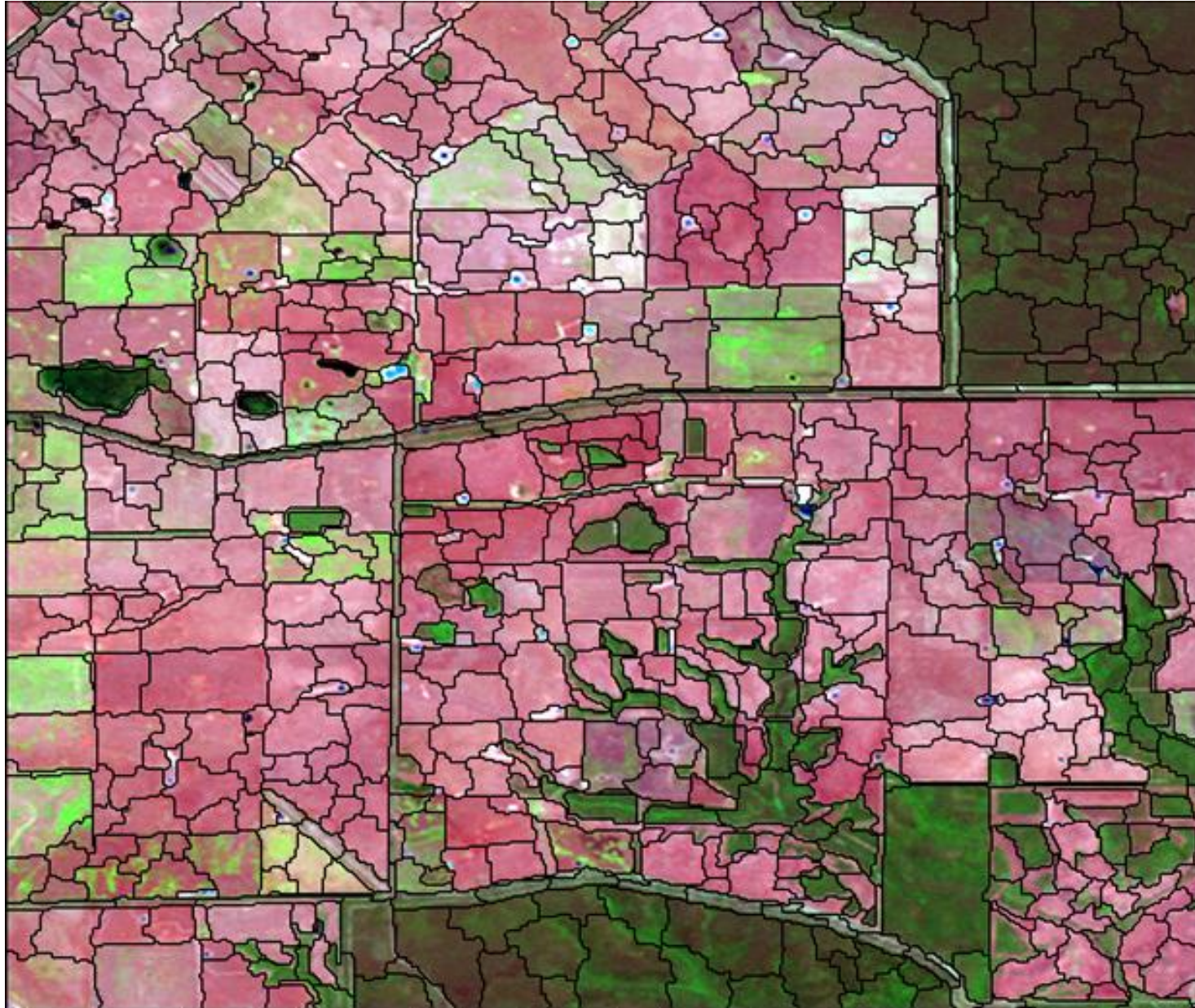
Terrain, Soil, Land Use & Map Themes



Gridded Daily Point Records



Automated Management Zone Boundary Within Field Mapping



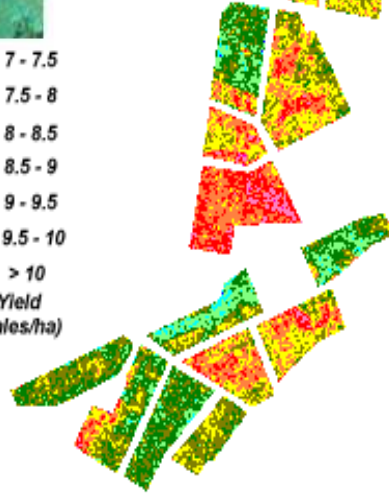
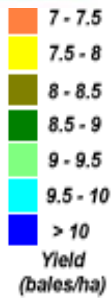
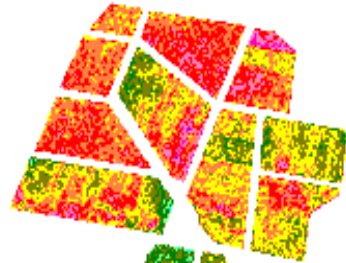
Management zone boundaries derived by segmentation of within field spectral response differences in Landsat imagery from 3 different years

yield variance mapping

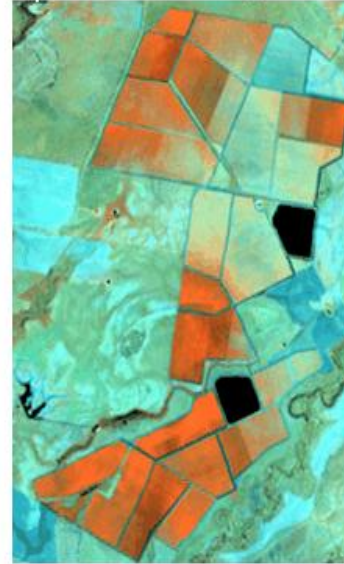
Tundunna Pre-Hail (25th December 1997)
Landsat TM Bands 4,5,7



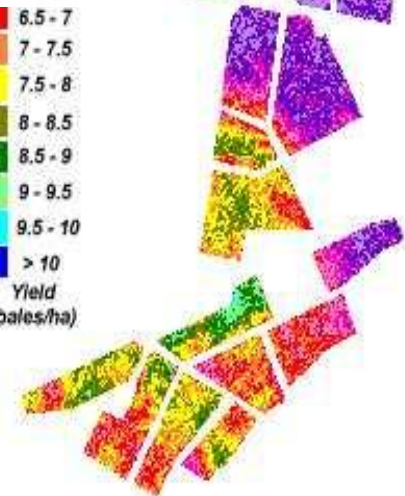
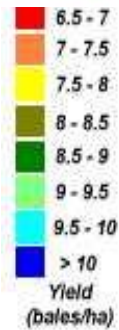
Tundunna Pre-Hail (25th December 1997)
Agrecon Yieldmap



Tundunna Post-Hail (10th February 1998)
Landsat TM Bands 4,5,7



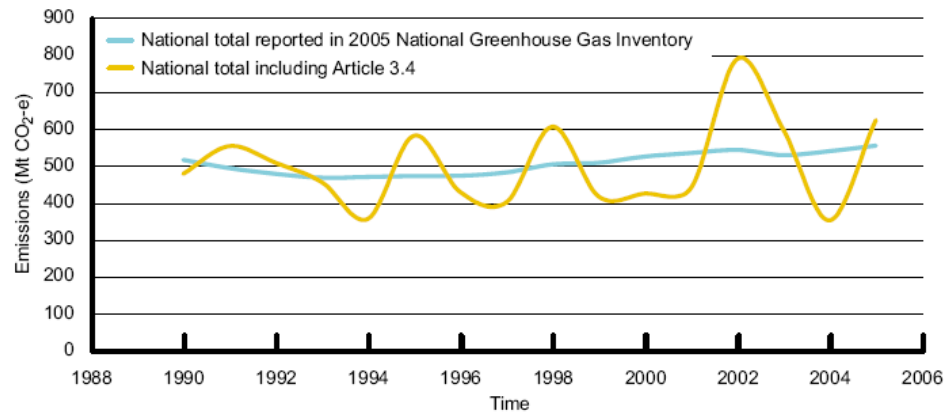
Tundunna Post-Hail (10th February 1998)
Agrecon Yieldmap



Reduced emissions or sequestration?



Figure 2.5 Comparative national emissions, with and without Article 3.4 emissions



Source: National Greenhouse Gas Inventory 2006, Department of Climate Change

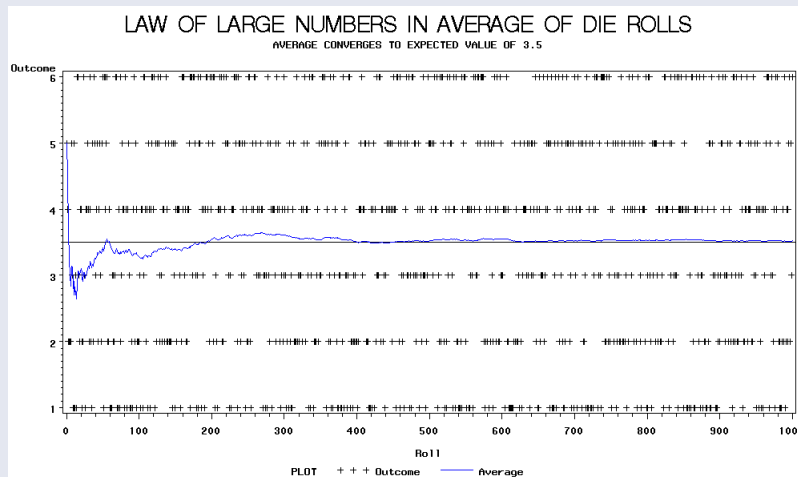
Should we be considering actions to reduce soil C emissions as well as sequestration?

- “Avoided release” of C builds on other examples – REDD, methane, NO_x
- Overcomes some issues of permanence and additionality
- Doesn't suffer from saturation – ie liability once sequestration stops
- Could be stacked with sequestration as a 2 stage process.

Combine existing tools with
a mathematical / statistical
approach



The **Law of Large Numbers** says that in repeated, [independent](#) trials with the same probability p of success in each trial, the percentage of successes is increasingly likely to be close to the chance of success as the number of trials increases. More precisely, the chance that the percentage of successes differs from the probability p by more than a fixed positive amount, $E > 0$, converges to zero as the number of trials n goes to infinity, for every number $e > 0$.



The **central limit theorem (CLT)** states conditions under which the mean of a sufficiently large number of [independent random variables](#), each with finite mean and variance, will be approximately [normally distributed](#) ([Rice 1995](#)). The central limit theorem also requires the random variables to be identically distributed, unless certain conditions are met. Since real-world quantities are often the balanced sum of many unobserved random events, this theorem provides a partial explanation for the prevalence of the normal probability distribution. The CLT also justifies the approximation of large-sample [statistics](#) to the normal distribution in controlled experiments.

Approaches already used in
plant breeding and trial
analysis



Grain growers have access to sophisticated tools

- Futures and options
- Swaps
- Forward contracts
- Pools

Carbon contracts should be regarded as financial instruments and so be regulated by the Financial Services Act

- Financial products
- Advisers should be licensed
- C markets should be appropriately supervised
- Audit and verification systems should be standardised and scrutinised.
- Trade Practices Act should apply - ACCC scrutiny.



1. Land title
 - NSW – Freehold title only extends to 150mm below the surface.
2. Need to consider systems approach, not 1 yr, 1 crop.
 - Role of rotations
 - Additives
 - Stackable credits
3. Practice based can be perverse
 - Need to address herbicide resistance
 - Be flexible and not rely on a single practice – focus on carbon maintenance not one practice / rotation over another.
4. Products need to be commercially relevant
 - 1 – 5 yr contracts in current markets.
 - Would a 30 - 70 yr contract be commercially relevant?
 - Generations of land ownership
 - Impact on land values?
 - Changing technology and knowledge?
5. How to deal with defaults / market failure?
 - CCX experience with a collapsed market – growers honour contracts but dont renew.

Credit stacking



Driving a 5 tonne tractor over cropping soils has been shown to:

1. Increase the power requirements of subsequent planting or tillage operations by 50%, *increasing fuel use and CO2 production.*
2. *Increase runoff by 40% under high intensity rainfall, increasing erosion and pollution increasing fugitive emissions from nitrate input to watercourses.*
3. Reduce long-term average infiltration and crop yield by 15%, and plant available water by 40%, *reducing biomass production and CO2 absorption.*
4. Reduce earthworm numbers and other indicators of soil health by 40-70%, *reducing water use and fertilizer efficiency, increasing CO 2 from N. fertiliser manufacture.*
5. Produce widespread soil compaction, *increasing incidence of waterlogging and N2O production.*

Further information



Climate Change Central www.climatechangecentral.com

Chicago Climate Exchange www.chicagoclimatex.com

GGA – www.graingrowers.com.au

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Thank you.