Increasing plants and improving soil health

Colin Seis

Winona

Myself and son, Nick

2000 acres (840 Ha)

- **Granite soil, Ph 5.5-6.0**
- **600 mm annual Rainfall**

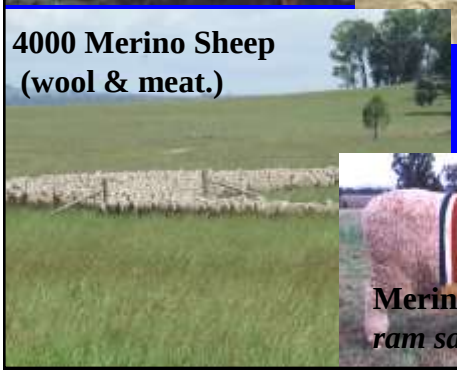
Gulgong Central Tablelands NSW Australia

Winona Enterprises 2014


Cattle trading


500 acres of Crops
Wheat, oats, cereal rye.


Working Kelpie Dogs

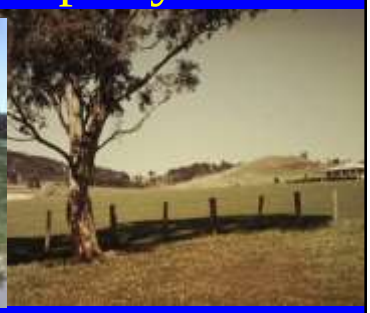

4000 Merino Sheep (wool & meat.)

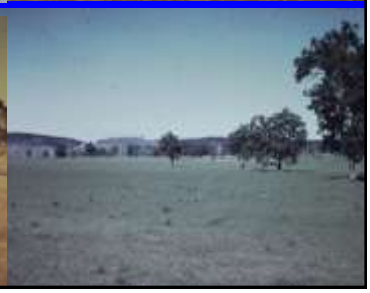
Merino *ram sales*


Native Grass Seed

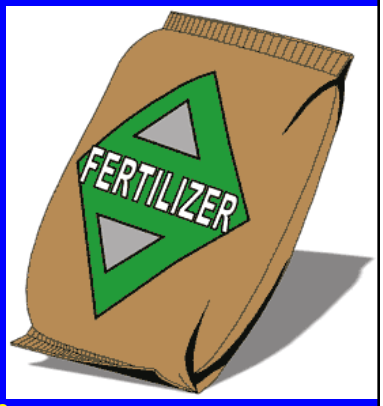
Since the late 1940s to 1978 Winona was a high input property.

- Mainly Sub Clover and annual Rye grass.
- Annually fertilised with superphosphate @ 125kg / Ha
- 300 acres of wheat and oats (ploughed & cultivated)



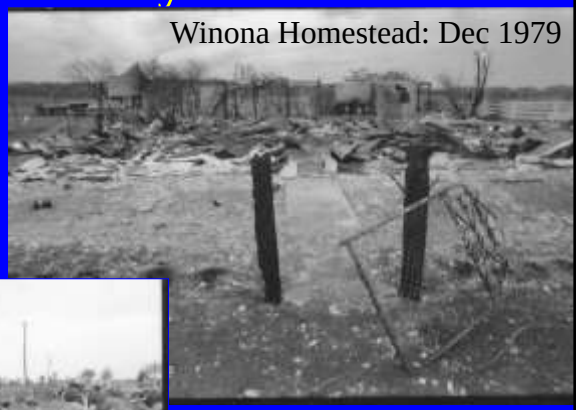


High input, Industrialized Agriculture started to crash on "Winona" during the 1970s



- Soil lost structure
- Soil became acid
- Rainfall no longer infiltrated
- Salinity problems
- Trees dying
- Fertilizer costs became too high
- Cost of sowing pasture became too high.
- We were going broke

Major bushfire destroyed Winona 1979

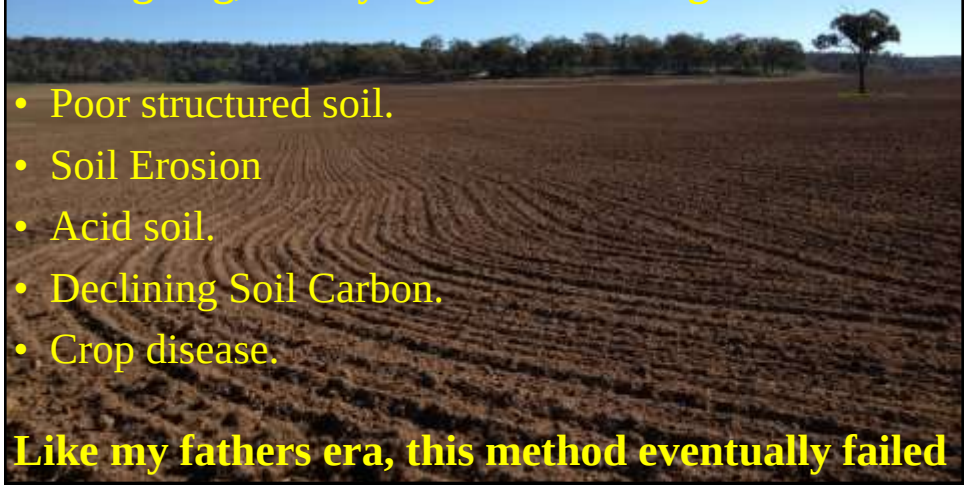

Winona Homestead: Dec 1979


Winona Shearing Shed: Dec 1979

- 3000 sheep killed
- All buildings destroyed
- 50 k of fencing burned
- No money

Because of the fire I had no money and few livestock

- I decided to grow more crops.
- **Ploughing, scarifying and 3 workings created:**



- Poor structured soil.
- Soil Erosion
- Acid soil.
- Declining Soil Carbon.
- Crop disease.

Like my fathers era, this method eventually failed

In 1985 I started to zero till crops.

- Weed control with Roundup in November.
- 3 - 4 more herbicide applications pre sowing.
- Herbicide applications in- crop
- 60 kg/ha DAP at sowing.
- Crop yields good at first.
- **I had replaced the plough with the boom spray**

Things started to go wrong,

Declining yields, crop disease, insect attack.

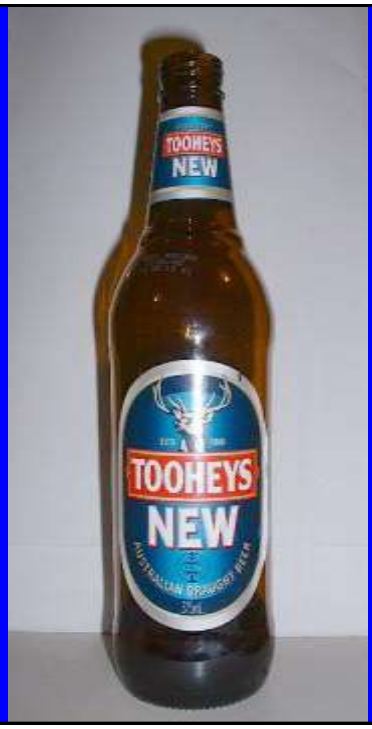
How did I fix the problems?

The agronomic advice in 1990 was:

- Increase fertiliser rates to over 100 kg/ha of DAP
- Add Urea in crop.
- Use fungicides
- Insecticides.
- Better weed control with more herbicides.

I did not accept the advice.

- It did not add up financially.
- The increased amount of N required at sowing required split application and seeder modifications.
- I thought there was something seriously wrong if fertiliser had to be increased to a point where it became toxic to the plant.
- **How did I solve these problems??**



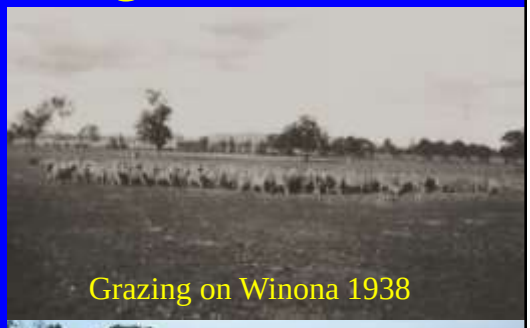
How did I change

- Looked for low input agriculture methods.(1980s)
- Stopped using pasture fertilizer and pesticides (1980)
- Focused on 100% ground cover. *(crops and pasture)*
- Started 'time control grazing' in 1990
- Developed 'Pasture Cropping' in 1993
- Combined 'Pasture Cropping' and 'time control grazing' *(Holistic planned grazing)* in 1995
- **Focused on restoring Winona to grassland.**

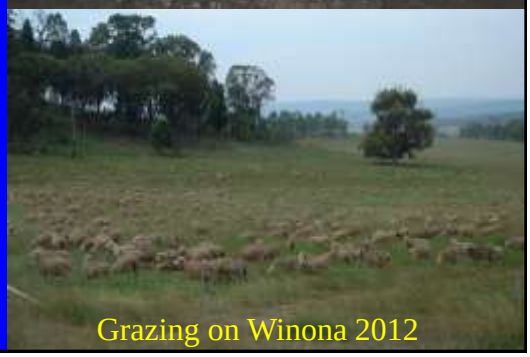
Grazing

- Grazing has been changed from 10 -12 mobs of 300 to 2 main mobs.
- *(Adult ewes 2500)*
  (Hoggets 1300)

Rotated round 70 paddocks of about 30 acres each.



Grazing on Winona 1938

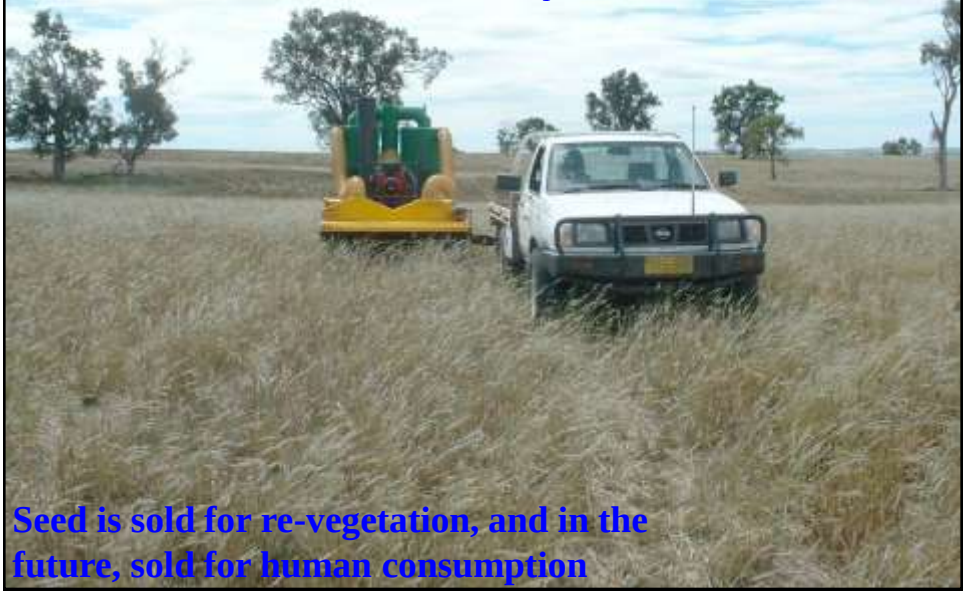


Grazing on Winona 2012

Around 300 acres of crops are sown using 'Pasture Cropping'

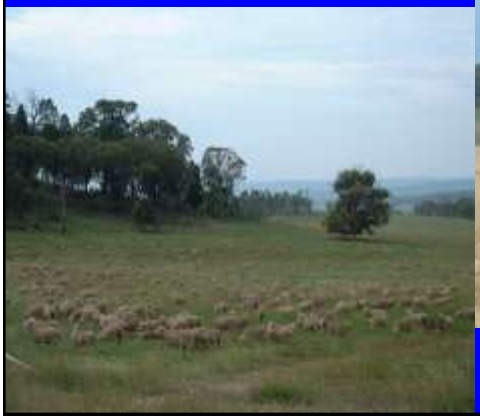
Most of this is harvested for grain.

Up to a ton of native grass seed is harvested annually.



Seed is sold for re-vegetation, and in the future, sold for human consumption

Animals and Crops are combined and managed in a way where each one benefits the other.



We started with only 9 perennial grass species.
The property is now 80% native perennial grass species with over 60 species

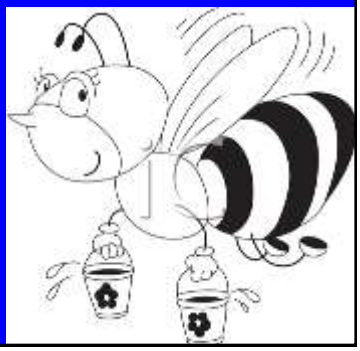
With the use of 'Pasture Cropping' and grazing management 'Winona' has been restored to grassland

- Soil carbon levels have increased
- Soil water holding capacity has increased
- Soil nutrients have increased

On Winona no insecticide has been used for over 20 years.

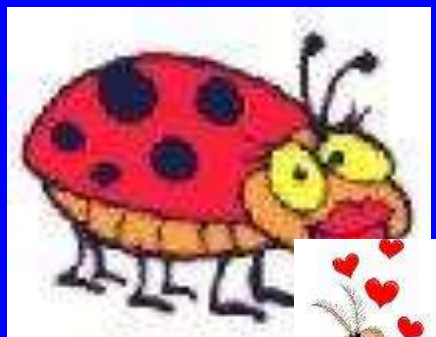
We have no insect attack in crops and pasture.

How??



Insects

1. On Winona there is now 600% more insects and 125% more insect diversity.
2. Insect attack of crops and pastures can be controlled by having **more insects.**
2. Insecticides are not selective, they also kill predators like spiders and wasps that will control insects naturally.
3. Insecticides will ultimately lead to more insects and more insecticides.



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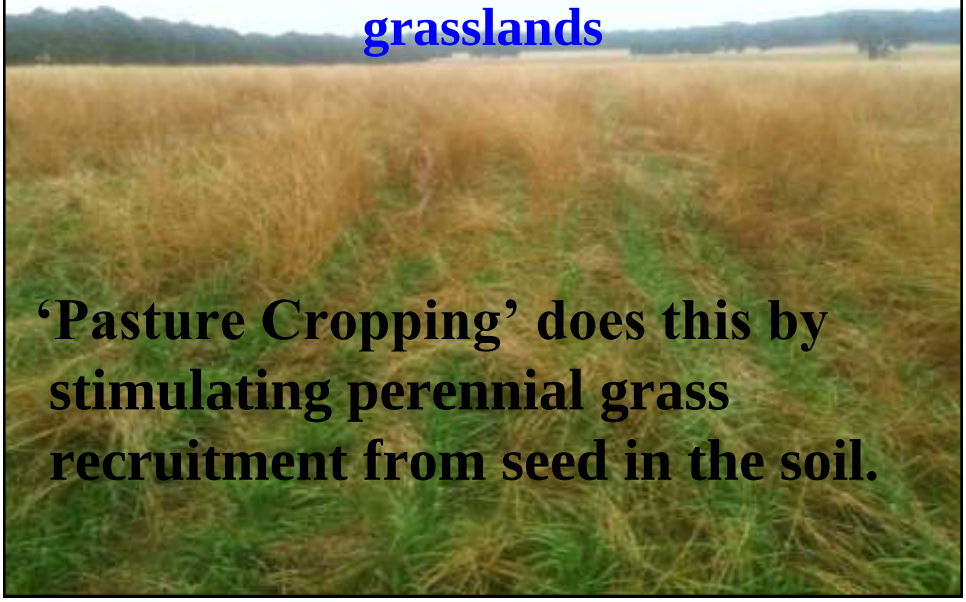
On Winona no perennial grass pasture has been re-sown for 30 years.

- How?

‘Pasture Cropping’ has been shown to improve existing pastures and restore grasslands



‘Pasture Cropping’ does this by stimulating perennial grass recruitment from seed in the soil.

No fungicide used on ‘Winona’ for over 20 years

No crop or pasture disease

How??

Soil microbe tests on Winona have shown

Total fungi increase	862%
Total bacteria increase	350%
Total protozoa increase	640%
Total nematode increase	over 1000%

Having healthy soil with large numbers and large diversity of soil microbes will control plant disease

Crop Fertilizer reduced by 70%

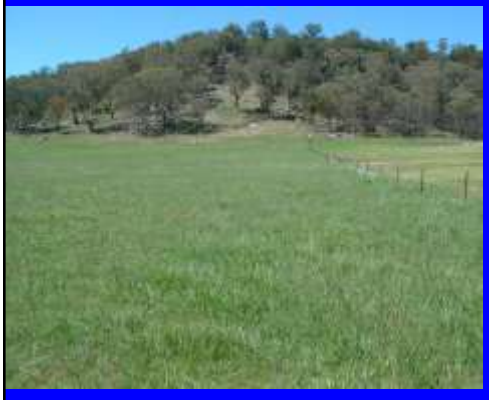
No fertiliser used on pasture for over 30 years

How??

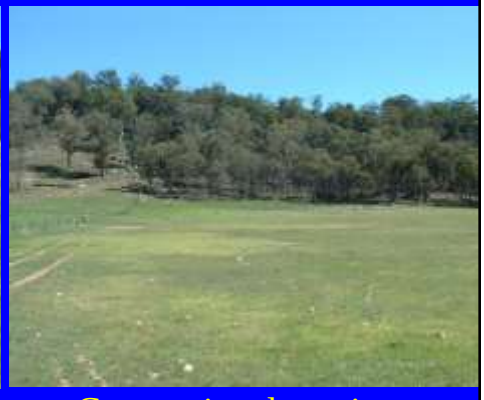
It is plants and the photosynthetic process that builds soil

The difference in land management techniques

Adjoining Paddocks March 2010



Pasture Cropped and Time Control Grazed

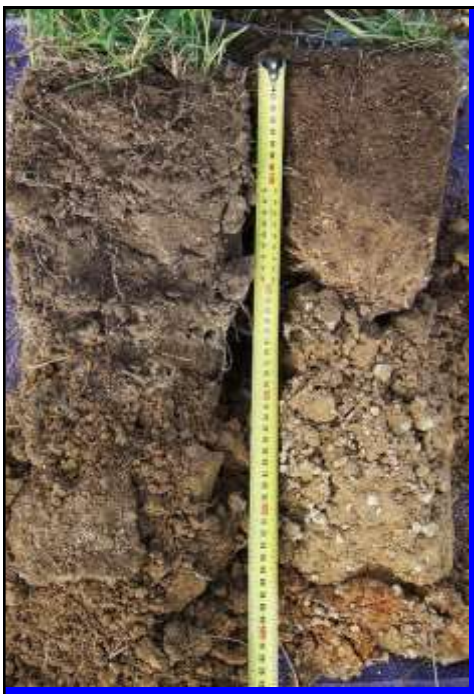


Conventional grazing and cropping

Winona Soil **Neighbor soil**

- Winona's soil now has 204% more organic carbon.
- Has sequestered 46.7 t /Ha of carbon (*172 ton/Ha of CO2.)*
- Holds almost 200% more water. (360,000 lt /Ha)

All of the soil nutrients including trace elements have increased by an average of 172%



90.1 t carbon/Ha 43.4 t carbon/Ha

- Winona's soil now has 204% more organic carbon.
  78% of the carbon is in stable humic form & 22% labile C
- Has sequestered 46.7 t /Ha (20t/ac) of carbon
  172 ton/Ha of CO2 or 71ton /ac
- Holds almost 200% more water.

All of the soil nutrients including trace elements have increased by an average of 162%

Eg. Calcium increase of 8166 kg/ha or 277%

- Ph has changed from 5.2 - 6.01

Soil Nutrients

	Avail	*Total*
Ca	234%	270%
Mg	110%	152%
Zn	250%	195%
Cu	185%	215%
B	150%	161%
Si	116%	113%
N	103%	151%
P	102%	155%
K	198%	150%
S	92%	159%
Fe	87%	130%
Na	45%	88%
Al	28%	140%

Research by Tim Wiley (Western Australia Dep. Agriculture) Showed increased levels of plant available nutrients directly beneath the crowns of perennial plants

	Bare soil	Beneath plant	Difference
Organic carbon (%)	0.24	1.04	433% increase
Phosphorus (Colwell ppm)	21	71	338% increase
Potassium (Colwell ppm)	44	150	341% increase
Sulphur (ppm)	2.7	7.9	293% increase
Nitrate N (ppm)	4	2	50% decrease
Ammonium N	2	3	50% increase
pH (CaCl)	5.8	7.1	1.3 unit increase
pH (water)	6.4	7.8	1.4 unit increase

Soil Carbon and soil water storage

- An increase in soil organic carbon level of 1% to a depth of 30 cm (1 ft) can increase the water holding capacity of soil by an extra 168,000 liters/Ha. **On every rainfall event.**

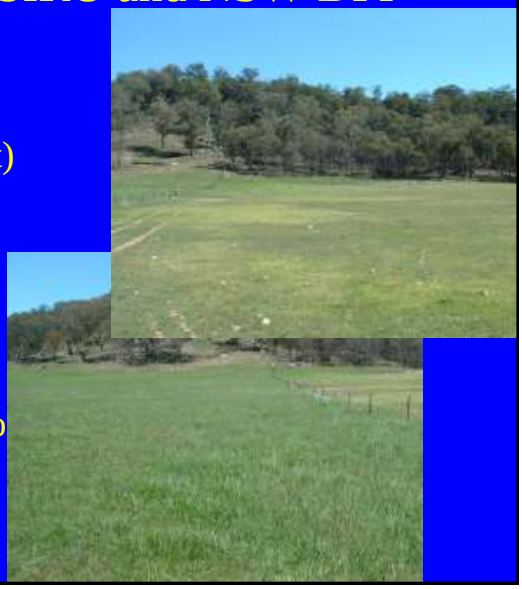
The Two previous paddocks:

- Winona (Pasture Cropped) 360,000 lt/Ha
- Adjoining (conventional) 188,000 lt/Ha
- Difference 172,000 lt/Ha of extra water holding capacity on every rainfall event

360,000 lt/HA 188,000 lt/Ha

Soil Carbon data November 2011 SCaRP program from CSIRO and NSW DPI

- Fence line comparison
- 100 soil tests to 60 cm (2ft)
- Showed an increase in soil carbon of 160%



- These results are similar to previous data collected at Winona by Sydney Uni. and Dr Christine Jones

Sydney University research results

Ecological study, Winona 2010 *(Dr. Peter Ampt)*

Fence line comparisons of "pasture cropping" & time control grazing compared to continuous grazing and conventional cropping

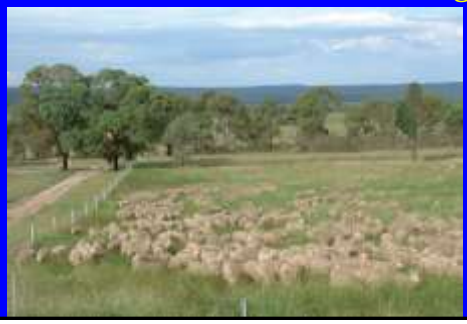
- Increase perennial grass by 71% *(82% compared to 11%)*
- Almost double soil organic carbon
- Almost double nitrogen
- Double soil microbial number
- Better water infiltration
- Better nutrient cycling
- Double sheep numbers.

Is it productive?

Since changing management wool quality is now:

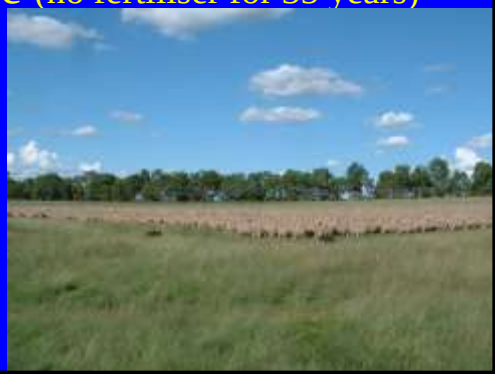
- **1990**
- Micron 18.5
- VM 2%
- Tensile strength 30 n/kt

- **2014**
- Micron 18.5
- VM < 1%
- Tensile strength > 45 n/kt



Since changing the management

- Lambing % is higher.
- Less drench
- Do not fertilise pasture (no fertiliser for 35 years)
- Do not drought feed.
- Less work.



During the last 10 dry years

- Reduced sheep numbers by 25% (sold wethers)
- Have not drought fed sheep.
- Lightly supplemented weaners.

- **Pastures have continued to improve.**

Is it profitable?

Winona annual costs *(2011 costs)*

From 1960- 1979

• Cropping expenses	$40,000
• 2000ac: Pasture fertilizer	$51,000
• Sheep Vet costs	$12000
• Pasture establishment: 200Ha@ $30Ha	$5000
• **Annual cost**	**$107,000**

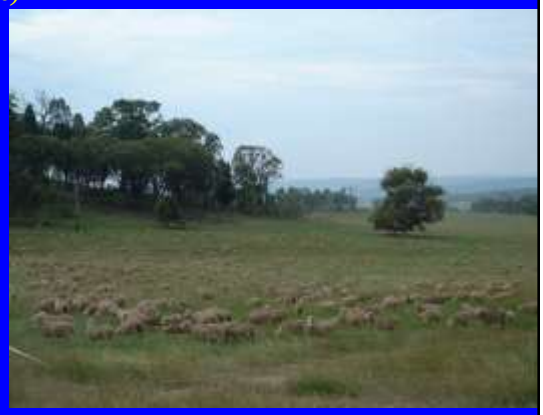
From 1980-2010

Cropping expenses	$20,000
• 800 Ha No pasture fertiliser	$0
• Sheep Vet costs	$7000
• Pasture establishment	$0
Annual Cost	**$27,000**

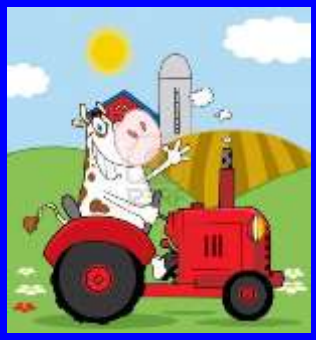
Annual saving over $80,000 annually

By changing agricultural practices I have:

- Saved over $50,000 on pasture fertiliser *(do not fertilize pasture)*
- Saved $20,000 on cropping costs. *(* Fertiliser r*educed by 70%)*
- Do not re-establish pastures
- Have perennial pastures with over 60 species.
- Do not have insect attack or crop disease.
- Winona is regenerative and resilient.
- Winona functions in an ecologically sound way
- **We are profitable**

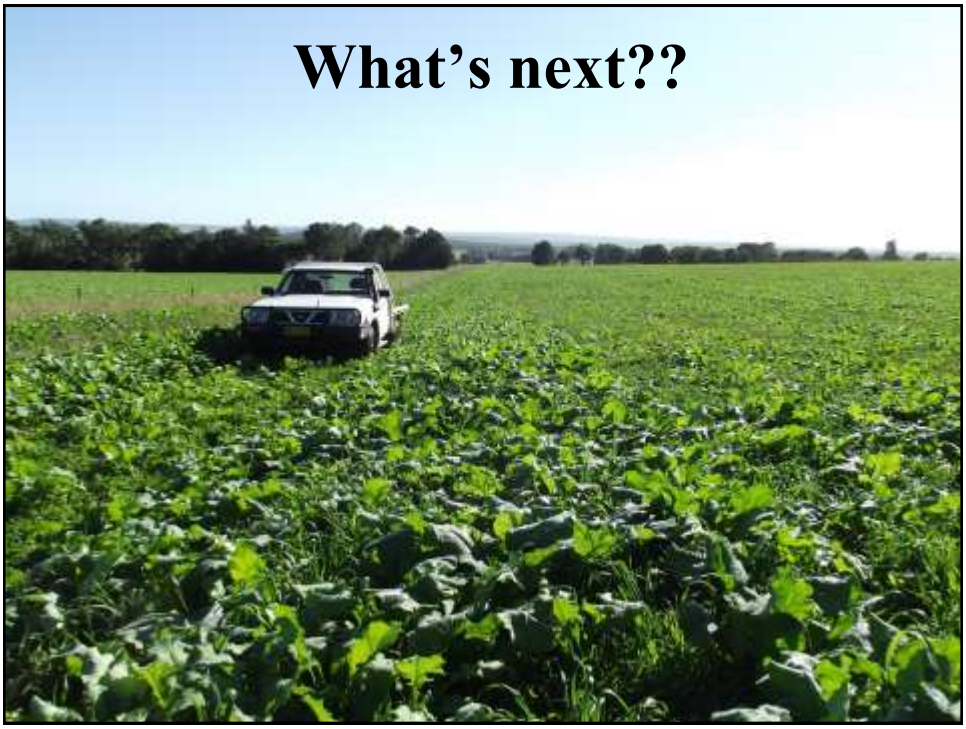


Compared to previous high input agriculture

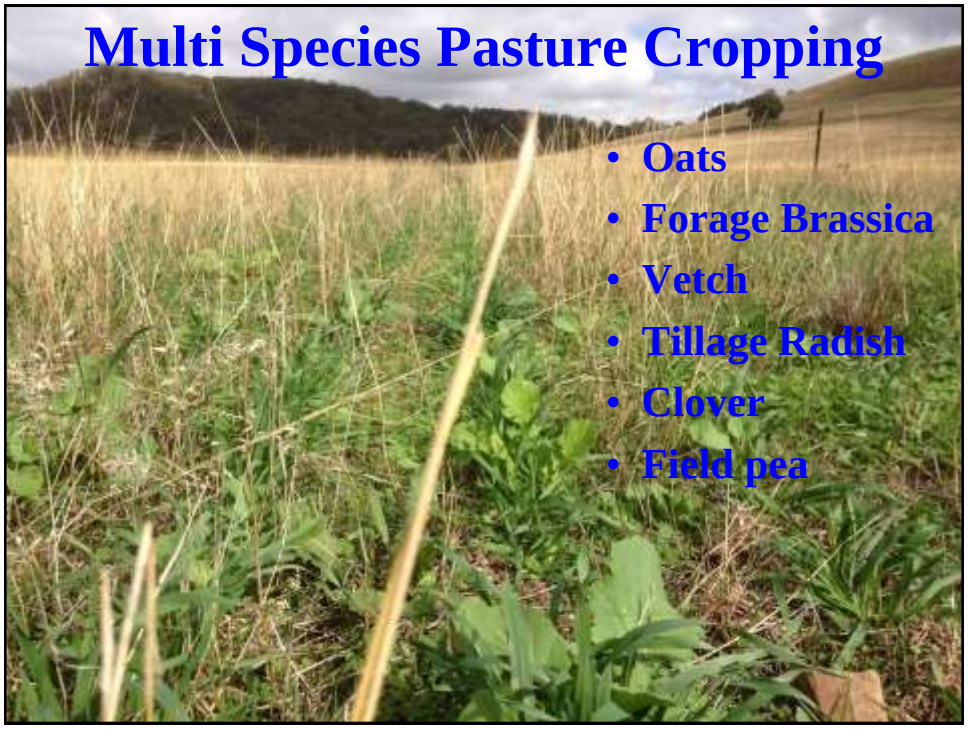


- Annual income is higher
- Winona is running more livestock.
- Crop yields are similar.
- Wool quality is better.
- Do not drought feed livestock
- Harvest and sell over 1000 Kg (1 Ton) of native grass seed
- Soil organic carbon levels are increasing
- Soil Phosphorus, calcium, ph, magnesium and trace elements are increasing

With over $80,000 less inputs and less labor



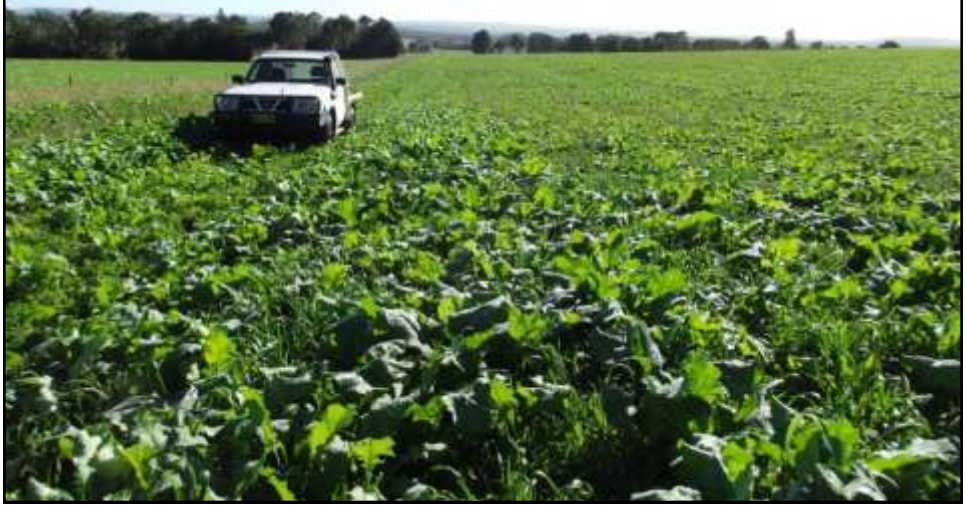
To improve soil structure and soil carbon further I have developed Multispecies Pasture Cropping



A mix of 5 to 10 species are sown into dormant grassland.

- Produce superior quality and quantity stock feed.
- Faster improvements in soil health, soil structure, carbon and nutrient cycling.
- Add Nitrogen with legumes & scavenge other nutrients.
- Weed control.
- Insect control (*flowering plants attract beneficial insects*
- Harvest cereal crop after grazing

Multi Species Pasture Cropping

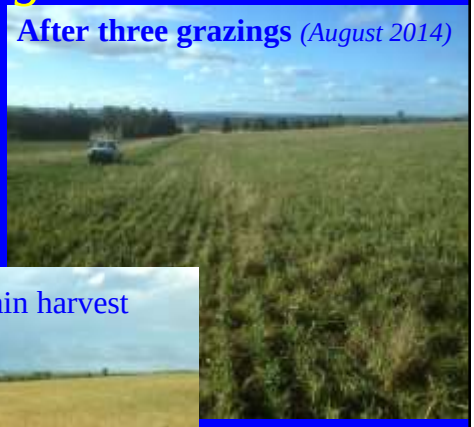


Multi Species Pasture Cropping

Harvesting Grain

Before grazing (*May 2014)*

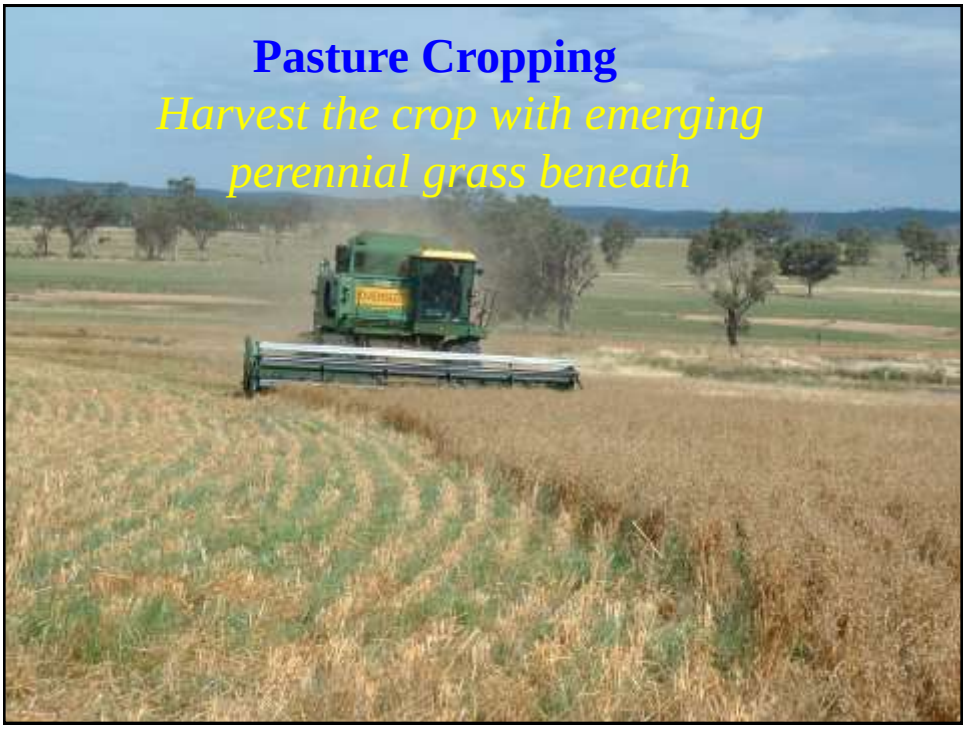
After three grazings *(August 2014)*



Grassland after grain harvest (*March 2015*

Pasture Cropping

Harvest the crop with emerging perennial grass beneath



Native grass seed can be harvested after the cereal crop is harvested

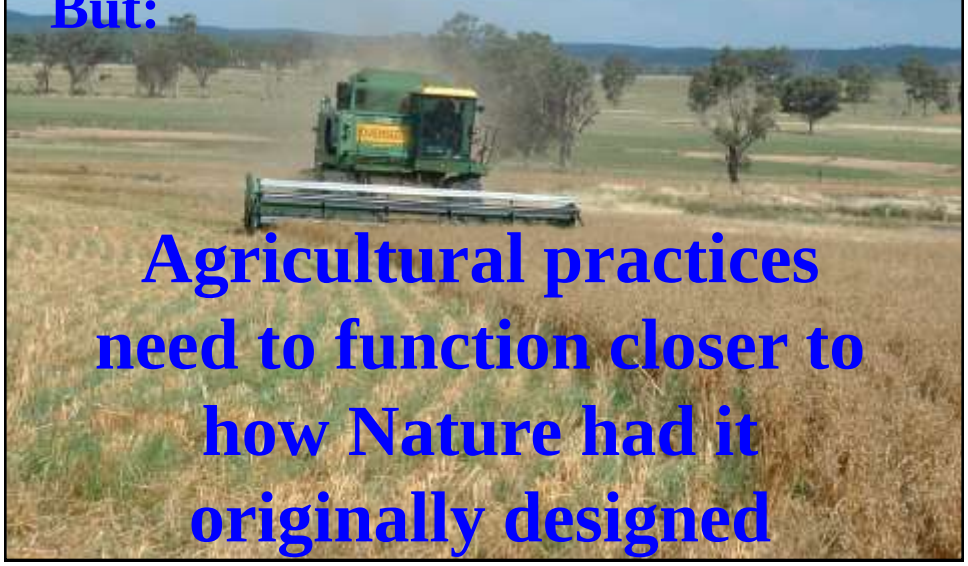
Seed is sold for re-vegetation, and in the future, sold for human consumption

Agriculture, and sound ecological practices should function together

By managing agriculture and sound ecological principals together, we can improve:

- **Healthy, nutrient dense food**
- **Soil Carbon & water holding capacity.**
- **Soil nutrient availability & cycling.**
- **Plant and animal diversity.**
- **Plant and animal disease.**
- **Soil health.**
- **Profit.**

- **Agriculture can be more profitable, & environmentally regenerative. But:**



Agricultural practices need to function closer to how Nature had it originally designed

If you require information
for an on-line, Pasture Cropping Course
Covering:

Pasture Cropping
Multispecies Pasture Cropping
Perennial Cover Cropping

www.perennialcovercropping.com

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