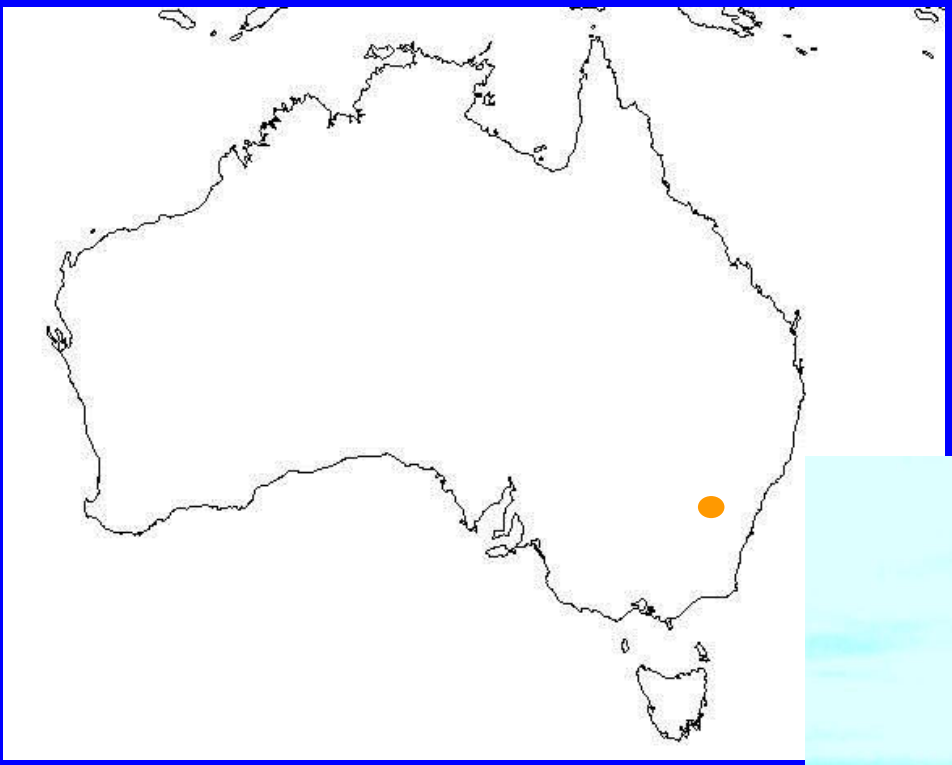
Soil, Plants, and Profit

Colin Seis

Winona



Winona Enterprises

Cattle trading

500 acres of pasture Cropped
Wheat, oats, cereal rye.

Working Kelpie Dogs

4000 Merino Sheep, wool & meat production.
(Holistic planned grazing)

Merino Ram sales

Native Grass Seed

When we are walking on the ground we are walking on the top of another world.

Below our feet is a world that is more complex than the world we live in.

Soil is a living, breathing, sub-aquatic ecosystem.

Photo: Gabe Brown

Soil is not dirt

There are so many microorganisms in the soil that a spoon-full of healthy soil contains over six billion microbes.

What feeds billions of soil microbes ??

Plants feed Soil microbes

- Organic matter from the leaves and roots
- Sugars from the roots *(root exudates)*
- In return, microbes supply nutrients to plants.

It is plants and microbes that build top soil and make soil nutrients available!!

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	21	71	338% increase
Potassium	44	150	341% increase
Sulphur (ppm)	2.7	7.9	293% increase
pH (water)	6.4	7.8	1.4 unit increase

- **It is plants that cycle soil nutrients.**
- **It is plants that creates top soil.**
- **It is plants that create good structured soil.**
- **It is plants that build soil carbon.**

For 10,000 years we have killed grasslands and destroyed soil

After the 2nd world war there were concerns about producing enough food for the increasing world population.

During the 1950s a new “Agricultural revolution’ was developed to solve these problems

Labelled the ‘Green Revolution’, it developed new, high yielding crops, and pasture species.

Then developed fertiliser and pesticides to help crops and pasture yield to their maximum

The ‘Green Revolution’ was very successful

- Produced huge amounts of food.
- Reduced hunger and poverty.
- Created wealth for farmers and graziers.

It sounds like an ideal method of agriculture.

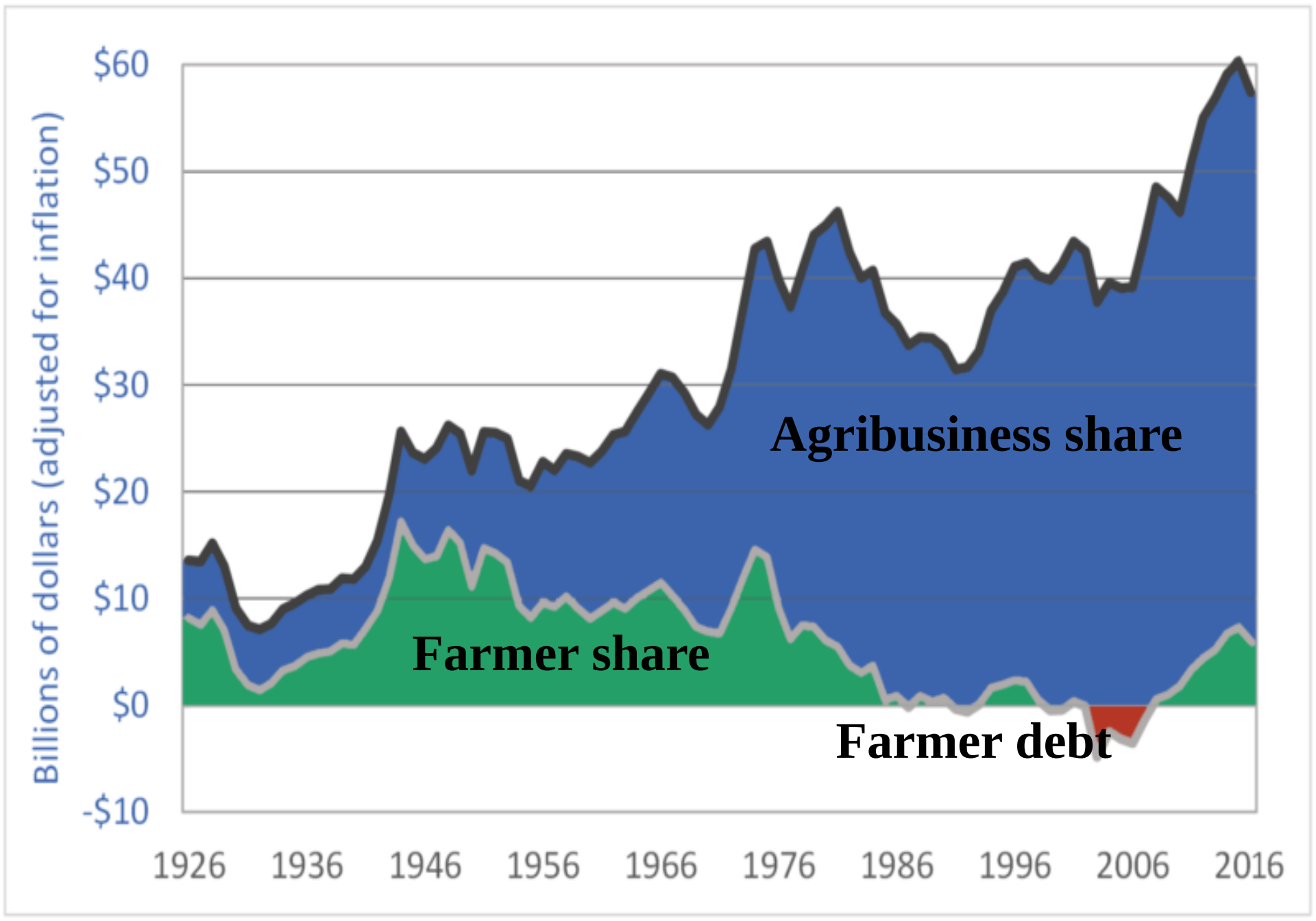
What could possibly go wrong??

It has created many problems

- **Ecological disaster for our farms and the planet**

- Declining soil health
- Dependency on fertiliser
- Dependency on pesticides
- Reduction in food quality
- Human health problems

Wealth is now with multi-national companies



THE GREEN REVOLUTION CAN NO LONGER BE AFFORDED.

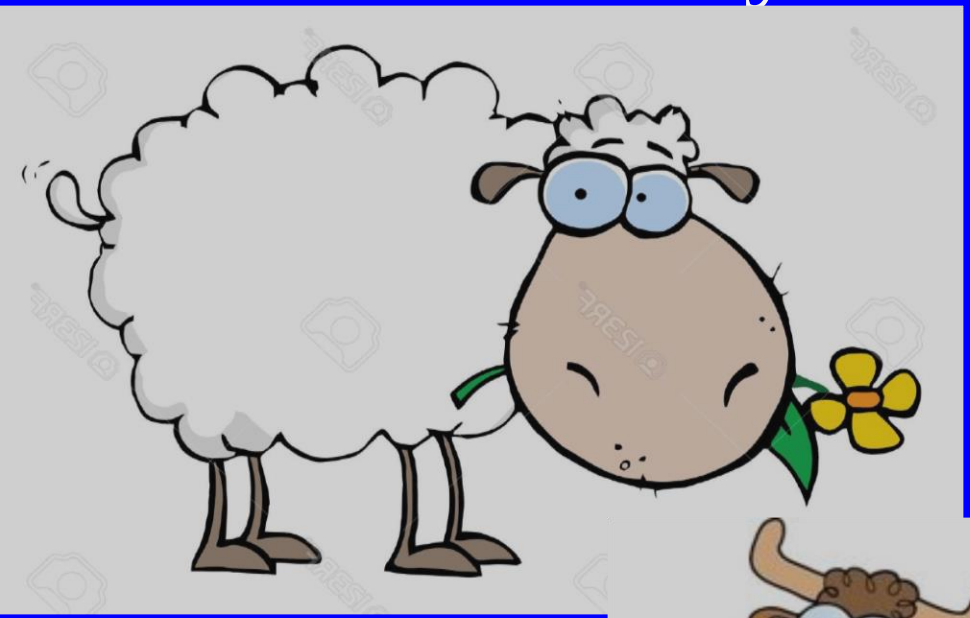
Many of the things we do in agriculture make someone else wealthy, not farmers

This form of agriculture has created serious human health problems

Agriculture is about FOOD

But there is something wrong

Mineral depletion in vegetables, meat, and dairy from 1940 - 1991



Minerals in food have declined by 60-90 %

Most of this decline in nutrients is related to a serious decline in Soil health and Soil Carbon

Poor quality food is caused by poor quality soil

High rates of fertilizer and pesticides have done serious damage to farms and soil.

This has been an ecological disaster

Fertiliser and pesticides will not fix our farms!!!

The farm ecosystem is broken.

How can we fix it ?

The way we graze animals is not working

- **Kills grasslands**
- **Destroys the soil ecosystem**
- **Destroys the farm ecosystem**

The way crops are grown using ploughs or excessive herbicides & pesticides

- **Kill grasslands**
- **Destroys the soil ecosystem**
- **Destroys the farm ecosystem**

How do we restore grasslands and soil??

How do we fix the problems associated with industrial agriculture??

We have isolated ourselves from nature

Our farms, soil, and animals
should be nurtured

How???

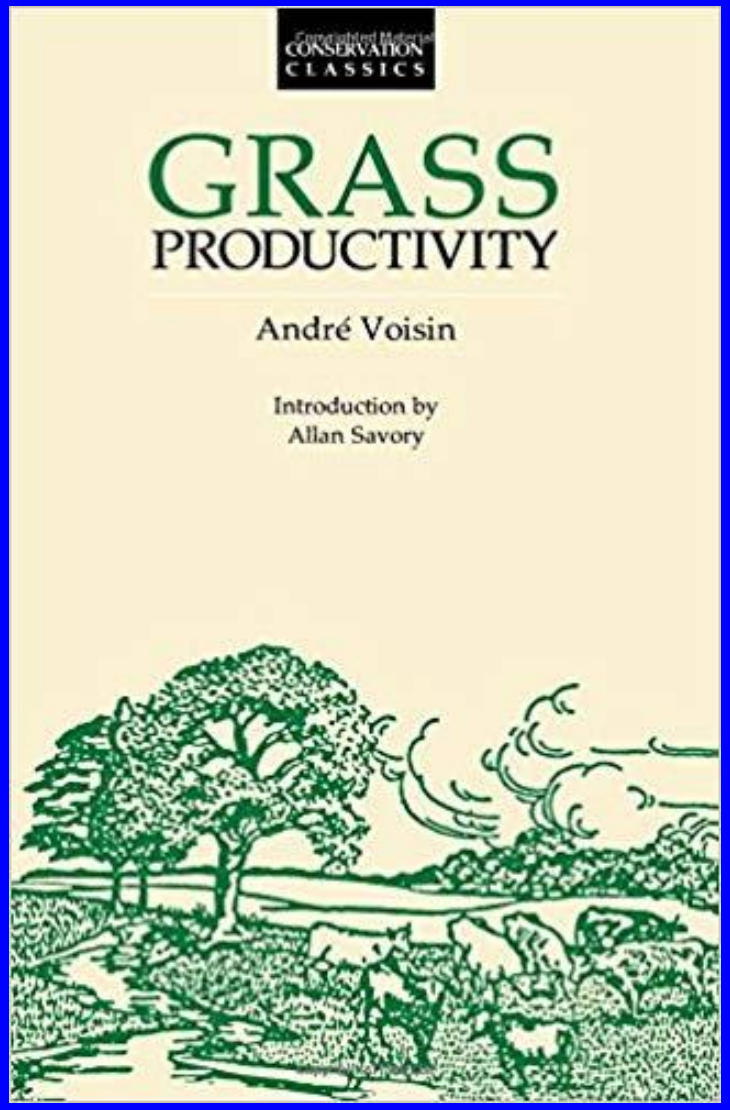
By growing plants, plants and more plants.

We need to cover our soil with a diverse range of living plants by restoring the grasslands

Plants will restore our farm, and soil and profit

In rangeland, the most practical and cost effective way is to restore the grassland with a change in grazing management

One of the very early pioneers of rotational grazing in the 1950s was the French scientist/farmer Andre Voisin.

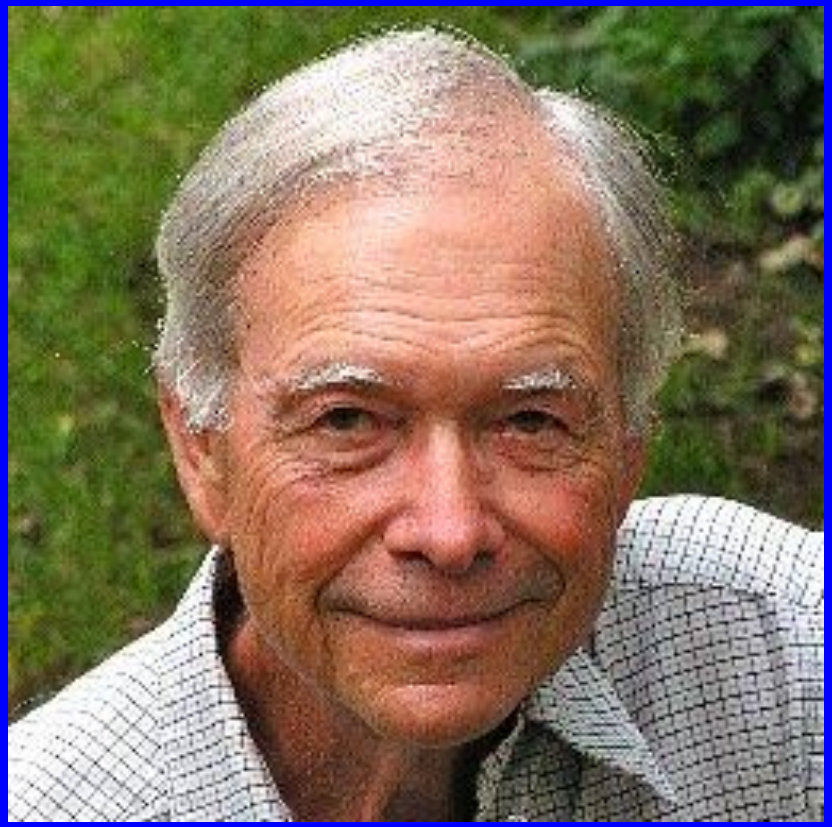


Franklin J. Crider, United States Department of Agriculture, 1955.

When 80-90% of the leaf is removed all of the roots stop growing.

When less than 50% of the leaf is removed none of the roots stop growing.

Alan Savory



- The idea of holistic planned grazing began with Alan Savory
- in the 1960s

- Alan has shown the world how to better manage grazing animals.

What is wrong with the way we graze

Allowing animals to graze as they wish, or by set-stocking has created many problems.

Even very light conservative stocking does serious damage, over time.

Inappropriate grazing management

- Kills perennial grassland plants
- Encourages weeds
- Creates plants with short roots.

- Creates soil erosion
- Creates soil compaction
- Stops water infiltration.
- Prevents soil nutrients cycling
- Destroys the soil ecosystem

Grazing

- Grazing techniques have not changed for hundreds of years.
- Inappropriate grazing methods have done major damage to grasslands around the world
- **Animals can be beneficial, if they are grazed well.**

Grazing on Winona 1938

Grazing on Winona 2018

Grazing Management

It is not grazing that kills plants

- It is not giving perennial plants enough time to recover from grazing that kills plants.
- It is not the animal that is the problem
- It is the human managing the animal that is the problem

How???

Allow time for plants to recover before they are re-grazed

What did I do on ‘Winona’?

Changed grazing management to holistic planned grazing in 1993

Developed ‘pasture cropping’ in 1993

‘Pasture Cropping’ is perennial cover cropping, where a crop is zero-tilled into grassland, after its growth has slowed or become dormant

The change in grazing management and 'pasture cropping' restored Winona

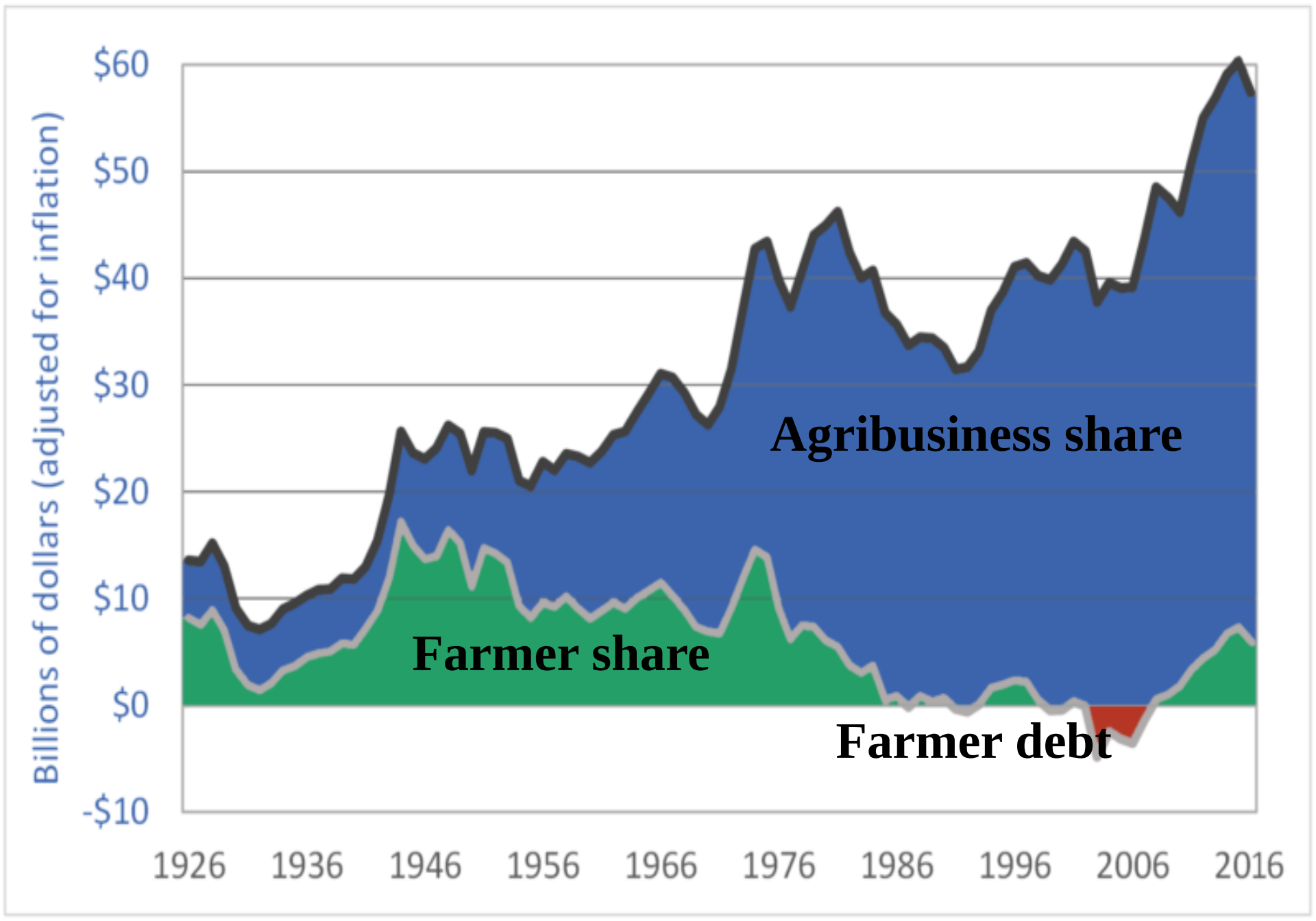
- Restored the grassland *(from 9 to 60 grassland species)*
- Annual weeds (*Decrease from 60% to less 5% since 1999)*
- Restored the soil ecosystem.
- *Soil structure*
- *Nutrient cycling*
- *Water holding capacity*
- *Soil Carbon (by 204%)*
- Restored the farm ecosystem
- More profit
- Less costs *(save $80,000 annually)*

These type of results are being achieved by farmers and graziers around Australia, and many other countries

Why aren't Regenerative Agriculture methods adopted more widely ??

Many people, farmers, agronomists and scientists are threatened by change

The companies that develop pesticides and fertiliser do not want people to stop using their products



THE GREEN REVOLUTION CAN NO LONGER BE AFFORDED.

After increasing plant diversity and restoring the soil ecosystem, the dramatic, and often fast changes in plants and soil has puzzled scientists for many years.

It is against what many people believe is possible!!!

How are these soil and yield changes happening??

Soil Microbes drive the change

- Soil microbes stimulate change in nutrient cycling, plant growth, plant disease suppression, and overall change in the soil ecosystem??

- **How?????**

Soil is a living, breathing, sub-aquatic ecosystem.

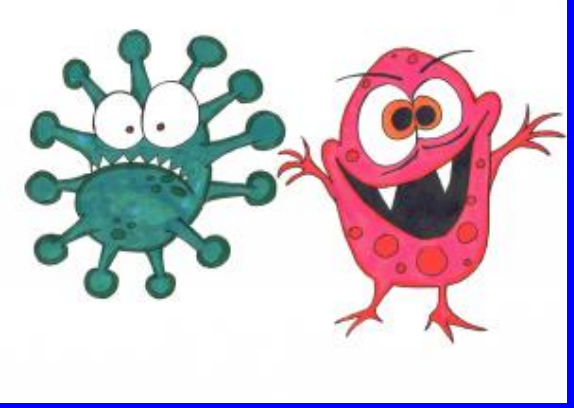
Photo: Gabe Brown

Soil Food Web

Bees, and many other insects work together as a super organism

Microbes can also work together like a super organism.

In the microbial world the term ‘Quorum Sensing’ refers to density dependant, coordinated behaviour, that regulates gene expression in the microbial population and/ or in the host plant.



Quorum Sensing

- Microbes in the soil or plant can switch the plants genes on or off.

Which can stimulate plant growth, plant health, create tolerance to drought, and plant disease suppression.

Quorum Sensing

- Microbial diversity and numbers are created by plant species diversity. *(More than 10 plant species)*

- A mix of plants produces diverse range of root exudates

- The large mix of root exudates feeds/supports a different and vast range of soil microbes.

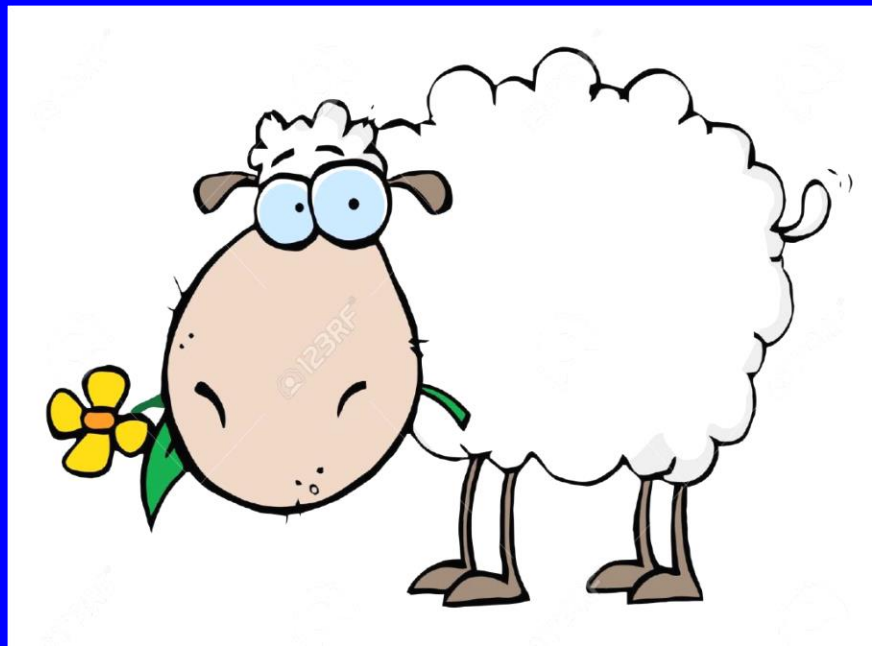
It is plant diversity of grassland or multi-species crops
that feeds and stimulates a vast range of soil microbes which creates the change in soil

How do we restore our farms??

By restoring grasslands and growing a diverse range of plants, plants and more plants.

How do we restore our properties??

- **Change the way we graze animals.**
- **Change the way we grow crops.**
- **All of the above.**



Plants will restore our properties, and soil and profit