Is Perennial Cover Cropping possible ??

Colin Seis

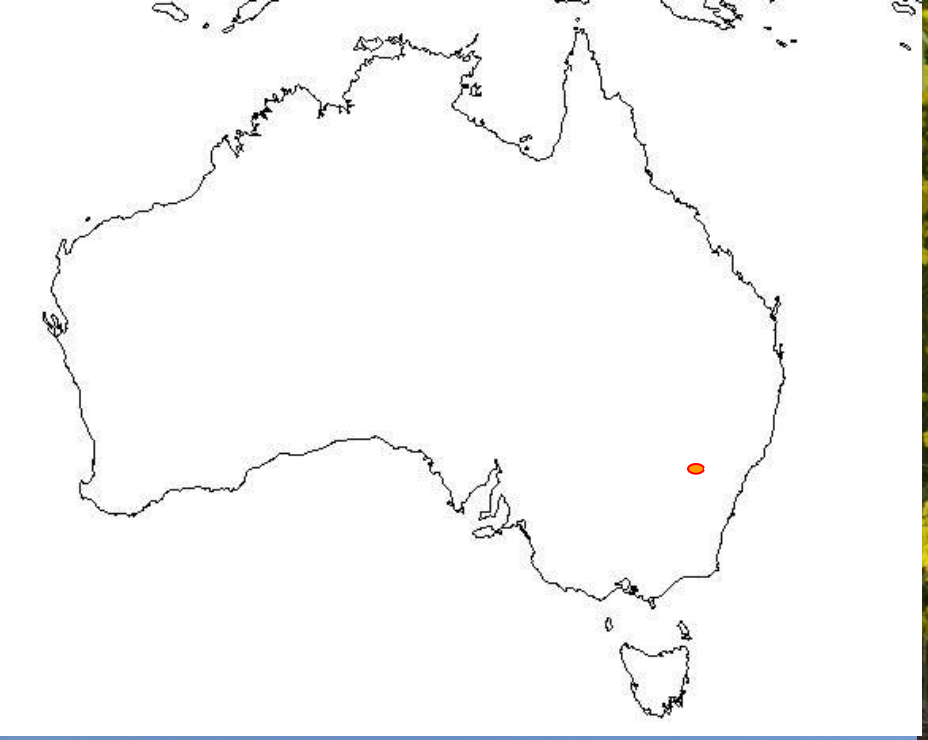
Winona

Myself and son Nick.

2000 acres.

200 miles NW of Sydney Australia.

- **Granite soil.**
- **26inch annual Rainfall.**
- **Restored Native grassland.**
- **No irrigation.**



Winona Enterprises 2019

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

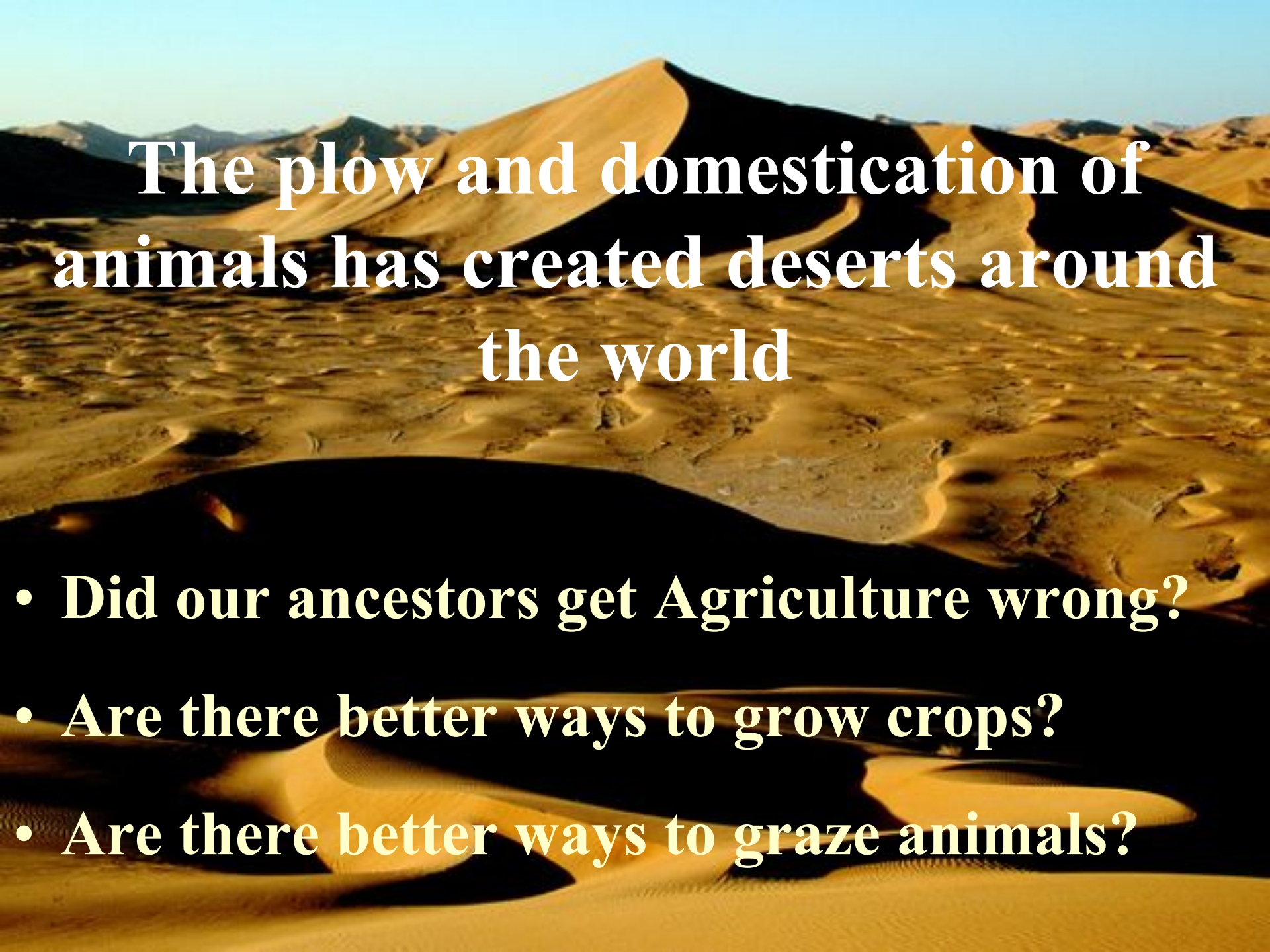
Agriculture started in Mesopotamia over 10,000 years ago

- Sumerian people started to harvest einkorn wheat from the grassland.
- Sheep and goats were domesticated.

The plow (ard) was developed 8000 years ago and later oxen domesticated and trained to pull the plow.

The Egyptians, and later Romans, fine-tuned the techniques
which were then adopted by Europeans.

Modern agriculture was born.



The plow and domestication of animals has created deserts around the world

- Did our ancestors get Agriculture wrong?
- Are there better ways to grow crops?
- Are there better ways to graze animals?

Were the methods of growing crops and managing animals wrong from the start?

For 10,000 years we have killed grasslands and destroyed soil to grow crops.

Until the early 1950s, agriculture was practiced without pesticides and small amounts of fertiliser.

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

A new "Agricultural revolution' was developed to solve these problems

Labelled the ‘Green Revolution’, it developed new, high yielding crops, and fertiliser and pesticides to help crops yield to their maximum

The ‘Green Revolution’ was very successful

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

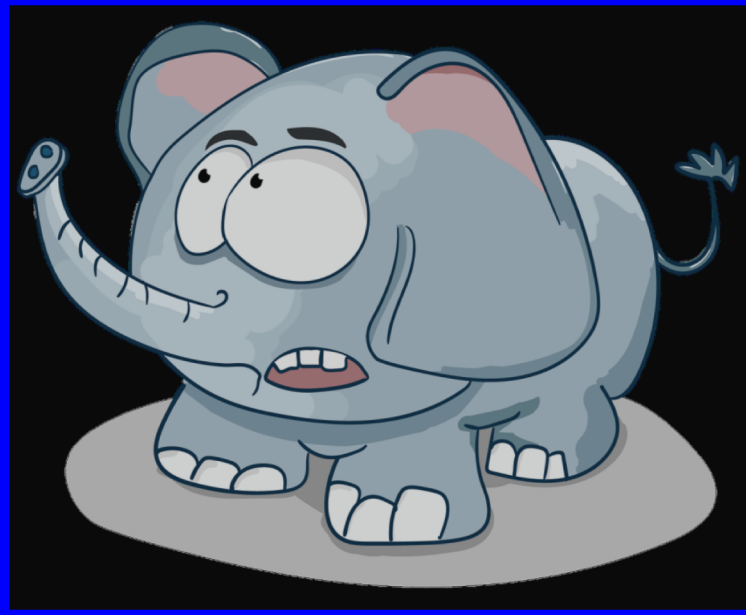
It sounds like an ideal method of agriculture.

What could possibly go wrong??

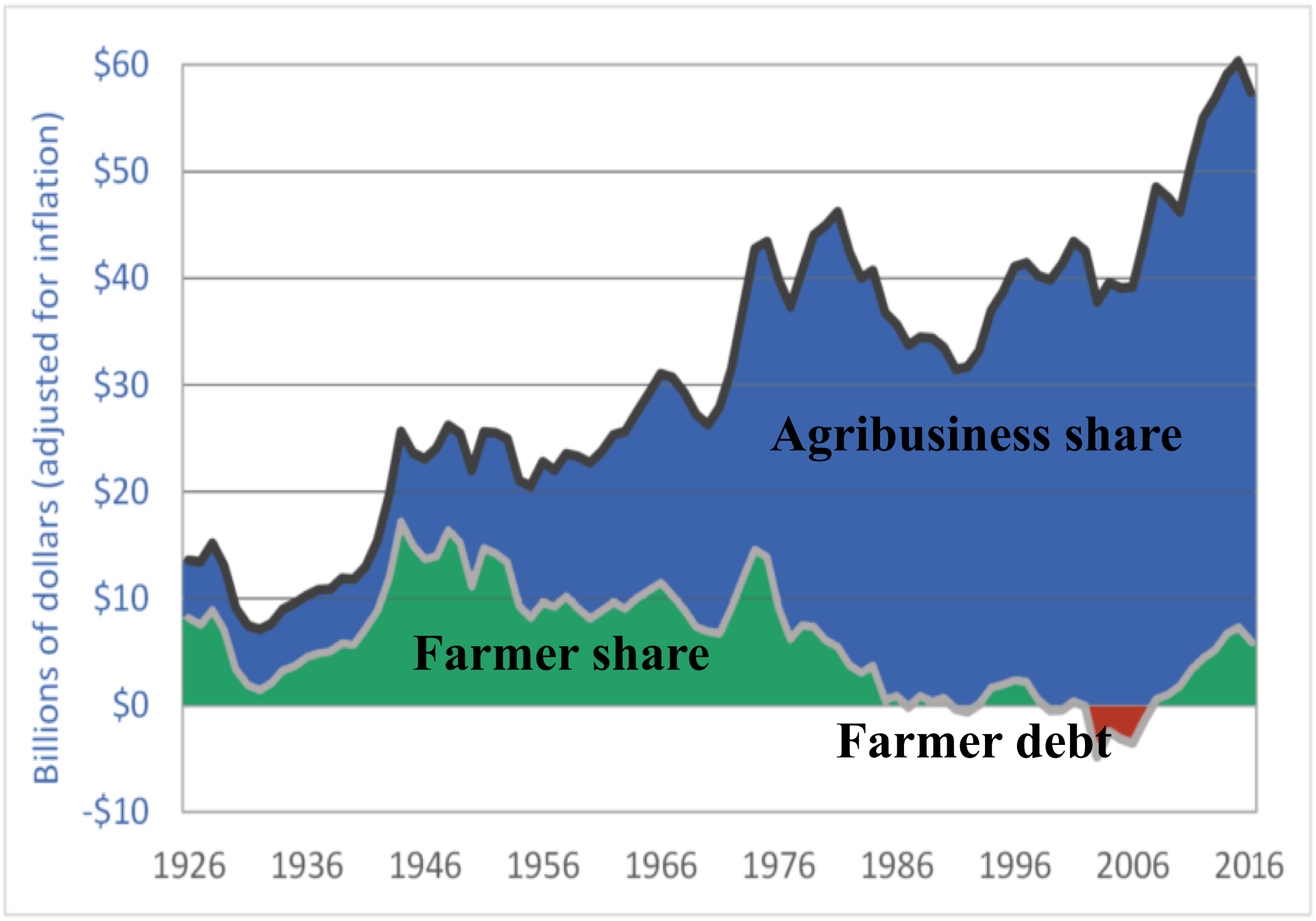
It has created many problems

- **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.

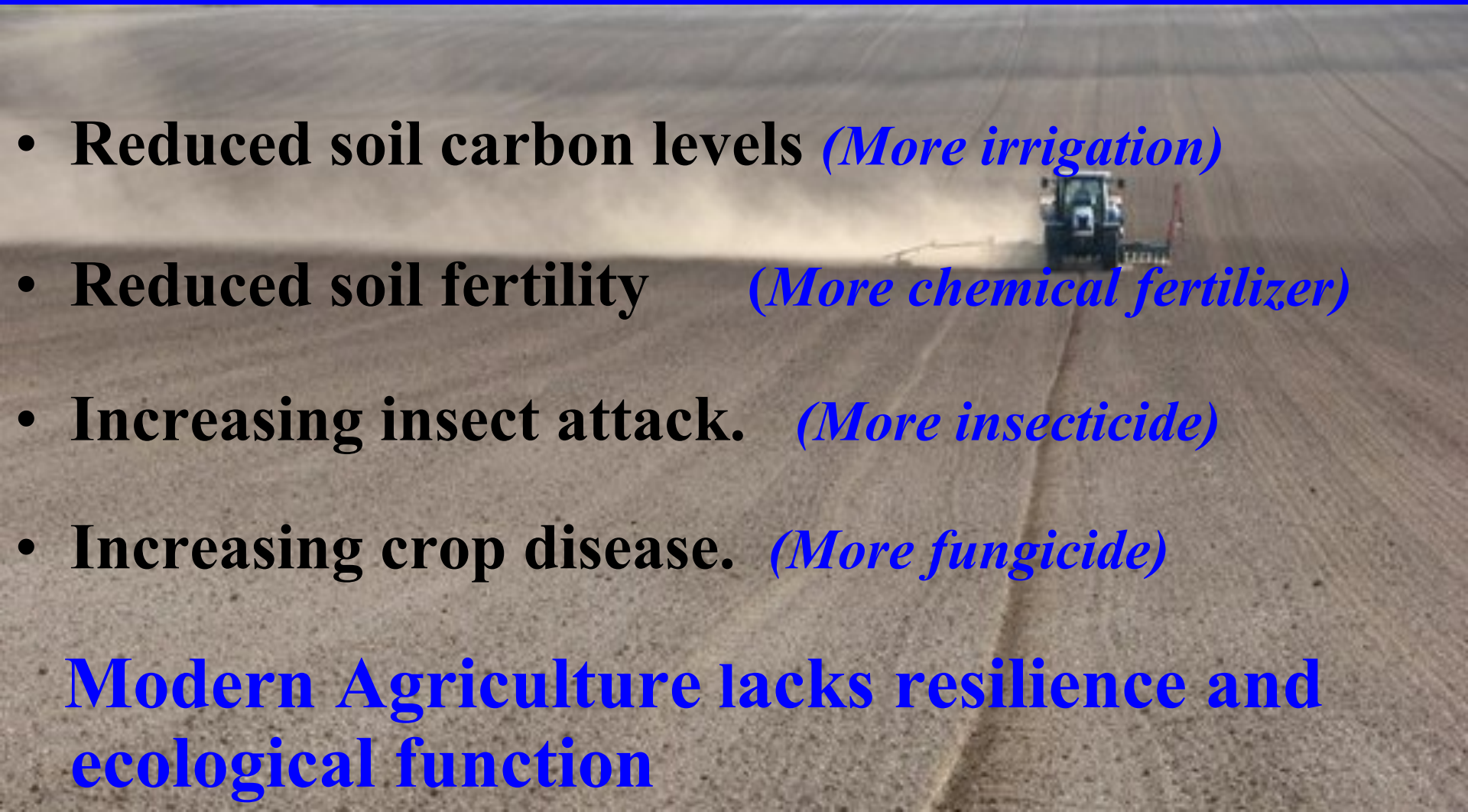


THE GREEN REVOLUTION CAN NO LONGER BE AFFORDED.

For the last 60 years, around the world, agriculture has been influenced by the use of: monoculture crops supported by high rates of fertilizer and pesticides

This has been an ecological disaster

Agriculture is crashing all over the world because it does not function in an ecologically sound way.



- **Reduced soil carbon levels** ***(More irrigation)***
- **Reduced soil fertility** ***(More chemical fertilizer)***
- **Increasing insect attack.** ***(More insecticide)***
- **Increasing crop disease.** ***(More fungicide)***

Modern Agriculture lacks resilience and ecological function

The recommended solutions are often more fertilizer, herbicide, and insecticide.

We rarely address the reasons why more inputs are required.

Increasing fertiliser and pesticides will not fix these problems.

The farm ecosystem is broken.

How do we fix it???

By growing plants, plants and more plants.

Plants will restore our farm and soil ecosystems and profit

<u>Not</u> Monocultures of plants

- Multi- species cover crops
- Perennial cover crops
- Perennial grassland
  (50- 100 plant species)

Grasslands

- For millions of years grasslands have dominated the planet.
- They fed many millions of grazing animals as well as predators and humans.
- These grassland species did not suffer from disease, insect attack or nutrient deficiency.

How did the original grasslands grow huge amounts of food without disease, insect attack, or fertilizer?

In balanced grassland ecosystems, nutrients are cycled and made available.

Plant disease and insect attack are controlled by their natural enemies

Our farms can function the same

Most agricultural problems are ecological problems

Where do plant nutrients come from?

- The earth is over four billion years old.
- All the nutrients that plants and animals use were on the planet, and are still on the planet.
- Bacteria and fungi use enzymes and acids to break down rock and access minerals.
- Plants evolved, and created the cycle of life, death, decay, and built soil.

How do plants make soil nutrients available?

- Soil microbes require plants for food.

Plants feed root exudates, and decaying plant organic matter, to soil microbes and in return microbes supply nutrients to plants.

‘What happened to my family

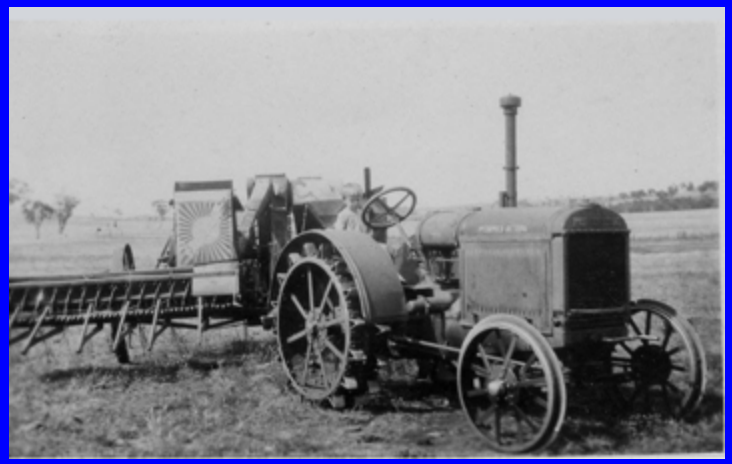
In 1860 my Great Grandparents, Nicholas and Catherine Seis were some of the original pioneer/settlers in the district.

- Produced merino sheep and wool
- Started growing wheat in 1868

Until the 1930s, agriculture was practiced without pesticides and small amounts of fertiliser

Industrial Agriculture was adopted in the 1930s.

Sowing wheat, 1934



Growing wheat was very profitable in the 1930s

Within 20 years major damage to soil and grasslands had occurred

Destroyed the grassland and contributed to soil health decline, erosion and salinity

1932

Same paddock 5 years later: 1937

To fix these problems my father (Harry Seis) adopted ‘Green Revolution Agriculture’ in 1950

Industrialized, high input, farming methods

From 1950 to 1978 on 'Winona'

This high input system

was very productive

during this era

Industrialized, high input, farming methods

From 1948 to 1978 on 'Winona'

Fertiliser & pesticides were costing over $80,000 annually

20 years after the adoption of ‘Green Revolution Agriculture’ the farm started to crash

This method of agriculture was destroying the farm ecosystem and sending us broke

We were growing things that wanted to die
and killing things that wanted to live

To fix the problems of the
'Green Revolution'
the 2nd Green Revolution
is being developed

Is it only possible to feed 9 billion people in 2050 with the use of more inputs of chemical fertiliser, pesticides, and genetically modified crops????

Agriculture is about FOOD

But there is something wrong

Mineral depletion in vegetables
1940 - 1991

- Copper reduced by 76%
- Calcium reduced by 46%
- Iron reduced by 27%
- Magnesium reduced by 24%
- Potassium reduced by 16%

Source: UK Ministry of Agriculture

Mineral depletion in meat
1940 - 2002

Iron reduced by 50%

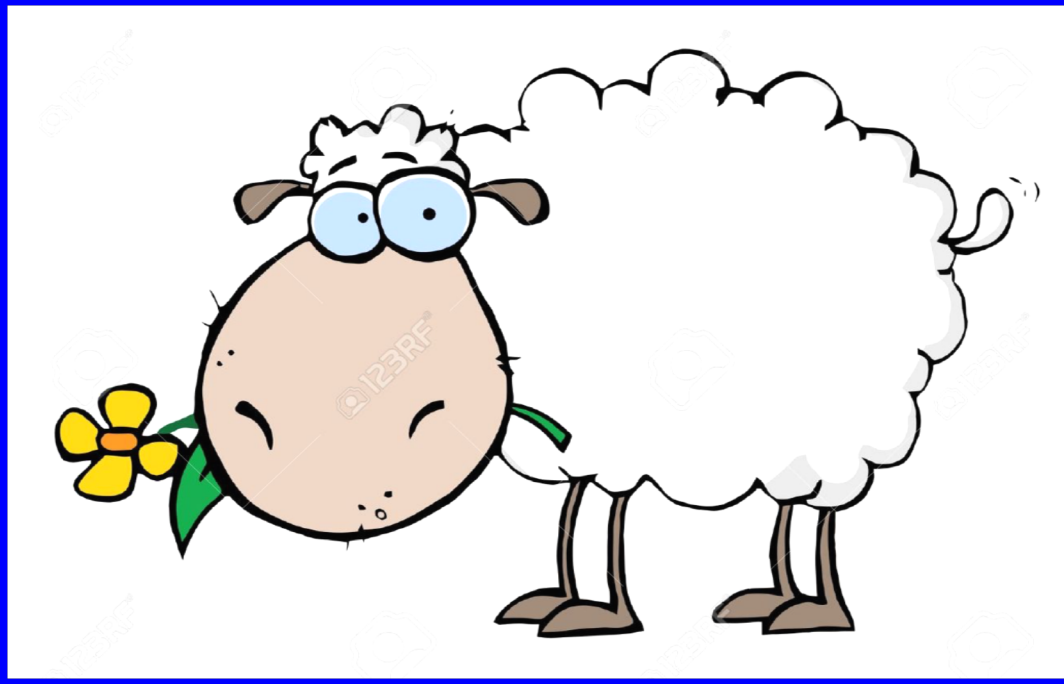
Copper reduced by 55%

Calcium reduced by 29%

Magnesium reduced by 15%

Potassium reduced by 9%

Phosphorus reduced by 21%



Source: UK Ministry of Agriculture

Australian fruit and vegetables

			1948	1991
• Potatoes	Calcium	reduced by		89%
• Broccoli	Magnesium	reduced by		82%
• Carrots	Vit. A	reduced by		99.6%
• Apples	Vit. C	reduced by		80%

It is possible to buy an orange today that contains ZERO vitamin C.

Mineral depletion in dairy
1940 - 2002

Iron reduced by 83%

Copper reduced by 97%

Magnesium reduced by 1%

Potassium reduced by 7%

Phosphorus reduced by 34%

Source: UK Ministry of Agriculture

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

Decreasing mineral density in wheat grain over the last 160 years

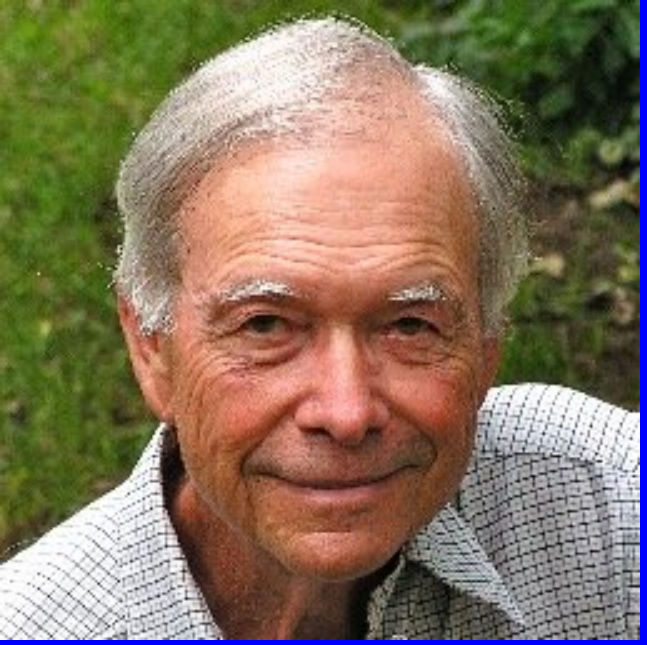
- **Broadbalk Wheat experiment – Rothamsted UK**
- Zinc, iron, copper & magnesium remained stable between 1845 and 1965
- Introduction of high- yielding semi-dwarf cultivars from the 1960s saw zinc, iron, copper & magnesium decreased significantly

There is a desperate need to change agricultural techniques because these techniques are failing all over the world

But how do we change and what do we change to???

There is great change happening around the planet.

There are a lot of good agricultural practices being adopted around the world



Farmers and ranchers are leading the way

We need to encourage scientists and politicians to catch up

Christine Jones

Ray Archuleta

Kristine Nichols

Jill Clapperton

Jonathon Lundgren

Dwayne Beck

What did I do on ‘Winona’?

- Changed grazing management to holistic planned grazing in 1993
- Changed the way I grew crops from plowing the soil to “Pasture Cropping” in 1993
- Restored the native grassland

What did I do on ‘Winona’?

Changed grazing management to holistic planned grazing in 1993

Changed the way I grew crops from plowing the soil to “Pasture Cropping” in 1993

Restored the native grassland

What were the results on ‘Winona’?

- **Restored perennial grassland!!**

- **Native perennial species**

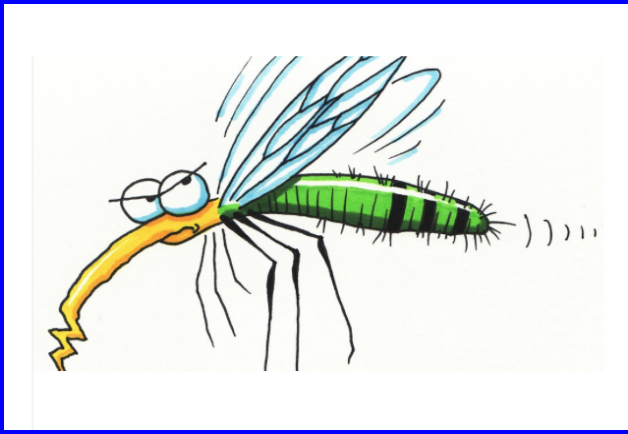
Increase from 10% to over 80% since 1999

- **Annual weeds**

Decrease from 60% to less 5% since 1999

Increase from 9 to 60 native grassland species

No insecticide has been used for over 20 years.



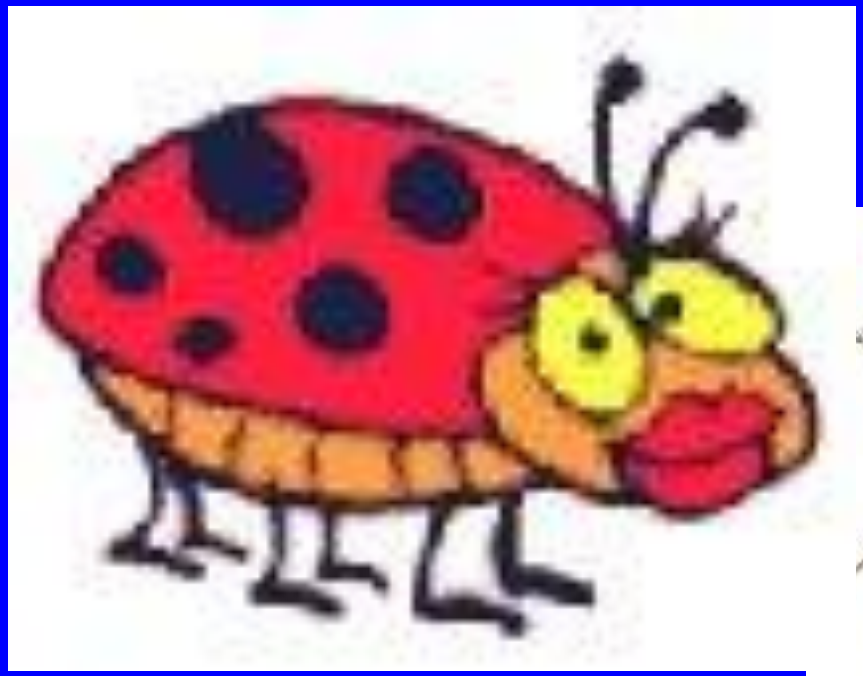
No insect attack in crops and pasture

How??

Increase in insect numbers and diversity with increased grassland plants

(*Elise Wenden, Canberra ANU 2007)*

- ***On Winona insects numbers have increased by 600%***
- ***Insect diversity has increased by 125%***
- ***We no longer have insect attack on crops or pasture***



Insects

Insect attack in crops and pastures can be controlled by having more insects.

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 beneficial nematode increase - over 1000%

Restored soil ecosystem will control plant disease.

No fertilizer on pasture for over 30 years.

Crop Fertilizer reduced by 70%

How??

Living, growing plants are the drivers of soil health, soil structure and nutrient cycling

- Plants add dead and decaying material to the soil, (roots and surface litter) which feed microbes
- Plants exude sugars (exudates) into the soil, which feed microbes

There are more ways of supplying nutrients to plants than applying fertilizer

- Myrorrhizal Fungi supply P, N trace elements and water
- Protozoa and nematodes eat bacteria & fungi which supplies N and other nutrients
- Free living N fixing bacteria supply Nitrogen *(up to 40kg/ha)*

The difference in land management techniques

Adjoining Paddocks

Pasture Cropped and plan grazed

Conventional grazing and cropping

Winona Soil *Neighbor's Soil*

- Winona's soil now has over 200% more organic carbon.

- Has sequestered 25 ton /ac of carbon
  (93 ton/ac of carbon dioxide)

- Holds more water.

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

e.g. Calcium increase of 8166 lb/ac or 277%

- Ph has changed from 5.2 - 6.01

Soil Carbon and soil water storage

- An increase in soil organic carbon level of 1% to a depth of 1 ft can increase the water holding capacity of soil by an extra

  17960 gallons/acre

  On every rainfall event.

38486 gal/ac 20098 gal/ac

Our Farms should function as ecosystems

Is it profitable?

Yes!!

I now save over $80,000 annually and produce more wool, grain & meat as well as native grass seed sales

I will explain how this was achieved during my next presentation.