Unravelling the puzzle at Jigsaw Farms

ACIAR/ Crawford Fund. Canberra. 23 March, 2021
Global Warming

Probability of exceeding 2°C
No climate policy: 100%
Emission budget of 1000 GtCO$_2$ until 2050: 25%

Possible Future without Climate Policy

Global Mean Surface Warming (°C)

max +2°C

1000 GtCO$_2$ until 2050

Past observed temperatures

Me

My Children

My Grandchildren

Source: Adapted from Meinshausen et al. (2009)
The challenge of Climate Change is to manage the unavoidable and avoid the unmanageable.
The Adaptation Challenge:

How do we design a grazing system that is more resilient and climate responsive?

What will we do in 2030 to 2050 as we have shorter growing seasons and perhaps reduced gross margins in the southern grazing zones?
The Mitigation Challenge:
- How do we reduce our methane emissions
- How do we reduce our nitrous oxide emissions
- How do we reduce our fuel and power emissions
- How do we capitalise on incentive based schemes or other sequestering opportunities
1kg of Greenhouse Gas Emissions

- 1 kg of Lentils
- 1.2 kg of Peanuts
- 800mls of Milk
- 290g of Salmon
- 290g of Eggs (about 5 small eggs)
- 270g of Chicken
- 244g of Kangaroo
- 212g of Rabbit
- 131 g of Australian Pork
- 44 g of Australian Beef
- 57g of Australian Lamb
THE JIGSAW FARMS STORY IN ONE SLIDE!

- Doubled the food and fibre that is produced per annum since 1996
- Carbon neutral since 2011
- Financial net return of 10 % + for 18 of last 25 years of ownership
- High Input and High Output Production system
- Sustainable environmental indicators are all positive
- 48 bird species in 1996 now have 164 species
- 653 Hectares of trees planted lots of co benefits for the farm
- High reproductive rates for stock therefore lower methane output
- Critical role that feedlot plays in reducing future methane emissions
- Carbon store in soil increased through perennial pastures
- 100% ground cover rule
- Water efficiency reflected by minimal evaporation (deep water storage) and maximum flow to water courses off farm.
- Family farm, be it at scale family. Succession under way
2005 Enterprise breakdown

- Agro forestry 10%
- Carbon/Reveg Plantings 15%
- Merino 25%
- Prime Lamb 25%
- Beef 25%

2019 Enterprise breakdown

- Agroforestry 9%
- Carbon/Reveg Plantings 10%
- Merino to Merino 40%
- Terminal Rams over X breds 20%
- Cross breeding beef 10%

2030 enterprise breakdown?

- 10% Agroforestry
- 10% Carbon/Reveg Plantings
- 50% Dual Purpose Merinos
- 10% to 20% Beef
- 10 to 20% Valve releases...
Beef/wethers/goats/trading?
Average Emissions from Western Victorian Farms

- Dairy 9.5 t C02e/ha or 9 t C02e/t milk solids
- Beef 4.5 t C02e/ha or 22.6 t C02e/t carcase
- Sheep 3.5 t C02e/ha or 18.4 t C02e wool(CFW)
- Grains .15 t C02e/ha or .1 tC02e/t grain
- Jigsaw Livestock 3.8 C02e/ha (2015)
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Soil Carbon. Perennial pastures. In general we sit between 4% and 5% and moving up. Lots of good reasons to do so regardless of carbon.
Trees. Half high value sawlogs and half permanent revegetation in shelter and wildlife corridors. Permanence is the key.
MORE LAMBS MORE OFTEN FINDINGS

1. NOT ENOUGH FLEX IN OUR SYSTEM
2. TOO MANY SIMILAR TYPE ANIMALS
3. JUNE/JULY FEED CRISIS
4. MAKING DECISIONS TOO LATE
5. NOT ACCEPTING WEATHER TRENDS (LATE AUTUMN BREAKS)
6. NOT CAPITALISING ON SCALE
7. GEOGRAPHICALLY PUTTING ALL EGGS IN ONE BASKET
8. NEED TO PROTECT PASTURES
9. FEEDLOT WORKS WELL SO NEED TO EXPAND IT
GHG emissions avoidance.
Change the rumen behaviour. Use of inhibitors. Such as Red Asparagopis seaweed. CSIRO and James Cook Uni are commercialise now.
Hopefully, next year we are going to start some experimental feeding focusing on feed conversion to weight gain basis at first. Then start to try to get a handle on methane. Not easy at farm level.
Merino Ewe Breeding objectives

- High index for PWT
- High index for EMD
- High index for PFAT
- While still having 18-19 micron wool
Strategies to reduce Enteric methane emission from livestock

**Management Strategies**
- Extended Lactation
- Reducing No. of Animals
- Improved Nutrition
- Strategic Supplementation
- Production Enhancing agents
- Improved Genetic Selection
- Improved Grassland Management
- Alternative Livestock System
- Animal Breeding

**Nutritional Strategies**
- Plant Breeding
- Improvement Forage Quality
- Diet Supplementation
  - Concentrate
  - Oil
  - Tannin
  - Monensin
- Dicarboxylic Acid
- Enzymes and Probiotic
- Propionate Enhancers
- Diet Modification: Ammonia, Molasses

**Rumen Manipulation**
- Biological Control using predators for methanogens
- Antibiotics (Such as rumensin)
- Genomics: To change microbes and their pathways
- Bacteriophages: Selectively kill rumen methanogens

**Advanced Strategies**
- Immunization
- Recombinant Technology
- Bacteriophages
- Bacteriocins
- Reductive Acetogenesis
- Chemical Defaunation
Cross breeding cattle operation. 12% free lunch. Drop in Carbon footprint. Carbon sense makes economic sense!
Take Home Messages

1. Climate Change is real and humans are a large part of the problem. Ruminant animals are tricky!
2. Climate Variability is real and will get more extreme in the future.
3. Mitigation is essential: agriculture and regional Australia have big opportunities in this space.
4. At the local farm level Adaptation should be a focus for farmers who want to manage the risks of CC – be they physical or policy driven.
5. Australian Farmers are well placed to be successful producers of food and fibre in what we will be at times full of Climate Challenges ..but only if we devise more flexible, energy efficient and resilient systems. Doing more of the same just won’t work!