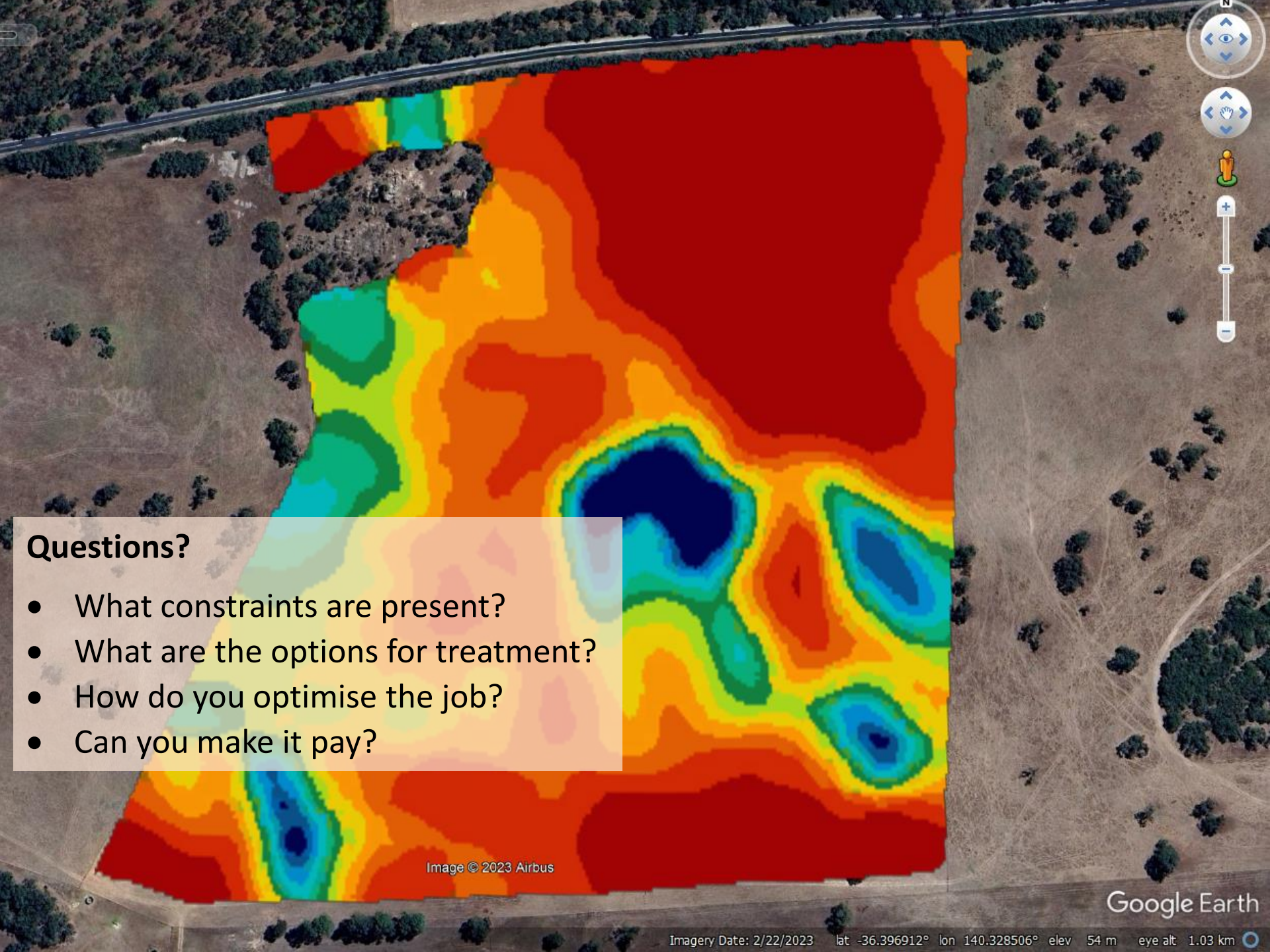
Time	Program
9.30 – 12.00 with smoko	Introduction to soil biology with Ash Martin
12.45	Depart for The Basin – Petherick Rd
1.00 – 3.15	Set the Scene – Mel & Heath Nickolls What have we learnt so far – Hamish Verco
	Impact of treatments on soil biology – Ash
	Impact of treatments on fodder quality – optimizing grazing outcomes – Michael Wilkes
	Optimising existing pastures and strategies to raise the bar – Felicity + Mel
3.15 – 3.30	Reflections, refreshments and evaluation

The Basin

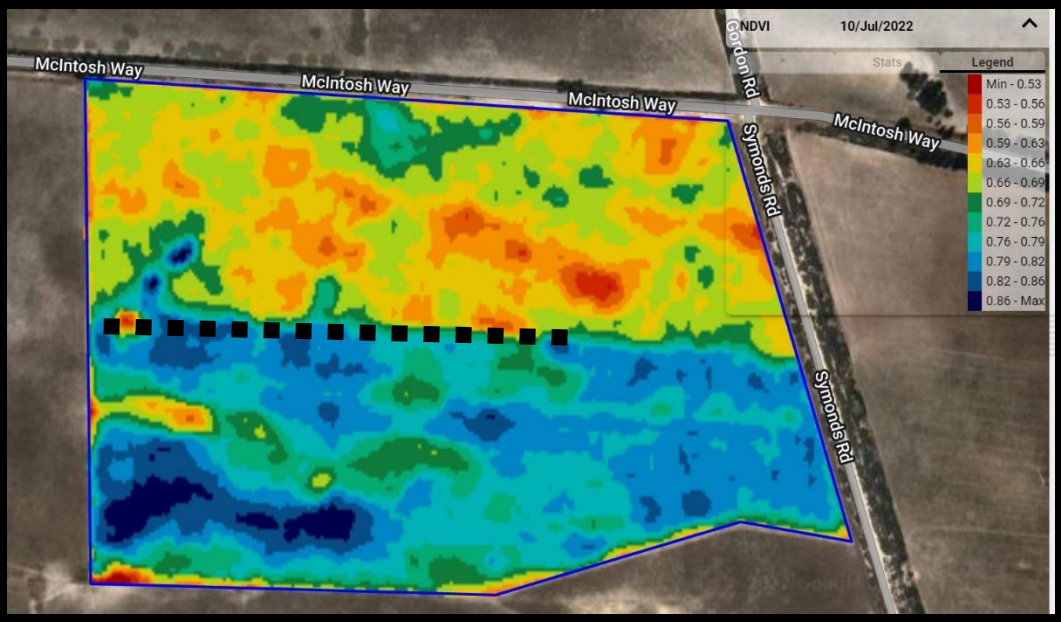

Image © 2023 Airbus
Google Earth
Imagery Date: 2/22/2023 lat -36.396912° lon 140.328506° elev 54 m eye alt 1.03 km



Questions?

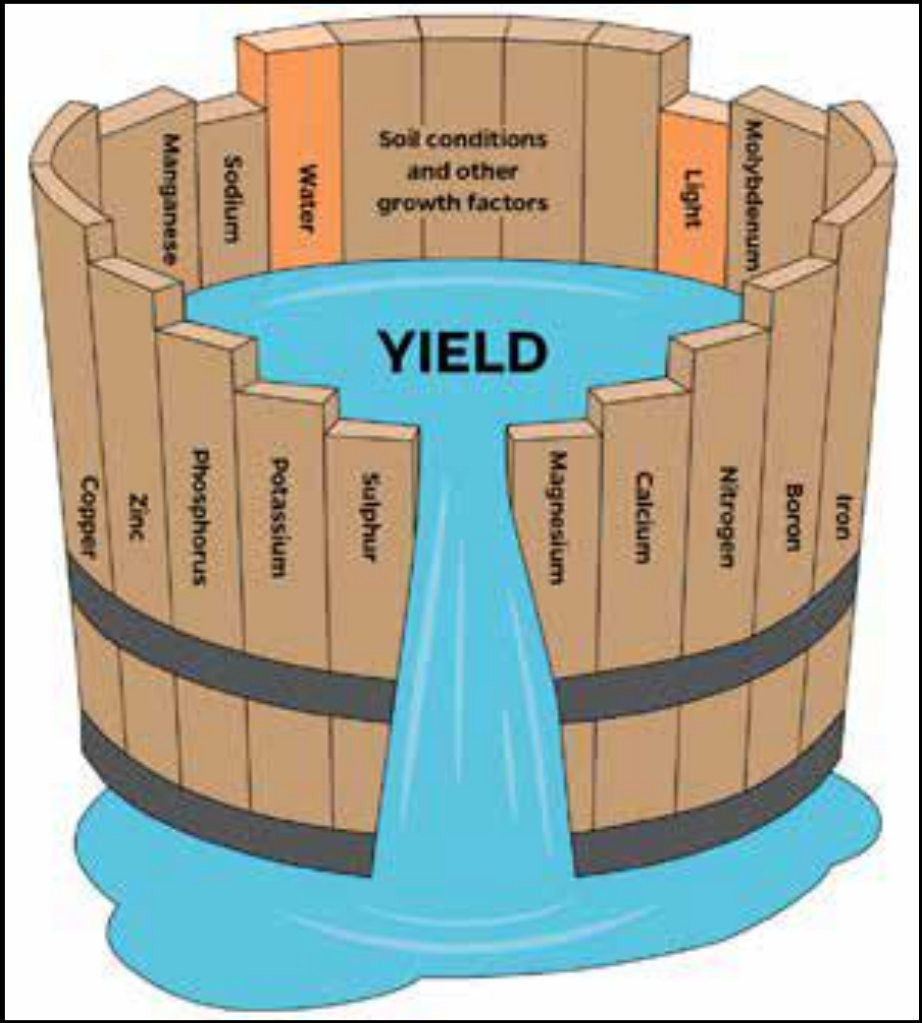
- What constraints are present?
- What are the options for treatment?
- How do you optimise the job?
- Can you make it pay?

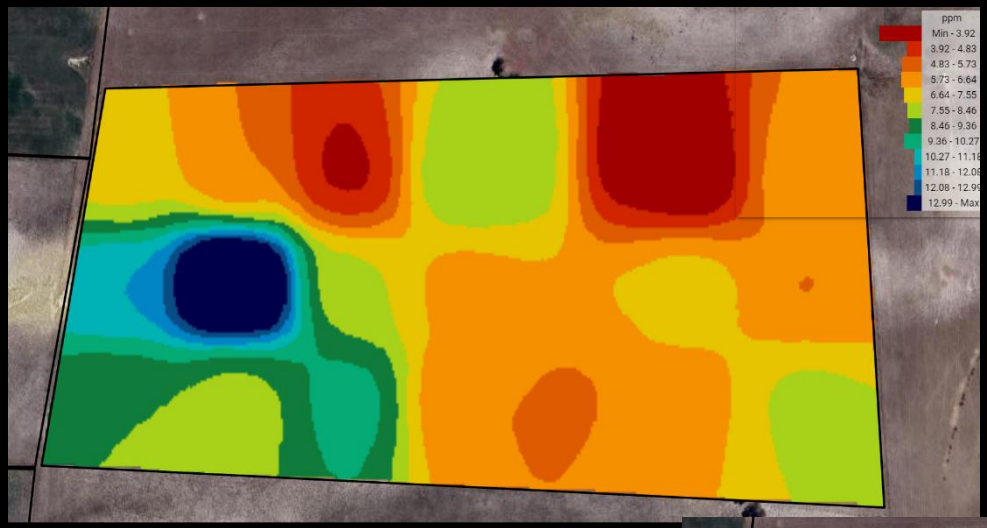
Working with what we've got


NDVI
10/Jul/2022
Stats
Legend
Min - 0.53
0.53 - 0.56
0.56 - 0.59
0.59 - 0.63
0.63 - 0.66
0.66 - 0.69
0.69 - 0.72
0.72 - 0.76
0.76 - 0.79
0.79 - 0.82
0.82 - 0.86
0.86 - Max
McIntosh Way
McIntosh Way
McIntosh Way
McIntosh Way
Gordon Rd
Symonds Rd
Symonds Rd

Foliar Treatments

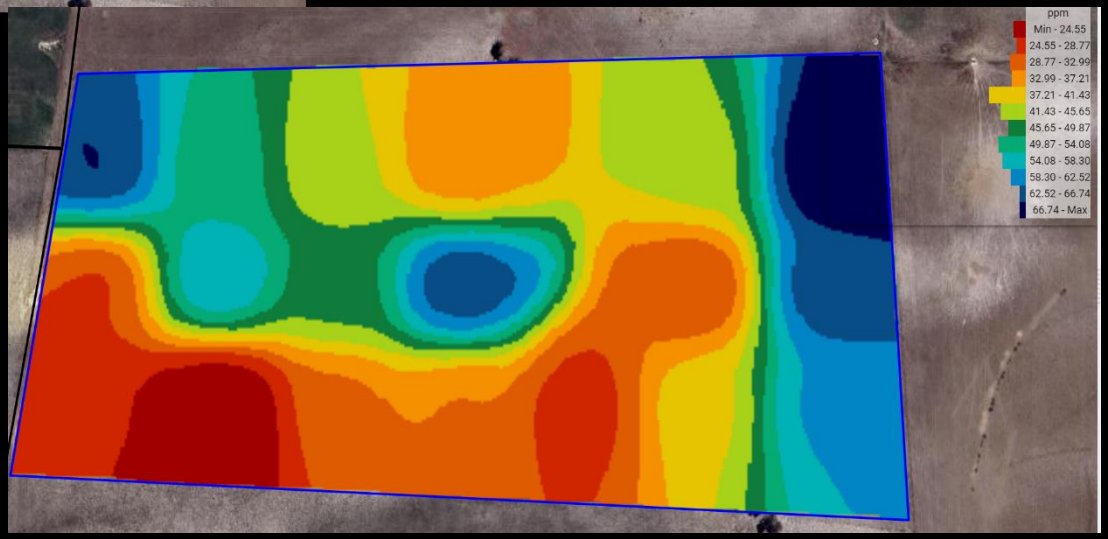
- 1T/ha DM increase
  - $10/ha + application
- 1.85T/ha DM increase
  - $45/ha + application


Soil conditions
and other
growth factors
Water
Light
Sodium
Manganese
Molybdenum
YIELD
Copper
Zinc
Phosphorus
Potassium
Sulphur
Magnesium
Calcium
Nitrogen
Boron
Iron



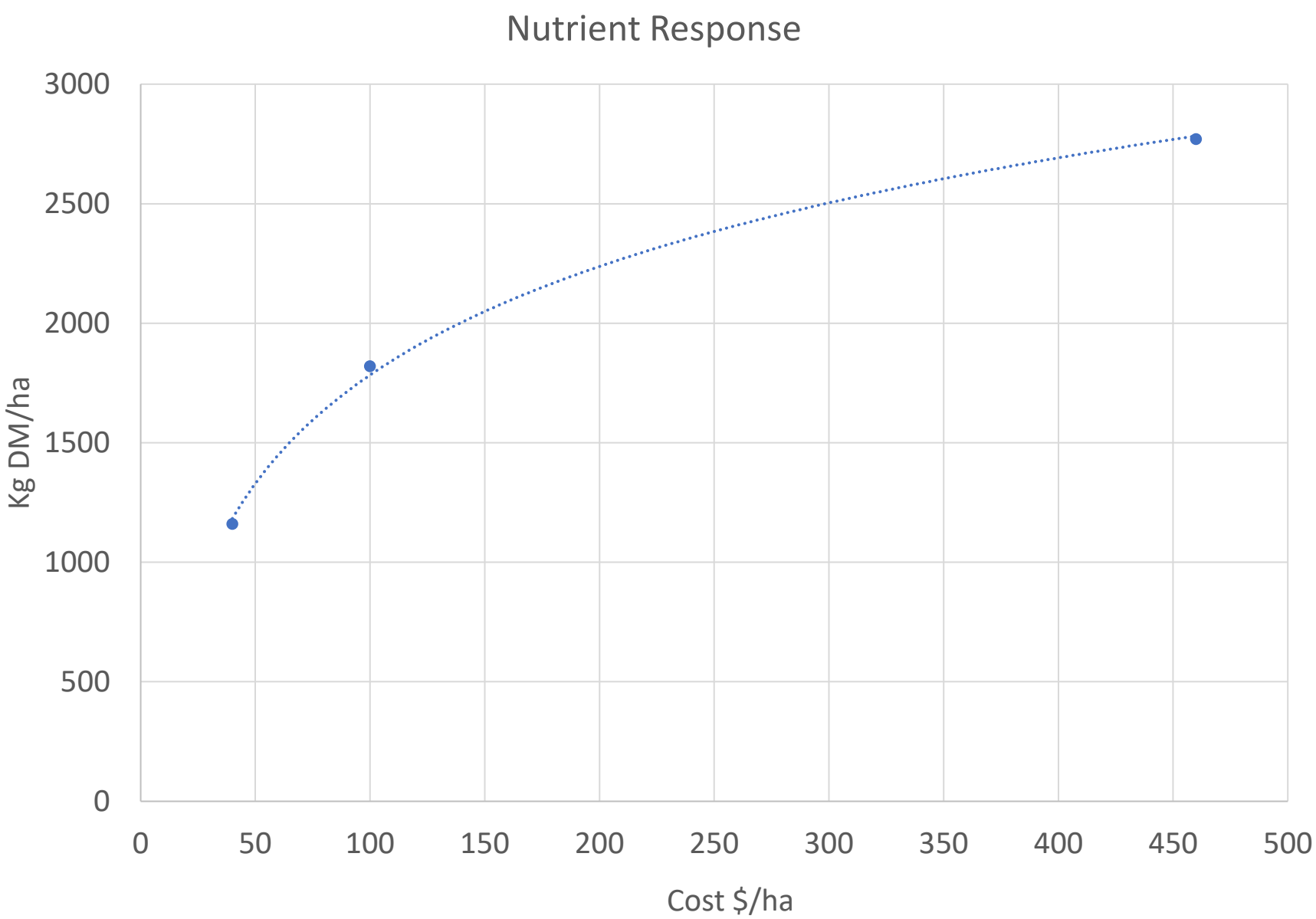
Colwell P

Colwell K



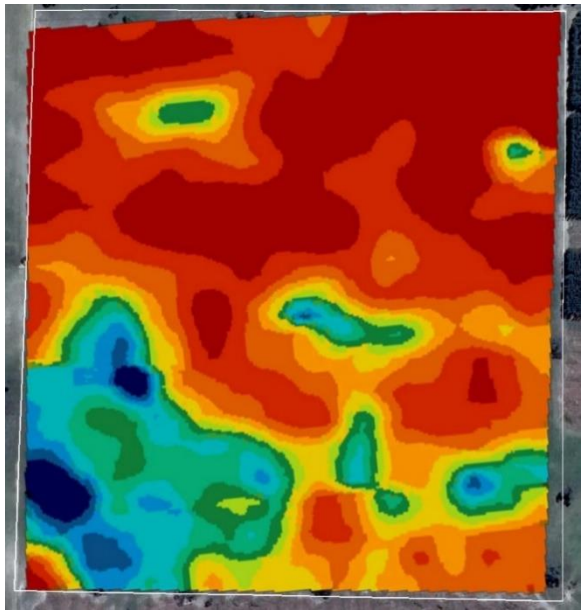
Targeting Law of Liebig's Minimum return

- 70% Production 1160kg DM/ha
- 80% Production 1820kg DM/ha
- 95% Production 2770kg DM/ha


Nutrient Response
3000
2500
2000
1500
1000
500
0
Kg DM/ha
0
50
100
150
200
250
300
350
400
450
500
Cost $/ha

Wee-Gun

Aerial photograph



Conductivity (EM38)

Blue = high
Red = low

Amelioration priorities

- Overcome water repellence – clay application @250t/ha
- Increase WHC
- Increase organic carbon and CEC
- Boost N, P and K
- Supply trace elements

1 t/ha

2 t/ha

4 t/ha

8 t/ha

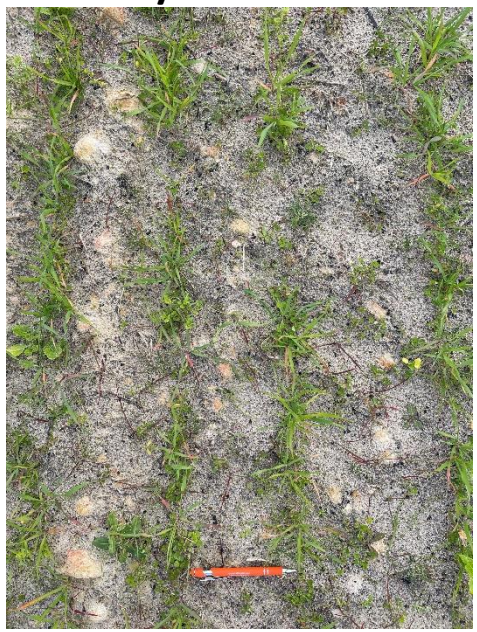
1) Custom Fertiliser: a blend of mono-ammonium phosphate, sulfate of potash, copper and molybdenum ($1873/t ex Naracoorte; GST Incl.) was spread at 160 kg/ha to supply 11N, 24P, 20K, 9S, 1Cu and 0.04Mo kg/ha ($299 + $41/ha spreading cost).

NDVI – 19 July

Fertiliser – 0.39

1 t/ha – 0.30

2 t/ha – 0.28



4 t/ha – 0.29

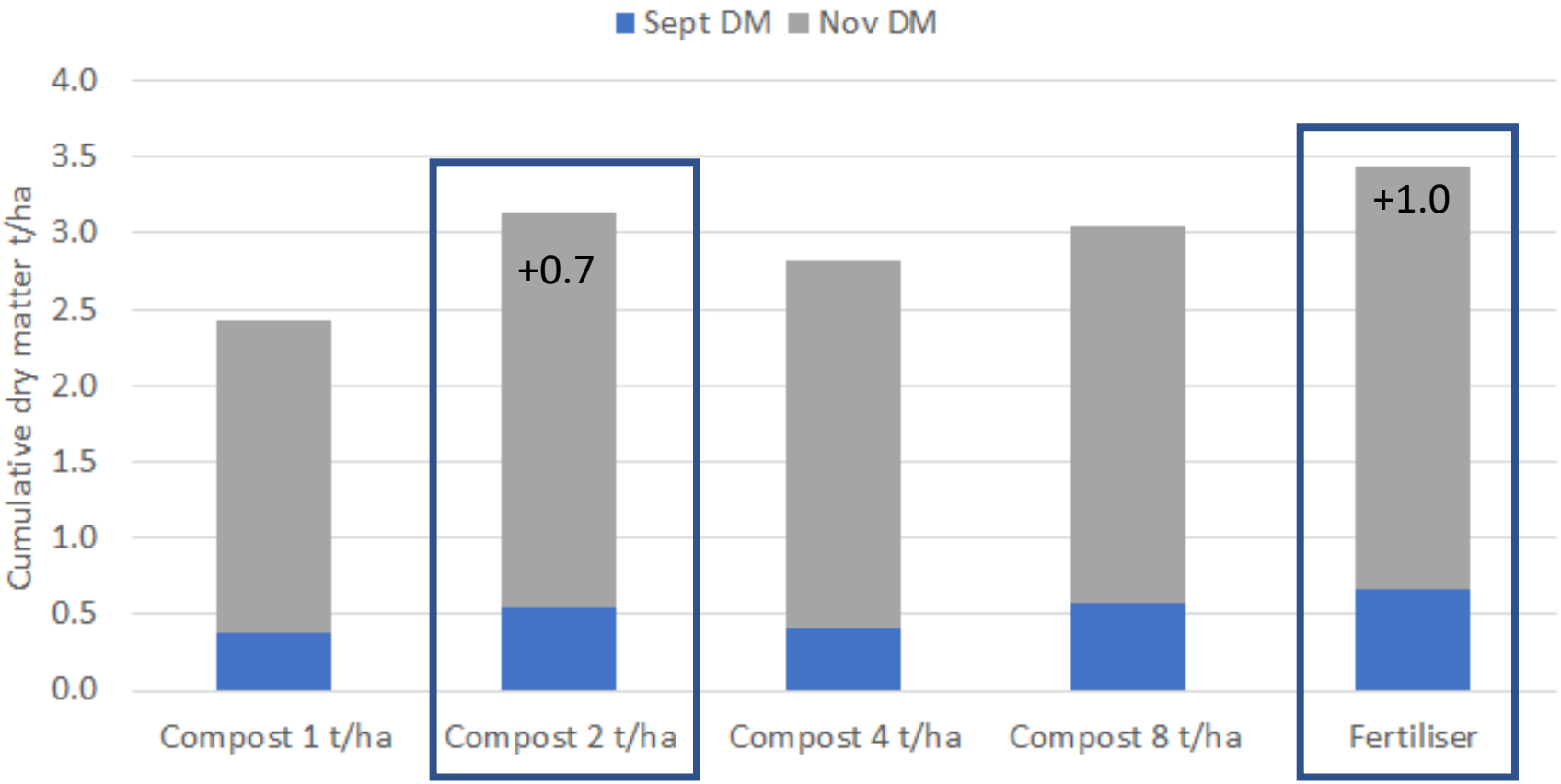
1 t/ha – 0.28

Wee Gun - Results

1 t/ha compost = 2 t/ha DM

Fertiliser = 2.8 t/ha DM

Wee Gun – Results - 2022



Wee Gun – Reflections – 2023

Clay rate and incorporation

Dispersive clay and the need for calcium

Get the timing right

Wee Gun – Reflections – 2023

Clay rate and incorporation

Dispersive clay and the need for calcium

Get the timing right

Spading & Deep Ripping Demonstration

FUNDED BY THE NATIONAL LANDCARE PROGRAM

BACKGROUND

A paddock at Western Flat was spread with 250 t/ha of clay that was incorporated in the top 15cm, overcoming water repellence. Two strips of 500 t/ha were applied and an Imants Spader + Deep Ripper was used to test clay incorporation and decompaction when operated at different ripping and mixing depths.

TREATMENTS

1) No-tillage Control
2) Rip 30cm and Spade 10cm
3) Rip 40cm and Spade 30cm

RESULTS

Soil strength was measured in August 2022 using a digital penetrometer. Penetration resistance exceeded the critical threshold of 2,500 kPa at 35cm in the Control, and was substantially improved by ripping to 40cm and spading to 30cm (Figure 1).

Image 1. Imants spader with deep rip tines for enhanced deep tillage.

Image 2. Treatments were applied to plots 10.5m wide, as seen here on the left.

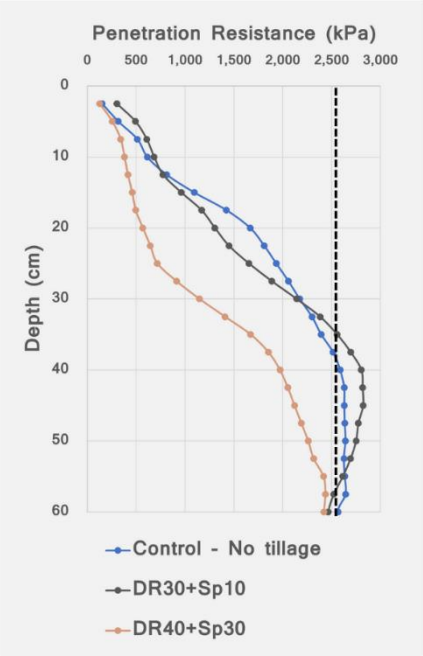
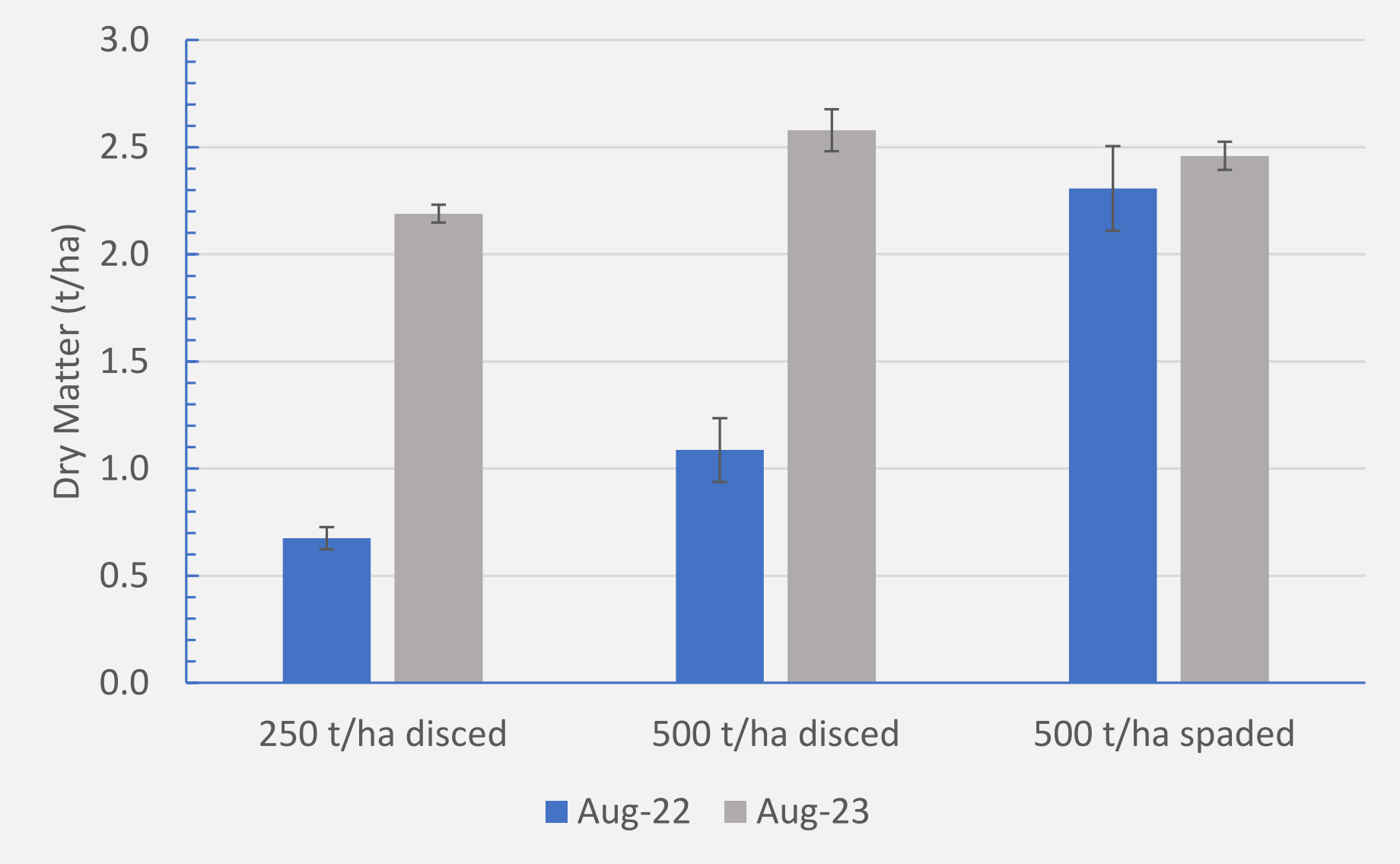


Figure 1. Deep ripping and spading reduced soil strength after clay spreading.

Many thanks to Hamish Verco for hosting this trial at Wee-Gun, Western Flat, SA.


NEW HOLLAND


3.0
2.5
2.0
1.5
1.0
0.5
0.0
Dry Matter (t/ha)
250 t/ha disced
500 t/ha disced
500 t/ha spaded
Aug-22
Aug-23

What happened to the biology?

Transition to SOIL HEALTH

Wee Gun results

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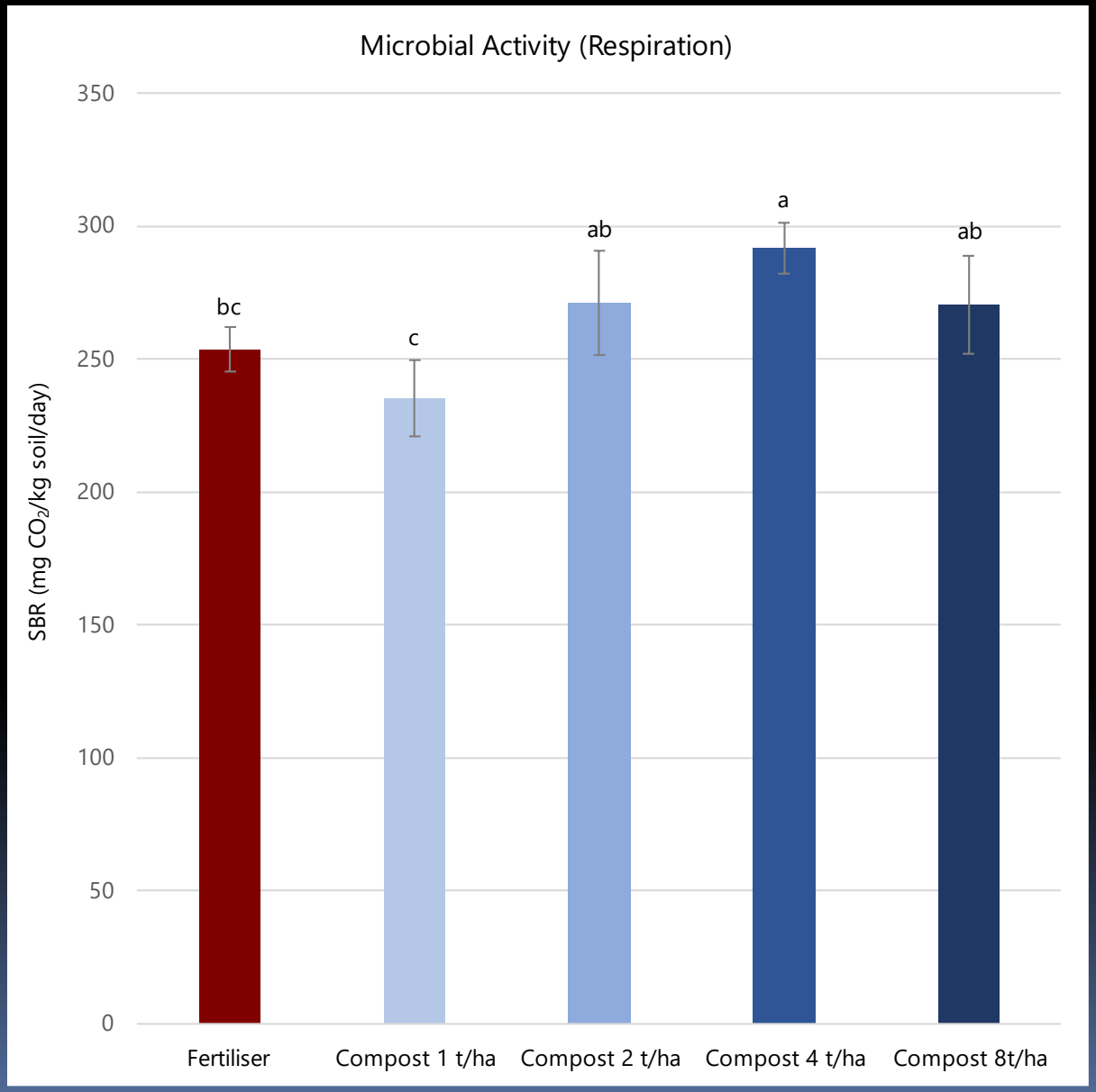
Transition to SOIL HEALTH

Microbe Activity (Respiration)



- Higher microbe activity with higher compost
  - Food
    - OM
    - Nutrients

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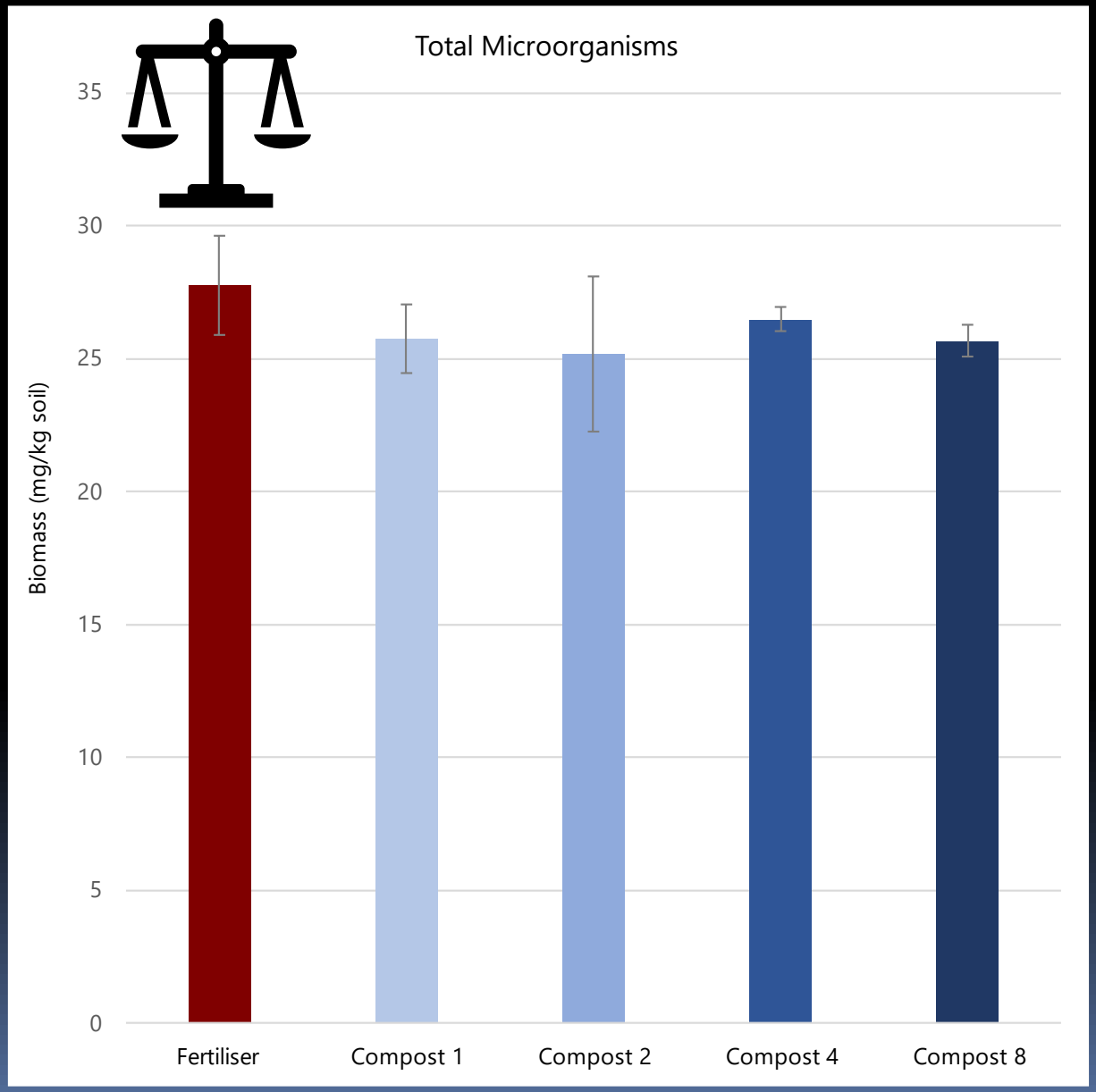
Transition to SOIL HEALTH

Total Microbe Biomass (PLFA)



- No difference between treatments
- Different trend to Activity
  - Tests telling us different things / perspective

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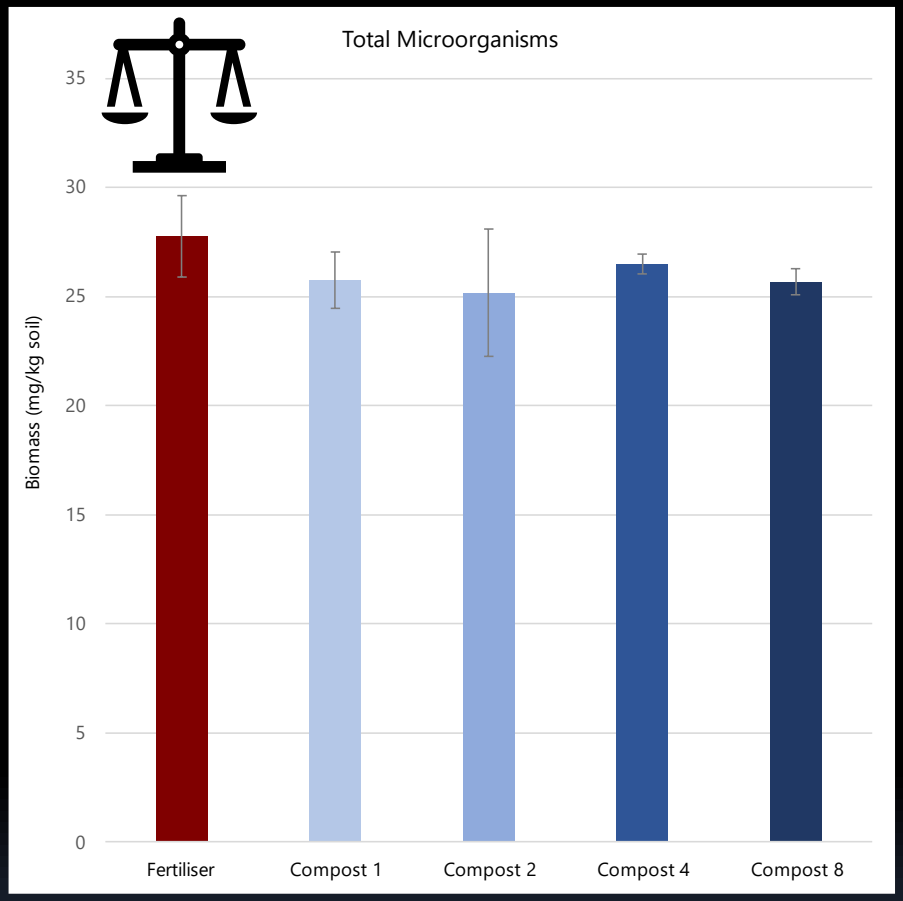
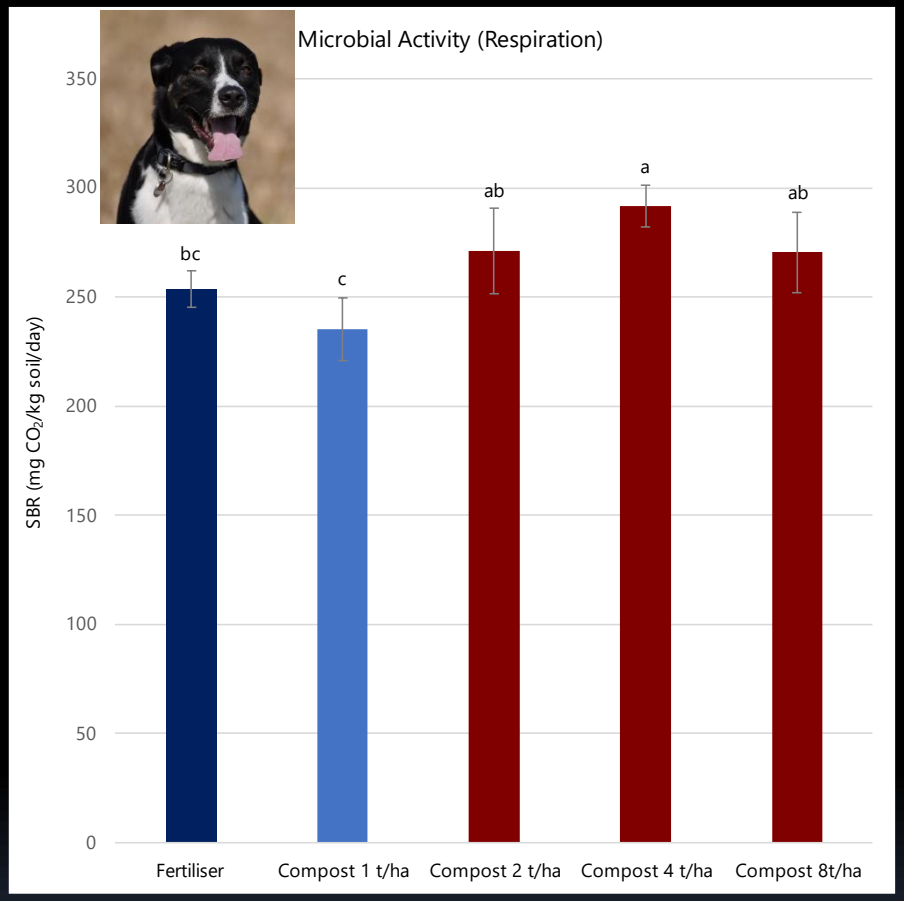
Transition to SOIL HEALTH

Total Microbe Biomass (PLFA)





- Biomass ≈ how many
- Activity ≈ how active

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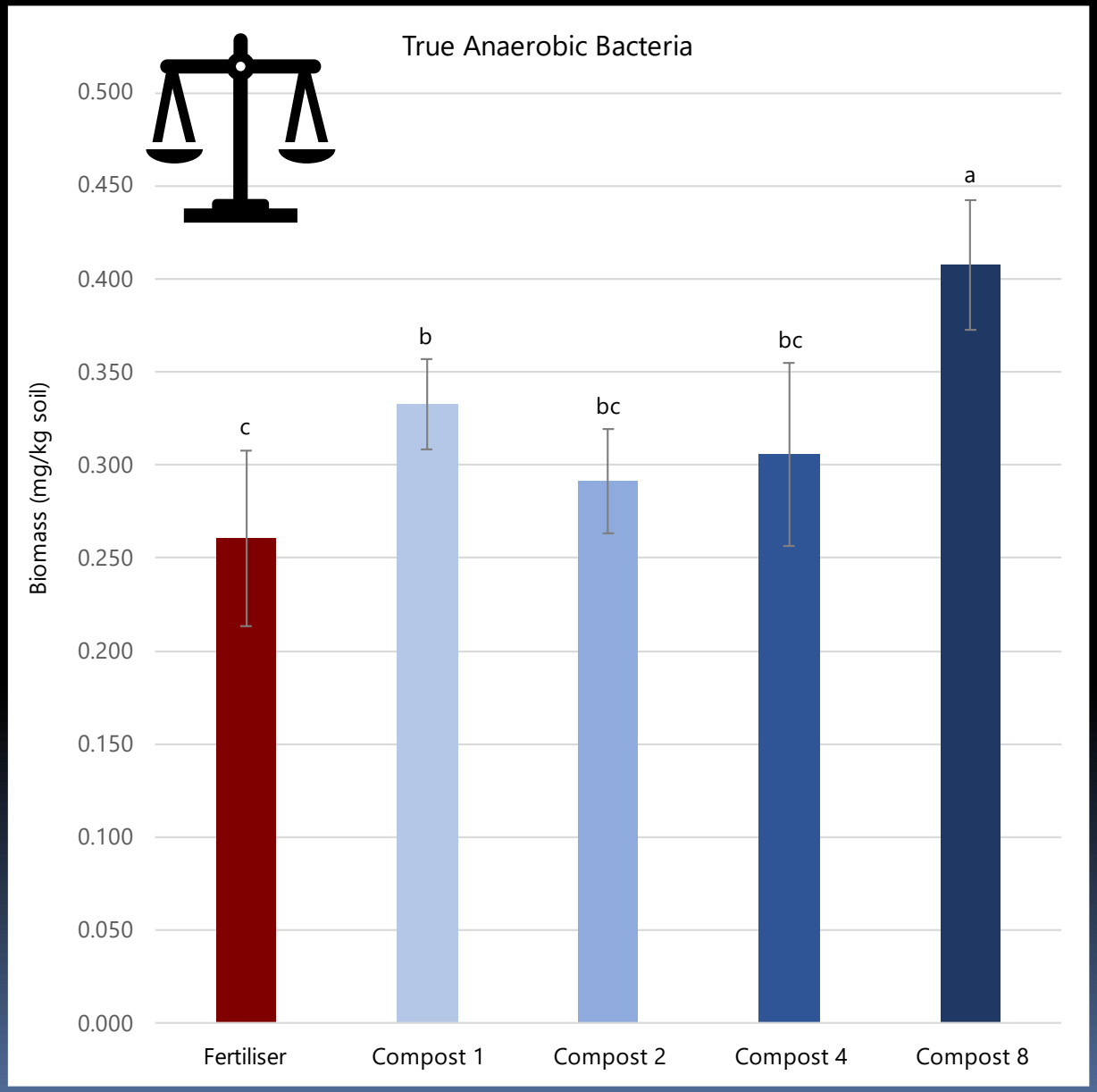
Transition to SOIL HEALTH

Anaerobe Biomass (PLFA)



- Anaerobes indicate low aeration
  - Compaction?
  - Crusting?
  - ??

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Transition to SOIL HEALTH

Lets make a move!

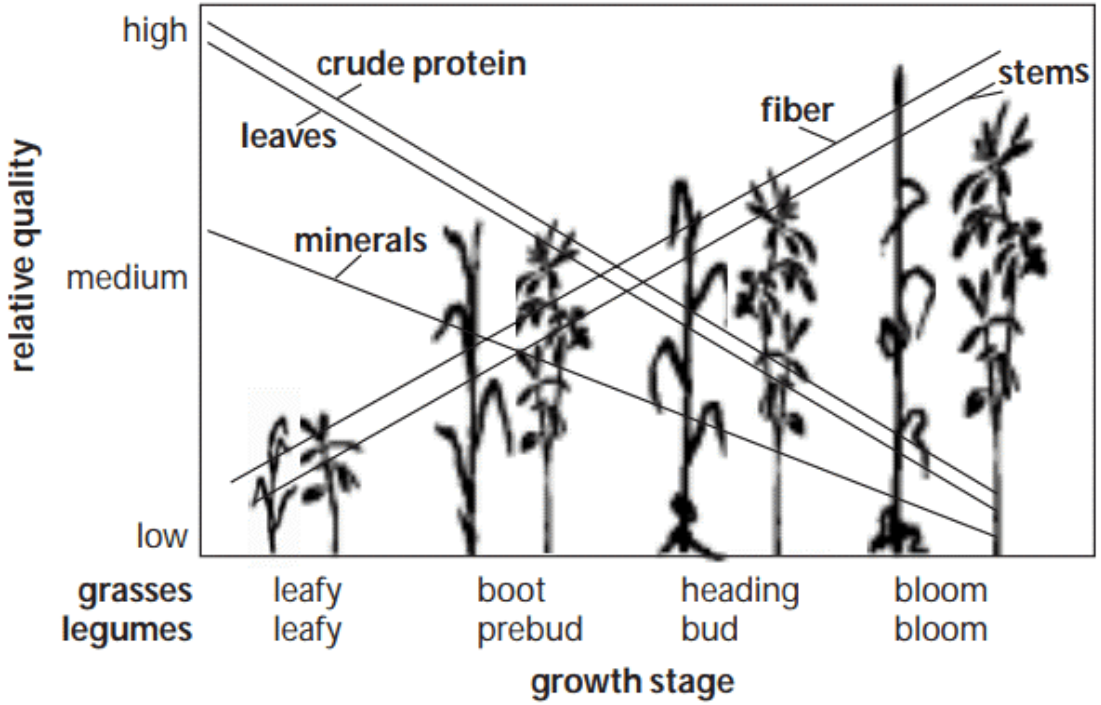
A framework to help put soil management learnings into practice to achieve measurable benefits

What was the impact on feed?

Improving production on sandy soils update

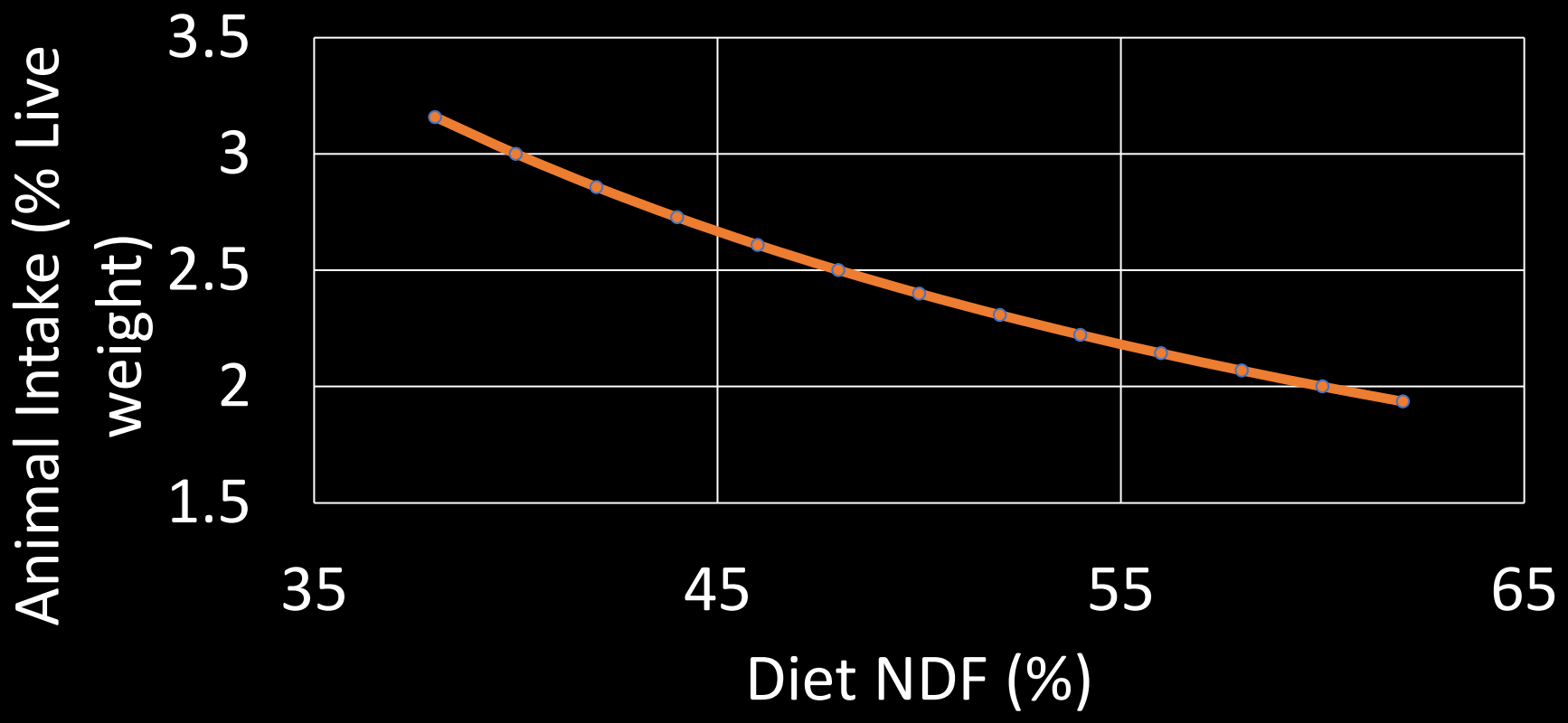
Feed quality considerations

Michael Wilkes

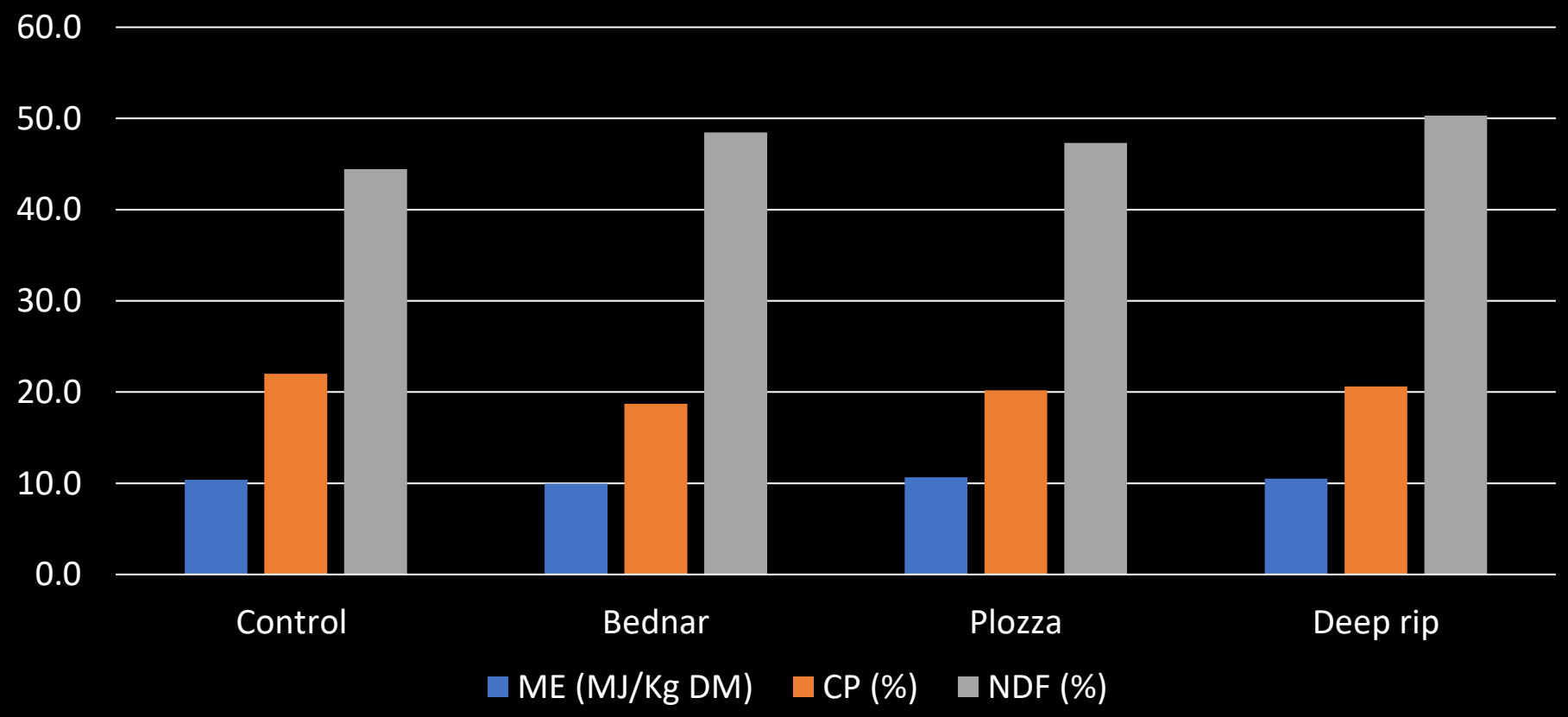


Source: *Adapted from Blaser, R., R.C. Hammes, Jr., J.P. Fontenot, H.T. Bryant, C.E. Polan, D.D. Wolf, F.S. McClaugherty, R.G. Klein, and J.S. Moore. 1986. Forage–animal management systems. Virginia Polytechnic Institute, Bulletin 86-7.*

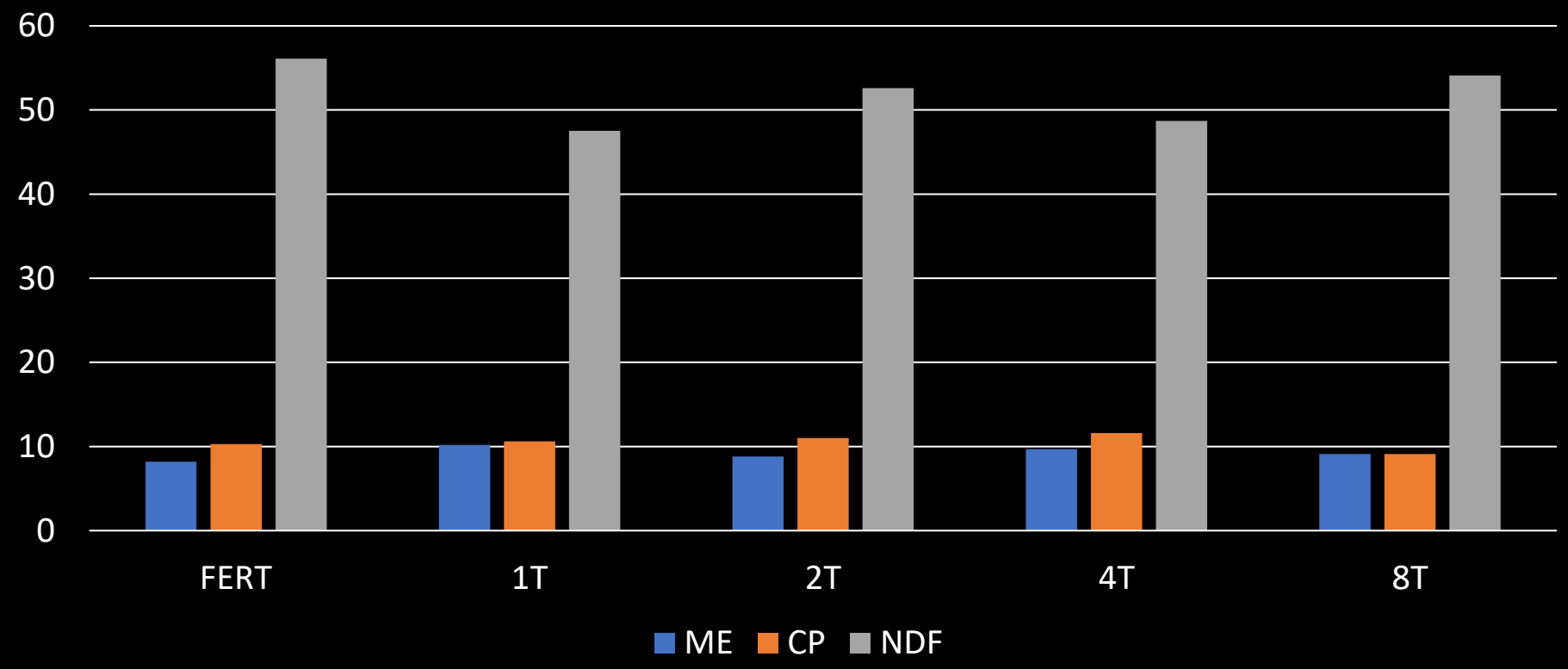
Maximising Feed Intake



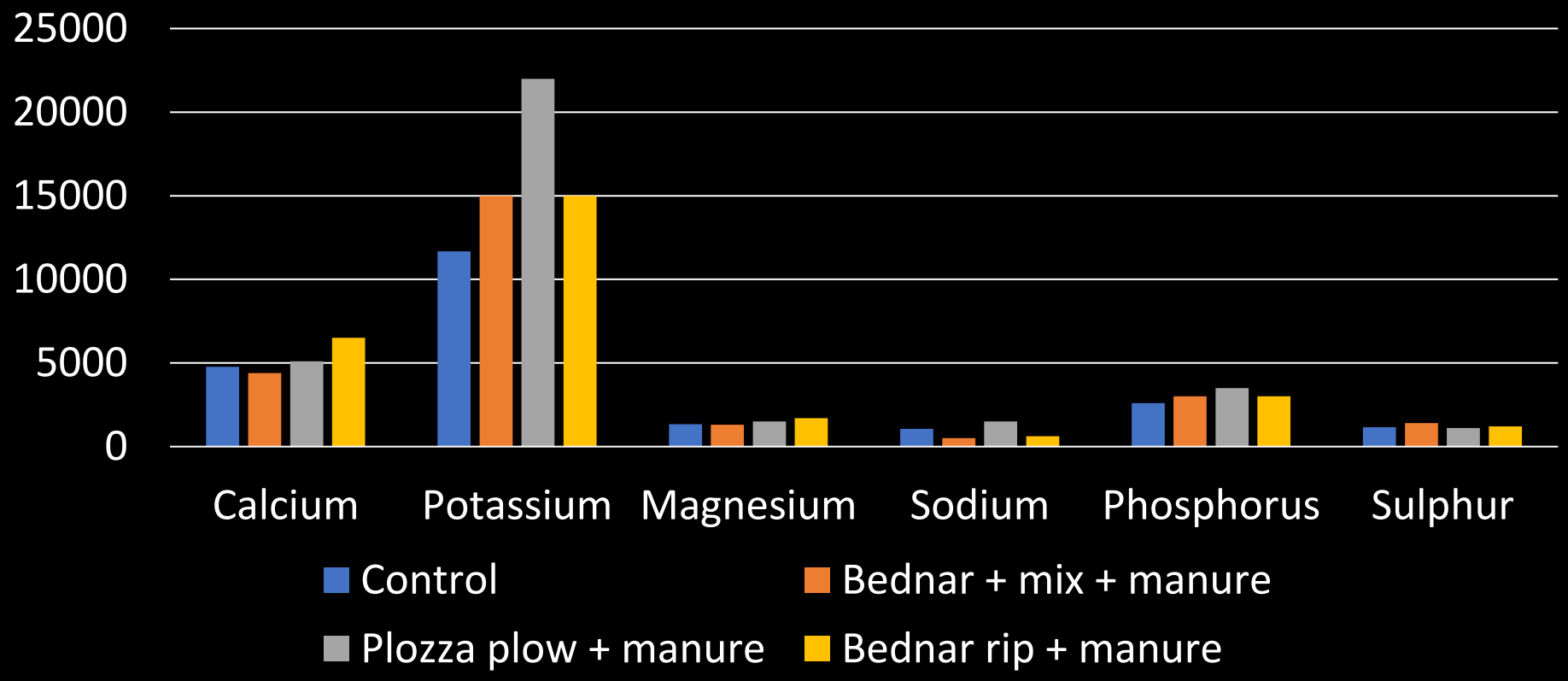
2023-Feed quality-Booderoo



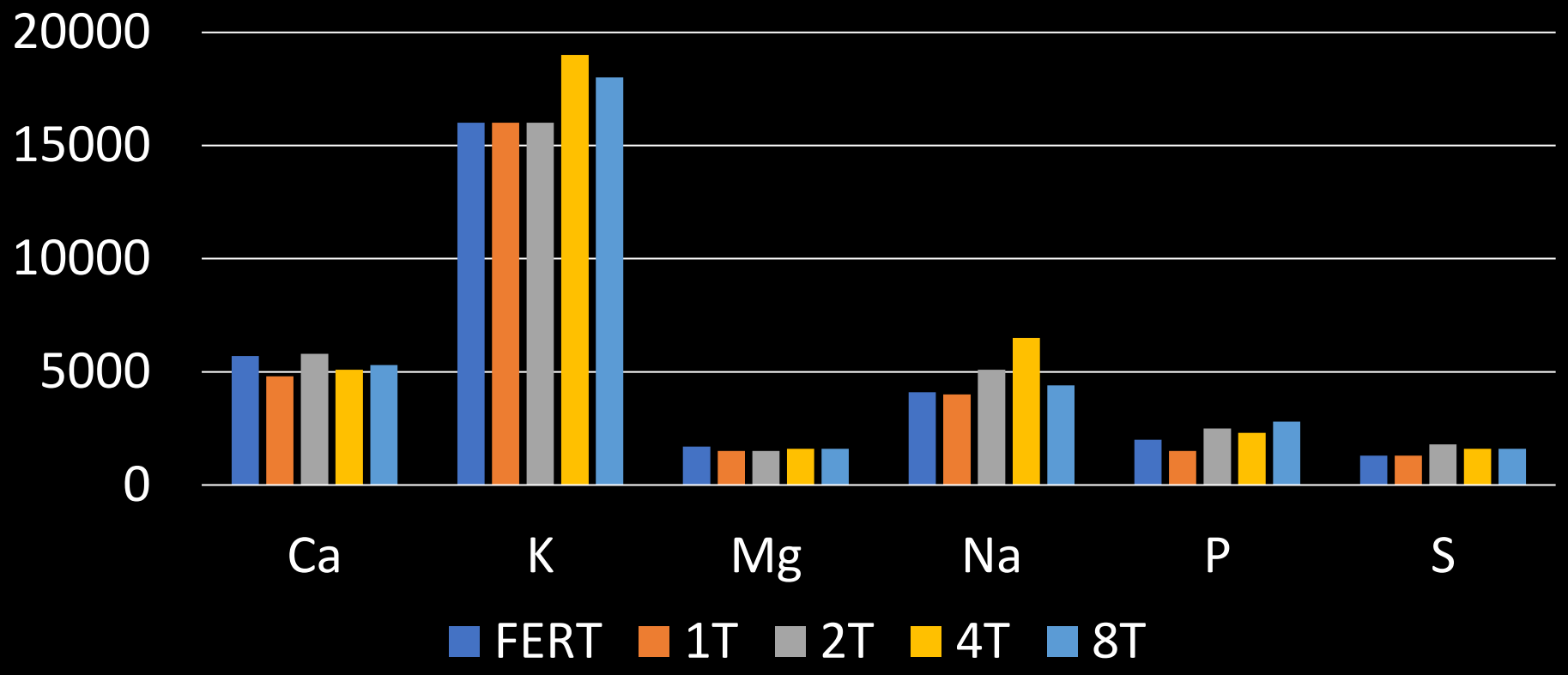
2023-Feed quality-Wee Gun



2023- Pasture Macro minerals-Booderoo



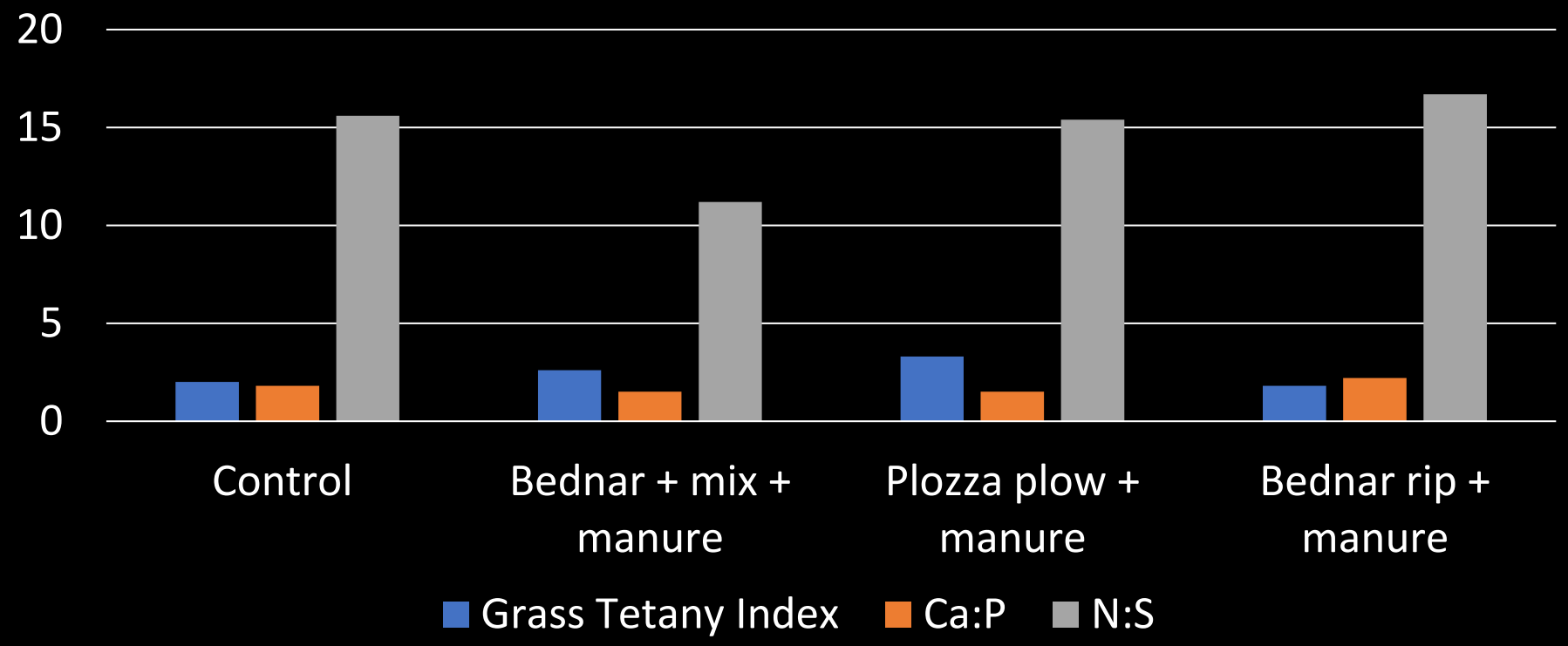
2023- Pasture Macro minerals-Wee Gun



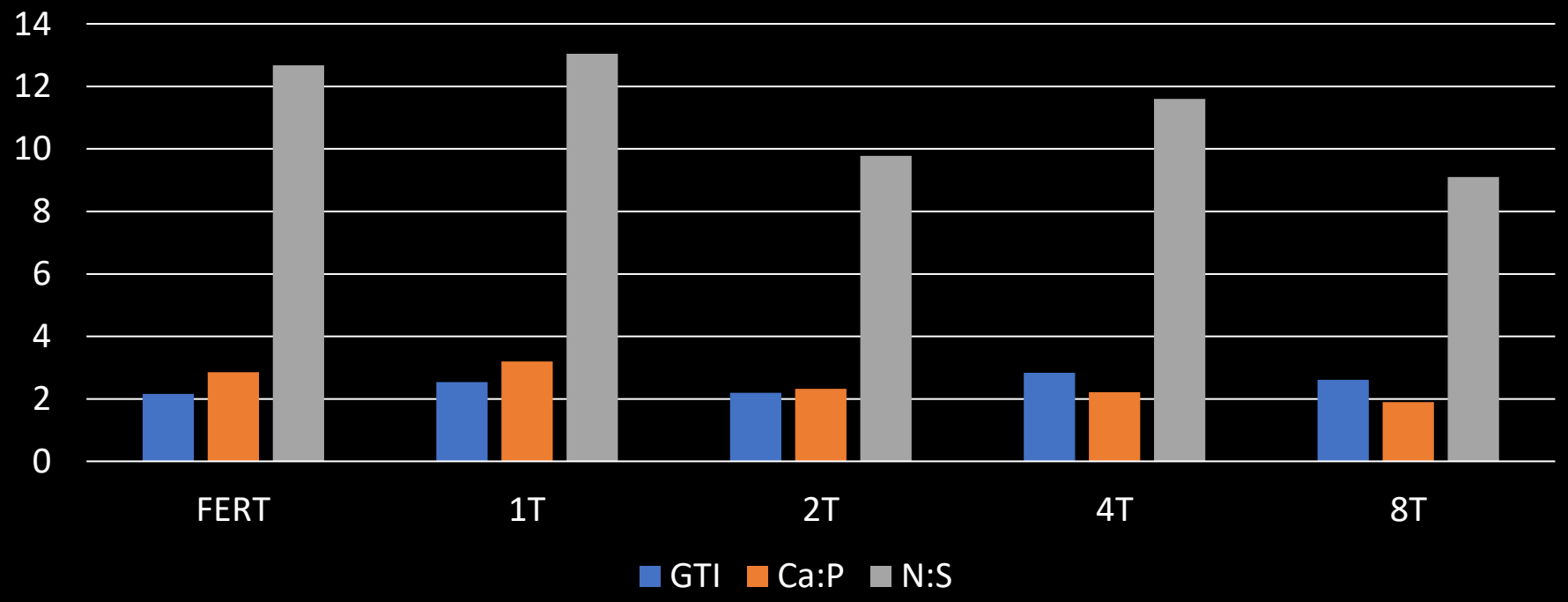
Pasture mineral considerations

- **Grass Tetany Index-** <2.2:1
- **Calcium:Phosphorous-** 2:1
- **Nitrogen:Sulphur-** 12-20:1

2023- Pasture Macro mineral ratios-Booderoo



2023- Pasture Macro mineral ratios-Wee Gun



Don’t forget the Micro minerals

- **Cobalt**
  - B12 synthesis
- **Copper**
  - Bone development
  - Blood cell development
  - Hair, hoof and fibre growth
- **Zinc**
  - Immune function
  - Reproductive function
  - Hair and hoof growth
- **Iodine**
  - Thyroid function
    - Metabolic rate
    - Reproductive function
- **Manganese**
  - Energy metabolism
  - Blood cell development
  - Bone development
- **Selenium**
  - Immune function
  - Reproductive function
  - Antioxidant status

Take home thoughts..

- Match to the feed requirements of livestock
  - ? If we can grow more earlier, does this change the production schedule?
- **Maximise pasture utilisation and feed intake**
- TEST to understand the composition of that feed:
  - Vegetative state pasture
    - K,Ca,Mg balance
  - Mature/Senescent pasture
    - Ca:P
    - Protein and Sulphur
- TARGETED supplementation to manage imbalances/deficiencies

MICHAEL WILKES LIVESTOCK CO.

‘This activity is jointly funded by MLA, GRDC and the Limestone Coast Landscape Board with funding from the Australian Government National Landcare Program and Future Drought Fund’.

Hosts, MLA, Ehsan and Limestone Coast Landscape Board, NLP, Presenters and Tracey Strugnell and the CTLAP

Thank you

What’s next? Any ideas you want to take test or take further?

- Current sandy soils projects
- Future Drought Fund – Extension, Long Term Trials – 5 years

Dryland Lucerne, maybe Veldt, Virtual Fencing, Mixed Species crops/pastures, carbon, C4 grasses

Project Summary

Improved knowledge and health of non wetting soils delivering sustainable and productive soil management decisions based on evidence

FUNDED BY THE NATIONAL LANDCARE PROGRAM

PROJECT SUMMARY

The project has been developed to optimise soil health and water use on sandy grazing country across the Coorong and Tatiara District Council regions. This project will demonstrate new and emerging technologies to build producer confidence to try new techniques, improve soil health and groundcover, increase production and reduce ground water recharge across the region.

PROJECT AIM

To improve the knowledge and skills of farmers in dealing with non wetting sands, understanding soil limitations, the options available to address the water repellence issues when establishing crops and pastures, and how to maximise production in existing pasture systems.

Image 1. Imants spader incorporating clay to overcome water repellence, Western Flat. (Photo credit, M. Fraser)

Image 2. Increasing perennial veldt pasture production, Meningie East. (Photo credit. F. Turner)

KEY PROJECT ACTIVITIES

Novel and conventional management techniques will be demonstrated in annual and perennial based systems on sandy soils with the aim of optimising production, maximising water use and improving soil health.

Demonstration sites will be established to address one of the following key issues

- Water repellence in sands
- Maximising pasture production in perennial based systems

These demonstration sites will be monitored over a two year period and supported with crop walks, workshops, technical updates and a web based platform.

ADDITIONAL ACTIVITIES

Installation of three automated soil moisture and water table monitoring systems and monitoring of an additional ten piezometers to capture changes in the water table and monitor dryland salinity trends.

COORONG DISTRICT COUNCIL
Tatiara the good country
Coorong Tatiara Local Action Plan
Australian Government
National Landcare Program

This project is supported by the Coorong and Tatiara District Councils through funding from the Australian Government's National Landcare Program

Increasing veldt production on sandy soils

BACKGROUND

Veldt grass over time has become dominant in the landscape across the Coorong and Tatiara District council regions.
As a pasture species that often regenerates naturally on sandy soils, little is known about its production potential and the agronomic practices that will maximise feed production - both quality and quantity. Three demonstration sites were established in 2022 looking at different agronomic opportunities to try and increase production.

TREATMENT LOCATIONS

Menalpyn - The role of Giberllic acid mixes in increasing veldt production

Jacobs Well - Exploring the soil nutrition requirements of veldt pasture

Cavanagh Farms - Can foliar treatments assist in increasing veldt production

Image 1. Location of Veldt treatment sites

Image 2. Veldt flowering in Spring, Field

ACTIVITIES AT EACH SITE

Each site was soil tested prior to the treatment being applied to understand the initial soil fertility levels.
Soil tests were taken from the 0-10cm layer (surface sampling) and the 10-30cm layer to look at soil fertility levels through the profile.
A combination of sampling techniques was utilised;

- Zone sampling (field was split into 3 soil zones based on historic imagery layers)
- Grid sampling (field was sampled on a 1ha grid to assess field variability)
- Representative path sampling (area was sampled on a path across the treatment area which was relatively consistent.

The demonstration strips were then applied across the paddock with biomass cuts taken to assess variation across treatments at a given time after application.

This project is supported by the Coorong and Tatiara District Councils through funding from the Australian Government's National Landcare Program

Cavanagh Farms

CAN FOLIAR TREATMENTS ASSIST IN INCREASING VELDT PRODUCTION?

BACKGROUND

With the observations being made at Menalpyn in 2021, farmers were keen to see if these results could be replicated in other areas, so a demonstration site was established at Mount Charles looking at the use of Giberellic Acid (GA) as a stand alone product compared with other foliar treatments to see if they could be cost-effective solutions to increasing veldt production on sandy soils.

SOIL FERTILITY SNAPSHOT

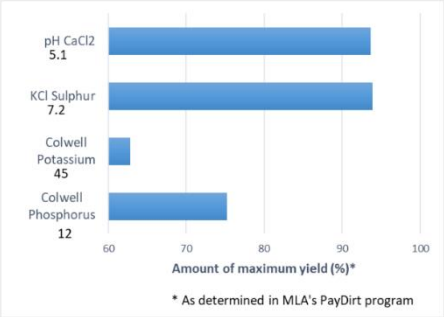


Figure 1. Soil Test results (0-10cm)

SITE ACTIVITIES

Soil Tests were taken on a transect across the site area as a representative sample.
All treatments were applied on 18/7/22 by boomspray with a control strip between each treatment for comparison.
Treatment 1: Giberellic Acid
Treatment 2: Amino Boost Max
Treatment 3: Momentum ZnP
Pasture cuts were taken approximately 6 weeks later on 28/8/22 with dry matter production and feed test data collected.

Figure 2. Site photo taken prior to sampling; GA treatment in foreground

RESULTS

Pasture assessments were taken and a sub-sample sent away for Feed Test analysis.
The Giberellic Acid provided the greatest increase in biomass production (Figure 3), however the quality of the feed was reduced - particularly when compared to the Amino Boost Max (Figure 4).
The control production measured was 1300kg DM/ha on the 28/8/22.

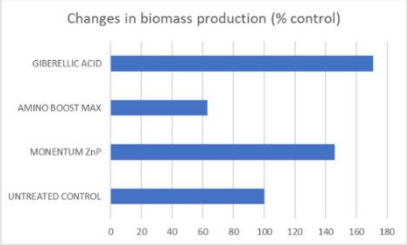


Figure 3. Changes in biomass production as a % of the untreated control

	CONTROL	Momentum ZnP	Amino Boost Max	Giberellic Acid
Dry Matter (%)	49.3	51.3	37.1	35.9
Crude Protein (%)	5.6	4.2	9.9	7.1
NDF (%)	72.4	76.1	66.5	73.2
DMD (%)	46.5	44.5	53.4	49.9
Est.ME (MJ/kg DM)	6.4	6	7.6	7

Figure 4. Differences in key feed quality factors between treatments

Thanks to the Allen / Cavanagh families for hosting this demonstration

"Menalpyn"

THE ROLE OF GIBERELLIC ACID MIXES IN INCREASING PASTURE PRODUCTION

BACKGROUND

The Cartledge family have been farming Menalpyn since it was cleared. Over that time pasture mixes have changed, but veldt grass has become an integral part of their pasture along with lucerne on which they graze their cattle.

Two years ago, they sprayed some strips of giberellic acid (GA) and other products across some veldt pastures to see if they could improve their winter feed production. The initial results were encouraging, so a more formal demonstration was established to quantify these responses and see if they were repeatable.

SOIL FERTILITY SNAPSHOT

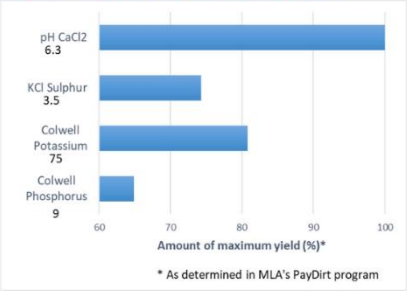


Figure 1. Average soil test results (0-10cm)

SITE ACTIVITIES

The site was soil tested on a zone basis to see how the site varied across different production zones. The average results (across 4 zones) are those presented in Figure 1.

Foliar treatments were then applied (2 different timings) and plant biomass measured prior to grazing.

Figure2. Visual response to treatment (RHS)

Tmt 1: Untreated Control
Tmt 2: SOA Applied 24/5/22 + Giberellic acid, UAN, Manganese, Copper, Zinc and Fulvic acid applied on 23/6/22.
Tmt 3: SOA Applied 24/5/22

RESULTS

Pasture assessments were conducted on 26/7/2022 to measure differences between treatments. They show a large increase in biomass production on low fertility soil in that critical winter period when feed is often lacking. (Control = 740 kg DM/ha)

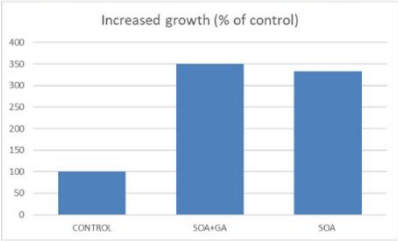


Figure 3. Biomass responses to treatments

Later applications (end of July) of the GA mix resulted in an increase in production but it wasn't as great as the earlier timing.

Thanks to the Cartledge family at Menalpyn for hosting this demonstration

"Jacobs Well"

EXPLORING THE SOIL NUTRITIONAL REQUIREMENTS OF VELDT GRASS

BACKGROUND

For a grass species that dominates the landscape in the Coorong and Tatiara regions, not a lot is known about the nutritional requirements of Veldt Grass and the impact on varying soil fertility levels on production.

The demonstration at Jacobs Well is exploring this over a 2 year period to see if the production response curve of Veldt is similar to that of other temperate perennial grasses.

SOIL FERTILITY SNAPSHOT

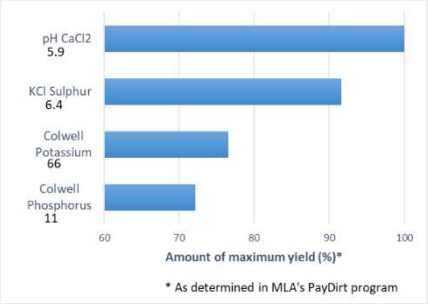


Figure 1. Average soil survey results (0-10cm)

SITE ACTIVITIES

The site was soil tested on a grid basis to determine nutrient variability across the site. Figures 2a-b shows the variability of key soil properties across the site.

Nutrient applications were then targeted to aim for 70%, 80% and 95% production levels as determined by MLA's PayDirt Program.

Phosporous and Potassium were then applied to target levels separately through a variable rate spreader.

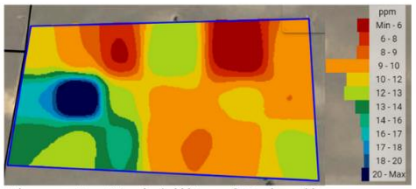


Figure 2a. Variability of Colwell phosphorous (P) (0-10cms)

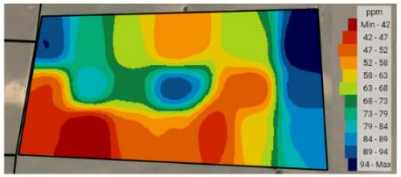


Figure 2b. Variability of Colwell potassium (K) (0-10cms)

RESULTS

The site was grazed over the winter and spring period and visual observations made with a noticeable change in pasture composition observed where the higher nutrient levels were applied (higher clover content).

In 2023, the spring growth 4 weeks post-grazing was measured (22/9/23) with the results shown below in Figure 3. This suggests that veldt grass may be nutrient responsive and that there is the capacity to increase production through fertiliser applications.

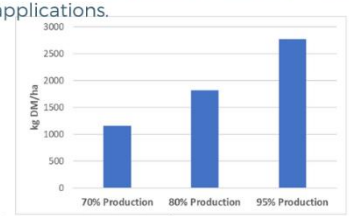


Figure 3. 2023 Spring Dry Matter results across fertiliser target production levels

Thanks to Mark Turner for hosting this demonstration

Deep Ripping + Inclusion Plates Demonstration

FUNDED BY THE NATIONAL LANDCARE PROGRAM

BACKGROUND

A paddock at Sherlock was deep ripped in 2022 to overcome high soil strength and dilute severe water repellence at the surface. A 6m wide Agrowplow SLTAP91 deep ripper with inclusion plates fitted was used to funnel the topsoil into the subsoil behind the shank, with the aim of de-compacting the profile to >50cm.

Image 1. Agrowplow Deep Ripper with inclusion plates fitted on the outside shanks.

TREATMENTS

1) No-tillage Control
2) Deep Rip + Inclusion Plates

Two seeding configurations were tested: direct seeding; and direct seeding + additional seed broadcast to achieve zero row spacing.

RESULTS

Soil strength was measured using a digital penetrometer. Penetration resistance (PR) exceeded the critical threshold of 2,500 kPa at 17cm in the Control (Figure 1); deep ripping reduced the PR below this threshold to a depth of 45cm.

Deep ripping increased barley grain yield by 0.16 t/ha above the Control (1.46 t/ha, Figure 2), and was further improved with zero row spacing (+ 0.32 t/ha).

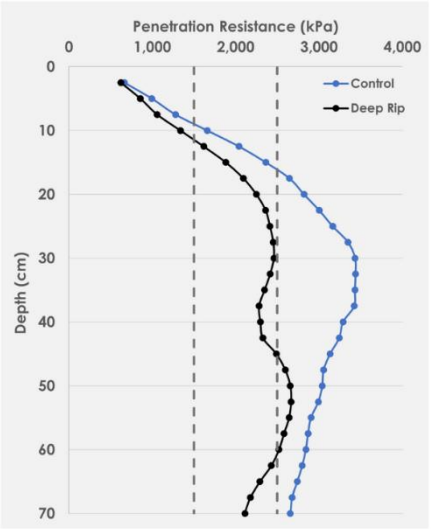


Figure 1. Soil penetration resistance (kPa), showing deep ripping causes a substantial reduction in soil strength.

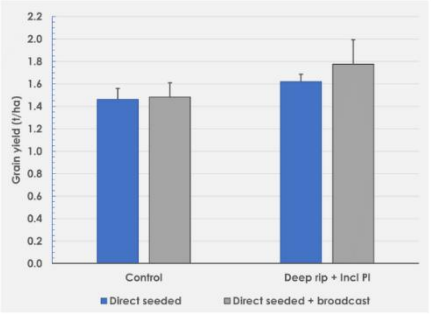


Figure 2. Barley grain yield results in 2022 in response to deep ripping with direct sowing +/- additional broadcast seed to achieve zero-row spacing.

Many thanks to David Peter for hosting this demonstration at Sherlock, SA.