PRODUCTIVE SALTLAND PASTURES
FOR SOUTHERN WA

MLA PDS L.PDS.2203

TOMLINSON PDS REPORT

Producer Demonstration Site

mla
MEAT & LIVESTOCK AUSTRALIA

GILLAMII CENTRE
Sustainable Agriculture In Practice

TAMGAREE KIKUYU

About the Project

2022-2027

In early 2022 the Gillamii Group was successful in obtaining funding for a new project through Meat and Livestock Australia (MLA) Producer Demonstration Sites (PDS) Program. The project is called 'Productive Saltland Pastures for Southern WA' and is a continuation of Gillamii's commitment to the remediation of salt-affected land into productive pasture systems for livestock grazing.

This PDS Project aims to improve members' knowledge and skills in the establishment, management, and benefits (profitability, productivity, and sustainability) of salt-tolerant forage systems on moderately salt-affected land. The objective of this program is to establish 150 hectares of salt-tolerant forage pastures on 6 local sites to demonstrate variation in productivity of key shrub and understory varieties and a paddock scale increase in:

- a. late summer/autumn (February – April) biomass production (up to 300%)
- b. soil organic carbon and total carbon

A cost-benefit analysis will also be conducted at each site to determine relative economic performance of the salt-tolerant feed-base systems as well as key livestock data (stocking rates, grazing days and liveweight gain of livestock).

This project is funded through Meat and Livestock Australia's (MLA) Producer Demonstration Sites (PDS) Program, supported by a group of dedicated host farmers.

Contents

Project Stakeholders

The Team

Role	Responsibility
Freya Spencer Gillamii Centre Project Manager	Responsible for the management of the project (deliverables as per Project Deliverables: Gillamii Responsibility section of landholder agreement, milestone stones, organisational structure, reporting and finances).
Alana McEwan MLA Project Manager	Responsible for the management of MLA's National PDS Program.
Hilary Waterson Gillamii Centre Financial Manager	Responsible for day-to-day management of project finances and financial audits.
PDS Host Landholder Tomlinson Addis Standish House	Responsible for project deliverables as per Project Deliverables: Landholder Responsibility section of the landholder agreement.

Project Partners

Role	Responsibility
Meat & Livestock Australia	Provide main financial support for site establishment, monitoring and extension.
CSIRO	Provide technical support for site establishment, extension and in-kind pasture analysis (nutrition and biomass).
DPIRD	Provide technical support for site establishment and extension.

Site Overview

Tomlinson Family

Salt River Road, Cranbrook

Site: 13 Hectares

Site Planning Workshop

Overview

On the 23rd of June 2022 a group of local producers and Department of Primary Industries and Regional Development (DPIRD) staff, hosted by Gillamii, spent the day visiting the MLA PDS Sites to workshop ideas for saltland pasture establishment.

This planning workshop was developed in partnership with the Department of Primary Industries and Regional Development, supported by funding through the Western Australian Government's State NRM program.

The aim of the workshop was to utilise the knowledge of Gillamii's producers, experienced in productive saltland pastures, and connect them with the new PDS producers, aided by expertise from DPIRD to discuss the best pasture mixes, site design and establishment plan, tailored to our local conditions and based on producer experiences.

The outcome of the workshop was the site plan on the following page, designed to help guide the establishment of the PDS sites in 2022. Baseline monitoring (presented in the first section of this report) was used to provide the group with additional information allowing for efficient and robust discussions out on site.

Site planning workshop at Tomlinson PDS Site

natural resource management program

Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

Site Preparation

1. Winter Spray on the 26th August 2022

- 2 Lt/ha Glyphosate 450
- 100ml/Ha Alpha Cypermethrin 200 EC + Ammonium Sulphate and wetter

2. Scarified on the 30th August 2022 - required for niche seeder

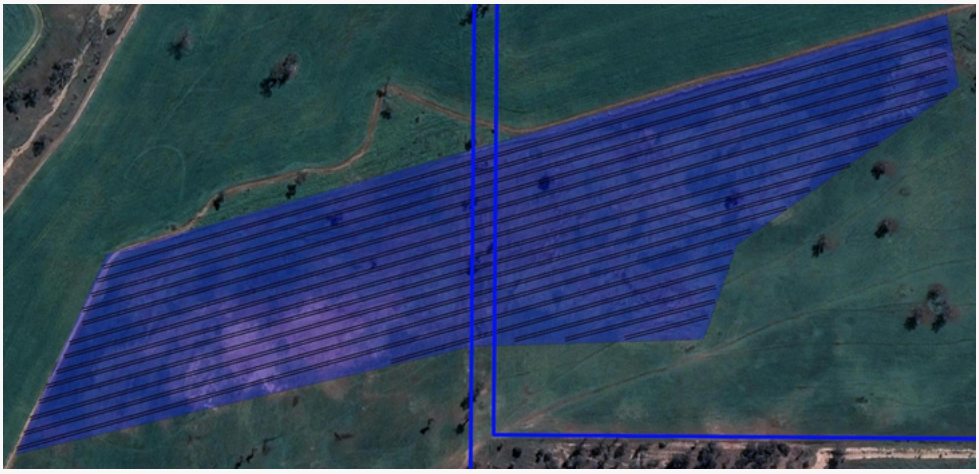
Site Seeding

1. Pasture Seeded on the 31st August 2022

- Fertiliser: 30 kg/ha MAP
- Seed:
  - 3.8kg/ha Balansa Clover
  - 0.5kg/ha Tamargee Kikuyu * Donated by Tamgaree Kikuyu
  - 1.5kg/ha Puccinellia
  - 0.75kg/ha Rhodes Grass *Chris added in
  - 9kg/ha Tall Wheat Grass

2. Saltbush Seeded on the 2nd and 16th of September 2022

- Direct seeded using the Niche Seeder
- Alleys designed to flow into existing drain
- Niche Seeder broke down on the 2nd and thus site seeding was finished on the 16th of September 2022
- Double Alley (4m between row and 12m between alley)
- Seed:
  - 0.32kg/ha Mix of Old Man, Wavy and River Saltbush
  - 2.8kg(40l)/km Vermiculite (bags are 7kg = 2.5km)



Final Saltland Pasture Plan with Shotgun Mix (Blue) and dual Saltbush Alleys which were corrected from west - east to southwest - northeast to run into drain. Dual alleys were meant to be 12m but there were closer to 10m.

Scarifying 2022 at Tomlinson PDS Site

Pasture Seeding 2022 at Tomlinson PDS Site

Saltbush Seeding 2022 at Tomlinson PDS Site

Pasture & Saltbush Seeded 2022 at Tomlinson PDS Site

Pasture Monitoring

2022 - 2027

Soil Analysis

The Veris U3/iScan scans a field's major physical, biological and chemical properties to help manage each hectare to its full potential. The Veris U3 allows rapid data collection over a wide window of soil and cropping conditions.

Note: Soil Analysis to be conducted twice only (2022 &2027)

Soil - Elevation

Topographic attributes are calculated from elevation measurements collected simultaneously with the on-the-go sensing systems using a real-time kinematic GPS.

Soil - pH

Veris on-the-go pH sensor has only one moving part – a soil sampler shoe. When the hydraulic cylinder pushes it in the ground, soil flows through. When the cylinder picks up the shoe, the soil in the shoe trough is pressed against the pH electrodes. After a few seconds the shoe is lowered again to collect more soil. As it does, the new soil coming in moves the previous soil sample out the back of the shoe trough and spray nozzles clean the pH electrodes.

Soil - OM (%)

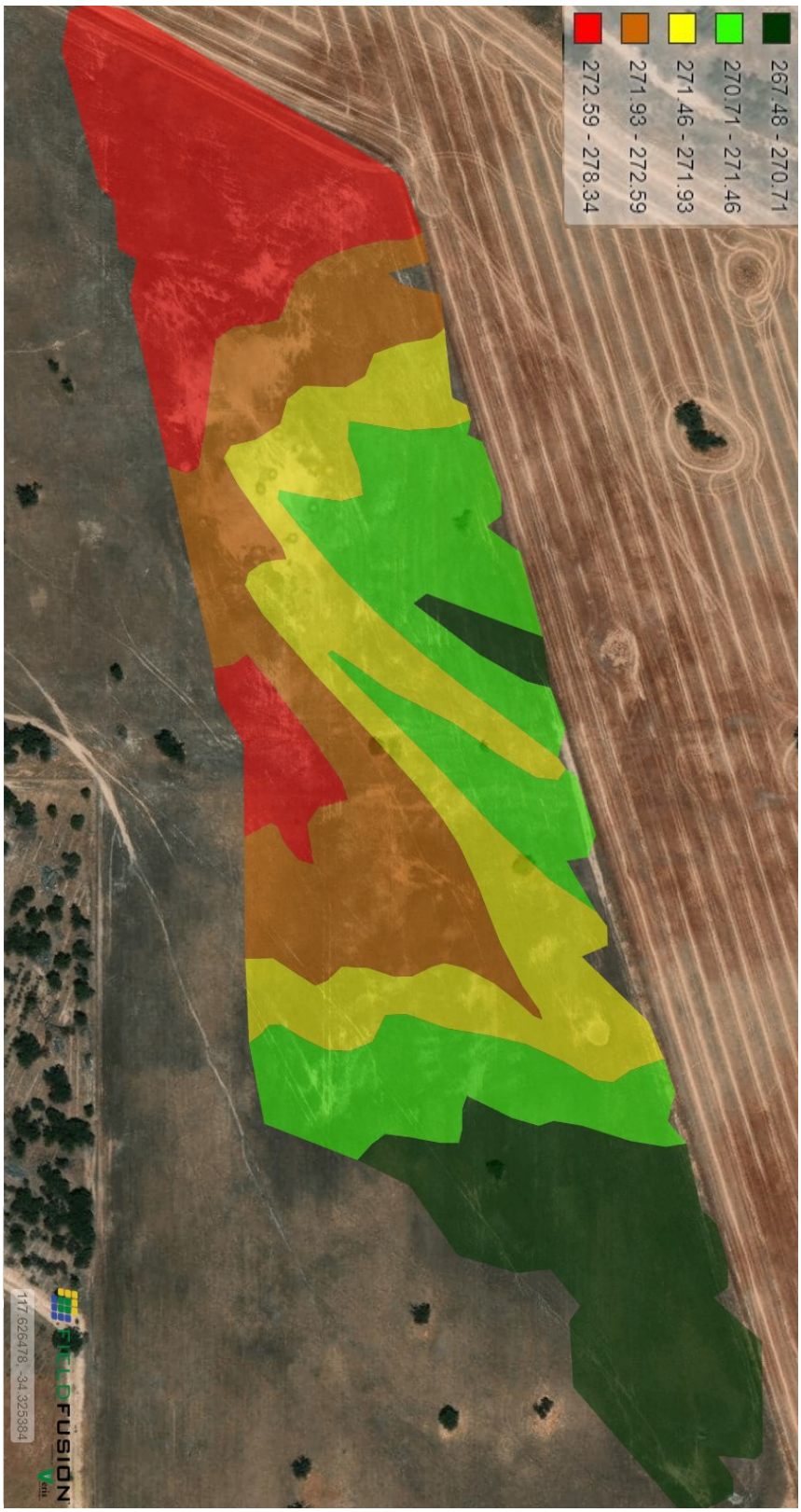
Soil organic carbon is a component of soil organic matter. Organic matter is primarily made up of carbon (58%), with the remaining mass consisting of water and other nutrients such as nitrogen and potassium. The OpticMapper sensor module is an optical sensor that measures soil reflectance. Soils that are higher in organic matter (OM) absorb more light, but can also appear darker when moist. The OpticMapper senses the subsurface where the moisture effect is minimized, and where soil color is primarily related to soil organic matter variations. Soil measurements are acquired through a sapphire window on the bottom of a furrow 'shoe' underneath crop residue and dry surface soil. Readings are collected every second and matched to their GPS location.

Soil - Salinity (ECa ms/m)

Electrical Conductivity: the ECa collected by the iScan is technically 'bulk apparent electrical conductivity' and is measured in situ primarily to map differences in soil texture (sand/silt/clay) across a paddock. When harmful levels of salinity are present in a paddock, the Veris iScan ECa can identify these areas. The more commonly known ECe measured in the lab is typically a saturated paste extract that removes any signal from the soil texture particles.

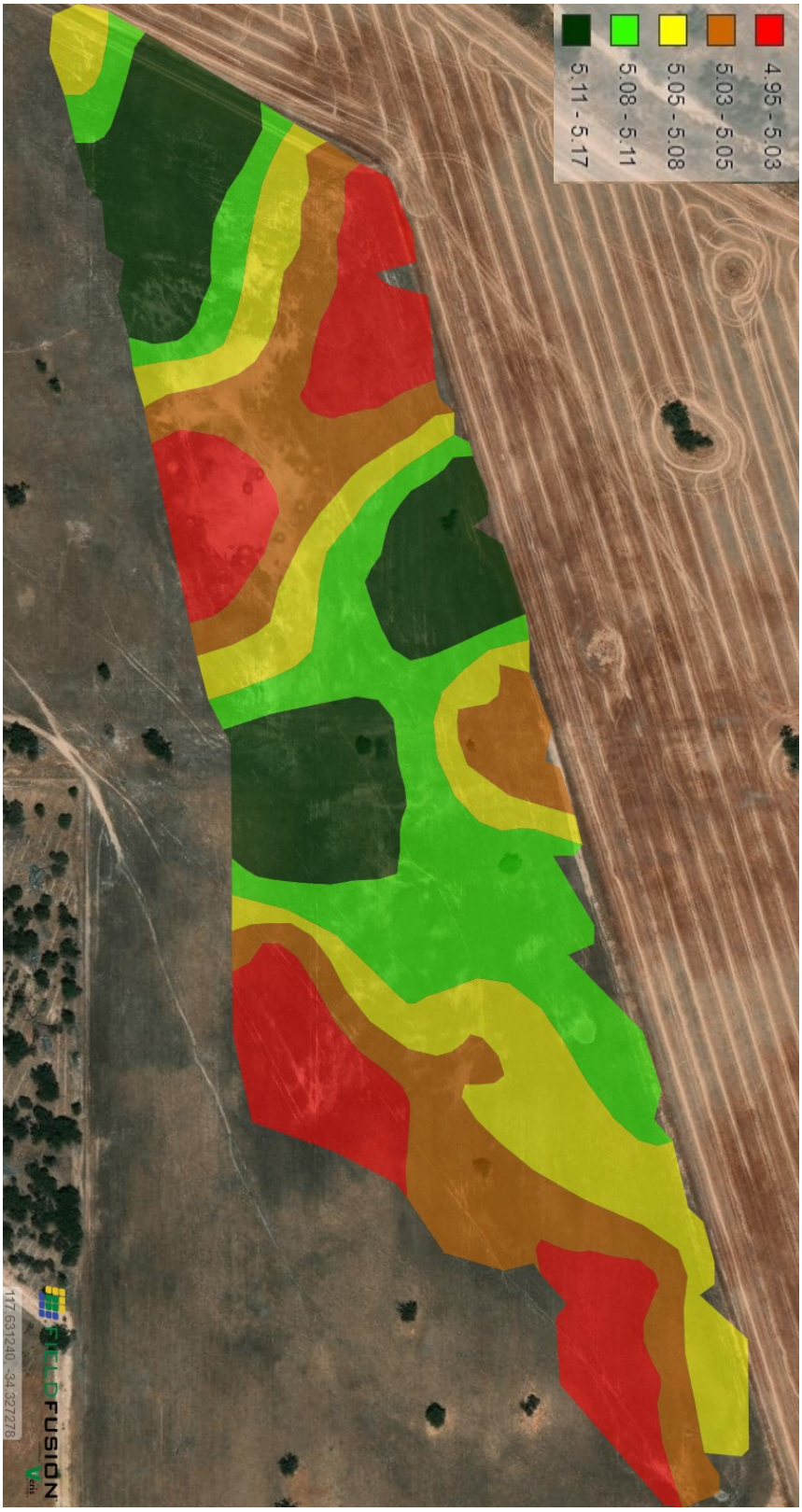
Soil - Elevation

Site 1



Soil - pH

Site 1



Ideal Range 5.5-7.5

Soil - OC

Site 1

Soil - EC

Site 1

Salinity class	EC_e all soils (mS/m)	EC_a EM38 horizontal mode (mS/m)
Non-saline	<200	<50
Slightly	200–400	50–100
Moderately	400–800	100–150
Highly	800–1600	150–200

Photo Points

Year 1 - February 2022 (Baseline Prior to Establishment)

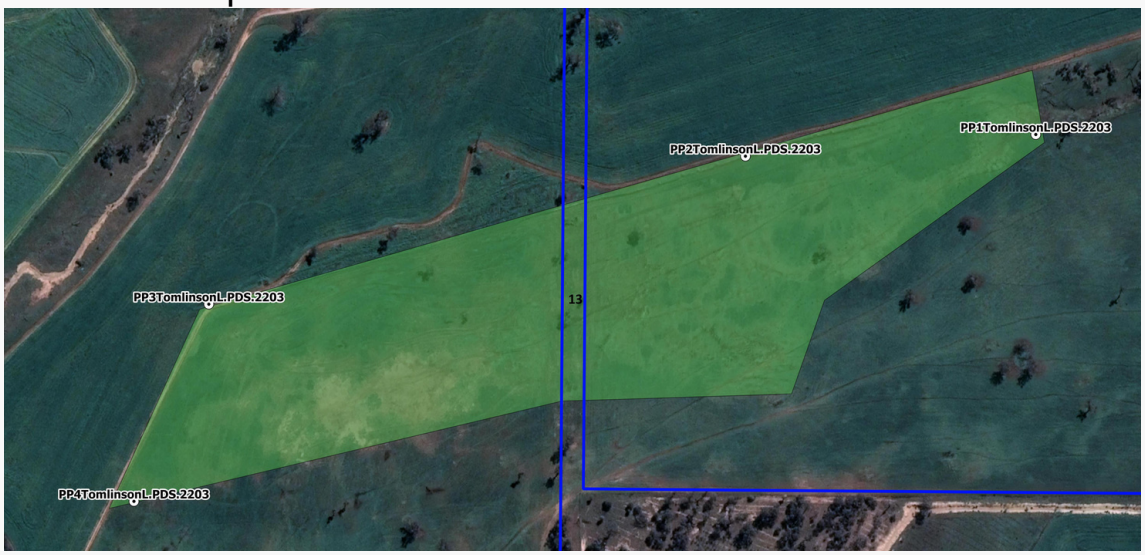
PP1

PP2

PP3

PP4

Photo Point Map



Year 1 - December 2022 (Establishment)

PP1

PP2

PP3

PP4

Photo Point Map

Year 2 - April 2023 (After First Summer)

PP1

PP2

PP3

PP4

Photo Point Map

Biomass

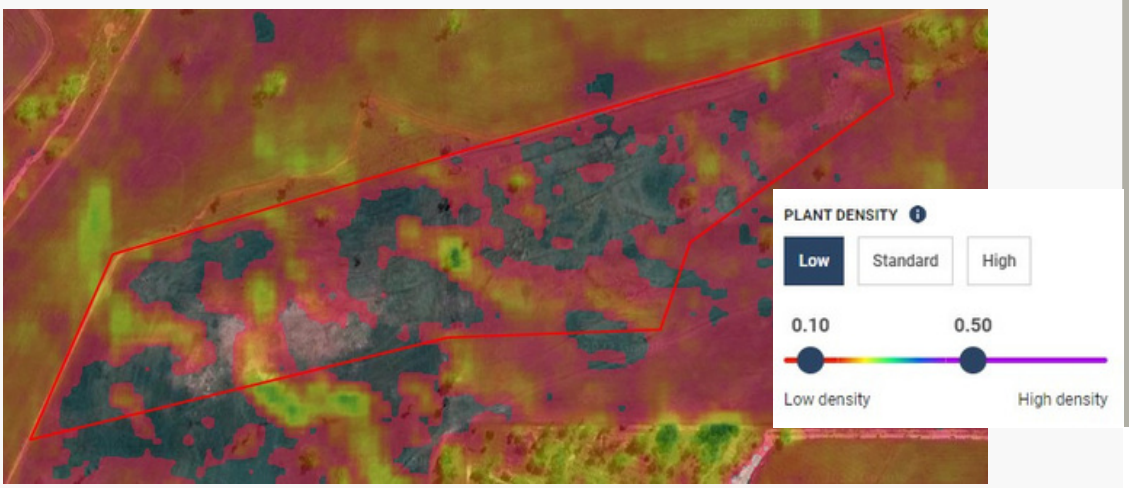
Year 1: Biomass Breakdown (Baseline Prior to Establishment)

Site sampled on the 24th February 2022
Summer-Autumn Rainfall to Date: 13mm (Kendenup W DPIRD Station)

Site 1:
Mean rank = 1.8
biomass/ha = 792kg DM
biomass/site = 10300kg DM

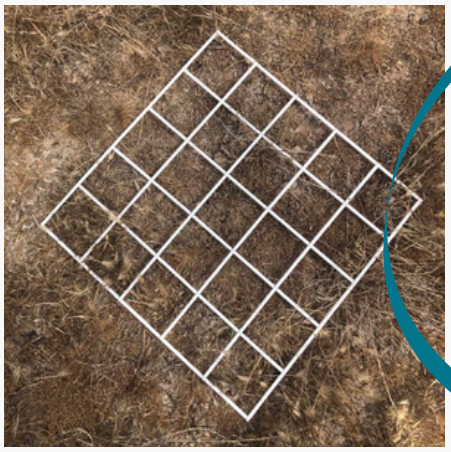
Please note that total biomass is not FOO and therefore does not represent total feed available to stock - see Pasture Nutrition section below for further information.

Site 1: NDVI February 2022 - March 2022



Year 1: Biomass On Offer (Rank)

1



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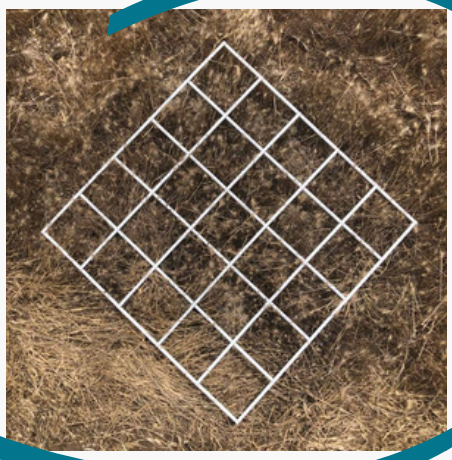

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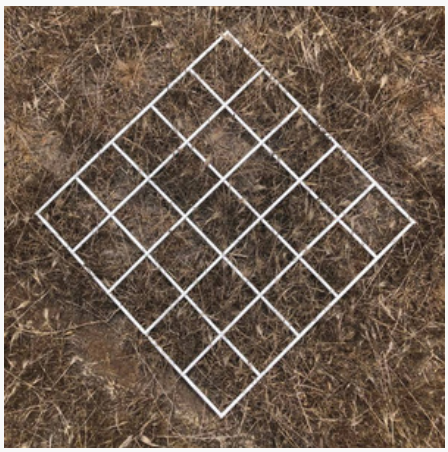

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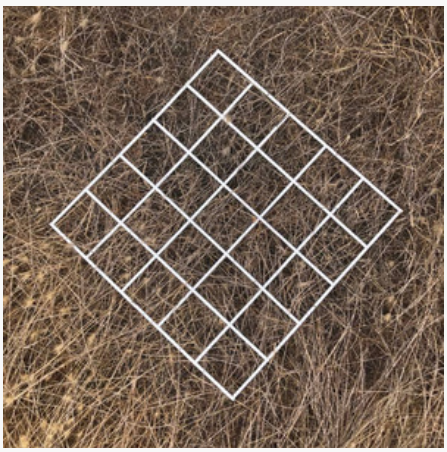

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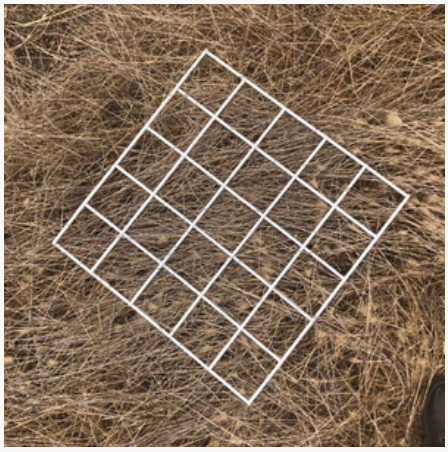


Average Ranking of 1.8

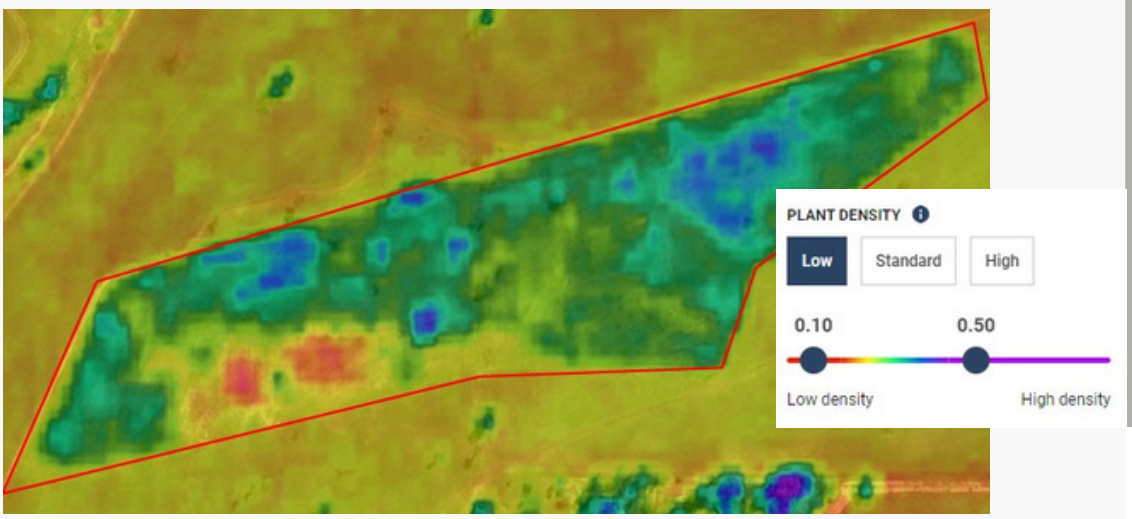
Year 2: Biomass Breakdown

Site sampled on the 1 March 2023
Summer-Autumn Rainfall to Date: 7.8mm (Kendenup W DPIRD Station)

Site 1:
Mean rank = 2.5
biomass/ha = 1536kg DM
biomass/site = 19963kg DM

Please note that total biomass is not FOO and therefore does not represent total feed available to stock - see Pasture Nutrition section below for further information.

Site 1: NDVI February 2023 - March 2023

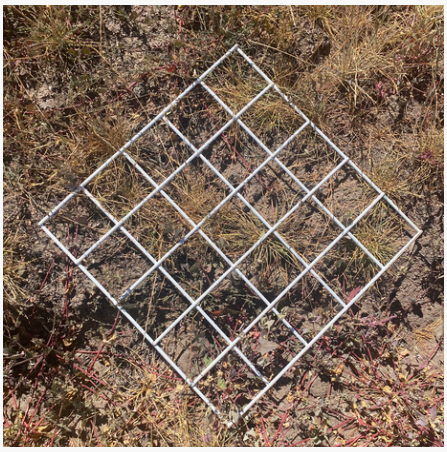


Note: Site had not been grazed

Year 2: Biomass On Offer (Rank)

1

2



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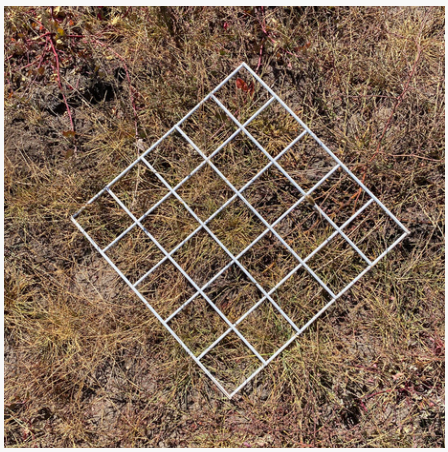

4

5

Average Ranking of 2.5

Nutrition

Note: Sampling has been conducted during the summer-autumn period as this project focuses on that specific seasonal food gap

Year 1: Species Composition (Summer-Autumn 2022 Baseline Prior to Establishment)

Site	Site Composition	Kg DM/Ha	DMD (%)
Barley Grass	87.70%	695	43.07
Rye Grass	9.50%	75	44.71
Toad Rush	2.80%	22	44.33

Species Nutrition

Site	ME (Mj/Kg)	Crude Protein (%)
Barley Grass	5.70	6.96
Rye Grass	5.98	8.38
Toad Rush	5.92	9.78

Total Kg DM/Ha = 792
Total Kg of DDM/Ha = 341
Average DMD =43.26%
Average ME(Mj/Kg) = 5.73
Average Crude Protein = 7.67%

Species Nutrition

Dry Matter Digestibility (DMD)
DDM (or DMD) is the portion of the dry matter in a feed that is digested by animals at a specified level of feed intake.

Metabolisable Energy (ME)
This is the energy part of the feed that is available to animals for heat production, maintenance and meat/wool/milk production, and can be expressed in megajoules per kilogram of dry matter (MJ/kgDM).

Crude Protein (CP)
The protein in a feed is estimated from the measured nitrogen (N) content of that feed. The estimate is termed crude protein, and is expressed as a percentage.

- Weaner lambs and pregnant or lactating ewes need 15% protein
- Growing adult sheep need 12% protein
- 9% protein is needed for survival

Year 2: Species Composition (Summer-Autumn 2023 Period)

Site	Site Composition	Kg DM/Ha	DMD (%)
Puccinellia	33.40%	514	44.70
Tall Wheat Grass	29.20%	449	50.30
Fat Hen Weed	17.40%	268	59.00
Unknown Weed	7.80%	120	49.80
Balansa Clover	5.10%	78	52.60

Old Man Saltbush, Wavy Leaf Saltbush, Rhodes Grass and Water Buttons made up the remainder 6.1% (not economical to analyse).

Species Nutrition

Site	ME (Mj/Kg)	Crude Protein (%)
Puccinellia	6.00	5.90
Tall Wheat Grass	6.90	5.60
Fat Hen Weed	8.40	10.10
Unknown Weed	6.90	5.00
Balansa Clover	7.30	17.10

Total Kg DM/Ha = 1429
Total Kg of DDM/Ha = 729
Average DMD =51%
Average ME(Mj/Kg) = 7
Average Crude Protein = 7.2%

Nutritional Interpretation: Grazing Days and Stocking Rates Over Time

Assumptions/Notes:

1. One DSE is based on the feed energy required to maintain a 45 kilogram liveweight Merino wether with zero weight change, no wool growth additional to that included in maintenance, and walking 7 km/day. 1 DSE has an energy requirement of approximately 8.7 MJ ME/day (DPIRD 2023).
2. Stocking rate of 4 DSE/Ha during the summer-autumn period
3. Grazing is not occurring on the site during the 2022-2023 period to allow the saltbush seedlings to adequately establish

2022

Based on Species Composition, Kilogram of Dry Matter per hectare (Kg DM/Ha), Dry Matter Digestibility (DMD) and Metabolisable Energy (ME) 52 Merino wethers could graze this site for 56 days (4h/ha) before a paddock rest period would be required. Protein is below 9% and full nutritional analysis has not been conducted, supplementary feeding would be required.

2023

Based on Species Composition, Kilogram of Dry Matter per hectare (Kg DM/Ha), Dry Matter Digestibility (DMD) and Metabolisable Energy (ME) 52 Merino wethers could graze this site for 147 days (4h/ha) before a paddock rest period would be required. Another way to view this is stocking rate could more then double for the same grazing period as 2022. This is a 160% increase in grazing days within the 1st year of establishment. Protein is still below 9% and full nutritional analysis has not been conducted, so some sort of supplementary feeding would still be required.

Summary

- 80% increase in Total Kg DM/Ha
- 114% increase in Total Kg of DDM/Ha
- 18% increase in Average DMD
- 22% increase in Average ME(Mj/Kg)
- 6% decrease in Average Crude Protein

Animal Productivity Monitoring

2024 - 2027

Cost-Benefit Analysis

2022 - 2027

Site Costings

Establishment Cost Summary - 2022

Seed	Amount	Unit Cost	Total Cost
• Balansa Clover	3.8kg/ha	$5.50	$271.70
• Tamargee Kikuyu	0.5kg/ha	$90.00	$585.00
• Puccinellia	1.5kg/ha	$33.00	$643.50
• Rhodes Grass	-	-	-
• Tall Wheat Grass	9kg/ha	$12.00	$1404.00
Fertiliser/Chemical			
• Glyphosate 450	2Lt/ha	$8.00	$208.00
• Alpha Cypermethrin 200 EC	0.1Lt/ha	$2.00	$2.60
• Ammonium Sulphate	%	$1.00/kg	$10.00
• Wetter	%	$5.00/L	$5.00
• MAP	30kg/ha	1.20/kg	$468.00
Operational			
• Spraying	13ha	$5.00/ha	$65.00
• Scarifying	13ha	$5.00/ha	$65.00
• Seeding Pasture	13ha	$40.00/ha	$520.00
• Seeding Saltbush (including seed cost & vermiculite	22km	$82.60/km	$1817.20
Infrastructure			
• Fencing (not included)			
• Water Source (TBC)			

Cost/ha = $466.50
Cost/Site = $6065.00

Maintenance Cost Summary - Annual

TBC	Amount	Unit Cost	Total Cost

Site Income

Income Summary

Not currently grazed	Amount	Unit Cost	Total Cost