



Soil sampling guidelines

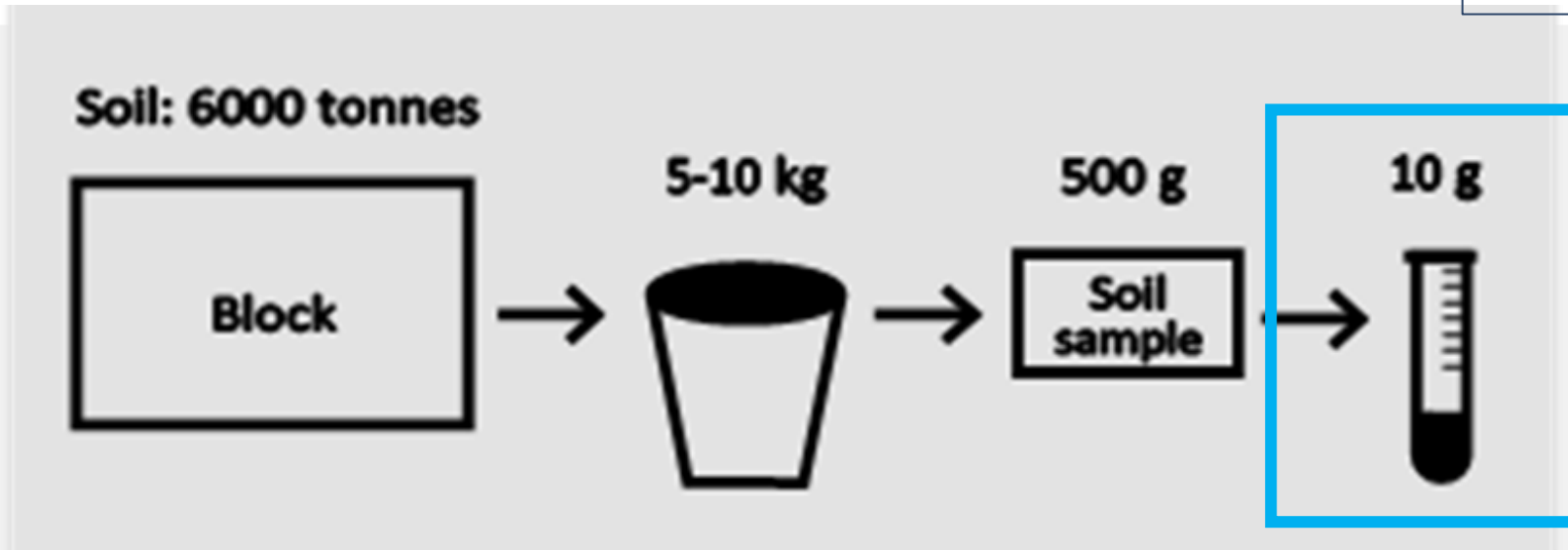
Sue Briggs – Agronomist / Service Specialist CSBP Lab

CSBP Lab. Extract Value.

Representative soil sample for analysis

- The greatest source of error in any soil testing service relates to the soil sampling technique.
- Remember: You will be making fertiliser decisions on a 5 – 50 g sample.

NO₃/NH₄ – 20g
P/K – 10g
S – 5g
pH/EC – 50g
OC or TOC – 5g
Excats – 15g



Take home messages for a representative soil sample

Have a clear objective of why you are sampling

Make it repeatable:

- GPS the sample location - record it electronically and share that with the grower.
- Sample at the same time of the year – depends on the agricultural industry

Sampling:

- Sample depth to adhere to interpretation guidelines of the agricultural industry – or region.
- Take an appropriate number of cores for a representative sample – take more than required – sub-sample before sending

Take home messages for a representative soil sample

Sample location

- Talk to the grower
- Use the technology available

Sampling handling

- Clean equipment and hands
- Storing and sending it to the laboratory – keep it cool or air dry before sending

Laboratory

- Same lab – develop a relationship with the Lab – question lab methods, conduct repeats

Why are you
sampling?



Why sample

Predictive:

- improve fertiliser decision making by measuring plant available nutrients and soil constraints.
- Results are benchmarked against interpretation guidelines.

Monitoring:

- Assess the trends of soil nutrient levels over time.
- Monitor soil nutrient trends can help inform fertiliser decisions.

Diagnostic:

- Problem-solving - determine the reason for poor growth in the paddock.
- Collect soil and plant samples from good and poor areas.
- Also consider the physical characteristics of the soil texture, soil depth, structure

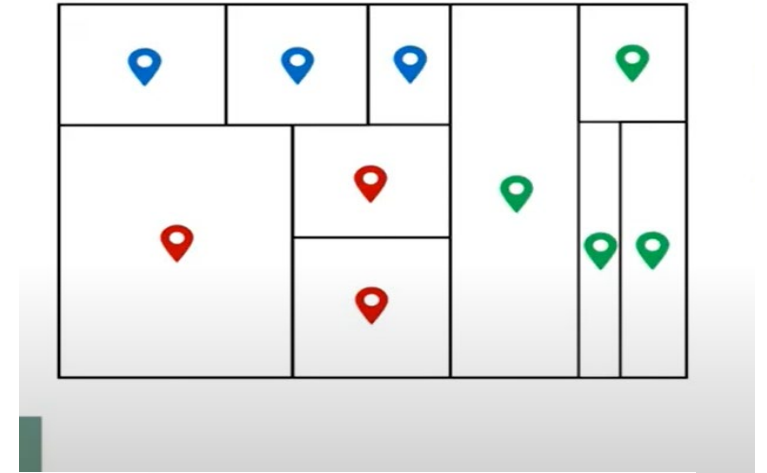
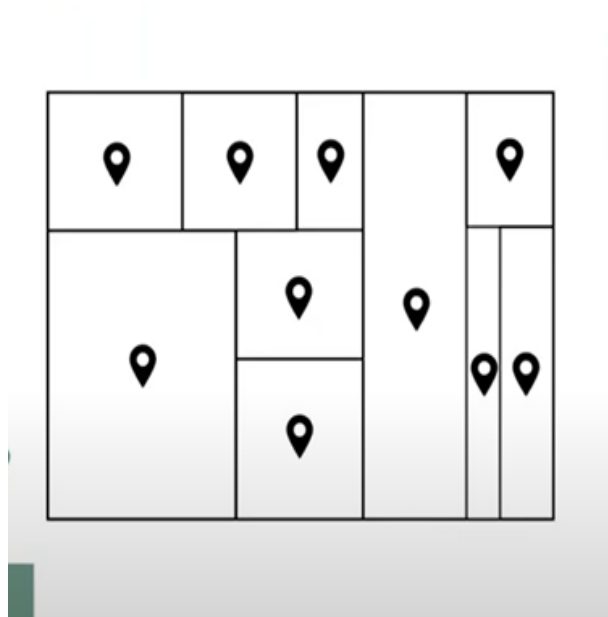
Compliance:

- Provide soil analytical data to aid environmental risk assessment.
- Test requirements differ from agricultural testing.

Develop a sampling strategy

Consider:

- How often you will sample – every year, every 3 years.
- Number of paddocks – every paddock, a portion of the farm.
- Sample depth
- What time of the year
- What nutrients to analyse



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What information is being used to identify a sampling site?



Identifying sampling location

- Use the grower's knowledge – check if any soil engineering has been done

Desktop assessment of soil variability

- Elevation/fuel usage data from the tractor
- Google Earth
- Electronic Magnetic (EM) survey
- Available Water Capacity
- Imagery – NDVI, NDRE
- Soil data layers – gamma radiometric or other layers publicly available sites
- Yield maps
- Protein maps

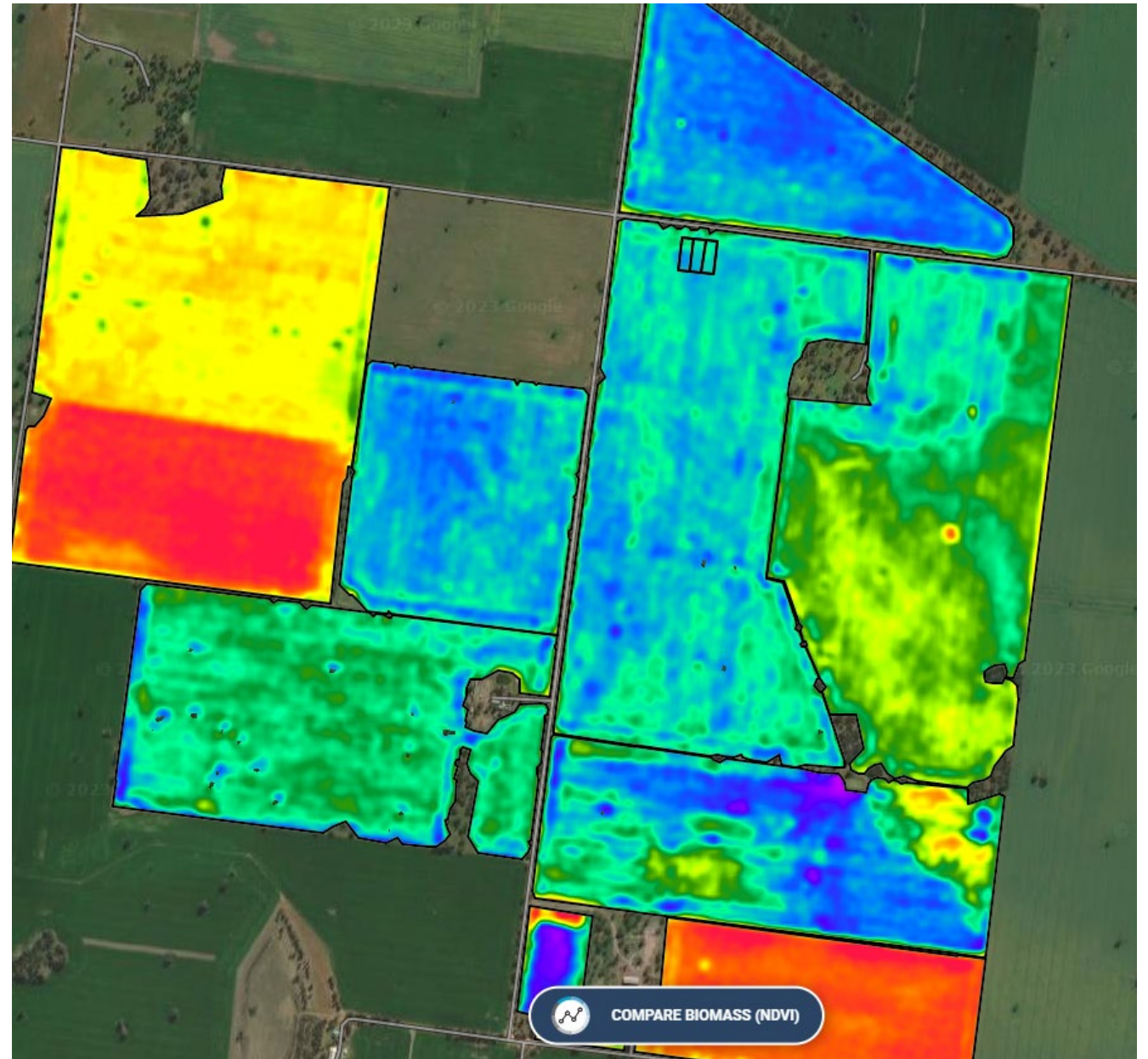
Available Water Capacity

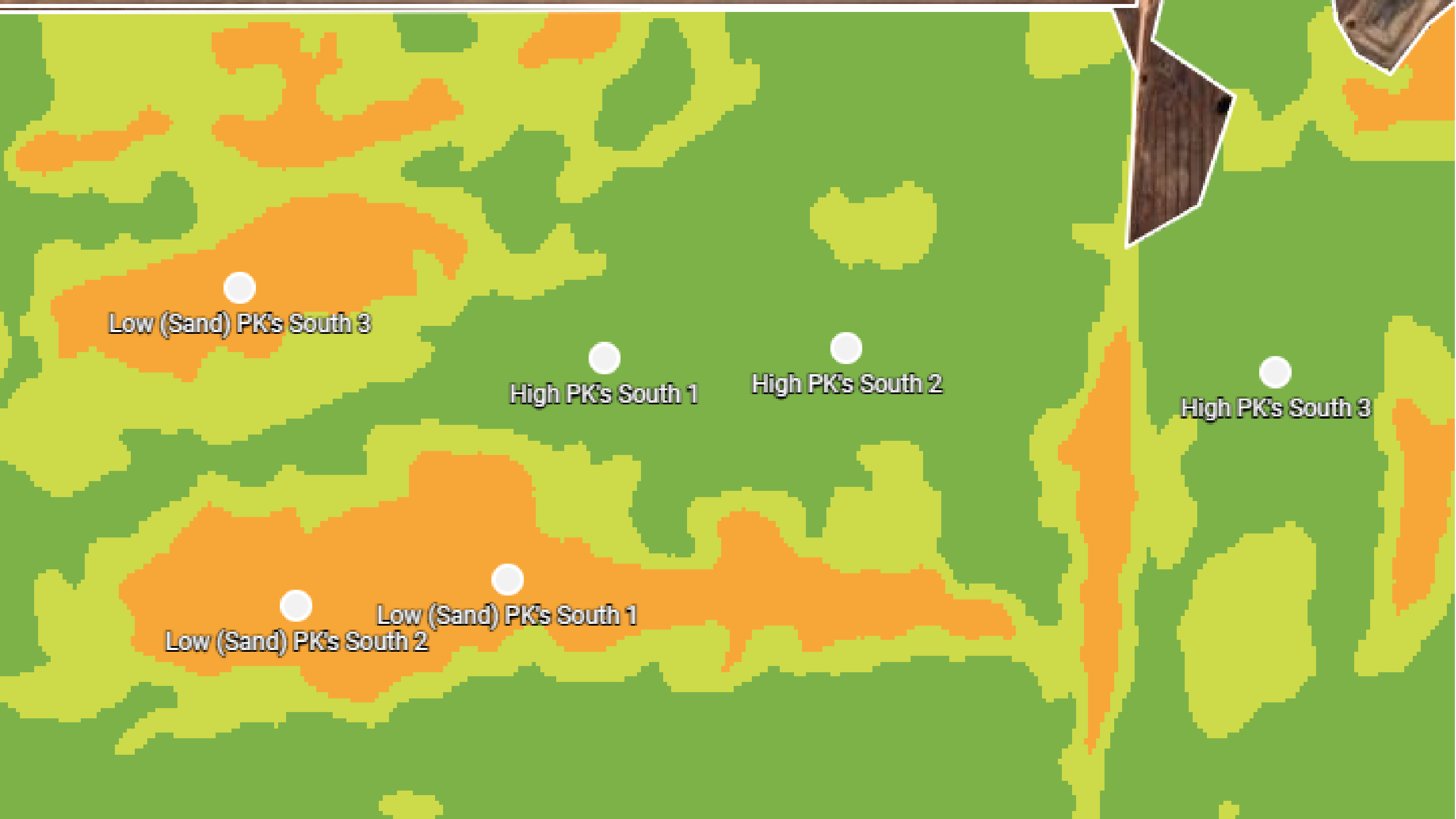


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From soil and landscape grid of Australia

NDVI Imagery





Low (Sand) PK's South 3

High PK's South 1

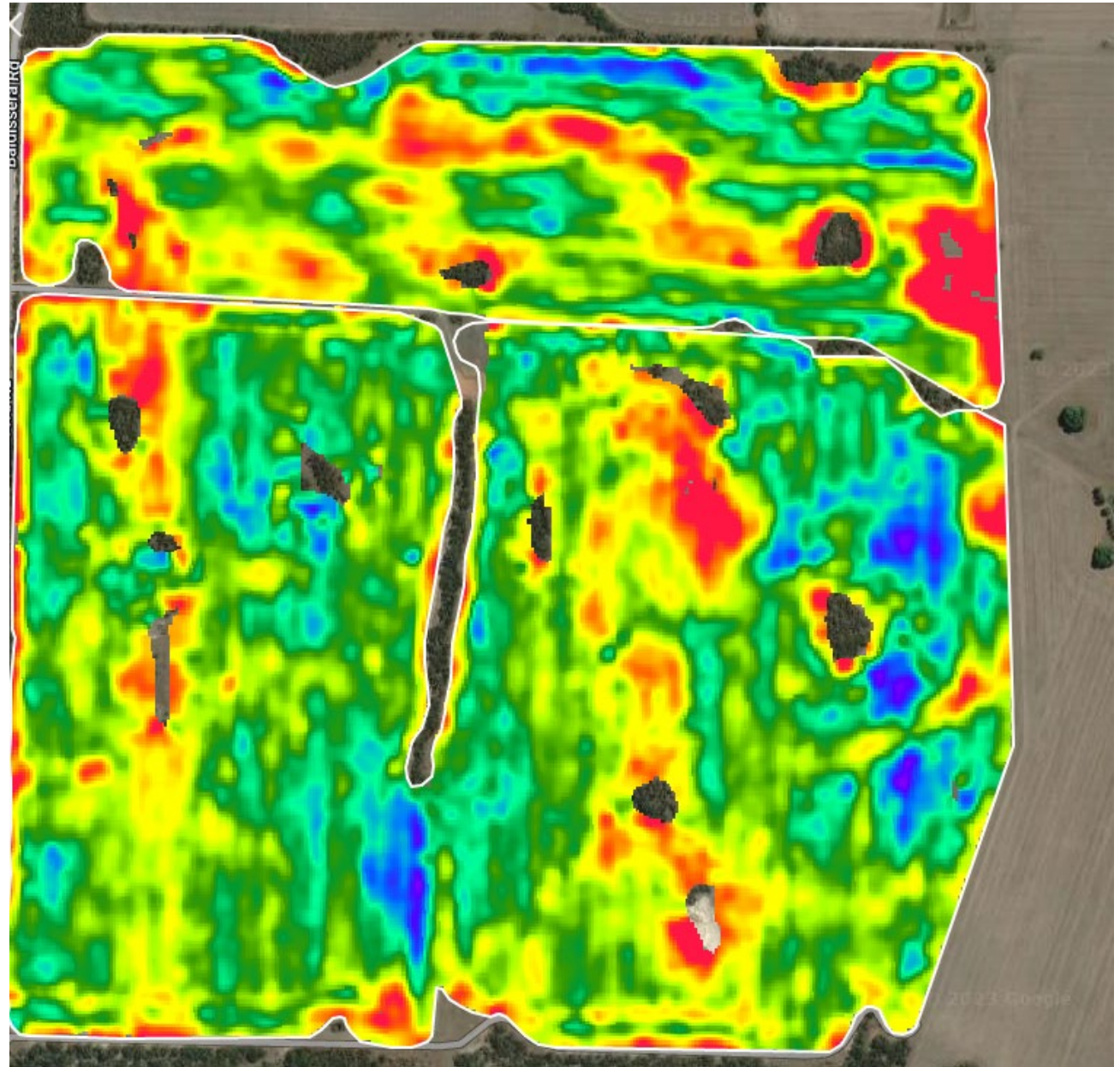
High PK's South 2

High PK's South 3

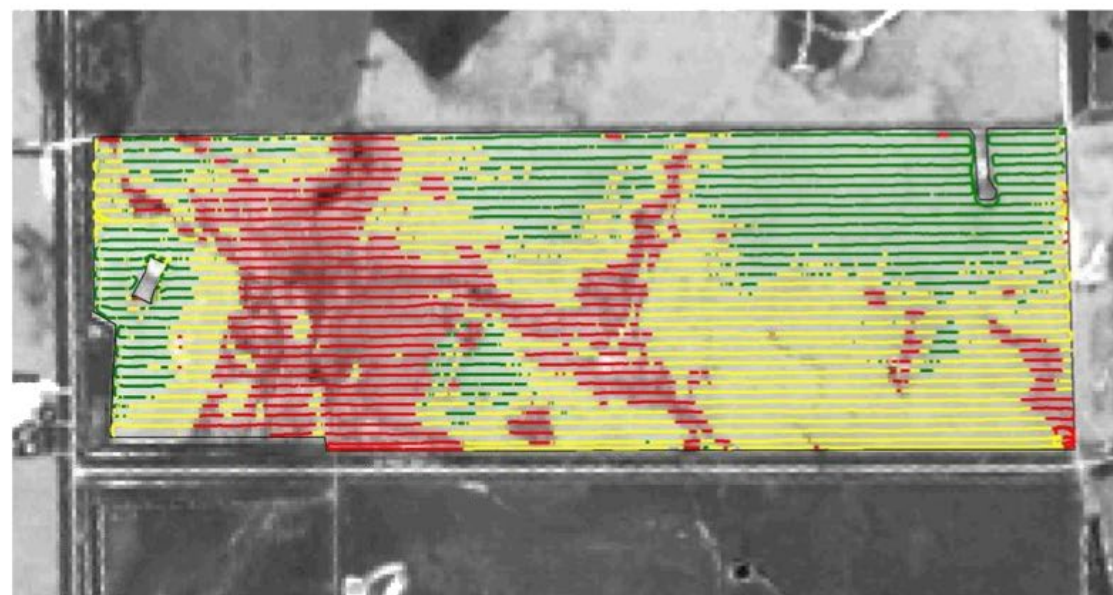
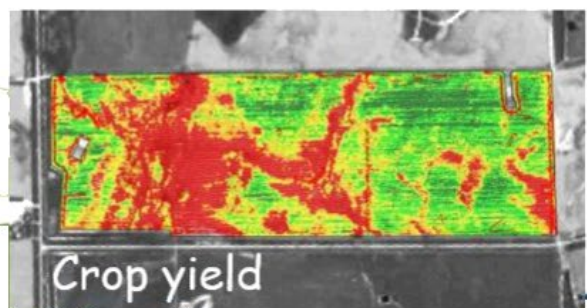
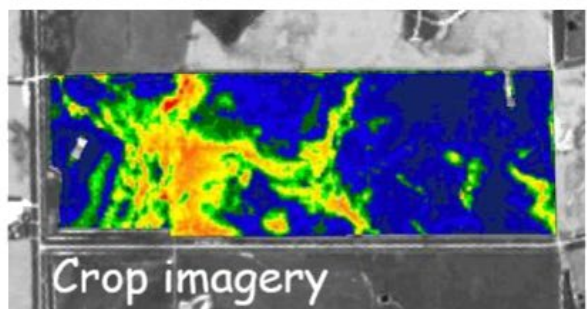
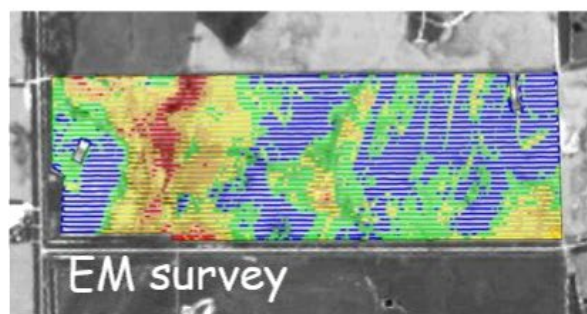
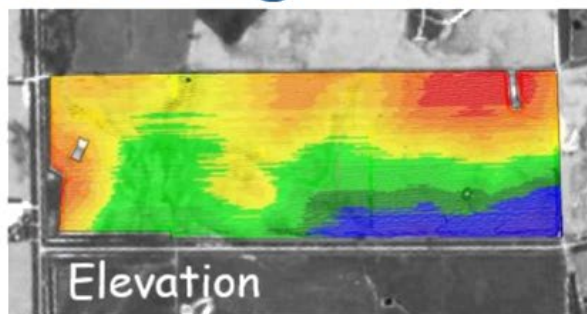
Low (Sand) PK's South 2

Low (Sand) PK's South 1

Yield Maps



Data integration

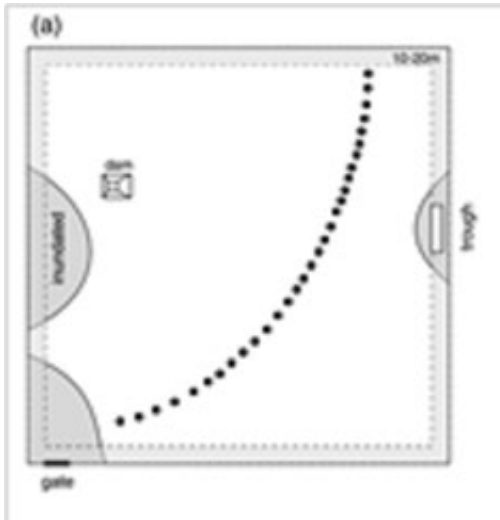


Use elevation, EM survey

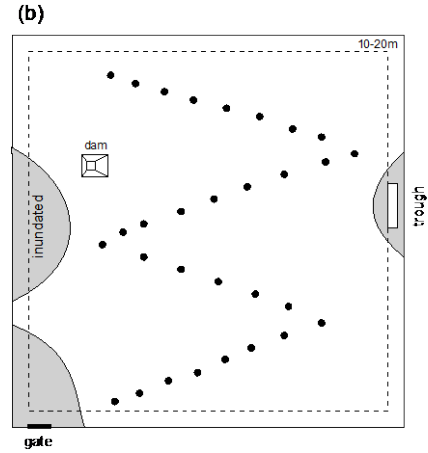
CSBP Lab. Extract Value.

Sampling pattern used for nutrient testing

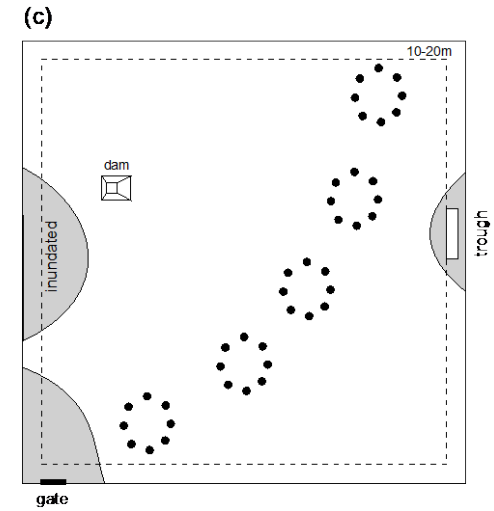
Transect



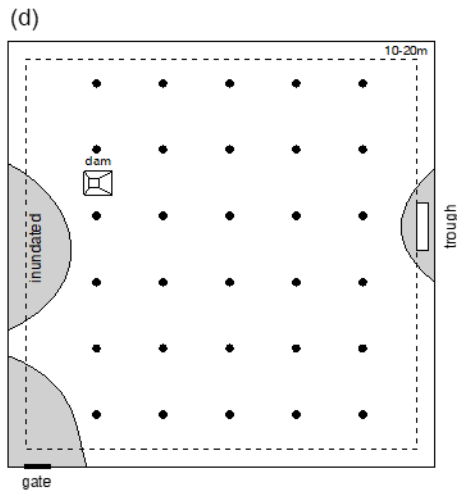
Zig zag



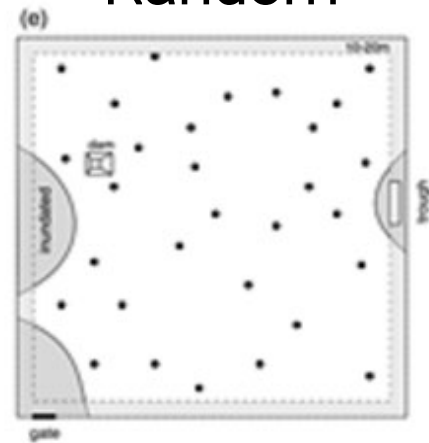
Cluster



Grid



Random



Representative sample - How many cores to collect

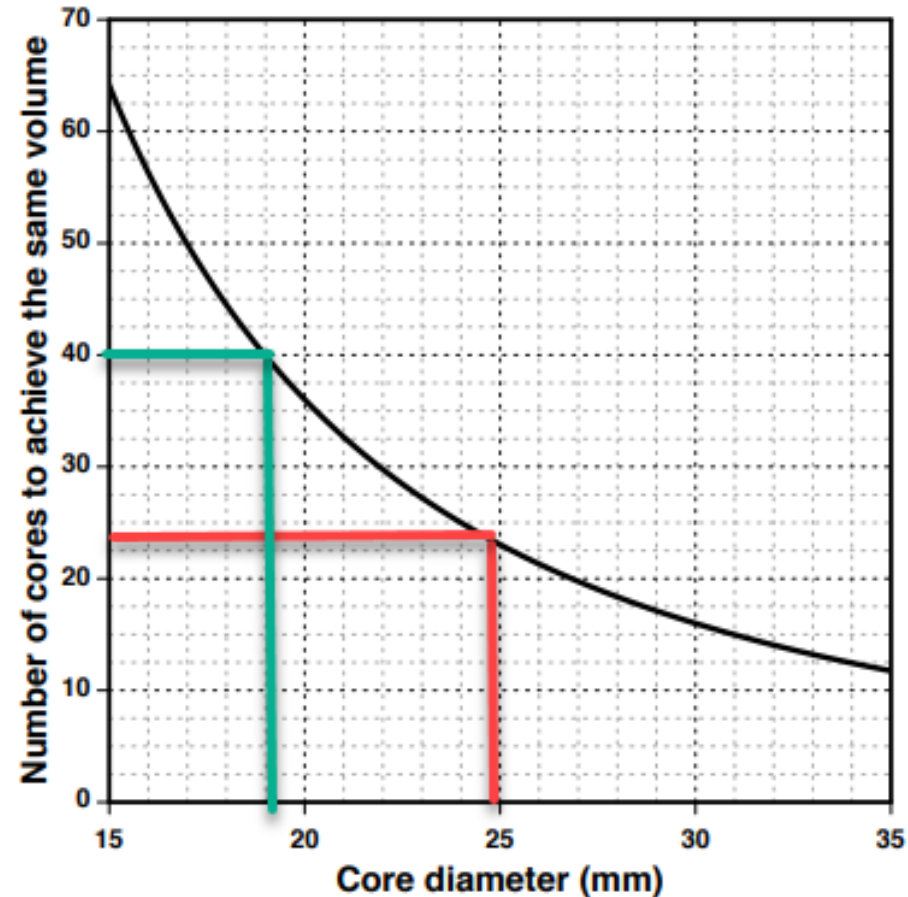
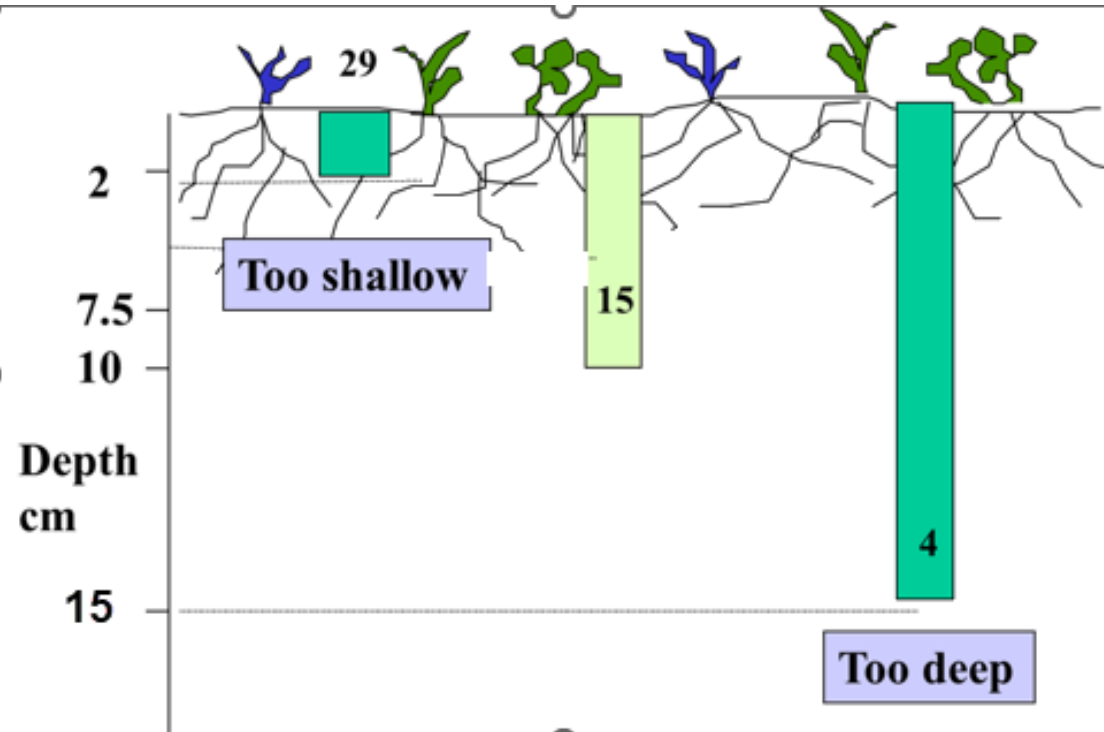


Figure 11. Number of soil cores required to achieve the same sampled area, volume and assumed variability as a standard 40 cores from a 19 mm diameter sample tube. Figure developed from first principles based on Brown (1999).

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Sample depth



		Medium Slope A	Medium Slope B
Depth		0 -?	0 -10
Phosphorus Colwell	mg/kg	37	14
Potassium Colwell	mg/kg	274	161
Sulfur	mg/kg	4.8	3.3
Conductivity	dS/m	0.130	0.072
pH Level (CaCl ₂)		4.6	4.4
pH Level (H ₂ O)		5.2	5.0
Exc. Aluminium	meq/100g	0.388	1.012
Exc. Calcium	meq/100g	5.06	1.81
Exc. Magnesium	meq/100g	0.83	0.39
Exc. Sodium	meq/100g	0.05	0.05
Exc. Potassium	meq/100g	0.53	0.26
ECEC (calculation)	meq/100g	6.858	3.522
Al%	%	5.7	28.7

Extract Value.

Areas to avoid – predictive or monitoring

Visible

- 20m from current and new fencelines, gates, treelines, dams, troughs
- Stock camps, feed-out areas, and stock tracks
- Fertiliser/lime dump areas if known
- Headlands
- Poorly drained areas
- Cut and fill areas
- Areas of poor growth or excessively good growth ie Dung and urine patches. (if the reason for sampling is to determine fertiliser requirements)
- Headlands

Sample handling

When analysing Nitrogen & Carbon options for sample handling

- Air dry 40⁰C
- Keep cool
- Rapid high temperature heat 105⁰C

NIR and MIR spectra

Method: Rayment & Lyons 6B4a&b

Units: %

A dried and finely ground (< 0.5mm) sample is loaded. The instrument (or its associated computer) will integrate the spectral signals with calibration equations.

NIR – Near Infrared reflectance spectra

- Shorter wavelength band - 750 – 250nm
- Used for analysis of plant, forages and grains
- Well suited to field scanning

MIR – Mid Infrared reflectance spectra

- Wavelength bands from 2500 to 25000um
- Potential to predict soil chemical, physical and mineralogical properties.

Test - MIR	Indicative coefficients of determination (R ²)
TOC	0.94
Carbonate %	0.95
Particle size % sand	0.93
Particle size % silt	0.87
Particle size % clay	0.86
pH (Ca)	0.88
Bulk density	0.67
Exchangeable Ca	0.89
Exchangeable Mg	0.88
Exchangeable K	0.73
Exchangeable Na	0.80

Source: Merry & Janik, CSIRO

NIR & MIR

Comments:

- Relies on calibration against laboratory sample results. Therefore, it can only be as good as the data set used.
- Large sample numbers are required for the calibration set. So, it is costly to set up a machine that will produce quality results.
- Calibration sets unique to each machine.
- Each soil type or variation of a soil type requires a calibration set.
- You are still required to take the soil sample and send to a laboratory.

\$20 million for technology to help farmers store carbon



- Use NIR technology
- Scan the intact soil core back at their lab
- Used in a cotton nitrogen trial on vertosols soils
- Needs a calibration set for each soil type
- Multiple devices used – they keep updating devices to align with new technological advances

RemScan®

- Use MIR technology
- From the mining industry



b. Extract Value.

EST. 1971

-32.095 / 115.802

CSBP Lab. Extract Value.

Contact details:

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Email: sue.briggs@csbp.com.au



Find a location or farm

Map MyData

Training 3
(445825)
DEC-011510

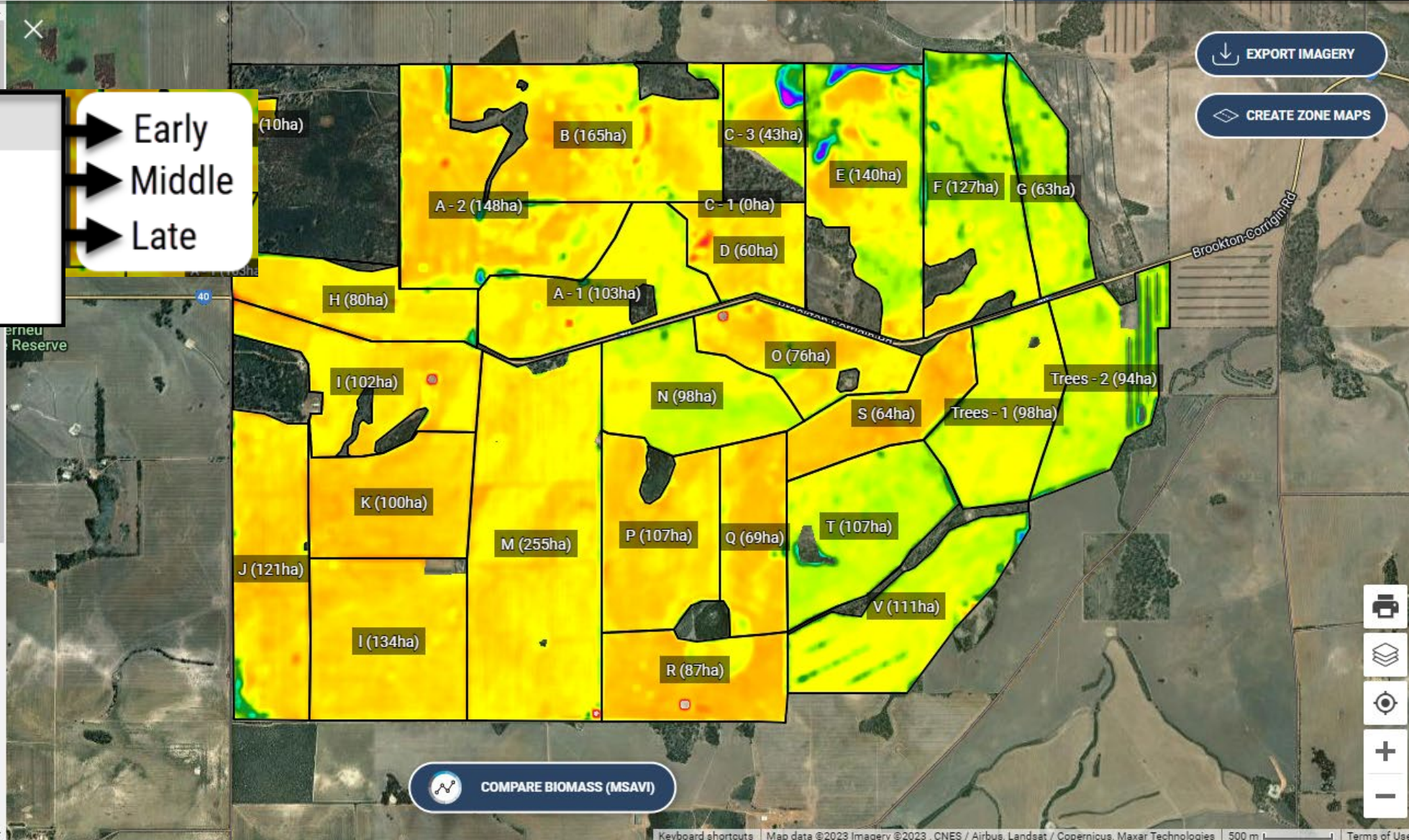
Ashley Juers

- MANAGE
- IMAGERY
- SAMPLES
- PLANS
- VIEW DATA
- NOTES
- ZONES
- YIELD
- SCOUT
- REVIEW

Imagery

- MSAVI - Biomass Soil Adjusted
- NDVI - Biomass
- NDRE - Biomass Red Edge
- AWC - Available Water Capacity

Early
Middle
Late



EXPORT IMAGERY

CREATE ZONE MAPS

OPACITY

IMAGE CLIPPING

Global **Farm** Paddock

Clip imagery to a farm by selecting it on the map.

FILTER BY CROP

- (No crop) 54 paddocks
- Barley 2 paddocks

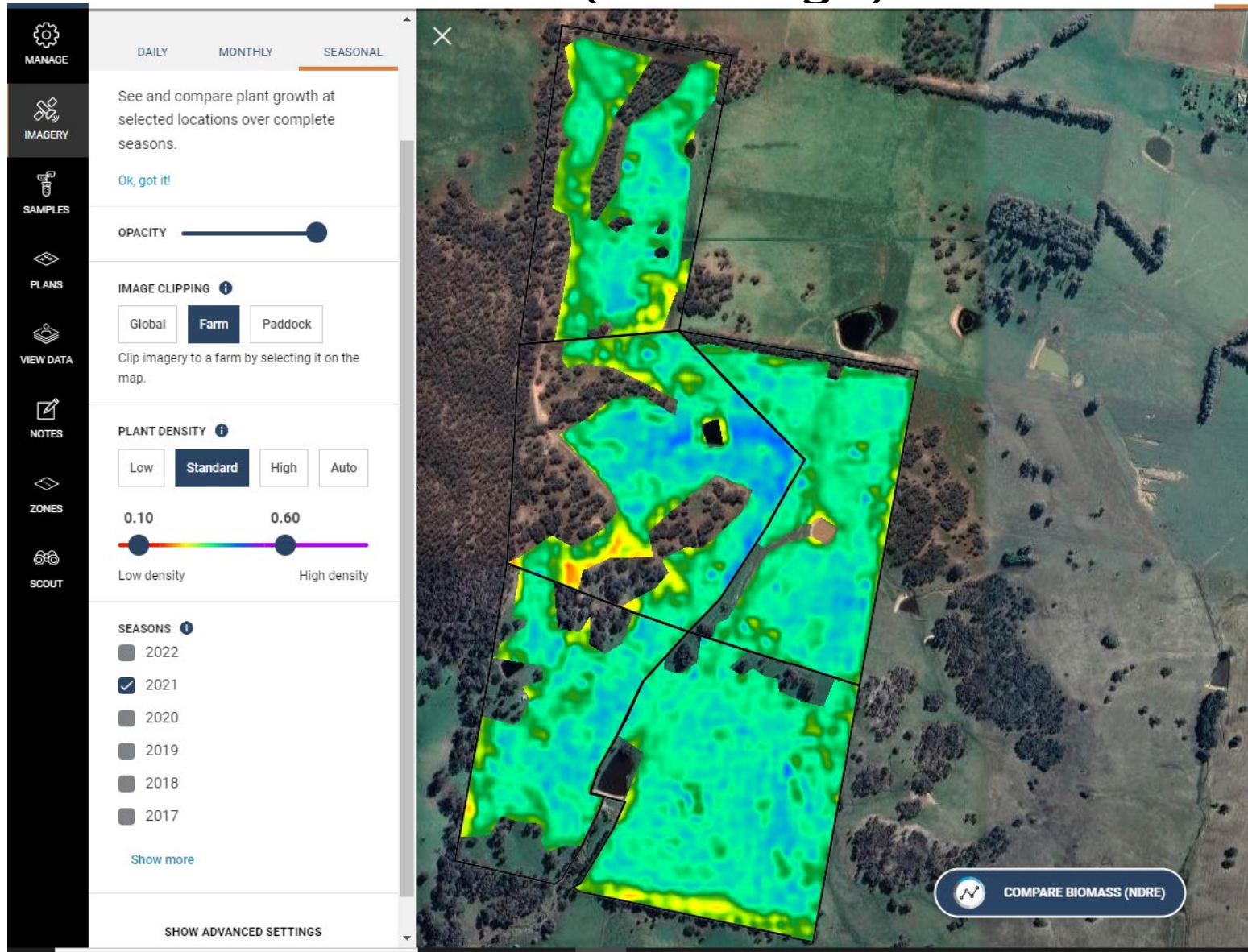
PLANT DENSITY

Low **Standard** High Auto



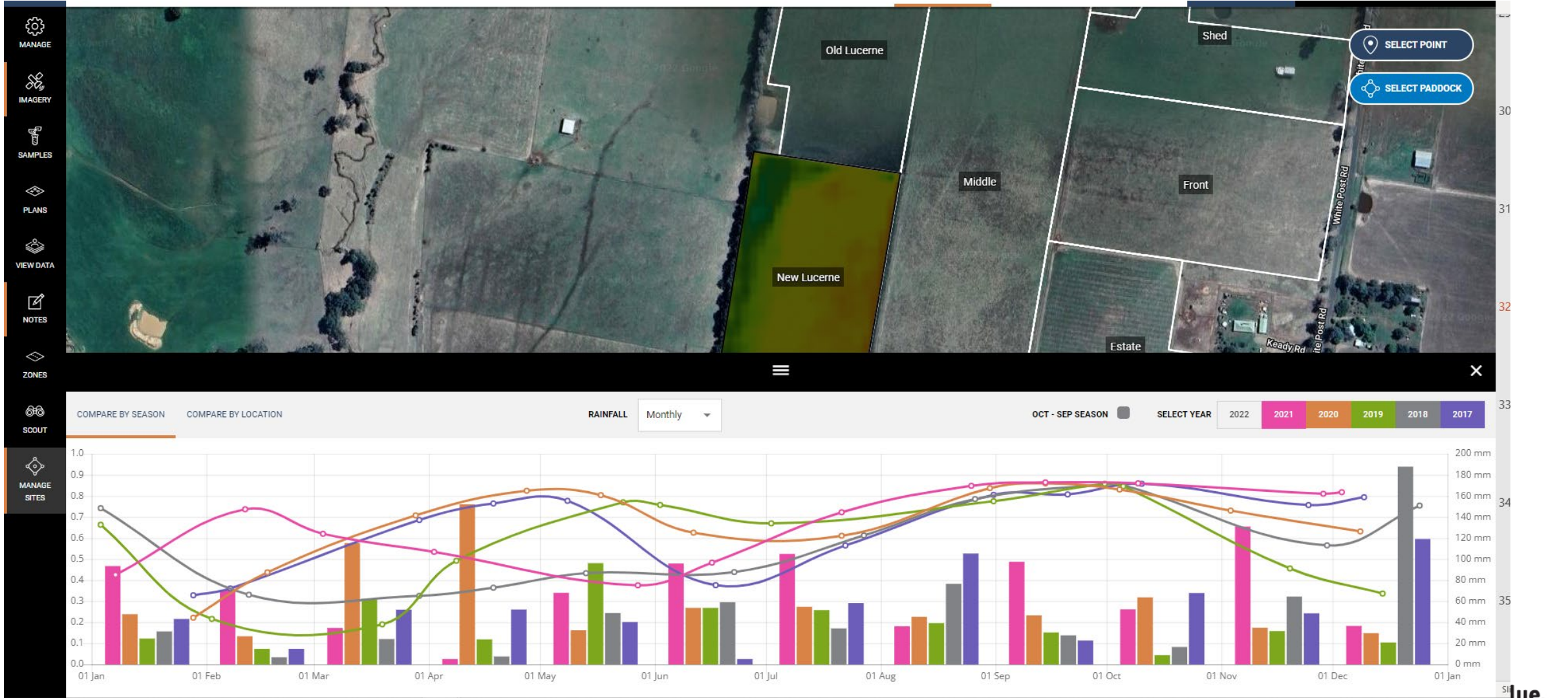
COMPARE BIOMASS (MSAVI)

Biomass – NDRE (Red Edge)

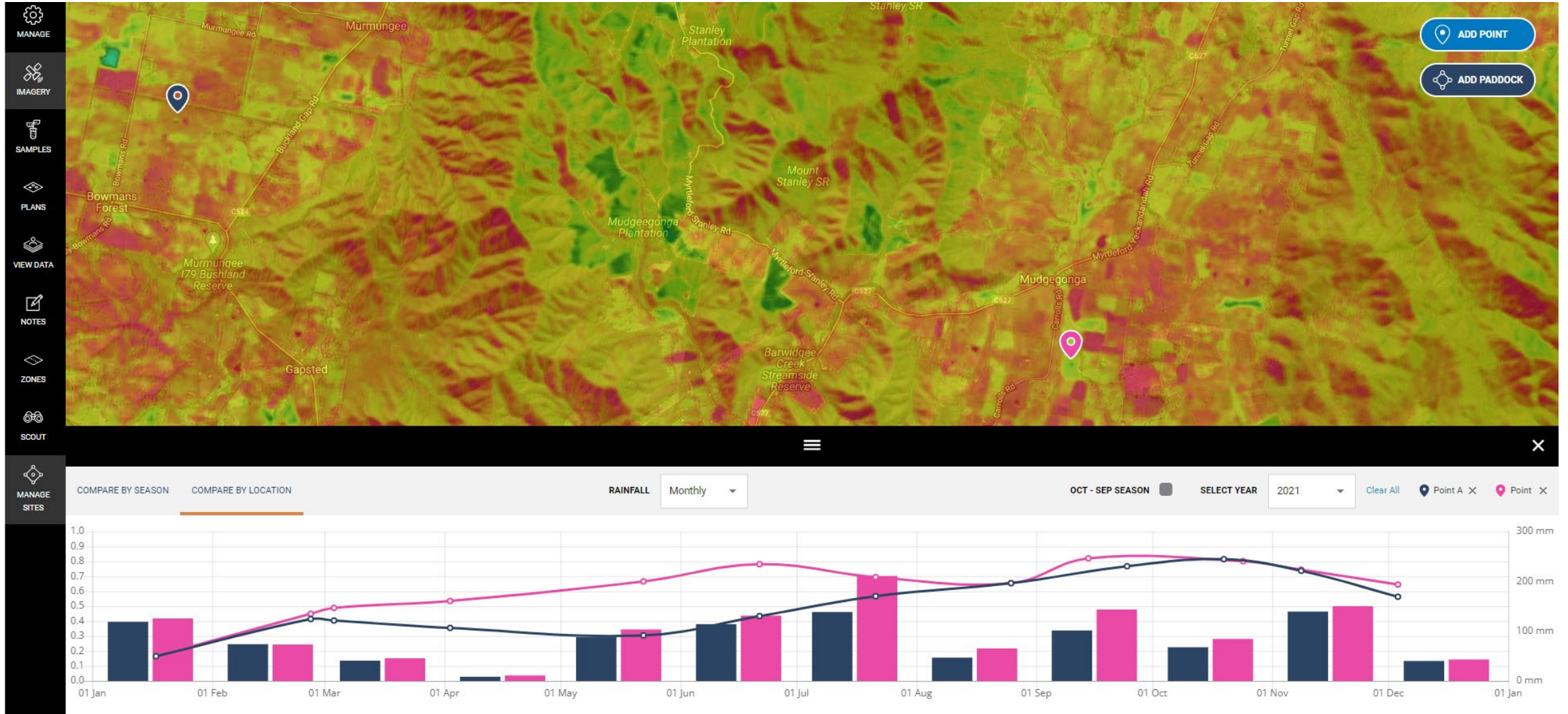


- Normalised Difference Red Edge (NDRE) provides a more accurate solution for measuring biomass and vegetation late in the season.
- Used after canopy closure or high biomass crops and pastures.
- Uses the Red Edge part of the spectrum to detect changes in chlorophyll content within the leaf and through the plant canopy.

Compare biomass by season

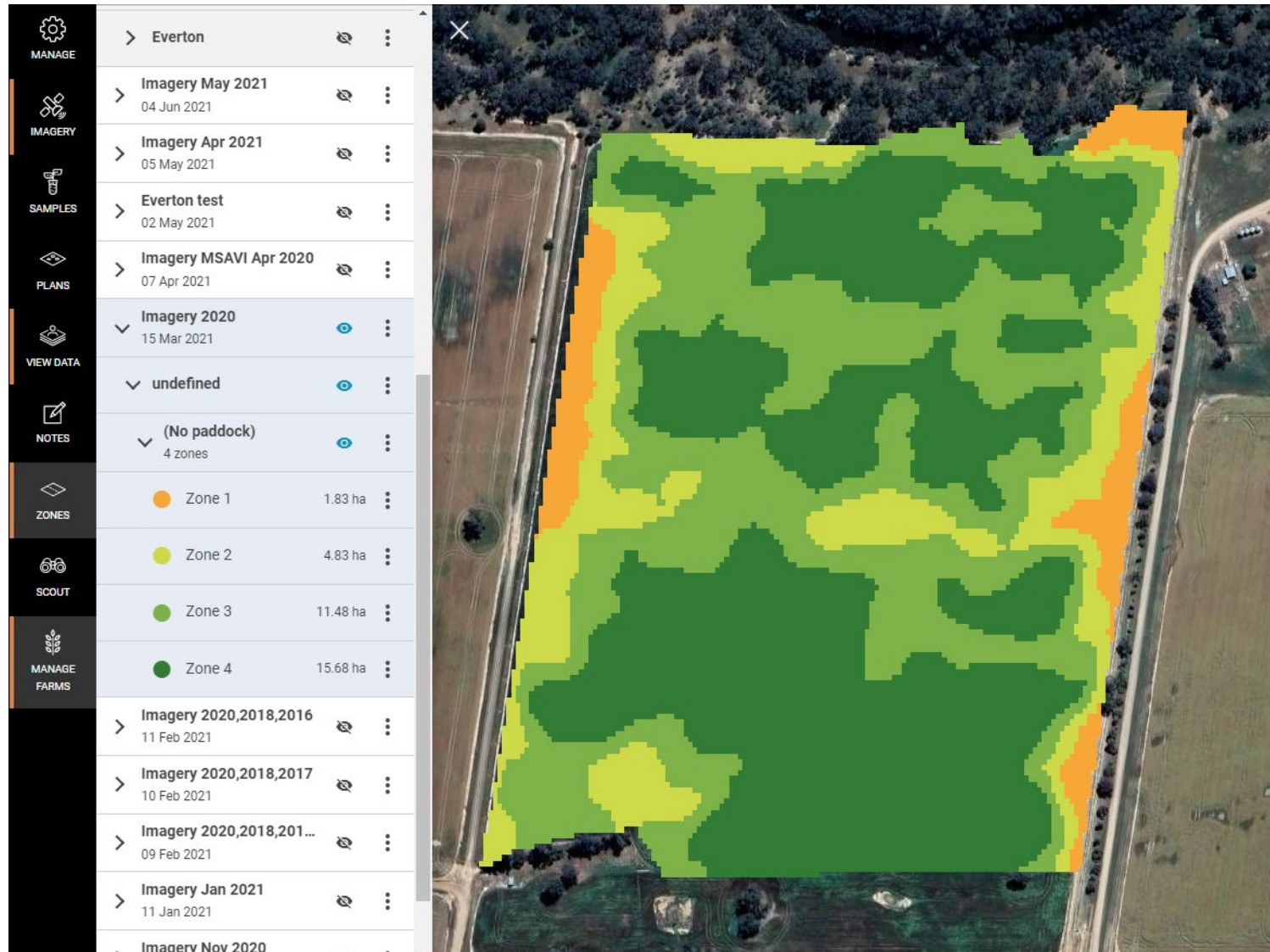


Compare by location



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Create zones from the biomass imagery



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Zones – Add / edit

The screenshot shows the software interface with a sidebar menu on the left. The 'ZONES' section is expanded, showing a list of zones. The main map area displays a satellite view with two zones highlighted: Zone 12 (orange) and Zone 13 (green). The sidebar menu includes: MANAGE, FILTERS, Imagery, SAMPLES, PLANS, VIEW DATA, NOTES, ZONES, SCOUT, and CREATE RX FILE.

Zone	Area (ha)
Zone 1	41.06
Zone 4	20.06

Create prescription files

The screenshot shows the 'Create prescription file' dialog box overlaid on the map. The dialog box contains the following information:

- Title: Create prescription file
- Subtitle: auto zone all paddocks 25.11
- Product: Single Super
- Zone 1: 41.06 ha, 250, 10,265
- Zone 4: 20.06 ha, 125, 2,508
- Total product: 12,773
- Buttons: ADD NEW PRODUCT +, Create prescription file, Reset



Find a location or farm



Map

MyData

DecipherAg Demo
(DEC-012004)

Ashley Juers
Owner



MyData - Files

FILES

SOIL SAMPLES

PLANT SAMPLES

Search folders and files



Add folder

Upload files

← Prescriptions > Biomass Prescriptions



a-1_Flexi-N_12Sep2022.zip



A-1_Flexi-N_27Jan2023.zip



A-1_Lime Sand_20Jan2023.zip



HillSide_Flexi-N_15Sep2022.zip

Download file



John Deere



File to download

RX.zip

Download

Cancel

Case IH

John Deere

New Holland

Trimble

(Other)

View results and set target nutrient levels

MANAGE

IMAGERY

SAMPLES

PLANS

VIEW DATA

NOTES

ZONES

SCOUT

CREATE RX FILE

Sample photos

FARMS

Filter by Farm(s)

SEASONS

2021

2020

2019

2018

ANALYSIS

NUTRIENT

Phosphorus Colwell

CRITERIA

Pasture

VALUES (mg/Kg)

● < 20.23

● 20.23 - 25.33

● 25.33 - 34.67

● > 34.67

DEPTHS

0 - 10cm

10 - 20cm

MANAGE SITES

Site Lou

Phosphorus Colwell

0 - 10cm

●	28.00	2021
●	21.00	2020
●	30.00	2019

CSBP Lab. Extract Value.

Graph results overtime

The screenshot displays a software interface for farm management. At the top, there is a search bar with the text "Find a location or farm" and a magnifying glass icon. To the right of the search bar are navigation icons for "Map", "CSBP Detect", and "MyData". Further right, the user's name "Ron (DEC-011153)" is shown with a dropdown arrow. On the far right, the account manager "Sue Briggs" is listed with a dropdown arrow and a message icon. Below the search bar is a large satellite map of a farm with several fields outlined in white. A green dot is circled in white on one of the fields, and an orange dot is on another. A "PLAN A SAMPLING JOB" button is located in the top right corner of the map area. On the left side, there is a vertical sidebar with icons for "MANAGE", "IMAGERY", "SAMPLES", "PLANS", "VIEW DATA", "NOTES", "ZONES", and "SCOUT". Below the map, the text "Site - Phalaris highway" is centered. Underneath this, there are four line graphs showing nutrient levels over time from 2018 to 2022. The first graph is titled "Phosphorus Colwell (mg/Kg)" and shows values of approximately 23 in 2019, 19 in 2020, and 27 in 2021. The second graph is titled "Sulfur (mg/Kg)" and shows values of approximately 10 in 2019, 6 in 2021, and 16 in 2022. The third graph is titled "Organic Carbon (%)" and shows a single data point of approximately 2.1 in 2019. The fourth graph is titled "pH Level (CaCl2) (pH)" and shows values of approximately 4.3 in 2019, 4.6 in 2020, 4.7 in 2021, and 5.1 in 2022. To the left of the graphs is a "Sample Photos" section with a photo of grass and the date "05 Nov 2020".

CSBP Lab. Extract Value.



Find a location or farm

Map MyData

DecipherAg Demo (DEC-012004)

Ashley Juers Owner



Samples

Upload sample results, view and analyse them on the map and plan sampling and scouting jobs.

Ok, got it!

SOIL PLANT

OPACITY

VIEW RESULTS FOR

- Single sites
- Paddock averages
- Zone averages

Demo Farm

ZONES

Seasonal NDRE 2017-2022

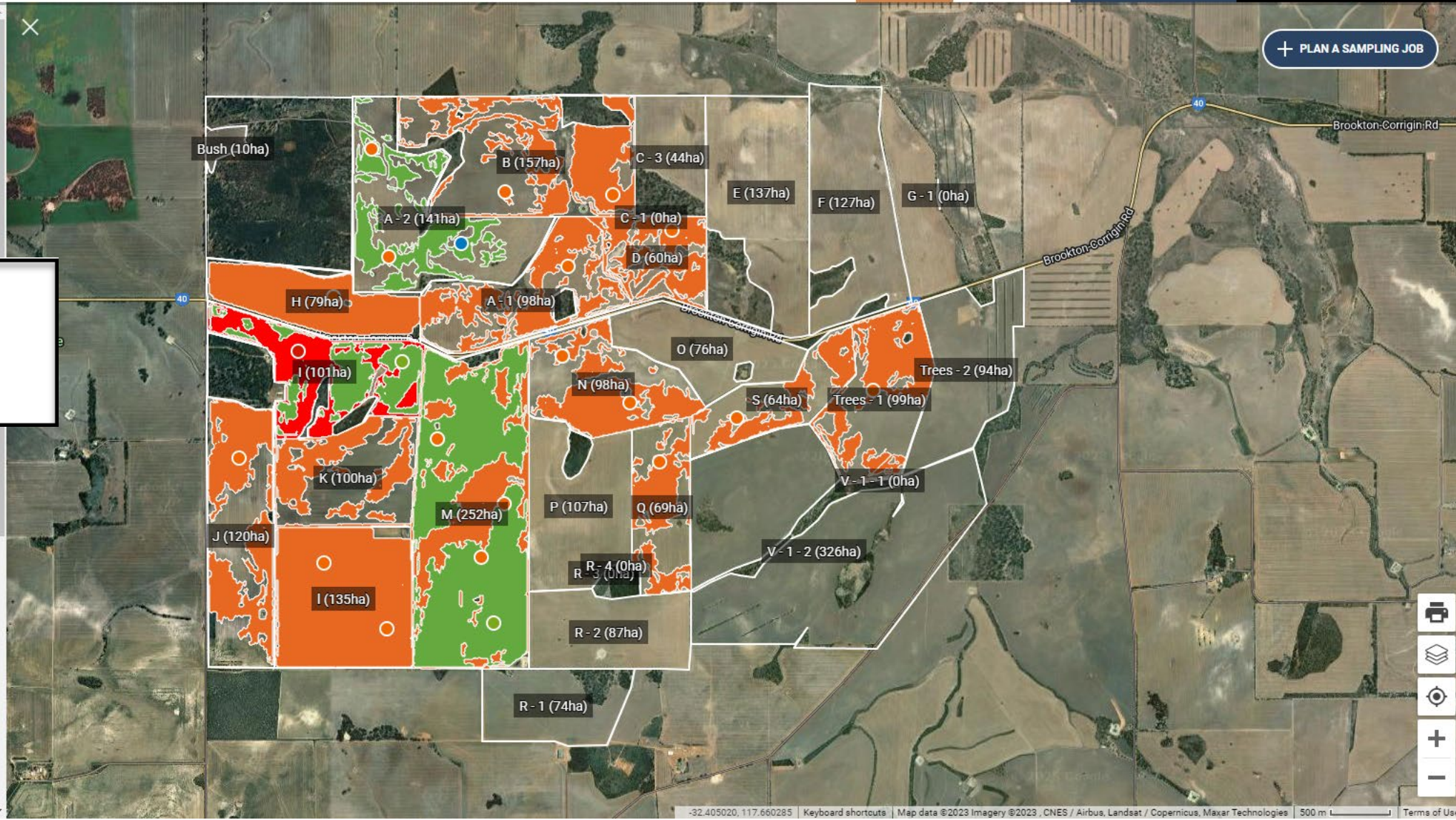
SEASONS

- 2018
- 2017
- 2016
- 2014

ANALYSIS

NUTRIENT

+ PLAN A SAMPLING JOB





Find a location or farm

Map MyData

- MANAGE
- IMAGERY
- SAMPLES
- PLANS**
- VIEW DATA
- NOTES
- ZONES
- YIELD
- SCOUT
- REVIEW
- MANAGE PLANS

Manage plans

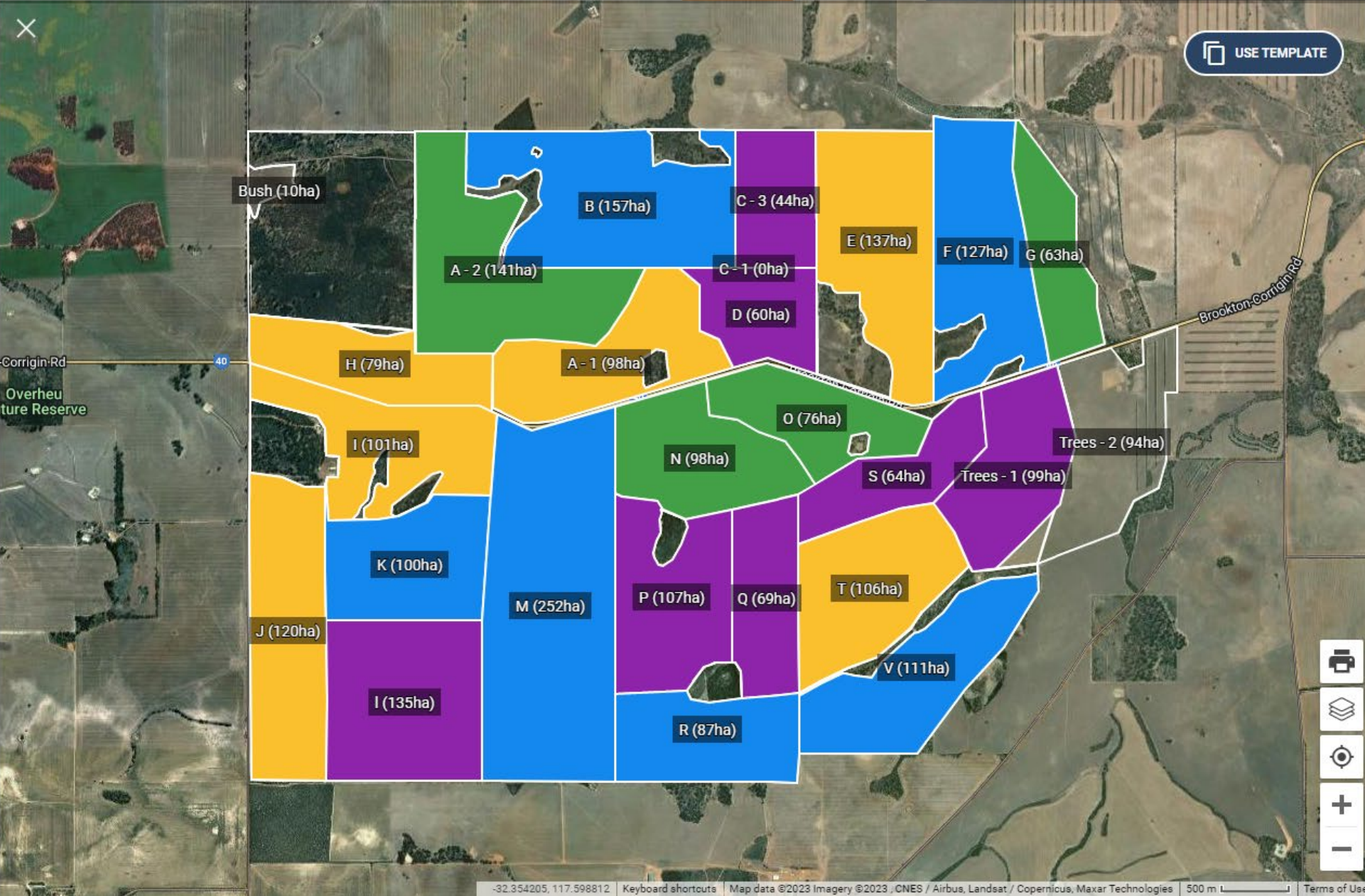
Create and manage your crop and nutrition plans for your paddocks.

Ok, got it!

Demo Farm 2023

Search paddock, crop, product

- A - 1 (98.4 ha)**
Canola
MacroPro Extra + Flexi-N + 1 more
- A - 2 (142.5 ha)**
Wheat
K-till Extra 95% AgMn 5%
- B (160.3 ha)**
Barley
K-Till Extra Plus + Flexi-N
- Bush (10.0 ha)**
- C (61.7 ha)**
Sub. Clover Clover
Tek Phos 3:1
- D (59.9 ha)**
Sub. Clover Clover
Tek Phos 3:1
- E (139.7 ha)**
Canola



USE TEMPLATE

Download files Show summary