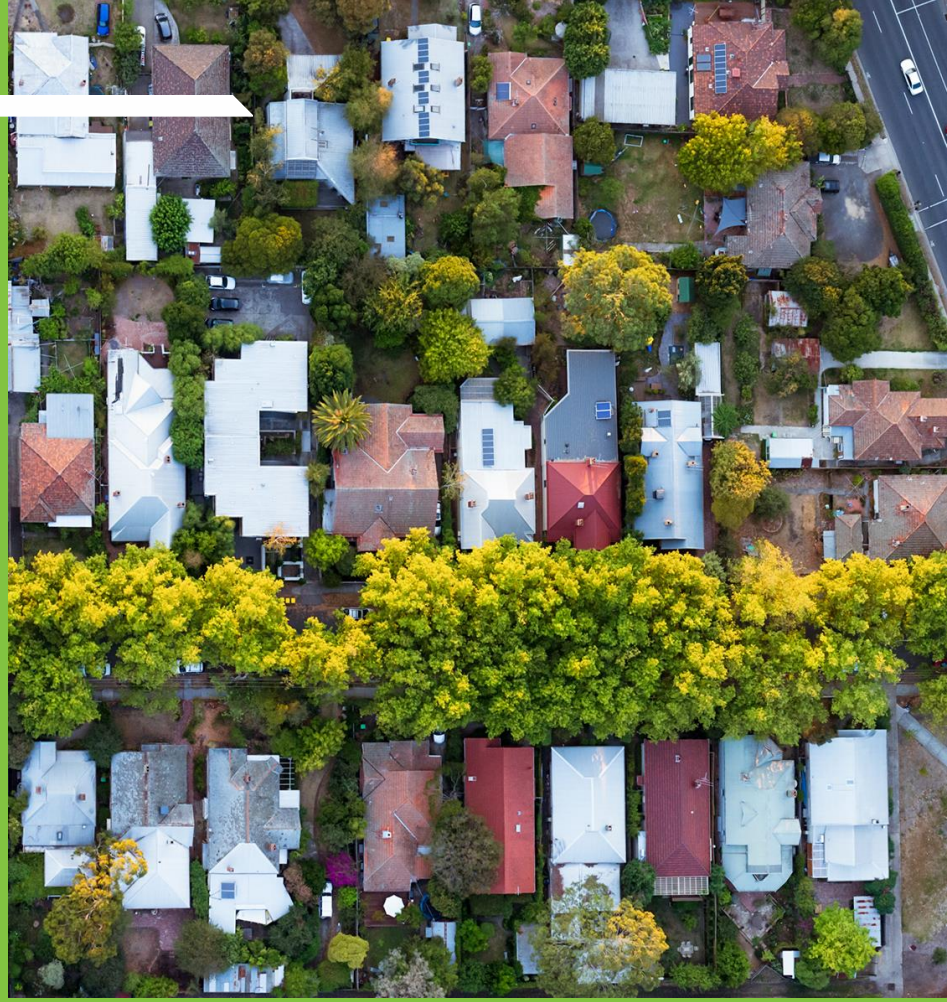
Grantee Symposium Event

Research & Development Fund – Organics

19 July 2022



Sustainability Victoria

Terra Nova Ag

Stephen Dumsday

‘Accelerating Adoption of Recycled Organics through Subsoil Amelioration in Agriculture’

Recycling Victoria Research and Development Fund – Organics

Simon Falkiner | Project Manager
19 July 2022

Project Lead's Background

Project Manager: Simon Falkiner

- Farmer and advisor specialising in the fields of soil health, crop and livestock production systems, and brand development.
- Actively involved in agricultural research. Projects have included:
  - Aus Industry Project – Application of Sensors to Determine Feeding Behaviour of Cattle.
  - Grain and Graze
  - NLP2 funded project focusing on subsoil amelioration (Corangamite CMA, Southern Farming Systems).
- Extensive experience in subsoil amelioration R&D (including machinery) and passionate advocate for its adoption in agriculture.

Project Lead's Background *(cont'd)*

Lead Organisation: Terra Nova Ag

- Established at Yaloak Estate in Ballan, Vic in 2020 as a provider of cropping and specialist subsoil health services.
- Yaloak Estate involved with subsoil amelioration since its beginning, including:
  - 2005-2009 | Trials led by Peter Sale (La Trobe), ARC funded project.
  - 2017-2019 | Waite Institute research into use of different amendments
- 10 years+ investment into research and development of bespoke machinery.
- Led by Steve Dumsday and Ben Inglis who are supported by a team of experienced operational and technical staff.
- Over 2,000ha of large-scale subsoil amelioration work undertaken to date.

Project Partner

Project Partner: AgVic

- Prof. Roger Armstrong and team at AgVic have extensive experience in R&D into use of organic and inorganic amendments in overcoming soil constraints.
- Prof. Armstrong currently leads or is a major partner on a range of large GRDC and High Performance Soils CRC projects.
- Prof. Armstrong and his team will support the project in providing technical support as well as in undertaking a statistically analysable trial into the use of FOGO in subsoil amelioration.

AGRICULTURE VICTORIA

Photo: Agriculture Victoria

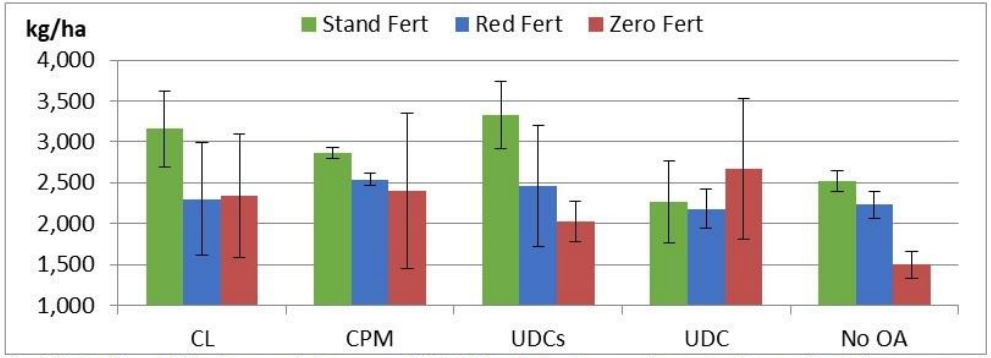
The Problem

Hostile Subsoils

- Sodicity widespread – covering ~3.6m ha of Vic grain producing region.
- Constrains root development and bucket size reducing yields.
- Subsoil constraints are varied and have different characteristics.
- Subsoil amelioration has been successful in addressing constraints.
- Solution may require blended amendments that target specific hostilities.

The Problem *(cont'd)*

Huge potential for productivity gains!



CL = Chicken litter, CPM = Composted pig manure, UDC = Urban derived compost (s = subsurface application),
No OA = No organic amendments (control)

The Problem *(cont'd)*

Barriers to Adoption

- Encouraging level of adoption of subsoil amelioration on large-scale projects, however broad adoption remains constrained by:
  - Understanding of subsoil constraints.
  - Access to organic amendments.
  - Predictability of results following subsoil amelioration.
  - Availability of commercial machinery.
  - Upfront cost.
- Project aims to leverage off Terra Nova Ag's experience with larger scale projects to address the above and increase end-user demand for FOGO.

Project Summary

Aim

- Develop and demonstrate a cost-effective integrated subsoil amelioration solution that can be utilised across a wide range of cropping operations.

Objectives

- Engage with farmers to understand opportunities for and barriers to adoption.
- Research supply chain to understand challenges and opportunities.
- Build confidence in performance of FOGO through trials and demonstrations.
- Develop an appropriate decision support tool for use by growers.
- Develop an appropriately sized, user-friendly machine for use by growers.

Project Summary *(cont'd)*

Product, Process or System Enhanced

- At present, subsoil amelioration is focused on large-scale cropping operations where the investment and effort is more easily justified.
- Historically, chicken litter has been the primary organic amendment used in subsoil amelioration.
- This project will focus on increasing the use of FOGO in the organic amendment blend and developing processes and machinery that is more easily deployed across cropping operations of all sizes.

Project Summary *(cont'd)*

Project Stages

- **Stage 1:** **Market Research/Engage with Growers (completion: 12/22)**
  Improve understanding of opportunities/barriers to adoption
- **Stage 2:** **Analysis of Supply Chain (completion: 12/22)**
  Improve understanding of cost structure and logistics
- **Stage 3:** **Machine Development (completion: 12/22)**
  Design appropriately sized user-friendly machine
- **Stage 4:** **FOGO Trial (underway, completion: 12/23)**
  Undertake 2 year paddock and trial-plot scale demonstrations
- **Stage 5:** **Prove in Operational Environment (completion 12/23)**
  Machine commissioned and tested in paddock environment

Project Locations

Three sites chosen for paddock scale demonstrations:

- HRZ: Winchelsea
- MRZ: Horsham
- Irrigation: Koondrook

All sites received an amendment blend designed to suit the conditions consisting of FOGO, pig manure and gypsum.

Rates applied were 10t/ha, 15t/ha and 20t/ha – focus will be how returns vary with change in rate.

Project Benefits and Outcomes

The project beneficiaries will be:

Growers: by providing a viable subsoil amelioration solution that deals with soil constraints to improve soil health and productivity.

Suppliers: by providing a potential sizeable, viable end-market for processed FOGO.

Researchers: by providing additional treatment data to add to the existing inventory of data on effectiveness of various OM amendments.

Councils: by providing a potential sizeable, viable end-market for FOGO, thereby avoiding landfill costs.

Community: by diverting FOGO from landfill which will reduce costs to households and businesses, and support the community's desire to move to a cleaner, greener, sustainable economy.

Opportunities

- Successful subsoil amelioration is dependent on the quality of the amendment that is used.
- Key factors include:
  - Moisture content
  - Screening size
  - Nitrogen concentration
  - C:N ratio
  - Level of contamination
- The project provides an opportunity to develop a feedback loop to inform development of quality standards and specifications for use of FOGO in agriculture.
  - Open to ideas on other opportunities!

Challenges

- The weather!
- Paddock scale demonstration at Horsham deferred until late 2022 due to conditions being too wet earlier this year.
- Demonstrates the benefit of undertaking paddock scale demonstrations in multiple locations with different climatic conditions.
- No doubt other challenges will be encountered along the journey.

Thank you

terranovaag.com.au

Elmore Compost & Organics

Frank Harney & Bill Grant

SV Organics R&D Symposium

19 July 2022

Deep soil amelioration R&D in central Victoria

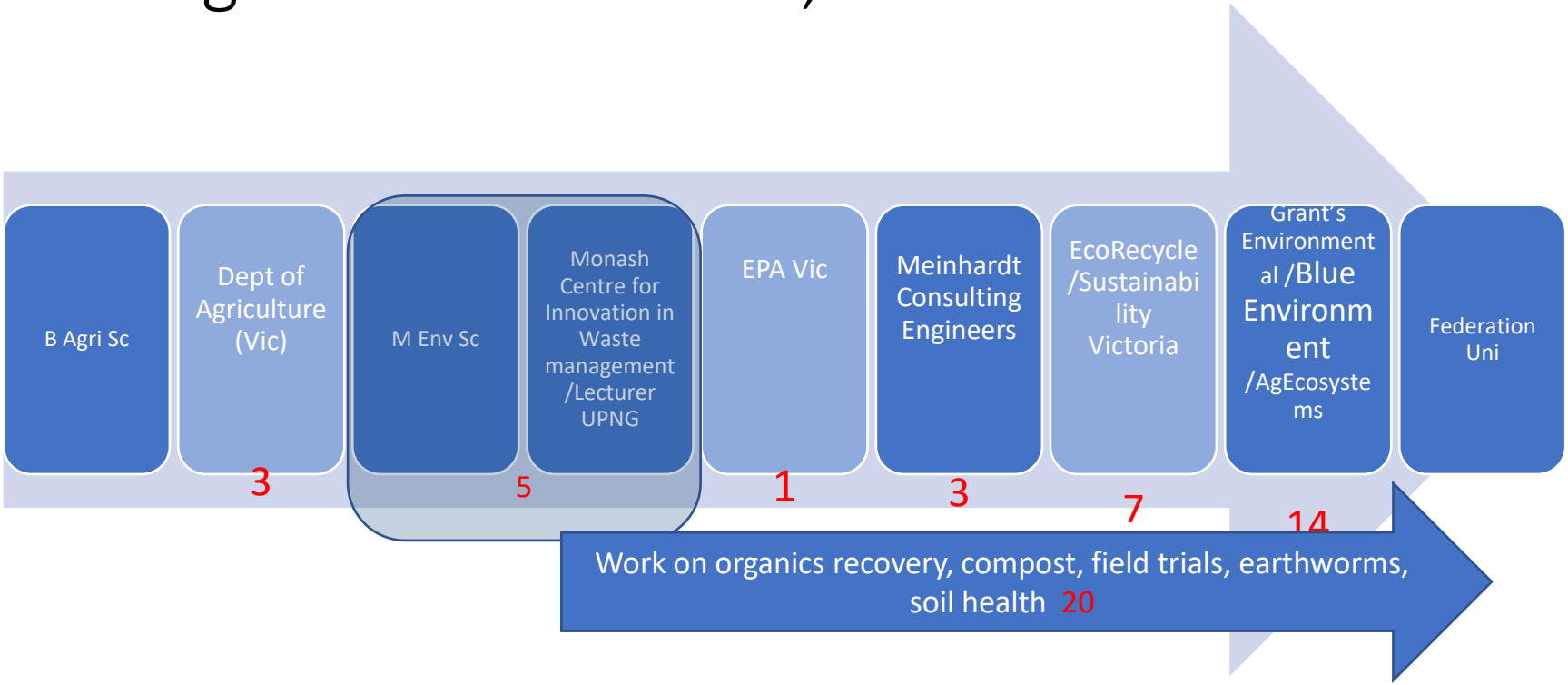
Presenters: Bill Grant, Research Fellow, Federation University

Frank Harney, Elmore Compost

Background – Elmore Compost & Organics

- 4th generation farmers
- Started with on-farm composting of pig manure and spoilt hay, for own use and local sales
- Expanded to receive other organics, gained Certification of products
- Focused on high quality, matured and specialised value-added compost products
- Also producing biochar, wood vinegar and humisoil soil amendments
- Have invested in development of deep soil amelioration units and products, and are using these on our own and other properties
- Elmore Compost & Organics are innovative, using precision farming tools and techniques, as well as adopting practices to improve soils and reduce the use of synthetic inputs (with some Certified Organic production to meet market demand)

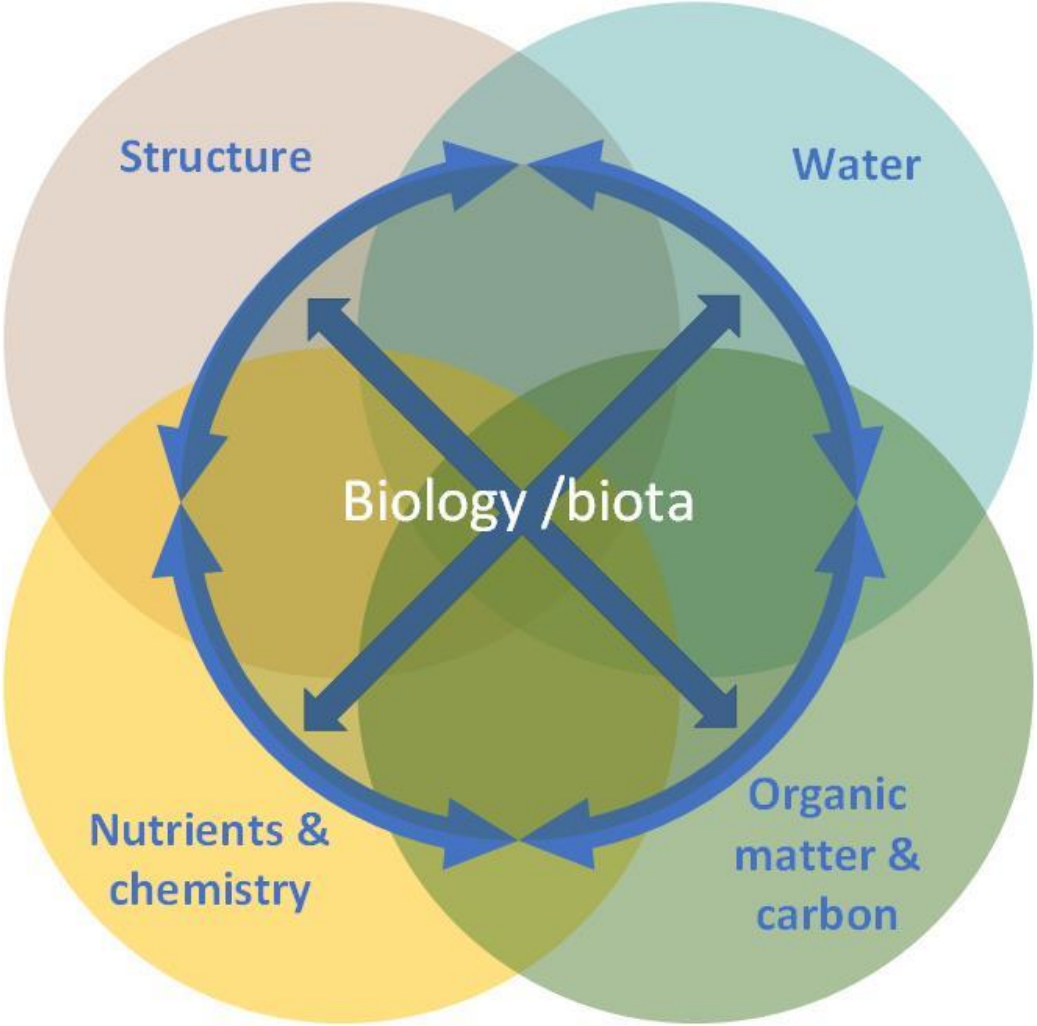
Background – Bill Grant, Federation Uni



Federation Uni has previously undertaken trails of DSA

The problem /market gap

- Deep Soil Amelioration (DSA) has great potential to improve soil health and productivity on soils with sub-soil constraints (i.e. most of Victoria's cropping and grazing land)
- Farmers need to be convinced /provided with evidence re: the benefit vrs cost
- DSA is expensive - $1,200-1,500 /ha inclusive of ameliorants, equipment, fuel, labour, etc.
- Many previous trials have used poultry manures and straws – these do not always persist in the soil for more than 3-5 years
- Matured/stable composts with higher 'humic' content & biochar products should persist for longer, acting for loner and reducing the need for repeated ripping. This should improve the economic viability of DSA, even if the matured compost and biochar products are more expensive.
- Organic amendments that persist for longer should result in more permanent changes to the subsoil due to deeper and thicker roots, better water infiltration and water holding capacity and more active and diverse biota down the soil profile.


Structure
Water
Biology /biota
Nutrients & chemistry
Organic matter & carbon

Alignment with funding objectives

- Use of municipal organic derived compost, biochar and ‘humisoil’
- Promotion of the use of products
  - Establishment of (hopefully long term) R&D sites
  - Field days
  - Information sheets
  - Youtube presentations
  - Project reporting
- Benefit-cost analysis of the use of products – looking at what yield responses will be needed over 10 years to deliver a decent return on investment (>15% real rate of return)

Project overview

Project Aims

- Investigate the effects of using more stable compost, humi-compost and biochar products in DSA compared to no rip, rip only, and DSA with less mature organics treatments (poultry manure)
- Establish two R&D trials that will allow on-going data collection
- Promote the use of matured composts in DSA

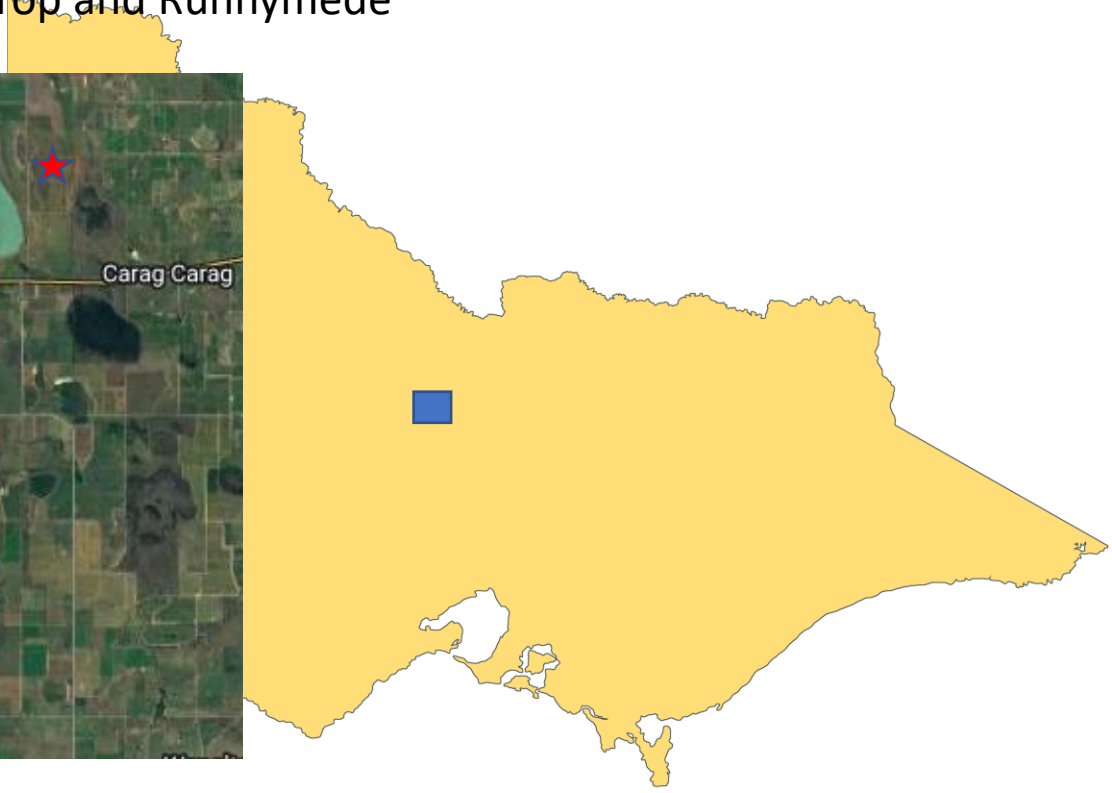
Product, process and system

- DSA with application of mature higher-nutrient municipal-manure composts, humi-soil and biochar products
- Focus of addressing sub-soil constraints
- Use of specialised deep ripping equipment

Project overview

What are we doing?

- Establishing two R&D trials at Corop and Runnymede



Project overview

Design
- Paddock scale
- Large single plots - randomised
- Sampling block across treatments
- GPS referenced – will sample same points

Treatments
- Control (between treatment plots)
- Rip-only
- 10 t/ha mature compost
- 30 t/ha mature compost
- 10 t/ha 90:10 mature compost:biochar blend
- 10 t/ha humi-compost
- 10 t/ha semi-composted poultry shed manure

Metrics
- Pre-trial soil testing – core testing to 0-30cm and 30-60cm to look at characteristics and variability
- Soil testing after DSA and 1st crop establishment, at the same time in 2023, and finally post harvest in 2023 (at end of funded trial period)
- Plant growth and yield parameters to be tested at various stages during the trial
- Ground cover and soil characteristics to be tested at various stages during the trial

Project overview

Soil Metrics

Testing to 0-30cm and 30-60cm (& potentially 60-90cm), with testing on and between rip lines. Composite samples will be collected at each sampling point.

- Total and labile carbon
- Bulk density
- Organic matter
- pH
- EC & sodicity
- Cation Exchange Capacity
- Total and available nitrogen and phosphorous
- Exchangeable Sodium, Potassium, Calcium, and Magnesium
- Microbial biomass will be measured in the second autumn sampling period to compare levels of soil biology under different treatments

- Field testing of penetrometer, water infiltration, earthworm counts
- Other qualitative observations (to be quantified where possible)

Project overview

Plant growth metrics

- % ground cover
- Density estimates
- Biomass yields per sq m
- Average root depth
- Grain yield of crops (harvesting equipment accurately logs yield across the paddock)
- Hay yields of fodder crops

Project benefits and outcomes

- Detailed literature review of DSA using organic amendments and related soil health/function and carbon research
- Promotion of DSA using compost products – raised awareness
- Data from funded period
- Benefit cost assessment re: levels of performance needed to be viable versus observed and expected performance
- Establishment of geo-referenced sites that will allow on-going data collection re: the fate for soil carbon from organic amendments beyond the life of the trial
- Information resources and reporting
- Potentially undergraduate and post-graduate spin off projects

Opportunities

- Value-adding to soil ameliorants (e.g. lime, gypsum, fertilisers)
- Integration of DSA with other ‘regen/healthy soils’ practices – e.g. minimum tillage, deep-rooted perennials, green manures/cover crops, rotational grazing
- Integration of DSA with precision agriculture tools
- Improving the flowability of products and delivery equipment
- Linking with existing ‘regen ag’ and soil health programs – NCCMA, Agriculture Victoria, growers groups (& also linking to Gippsland & Ballarat Federation University partnerships)
- Potential inclusion/integration of subject matter into Federation University Certificate, short course, honours and post-graduate programs/projects

Challenges

- Uncommonly ‘wet’ and good growing season(s)
- Obtaining statistically significant/’valid’ differences between treatments within the funded trial period
- Farmer participation in field days and penetration of key messages

Potential collaboration

- Information sharing – useful articles and papers, observations at sites
- Access to research databases and papers via Fed Uni
- Review of draft literature review and information resources
- Potential for Federation University students to collect data from sites

Contacts

Bill Grant – b.grant@federation.edu.au 0407 882 070

Frank Harney – frank@elmorecompost.com.au 0428 511 525

Deep soil amelioration research and demonstration promotional program

Loading the Sub-Soil Deep Ripper

Distribution box

Delivery of ameliorant to the soil

Delivery to the front tines

Delivery to the rear tines and finishing

Indication of a 30 cm application of ameliorant

Cirque du Soil

Jean Darling

GROWGOOD FERTILISER:
A HYPERLOCAL FOOD WASTE AGRI-PRODUCT

CIRQUE DU SOIL

COMMUNITY COMPOST COLLECTIVE

> WE CREATE INCLUSIVE CIRCULAR WASTE PROGRAMS AND PROTOTYPE THE POSSIBILITIES TO ENABLE OUR LOCAL COMMUNITIES IN OUR CITIES TRANSITION TOWARDS REGENERATIVE WASTE PRACTICES.

Cirque du Soil aka 'Circular Soil' is a circular waste management certified social enterprise. We're actively addressing the missing middle in waste diversion in Precincts and Multi-Unit Developments using place based frameworks to reduce our impact on the planet.

Our mission:

- Advocate for a circular city through food systems;
- Create zero waste neighbourhood programs that engage precincts to take climate action
- Reduce and divert waste going to landfill and our soils
- Help local businesses transition to the circular economy by brokering precinct waste streams to locally manufactured circular products and services

THE CIRQUE DU SOIL TEAM

NANON, MARKETING

CAITLIN, COMMUNITY PROJECTS

SOIL, OMNIPRESENT

BENNY, OPERATIONS

STEPHEN, SOCIAL IMPACT AND OPS

RACHEL, GRAPHICS / LANDSCAPING

REANNA, ENGAGEMENT

JEAN, FOUNDER / MD

WINIFRED, DIGGER OF SCRAPS

11%
of the world's methane emissions is generated in landfill globally.
Global Methane Initiative

WHO WE WORK WITH

RESIDENTIAL DEVELOPMENTS

- Kerb / Pick up service up to 200 unit developments.
- >150 units - consulting for onsite circular food waste solutions

FOOD BUSINESSES

Precinct Hospo Sectors
Cafes/Restaurants/Bars

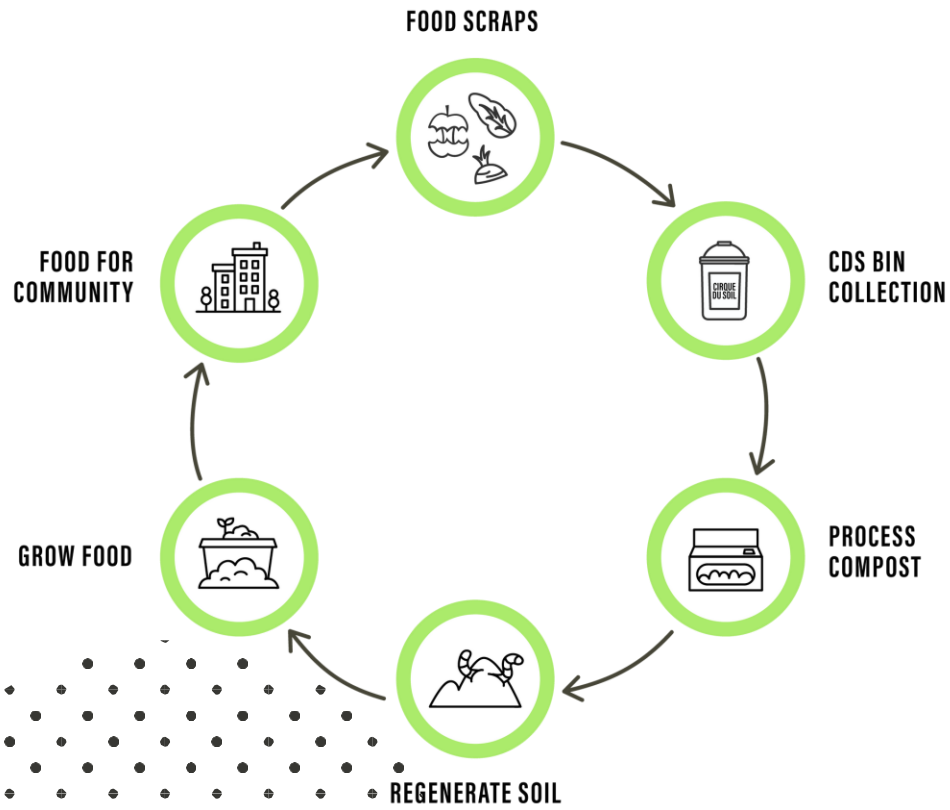
OFFICES + ORGANISATIONS

> 15 staff

COUNCILS + DEVELOPERS

Circular waste consulting services

ONE OF OUR WASTE PROGRAMS: COMMUNITY COMPOST COLLECTIVE



OUR TIMELINE

Early 2020: Launch of Community Compost Collective program in early 2020 centred around recovering urban food waste to produce high nutrient biodiverse fertiliser on a close to zero carbon processing footprint, to regenerate urban soil for the Melbourne food bowl; re-imagining urban food forest networks in our balconies, streets, parks and market gardens.

Late 2022: Launch of Community Waste Collectives which targets hospitality waste beyond organics. This industry partnered program will address both upstream and downstream waste generated in inner city precincts to scale up micro-recycling of local manufacturers in inner city Melbourne, to fully circular outcomes.

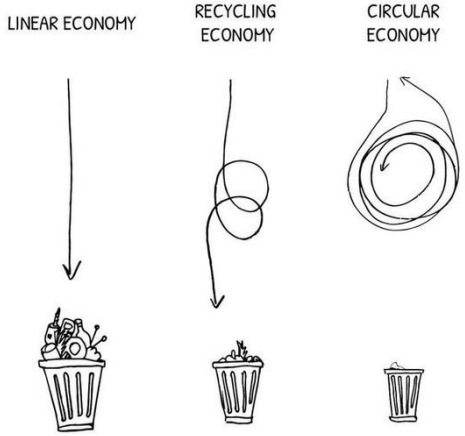
Mid 2023: Publication launch of Circular Hospitality Best Practice Guide

Late 2023: Product development of GrowGood Fertiliser and market trials.

How we process

food recycling technology

SO WHAT IS A CIRCULAR ECONOMY AND WHY SHOULD WE TRANSITION TOWARDS ONE?



PLAN C Empowering circular futures

Currently, our global economy is built on the concept of a linear and depletive economy, where we extract, manufacture, distribute, use and dispose.

A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems where we live.

GROW GOOD, LOCALLY

By 2050, 80% of the world's population will live in urban areas. This comes with risk - habitat and biodiversity loss are on the rise as urban centres of consumption continue to rise.

Currently **5.4 million tonnes** of fertiliser is sold in Australia annually, **approximately 50% is imported from overseas**. Simultaneously, in Victoria over 400,000 tonnes of food waste in landfill originates from households.

A joint partnership between Cirque du Soil, RMIT STEM College and Maze Products, the GrowGood Fertiliser project seeks to develop fertiliser products derived from high street food waste diverted from landfill through rigorous soil and plant testing trials of tangible agricultural fertiliser products, leading to the creation of a commercially viable product derived from the City of Yarra precinct food waste stream. (Yes - This includes your $17.90 avocado toast brekkies!)

GROWGOOD PROJECT TEAM

JEAN DARLING
Project Manager
Cirque du Soil

STEPHEN MASON
Finance + Commercialisation
Cirque du Soil

CAITLIN PHILLIPS-PEDDLESDEN
Project Monitoring + Evaluation
Cirque du Soil

RONEN MAZOR
Market Readiness
+ Logistics Lead Partner
Maze Products

SALLY HARRISON
GrowGood Research Associate
PhD Candidate

DR AKANE UESUGI
RMIT Lead Researcher,
Lecturer in Plant Ecology
(Biosciences and Food Technology)

DR SAM GROVER
RMIT Co-Investigator
Soil and Environmental Science

DR PETER TORLEY
RMIT Co-Investigator
Associate Professor
Land and Food Sciences

DOES THIS GROW GOOD?

SHOPPING CENTRE
PUBLIC INSTITUTION
APARTMENT
RESIDUE TESTING ACROSS VARIOUS URBAN ENVIRONMENTS
HOSPITAL
HOTEL

GROWGOOD R&D PROJECT PARTNERS

RMIT UNIVERSITY

maze

VICTORIA State Government

Green Eco TECHNOLOGIES

Sustainability Victoria

ecoguardians

GROWGOOD R&D
PROJECT SUMMARY + OBJECTIVES

- Prove that the fertiliser blend developed does not have unintended negative environmental or safety consequences, and can meet ASPAC lab testing, Australian Standard guidelines and certification standards.

- Establish the improvement to crop yields and determine the economic value of local source of food waste into a hyperlocal agri-product.

- Determine the ideal blend(s) required to transform the input material (residue) into a safe and effective product.

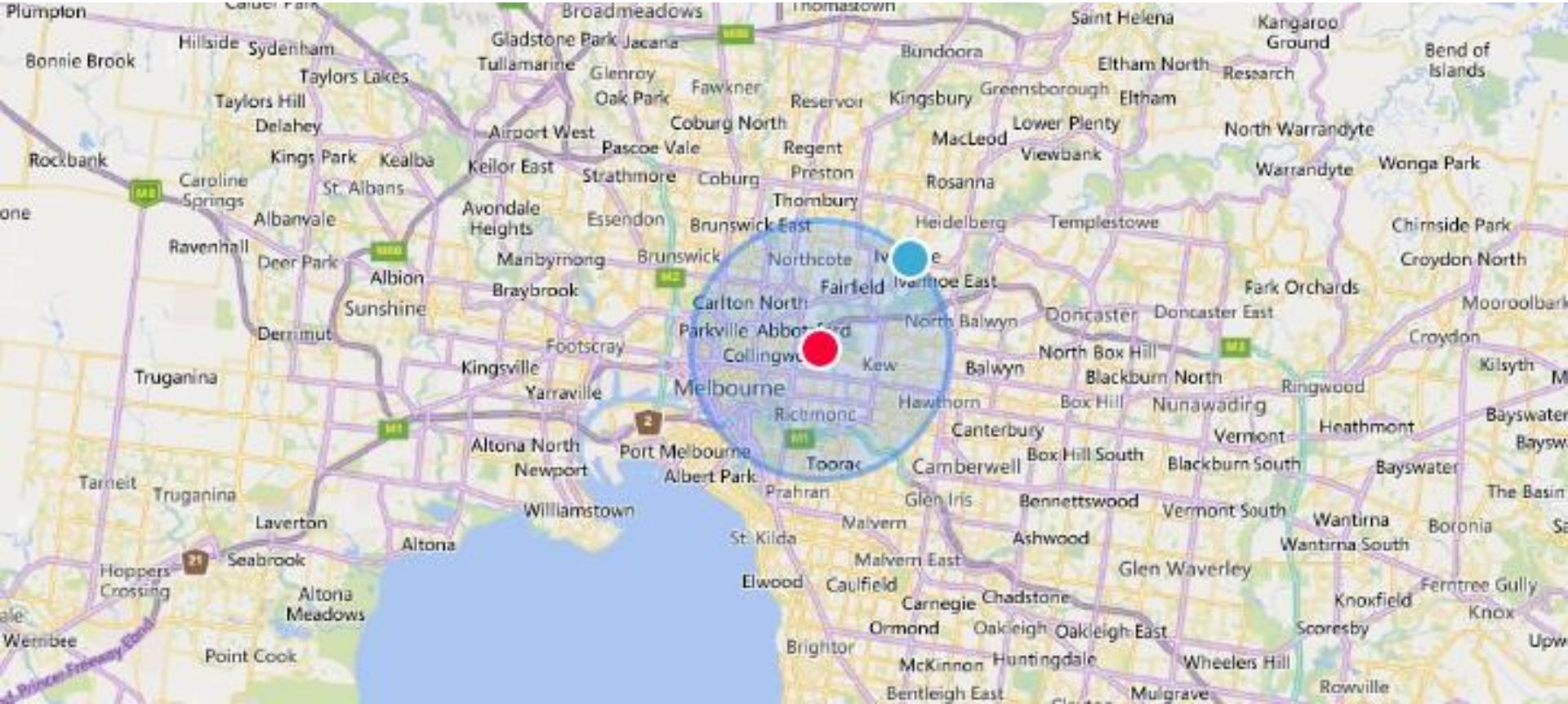
- Discover the residue's inherent value and (re)application as a fertiliser blend, through a series of comprehensive plant growth trials.

- Create a market-ready bio-organic fertiliser and demonstrate proof of concept of a closed-loop system around food waste from the existing Cirque du Soil urban community compost program and Wastemaster food recycling machine outputs.

- Ultimately contribute toward the regeneration of soil quality, resulting in premium soils with improved nutrient quality and supporting domestic and local agricultural edible produce production.

- Provide a groundbreaking evidence-base prototype for an entirely closed-loop food waste circular economy, whereby food waste is collected, processed, blended, packaged and distributed in an effective fertiliser form - **all within a localised urban environment.**

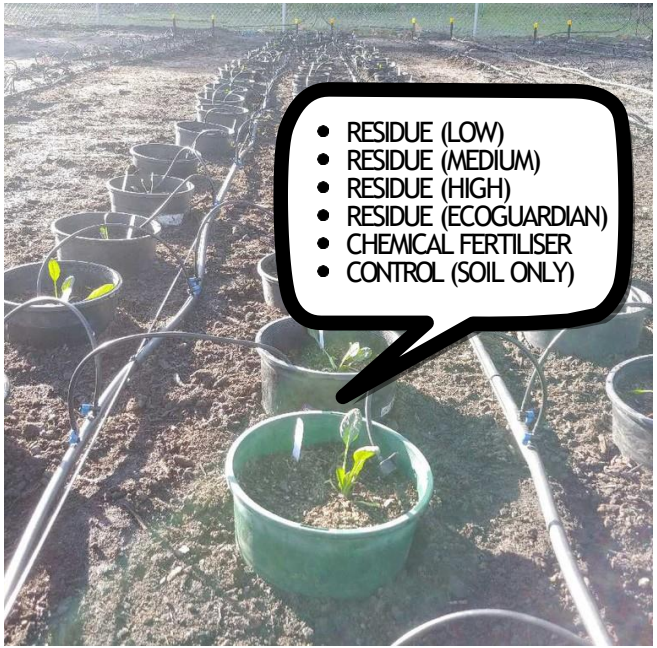
GROWGOOD FERTILISER:
A HYPERLOCAL URBAN AGRI-PRODUCT (ALL WITHIN 5KM)



GROWGOOD R&D PROJECT ACTIVITIES

GROWGOOD R&D PROJECT ACTIVITIES

1. HOW ARE WE TESTING FOR GROWGOOD FERTILISER?



PLANT TRIALS

SPINACH (WINTER CROP)

TOMATOES (SUMMER CROP)

2. HOW ARE WE ASSESSING THE QUALITY OF CROP?

- CROP YIELD (BIOMASS)
- COLOUR
- TOUGHNESS
- CHEMISTRY
- TASTE

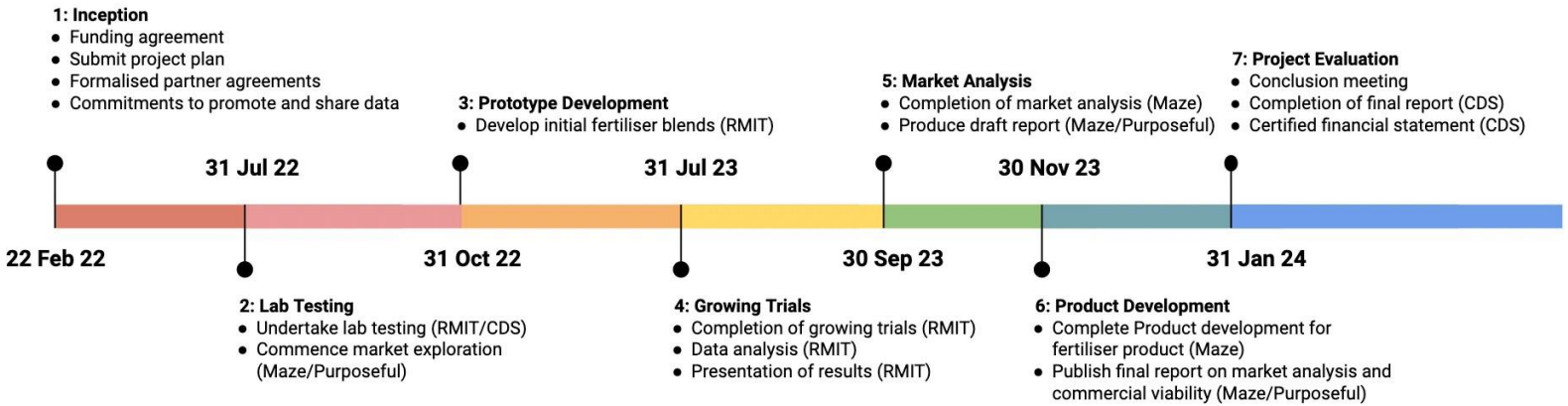
3. DOES GROWGOOD FERTILISER IMPROVE THE QUALITY OF SOIL?

- CHEMICAL ANALYSIS OF RESIDUE
- SOIL NUTRIENT DURING THE GROWTH PERIOD

GROWGOOD R&D PROJECT LOCATION

RMIT BUNDOORA - HOME TO RMIT BIOSCIENCES WITH FIELD SITES PURPOSE BUILT FOR LARGE SCALE FIELD EXPERIMENTS

GROWGOOD R&D PROJECT TIMELINE



GROWGOOD R&D PROJECT BENEFITS + OUTCOMES

GROWGOOD

FERTILISER FROM URBAN FOOD WASTE

VALIDATION OF SOIL IMPROVEMENT AND GROWTH YIELDS

REGENERATE LOCAL SOILS

INCREASE MICRO-COLLECTIONS

INCREASE FOOD SECURITY + SOIL BIODIVERSITY

STOP PAYING $12 FOR LETTUCE

NUTRIENT BASED CIRCULAR ECONOMY

ACCELERATE LOCAL FOOD GROWING SYSTEMS AND URBAN FARMING / GREENING INITIATIVES

GROW LOCAL, BUY LOCAL: A CLOSE TO ZERO CARBON MODEL

MINIMISING CARBON FOOTPRINT

FACILITATING F&B HOSPITALITY INDUSTRY AND CONSUMER BEHAVIOUR CHANGE

INCREASE PUBLIC AWARENESS + EDUCATION

BE A BINFLUENCER

INCREASE FOOD WASTE DIVERSION FROM LANDFILL

REDUCE UPSTREAM + DOWNSTREAM FOOD WASTE

"BROADENING THE URBAN WASTE TO LOCAL GROWING NARRATIVE"

GROWGOOD R&D PROJECT

OPPORTUNITIES

- UNDERSTANDING NUTRITIONAL COMPOSITION OF FOOD WASTE FROM SPECIFIC URBAN ENVIRONMENTS
- COMBINING OUR PRODUCT WITH OTHER SPENT FOOD WASTE
- MATERIALS DESIGN + PROTOTYPE NEW FORMS AND BIOMATERIALS
- FACILITATE CITIES TO PRODUCE THEIR OWN
- FERTILISER ECOSYSTEMS CHANGE

CHALLENGES

- CONTAMINATION
- THE INCONSISTENT NATURE OF WHAT GOES INTO AN ORGANICS COLLECTION AT ANY GIVEN PERIOD
- "ORGANIC" CERTIFICATION AND ACCEPTANCE FROM ORGANIC VEG PRODUCERS

FIND US ON

www.cirquedusoil.com.au

STREET ADDRESS

2/377 Little Lonsdale Street
Melbourne VIC 3000

GET IN TOUCH

Jean Darling 0412 4321 34
Stephen Mason 0434 5511 44

cirquedusoil cirque.dusoil hello@cirquedusoil.com.au

Agpath

Dr Mary Cole

AGPATH
Agricultural Pathology and Biological Farming Service
Agricultural Consultants since 1980

Quantifying Mineralisation & Biological Status from Organic Amendments C-12300

Recycling Victoria: a new economy

Recycling Victoria Research and Development Fund – Organics

Contract ID – Dr Mary Cole - 0413 013 247

Sustainability Victoria

VICTORIA State Government

Lead organisation – Agpath Pty Ltd

I pay my respects to the elders past, present and emerging of the Kulin Nation for this place where we are meeting.

I wish to acknowledge that their custodianship of this land has never been ceded.

Dr Mary Cole, director & Principal scientist of Agpath Pty Ltd founded in 1980.

Honorary Senior fellow, Faculty of Veterinary & Agricultural Sciences, University of Melbourne

Worked in soil health during academic career – worked to minimise use of synthetic chemicals in all agriculture around the world.

Problem to be solved

- How does FOGO influence green organic recycling ?
- What are the nutrient levels & mineralisation of organics?
- What is the biological status of organic products?
- What are the nutrient levels & mineralisation of organic products in the soil?
- What is the biological status of organic products in the soil?
- What is the product-specific influence of recycled organics on plant health?

Participants

- Agpath Laboratories Pty Ltd – grant recipient
- Sustainability Victoria – funding body
- CORE – Centre for Organic Research & Education - major partner
- Univ of Melbourne – partner
- GRO – Gippsland Regional Organics – partner
- Charlton feedlot – partner
- Agrisolutions, Horticultural farms, Pasture

Summary of project

Aim: understand mineralisation of nutrients from products & get them fit-for-purpose.

Objectives: several

Identified problems: lack of good data/information

Anticipated outcomes: many

Program design: ---- two pasture and two vegetable farms on two different soils;
--- replicated trials plots on each;
--- field trials as farmers would use the products

Pasture site: Peaty loam:
Agpath site
105 Gunn Road, Garfield

Dr Mary Cole Agpath P/L

Pasture site: Clay loam:
85 Labertouche Road,
Labertouche.

Feed lot material at Labertouche site

Dr Mary Cole Agpath P/L

Vegetable site: clay loam
100 Alcorn Road,
Labertouche

10 Lea Road, Koo Wee Rup. Peaty loam soil

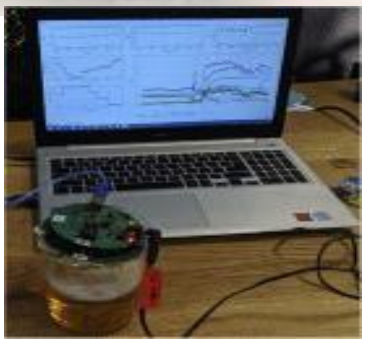
Dr Mary Cole Agpath P/L

Who benefits?
Producers of recycled organic products;
Farmers: Urban, parks & gardens; Community;
Environment; Council/government/standards

Opportunities

- Product fit-for-purpose
- Energy source – waste to energy
- Address carbon capture
- Reduce farmer costs in inputs

Challenges

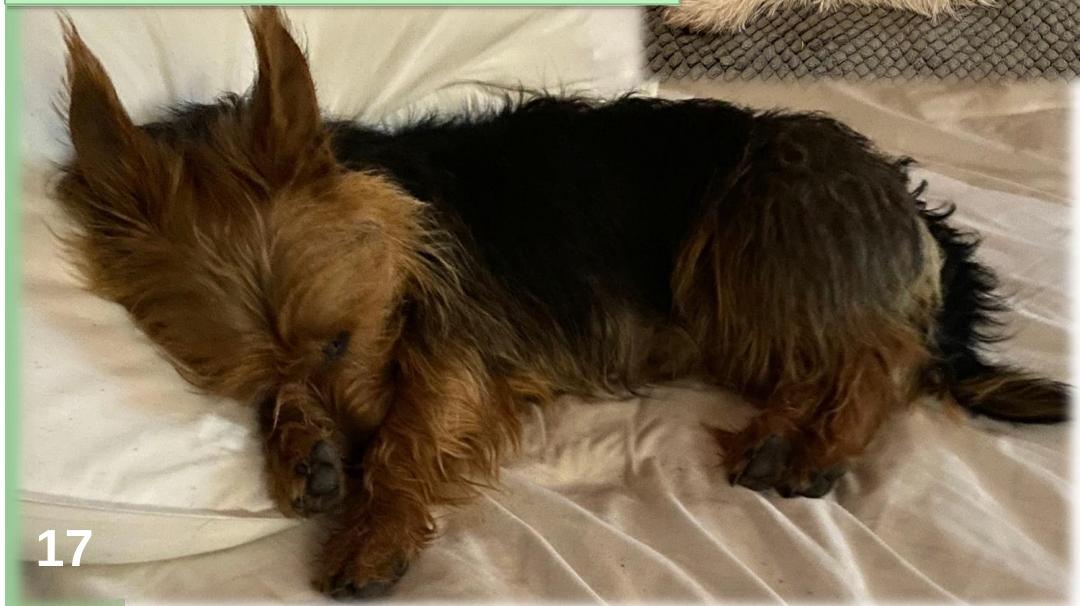


- Dealing with bureaucracy;
- Finding suitable farms on which to carry out research;
- Technical issues with research equipment eg e-noses
- Working around the weather in winter;
- Product delivery

Thank-you to Mitch and Andrew

Every good project needs good(engaged?) management staff

Lottie



Wilbur

NutriV

Raquel Said

Sustainability Victoria Symposium

FRESH SELECT
"If it's fresh, it must be Select"

Nutri V

FRESH SELECT
"If it's fresh, it must be Select"

Nutri V

Our Mission

To see 100% crop yield used, with non-retail and waste produce converted into nutritious and delicious foods and ingredients that will increase vegetable consumption in our population via a sustainable food supply model.

100% Australian Grown and Made

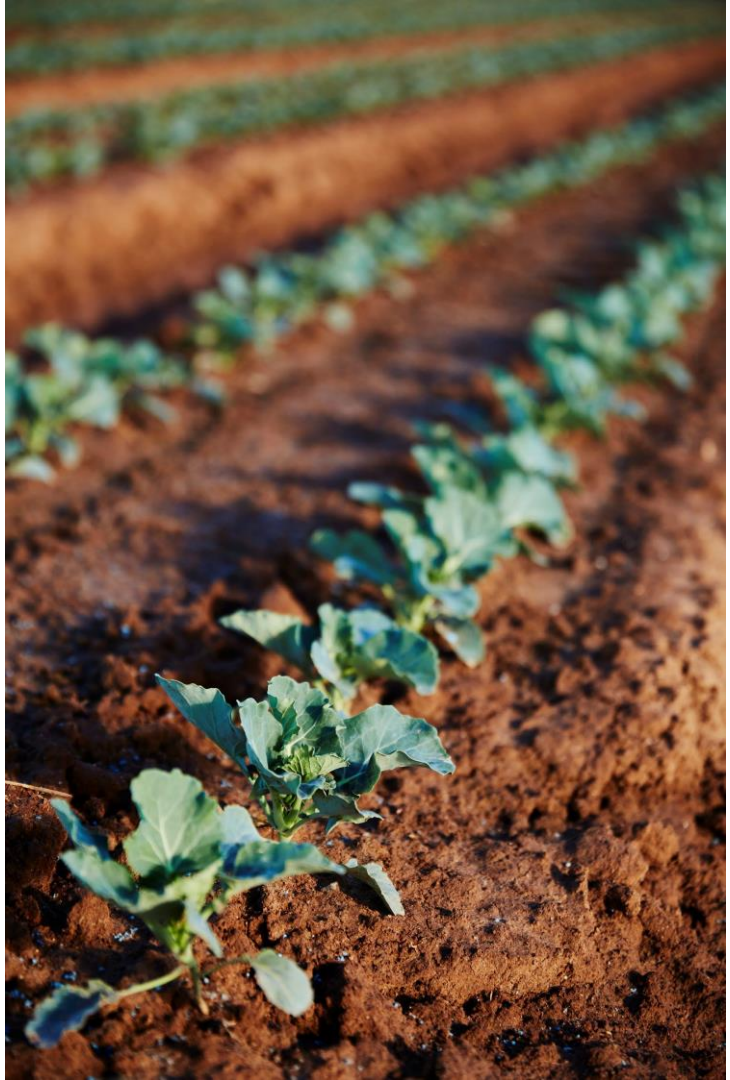
Collaboration between CSIRO and Fresh Select

CSIRO

FRESH SELECT
"If it's fresh, it must be Select"

FRESH SELECT

Nutri V



Focus on Sustainability

Opportunity for all Australian farmers

Supporting 100% yield of every crop

Entire vegetable used, including leaves and stalk

No such thing as ‘ugly’ veg

Marginal and under-utilised land a big opportunity

Most farms expect to only harvest 75% of what they plant, add to that non retail grade produce and crop utilisation can be as low as 60%.

Extended shelf life

Our process turns non-retail product into shelf stable serves of vegetables

Expandable solution

This solution goes beyond Fresh Select Farms as it is expandable across the country to many other crops

FRESH SELECT

Nutri V

Project Overview

What are we trying to achieve?

Project Summary

To build Victoria's first regional food transformation hub to upcycle 7280 tonnes of vegetable waste into high-value nutritional products.

Target feedstock

Initially we started with broccoli and cauliflower waste from Fresh Select. This project has grown support the local farming community to eliminate food waste, generate new revenue streams and operate more sustainably.

Up Stream Impacts

100% Australian ingredients replacing off-shore imports

Millions of serves of vegetables available to use in food products

FRESH SELECT

Nutri V

What are we creating?

Our on-site capability

Vegetable Powder

Vegetable powders for use as an ingredient that can be used in almost any end product.

Snack Line

To be launched in Oct 2022 nationally with Coles Nutri V Goodies is a delicious healthier for you snack with 2 serves of vegetables per pack.

Patented Ingredients coming

Vegetable based ingredients with higher health claims under development to target.

R&D work

We are working with a range of other companies to identify ingredients and products.

FRESH SELECT

Nutri V

What will we deliver?

KEY STATISTICS

7280t

Tonnage Processed

Amount of material processed a year

11

Jobs Created

Our new processing hub means new jobs

365t

Vegetable Powder Produced

All recovered from waste

60 MILLION

Serves of Vegetables created

Available for upstream commercial and health benefits

232t CO2-e*

Emissions reduced

Greenhouse gas emissions abated

4282ha

Local land catchment supported

Based on the processing capacity, 4282 hectares of food loss can be captured

FRESH SELECT

Nutri V

*Based on The Path to half © Sustainability Victoria 2020. For every tonne of food waste reduced, we could save .29t of Carbon Dioxide

Innovation Timeline

Where did we start → what's next

WHERE WE ARE NOW

Pre-Commercialisation

$500,000
Including:
- Market opportunity assessment
- R&D
- Business planning

2018/2019

Start Up Phase

$500,000
Including:
- R&D,
- POC,
- Product trials
- Tech assessment
- Business planning

2020

Scale Up Phase

1.6M total project spend
500,00 from SV
Including:
- Equipment
- Commissioning
- Scale up for launch
- Education
- Launch event

2021/2022

Post Launch

2M anticipated CSIRO spend over next 3 years to progress 2 further patents bringing minimum 5 new products to market.
All tying back to waste initiatives.

2022-2025

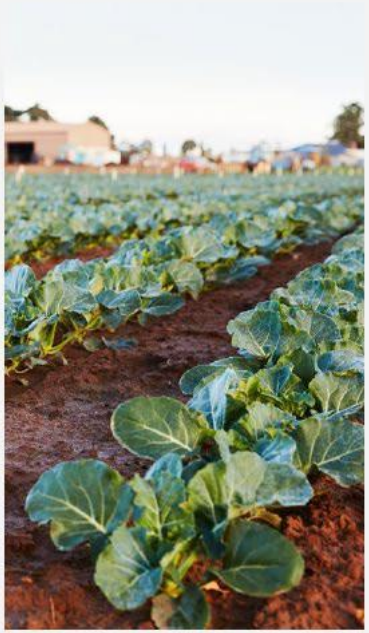
NOV 2019

Nutri V was formally established with parents Fresh Select and CSRIRO

2022

Initial revenue generated through on-self retail product

Have any questions – Contact us at raquel@nutriv.com.au



FRESH SELECT

Nutri V

Waste Mining

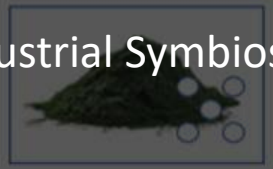
Robert D’Arcy

OASIS

Water Food Energy Technology

Project Summary

Organics & Aquaculture Sustainable Industrial Symbiosis



WasteMining

THE UNIVERSITY OF MELBOURNE

Sustainability Victoria

VICTORIA State Government

WESTERN WASTE MANAGEMENT

BrAle Resources Ltd

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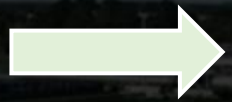
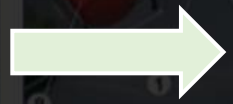
Current disposal routes

Separated food waste

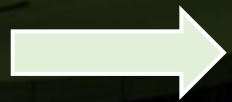


Landfill

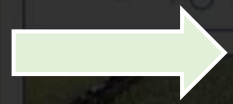


Pollution

Separated food waste



Compost



Land spreading

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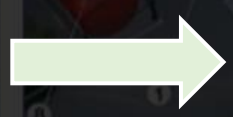
Current recognized alternatives

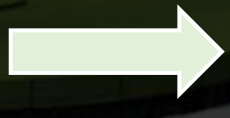
Separated food waste

Incineration

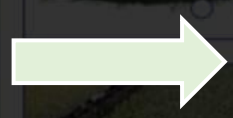


Pollution

Separated food waste



Anaerobic Digestion



Land spreading

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Our proposal

Organic & Aquaculture Sustainable Industrial Symbiosis

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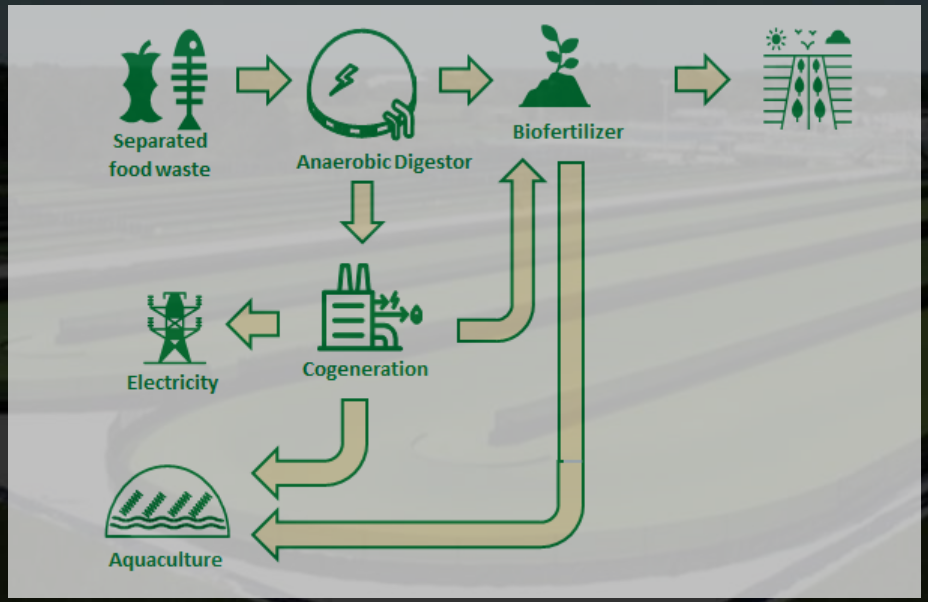
Process Outline



- Utilizes well established technologies in an innovative configuration
- Designed to:
  - optimize use of nutrients
  - Maximizes the number of commercially valuable products
- Practical example of the Circular Economy

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Anaerobic Digestors

- 2 digestors
  - 3 tonnes per day (1,095 tonnes pa)
- Packaged units in 40-foot shipping containers
- Low pressure biogas storage bag
  - $50m^3$
- Electricity generator and materials handling equipment

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- Anaerobically digested organics rich in nutrients
- Screw press to separate into 2 fractions
  - Solid fraction composted into biofertilizer
  - Liquid fraction diverted to aquaculture

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Algae Cultivation

(Spirulina & Nanochlorpsis)

Algae to be sourced from the Australian National Algae Culture Collection - CSIRO

- 2 cultivation greenhouses
- 100m by 10m each
- Cogeneration exhaust to enhance the CO_2 content of the water.
- Heat recovered from the cogeneration system heat water
- Artificial LED lighting would be used to accelerate growth rates.
- Drying would take place de-humified chambers to avoid thermally damaging the algae.

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Duckweed (Lemna) Cultivation

Duckweed to be sourced from CSIRO Land and Water Luca Heights Laboratory

- 1 Ha cultivation area
- 291m by 36m raceway design
  - 9m channel width
- Screw press dewatering
- Flash drying or ensiling
- Product partners
  - Beef
  - Poultry
  - Aquaculture

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Project Participants

Biographies & Roles

WasteMining
THE UNIVERSITY OF MELBOURNE
Sustainability Victoria
VICTORIA State Government
WESTERN WASTE MANAGEMENT
BrAle Resources Ltd

brian@braleconsulting.com
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Project Participants

Participant	Role
WasteMining	Project lead. Financially responsible for project realization.
The University of Melbourne	Project validation. Independent verification of project outcomes and performance
Western Waste Management	Project host. Commercial waste management business supplying feedstocks and site
BrAle Resources Ltd	Project management. Ensuring project is completed to Sustainability Victoria's satisfaction

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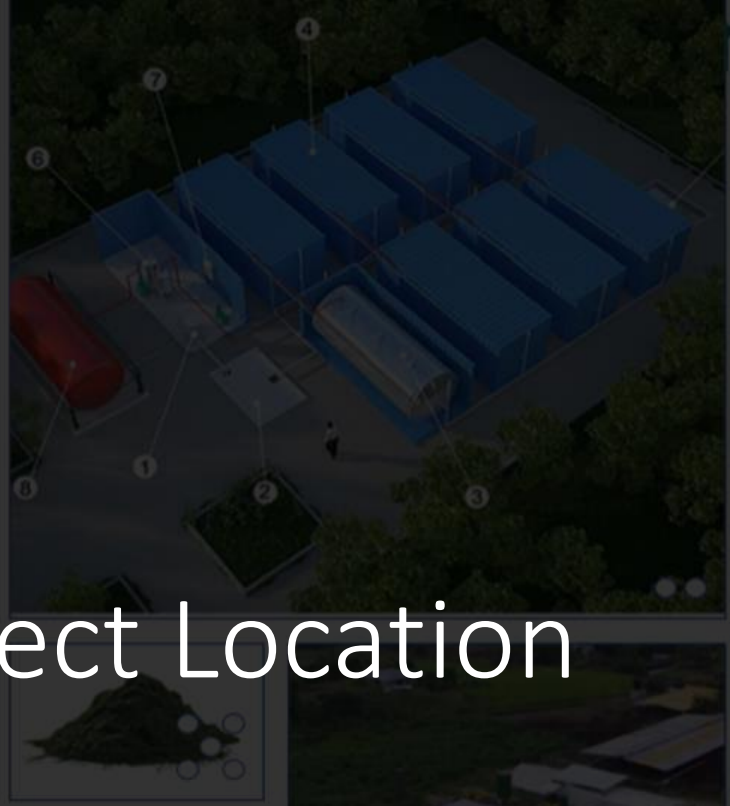
Project Location

Location & layout



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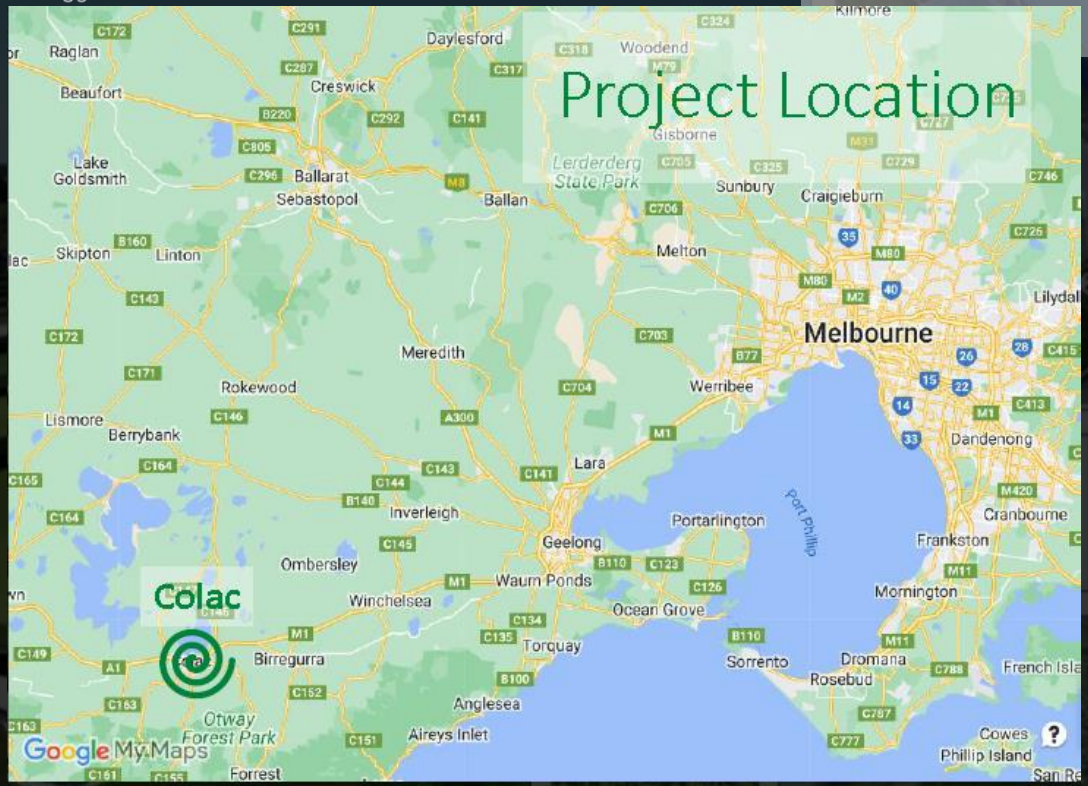
Project Location



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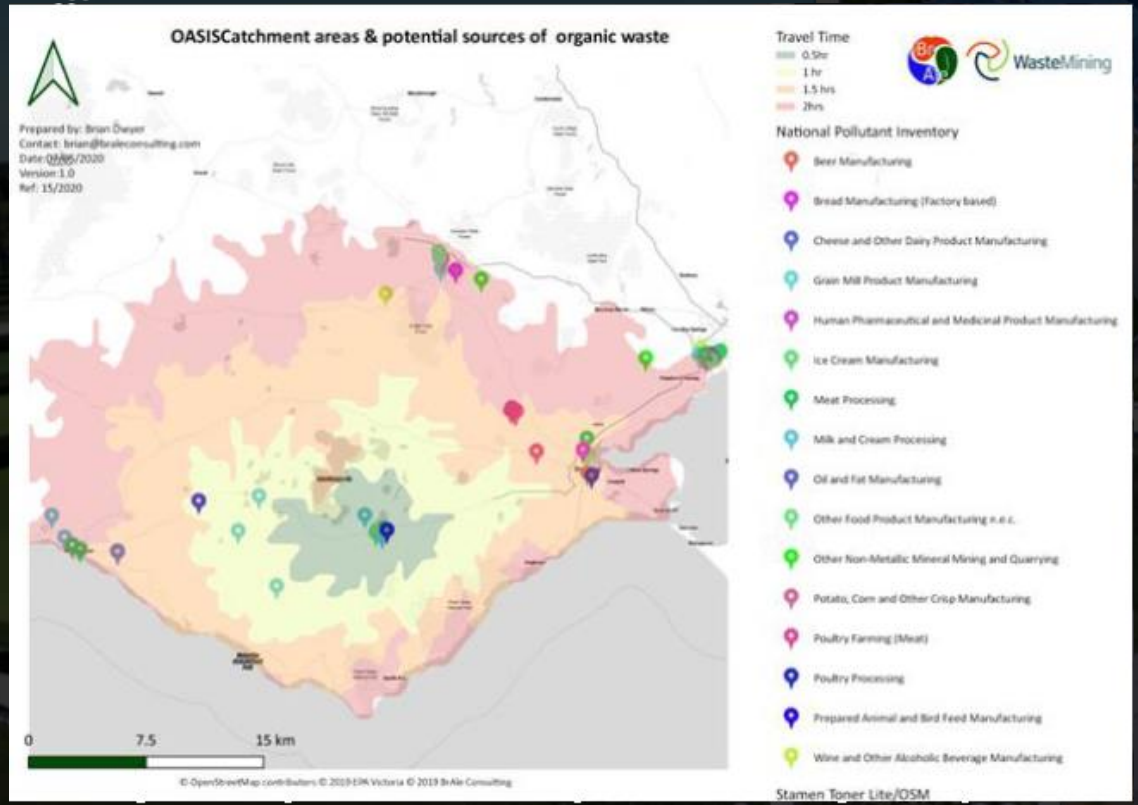
Project hinterland



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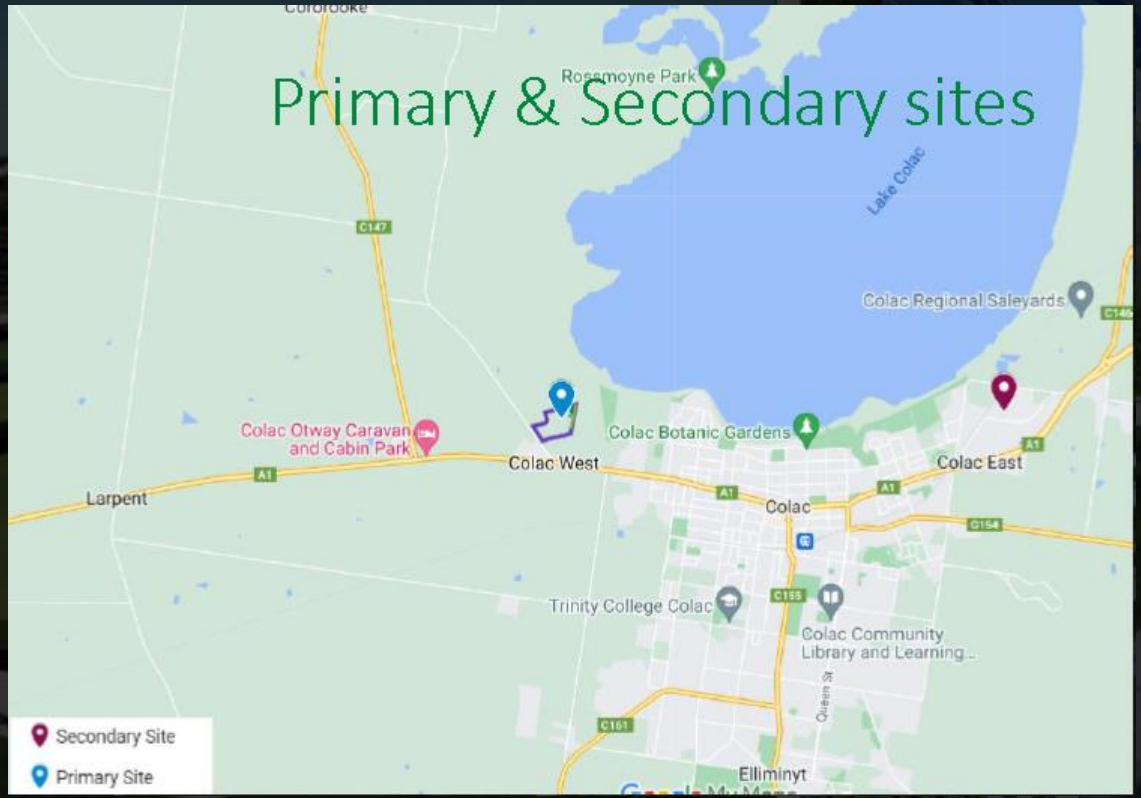
Primary & Secondary sites



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Site Layout

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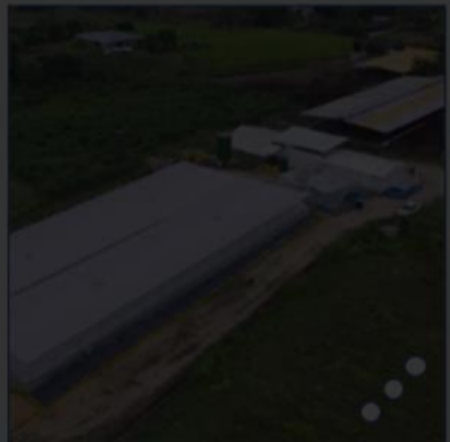

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Project deliverables & benefits

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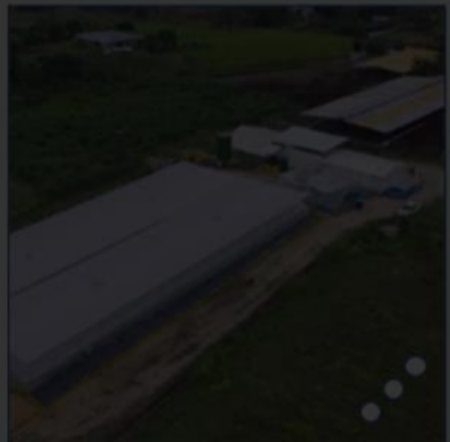
Deliverables

- Market review identifying opportunities for alternative proteins sourced from aquaculture
- Identification of potential industry partners to trial aquaculture products
- Characterization of food wastes for anaerobic digestion to develop “recipes” optimized for aquaculture
- Demonstration of pilot plant operation
- Economic feasibility of OASIS concept



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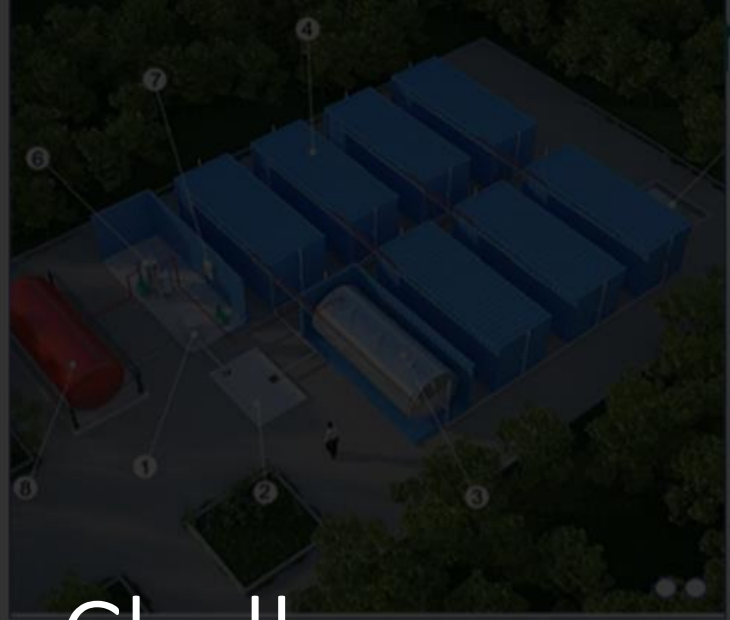

Challenges

Potential barriers to implementing OASIS

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OASIS
Water Food Energy Technology

Challenges

- Regulatory
  - EPA
  - Planning
  - local acceptance
- Supply Chain
  - Validation feedstocks
  - Equipment delivery times
  - Escalating capital costs
- Operational
  - Feedstock consistency
  - Scaling up production
  - Suitably qualified staff
- Market
  - Lack of product awareness
  - Conservative nature of agri-food sector (precautionary principle)

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Gaia EnvrioTech

Luke Brennan & Michael Renehan

Gaia EnviroTech

Commercialising FOGO and other organic waste using Anaerobic Digestion

Sustainability Victoria – R&D Fund Organics Symposium

July 2022

Gaia EnviroTech

Our Mission

To provide benefit to the community through the delivery of ***environmentally sustainable and economically viable,*** organic waste management solutions.

The Gaia EnviroTech Team

- Bioenergy and Organic Waste division of Gekko Systems
- Designer, manufacturer and operator of modular anaerobic biodigesters, and in-vessel rapid composters
- Engineering department with expertise across design, process, mechanical and chemical engineering
- Bio-laboratory that provides testing and analysis on organic waste samples
- Based in Ballarat

Gekko Group

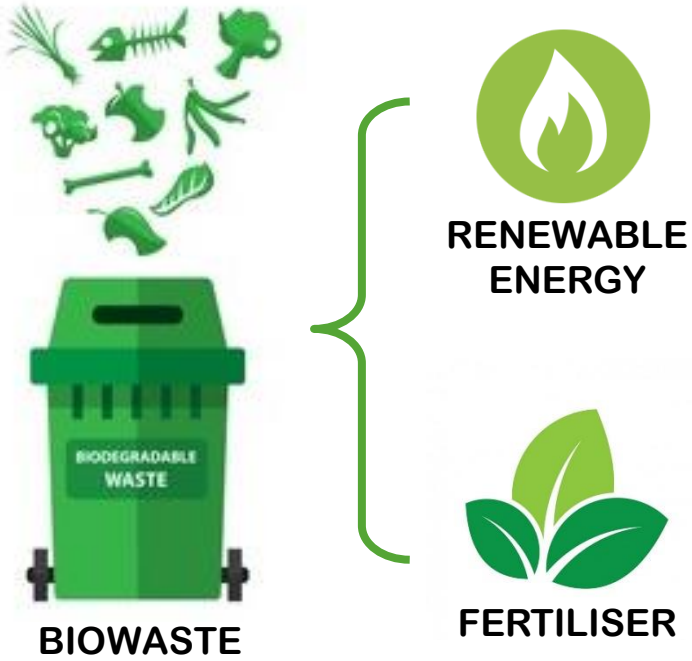
- Gekko Systems, Gekko Medical and Gaia EnviroTech form the Gekko group
  - *Globally focused with offices and agents worldwide*
  - *Gekko Systems provide equipment and technology services to the mining sector*
  - *In 2020, Gekko developed a ventilator as response to COVID-19: Gekko Medical*

Organisational Strengths:

- *world class design and engineering team*
- *strong government profile and networks*
- *strong cultural and value structure*
- *locally designed, manufactured and supported*

The Gekko Manifesto: "smarter together"

The problem we're trying to solve



- The disposal of organic waste is challenging due to increasing cost, regulatory requirements, and odour issues.
- Organic waste in landfill is a major contributor to green house emissions.
- Waste as a resource is not currently being utilized in Australia as well as it could be due to some key barriers
- Community expectation is changing around how waste is managed, with a greater focus on the 'circular economy'.
- Recycled organic products are not currently being utilized to their full potential.

Project Contributors

Gaia EnviroTech

Project Partners

CLEANAWAY

Hepburn SHIRE COUNCIL

McCain

TRIGG FARM

Research Partners

Federation UNIVERSITY • AUSTRALIA

RMIT UNIVERSITY

Research Objectives

1. Unlock the commercial potential of digestate, which is produced through anaerobic digestion

2. Expand the commercial potential of the energy produced by the treatment of food waste

3. Demonstrate a viable processing/treatment system for FOGO waste streams to make AD of FOGO and other organic waste streams a commercially attractive solution for Australasian markets.

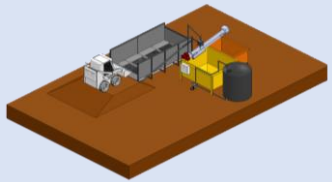
Project Summary

SITE A – Creswick Transfer Station

Pre-Processing

INPUT

- FOGO
- Food Waste*



OUTPUT

- Organics Liquid
- Organics Fibre

Rapid Composter

INPUT

- Organics Fibre
- Digestate Cake

OUTPUT

- Compost

SITE B – Trigg Farm

Biodigester

INPUT

- FOGO Liquid
- Cow Manure
- Food Waste*

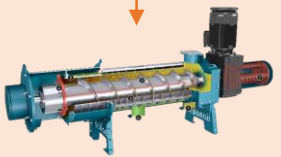
OUTPUT

- Energy
- Digestate

Post-Processing

INPUT

- Digestate



OUTPUT

- Digestate Cake
- Digestate Liquid

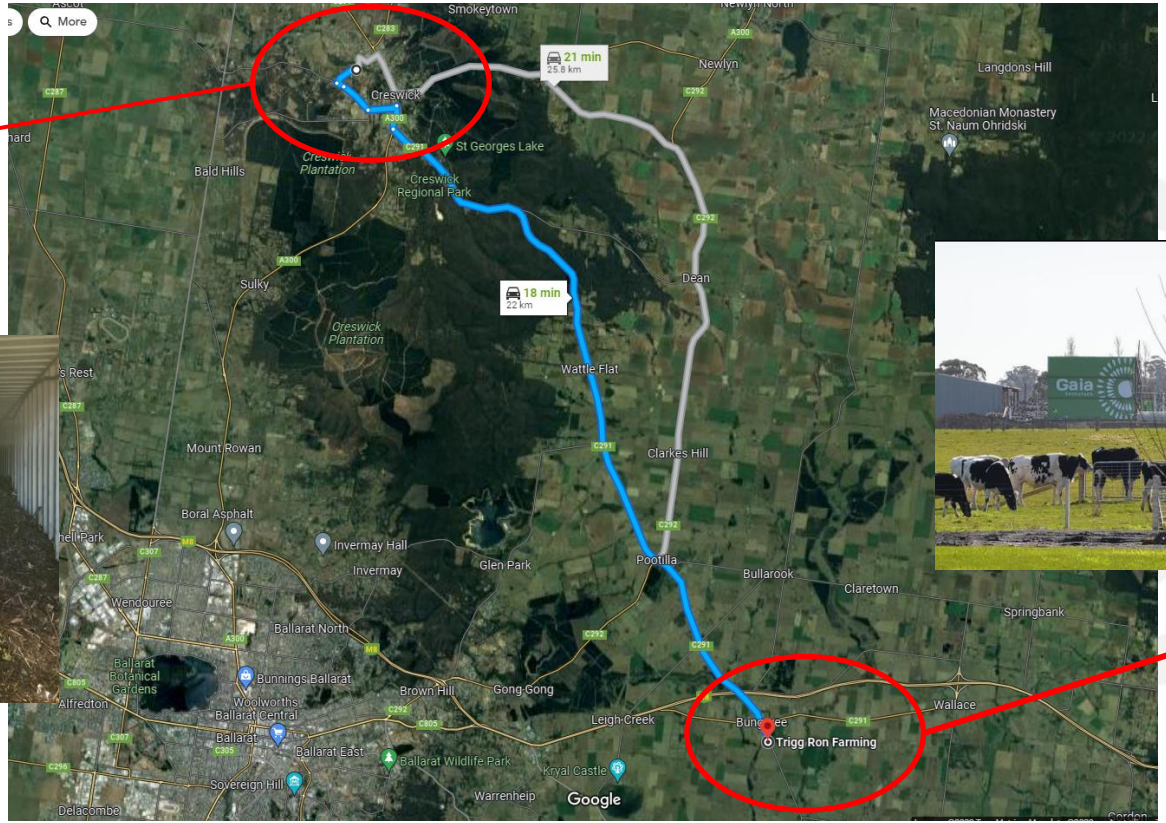
RESEARCH PARTNERS

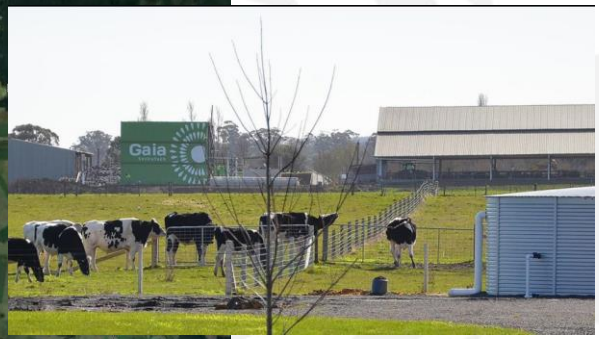
- FED UNI
- RMIT

Material transfer between sights

Project Locations

SITE A
Creswick
Transfer
Station





SITE B
Trigg Farm

Project Benefits and Outcomes

ENVIRONMENTAL

- Reduce landfill through diversion
- Manage odour
- Prevent potent green-house gasses
- **Produce natural fertiliser**
- Generate renewable energy

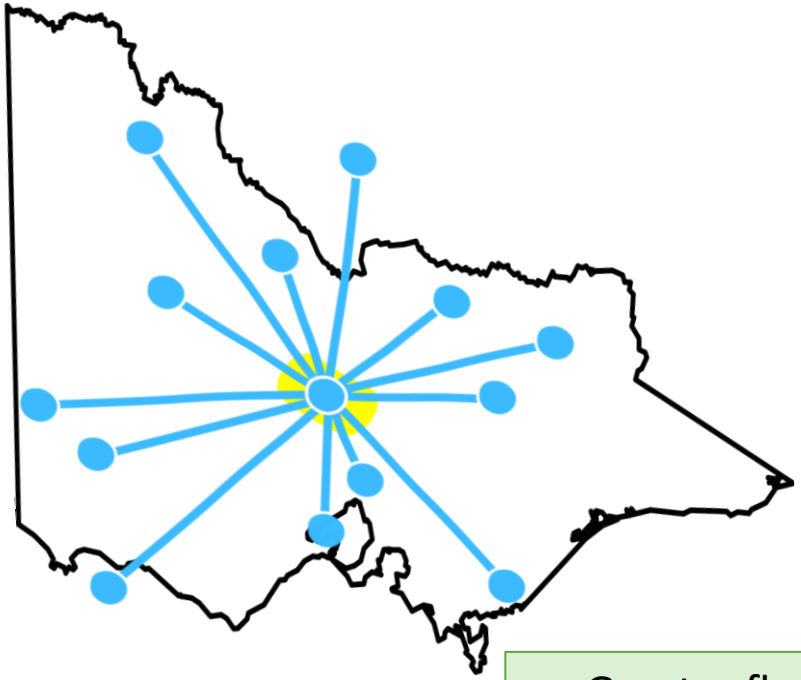
ECONOMICAL

- **Increased up-take of recycled organics by tailoring end product for specific use.**
- Avoid high-cost of chemical fertiliser
- Renewable energy production for on-site use
- Redemption of renewable energy &/or carbon credits
- Reduction of waste disposal charges

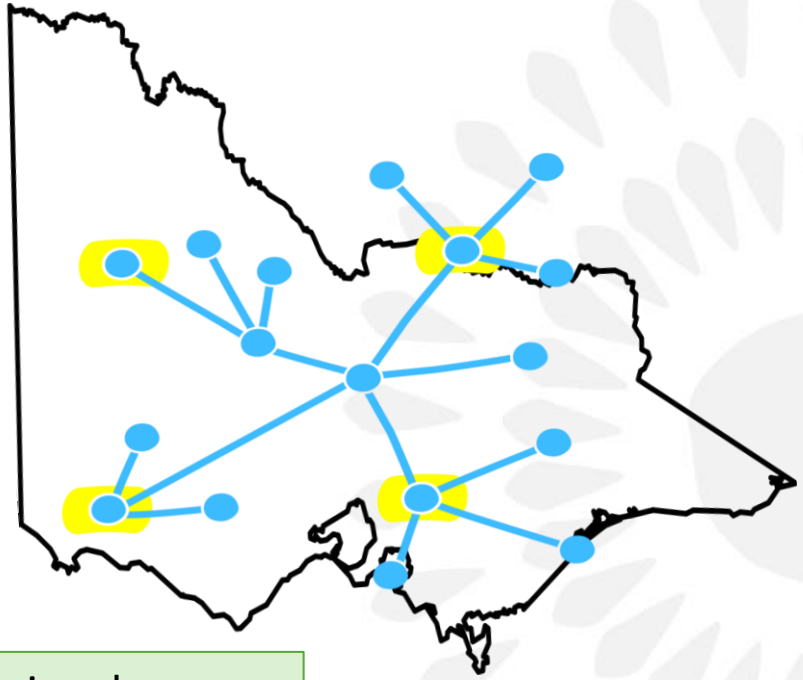
SOCIAL

- Community confidence from sound environmental practice
- Sustainable operations reduce business risk
- Enhanced social license to operate
- Circular Economy approach

Local approach to organic waste management



VS



- Greater flexibility for regional areas
- Reduction in ‘waste miles’
- Viable for smaller waste volumes

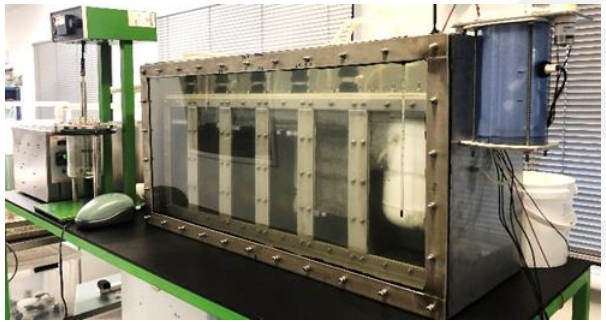
Opportunities

- Broader application of recycled organics product in the agricultural industry.
- Further processing of recycled organics products to diversify how and where it can be applied (i.e. pellatisation, etc.).
- Tailoring the nutrient make up of the end product to suit particular industries and soil types.
- Holistic approach to management of organic waste streams by treating the different aspects of the streams in the most effective way (i.e. liquids vs fibre).
- Prove the process for the management of digestate, which can remove a key barrier and increase the uptake of the technology.

FIAL Consortium Project – Biolab and Feedstock

FIAL Consortium project created to explore feedstock performance in the agribusiness industry, which included the establishment of a bio-laboratory at Gaia EnviroTech HQ.

Benchtop multistage biodigester



Challenges

- Contamination of feedstock
- Impact from regulatory changes to digestate
- Long-term energy use
- Volatile equipment supply
- Security of feed stream long term
- Economical production of high-quality and usable recycled organics product at smaller scale.

Questions

Gaia Envirotech appreciates the opportunity to discuss our project, and please contact us should you like to learn more:

https://www.gaia-enviro.com/

Michael Renehan – Executive General Manager
Michael.Renehan@gaia-enviro.com

Luke Brennan – Business Development Manager
lukeb@gaia-enrivo.com