Quantifying mineralisation and biological status from organic amendments and soil

Wednesday October 11th 2023.

For more information on this project please contact: Dr Mary Cole on 0413 013 247 or email on mary@agpath.com.au

AGPATH
Agricultural Pathology and Biological Farming Service
Agricultural Consultants since 1980

This project is supported by funding from the Victorian Government

Sustainability Victoria
VICTORIA State Government

ABOUT THIS PROJECT

Sustainability Victoria project C-12300 commenced in March 2022 with extended expiry date of June 20th 2024. There is organic material going to land-fill that could be a resource for farmers, landscapers, council park employees, etc. By finding the best blend of these raw materials, fit-for-purpose products can be produced in which farmers can have confidence in using on their enterprises. This is the aim of this project.

REASON FOR PROJECT

Identified problems:

- Lack of information on the influence of FOGO on green organic matter recycling.
- Lack of information on nutrient levels and mineralisation of organic products
- Lack of information on biological status in organic products
- Lack of information on nutrient levels and mineralisation of organic products on soil.
- Lack of information on biological status of organic products in soil.
- lack of product-specific information on the influence of recycled organics on plant health.

In systems where FOGO is part of the green organic recycling, there appears to be little or no information about the impact of this material on unacceptable levels of odour emission. There is a need for quantified data around mineralisation, nutrient levels and biological status of organic products and their influence in the soil. Also, there is a need for product-specific, soil-type-related information on plant health.

THE PROJECT AIMS

This project proposes to better understand the potential for a range of organic products to improve soil health and plant yield. Based on the research results, product-specific recommendations will be made available as well as contributions to existing government standards or specifications on the recycling and use of organic products.

ANTICIPATED OUTCOMES

Anticipated outcomes:

- Divert organic material from landfill and transform into a valuable resource such as feedstock/ compost/organic soil amendments.

- Better fit-for-purpose products.
- Decreased susceptibility to pest and disease and increased productivity.
- Confidence of users in products – inadequate information on presence of toxic contaminants.
- Address carbon capture by improving organic matter in soils.
- Improve resilience of current farming systems to increasing climate variability.
- Contribute to improved national standards for organic products.
- Determine cost-benefit to user.
- Substitute conventional finite resources with environmentally compatible recycled organic materials.
- Reduce energy input into the food production system by replacing energy intensive inputs with environmentally compatible recycled organic materials.

There are problems in agriculture from the methods of industrial farming and use of high volumes of synthetic nitrogenous fertiliser leading to high emissions of CO_2 (land cultivation) and NO_2 (cattle). Despite the many recycled organic products currently available in Australian horticultural and broadacre farming, there is limited scientific research quantifying the influences of these products on soil health (e.g. soil microbiology) and plant response. Nutrient release and mineralisation of most of these products has not been well quantified but needs to be carried out for a more precise application in the field. Product-specific recommendations that are based on comprehensive research into the impact of a product on soil microbiology and how this in turn affects nutrient release in the soil as well as plant yield are not available for the majority of the commercial recycled organic products. As a result, the optimum benefit associated with the application of organic amendments to soil is not realised. A major outcome of this project is diverting organic matter from landfill and transforming it into a valuable resource. Biological activity is not well addressed in the Australian standard on organic amendments, e.g., AS4454. A suitable quantifiable unit such as fungal: bacterial ratio could be part of organic matter classification.

WHO WILL BENEFIT?

Producers of recycled organic products: production of fit-for-purpose organic amendments; increased confidence by potential users resulting in higher uptake of recycled products.
Farmers: minimise synthetic chemical input/reduce costs, build up soil organic matter, improve soil microbiology, increase soil water holding capacity, and plant yield. Lead to possible carbon credits by increased sequestration.
Urban, parks and gardens: removes the need for excessive use of synthetic chemicals, e.g. herbicides, in high-use urban gardens, parks and children's activity areas.

Community: increased awareness of the need for recycling limited resources by exposure to the positive aspects of recycled organic products in their urban environment.
Environment: contribute to mitigating global warming; diversion of organics from landfill to agriculture; reduce consumption of finite mined inputs offset by nutrient being cycled organically; rebuild and maintain the microbial cycle.
Council/government/standards: recommend/support development of improved specifications and standards by acknowledging the role of biology in soil health.

PARTICIPATING PARTIES

Sustainability Victoria (SV) – granting body
Agpath Pty Ltd – grant recipient Dr Mary Cole – project leader
University of Melbourne
CORE – Centre for Organic Research & Education
GRO – Gippsland regional Organics
Charlton Feedlot
Agrisolutions Pty Ltd
Pasture farms

SUSTAINABILITY VICTORIA TEAM

Mitchell Watson and Andrew Dougal, now Andrew Dougal.

AGPATH PTY LTD TEAM

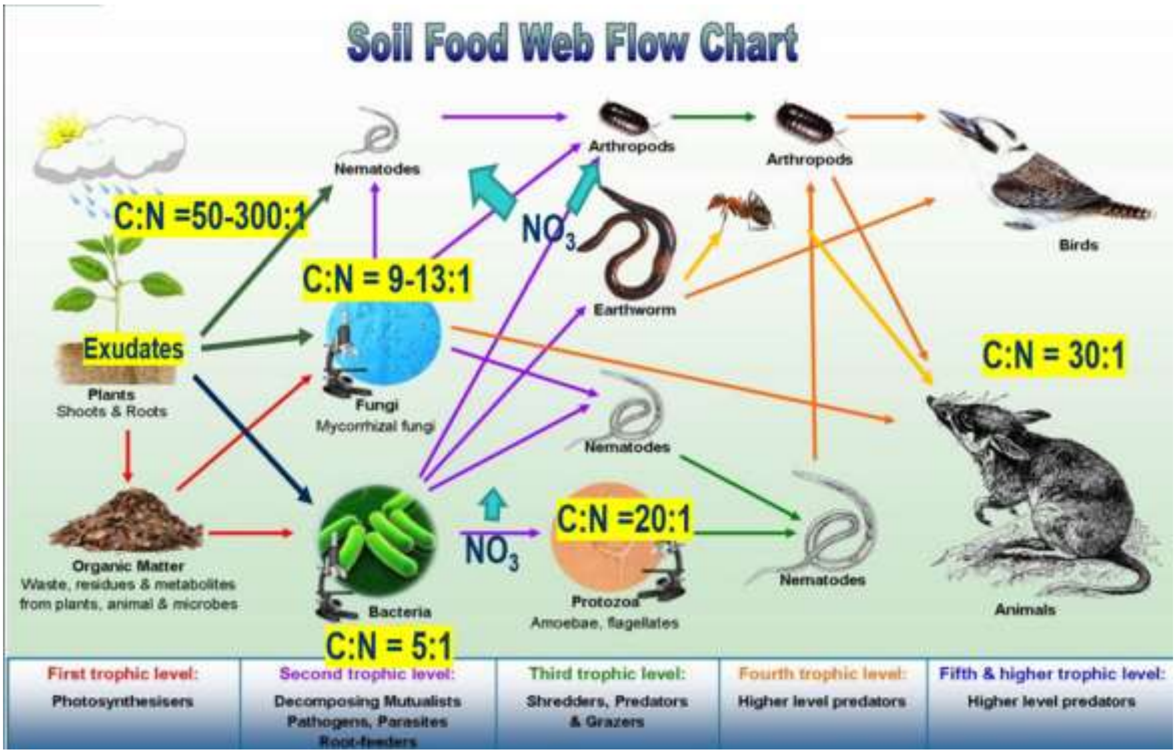
Dr Mary Cole, Alan Cole OAM, Rachel Cavello, Kylie Ridgway, Naomi McLaren, Ashley Mahoney, Marissa Cavello, Ben Wakefield, Rosie Croft (Lottie and Wilbur Cole).

THIS REPORT

This report and field day aim to show the research plots and provide some early data for participants on the project. The final report for the whole project is due by June 30th, 2024. Information provided in this report will not be final statistics but will give an example and overview of trends as we see them to date. As you will all be aware 2022 was a very wet year so it impacted on many projects that required field work. Because of this most of the field and replicated trials were carried out this year, 2023, and are still in progress. This means final data cannot be presented.

WHAT IS A HEALTHY SOIL?

A healthy Soil Food Web, although not apparent to the naked eye, is a dynamic living system that is teeming with life. Most of the organisms that live in the soil are beneficial microorganisms such as fungi, bacteria, protozoa, and nematodes. While seemingly insignificant, they are represented in the millions in any given soil, providing a range of important services that promote plant growth and vigour. The collective term for all of these organisms is the 'soil food web'. The interactions amongst these organisms can provide plants with many of the requirements that they need to survive and flourish which includes the availability & retention of nutrients, disease suppression, and the building of soil structure.



However, soil biology is an aspect that has largely been overlooked with many growers preferring to settle for something delivering a quick short-term fix such as synthetic chemicals. The use of chemicals to kill pathogens and pests can also kill the beneficial organisms. The result is a sterile environment conducive to further disease and nutrient deficiencies. The quick fix often leads to a grower's dependency on more and more artificial chemical and fertilizers to maintain his/her crops as with each application the natural soil food web is being destroyed. The arrows in the diagram above are destroyed using synthetic chemicals. Agpath runs bimonthly weekend workshops for anyone wanting to learn how to make high quality compost and compost tea for soil health and disease management. A balanced and healthy soil food web provides many benefits such as reducing/removing the need for fertiliser, pesticide and fungicide requirements.

What makes a healthy soil food web?

A healthy food web occurs when:

1. All the organisms that a plant requires are present and functioning.

2. Nutrients in the soil are in the correct forms that will enable a plant to take-up them up. It is one of the functions of a healthy foodweb to hold nutrients in non-leachable forms that remain in the soil, until such time the plant requires the nutrients. At this point the plant "turns-on" the right biology to convert the nutrients into forms the plant can take-up (but which are typically very leachable).

3. The correct ratio of fungi to bacteria is present, and that the ratio of predator to prey is present ensuring soil pH, soil structure, and nutrient cycling occur at the correct rates producing the right forms of nutrients the plant requires. The functions of a healthy foodweb are:

1. Retention of nutrients so they do not leach or pass off as vapour from the soil. Retaining the natural nutrients means a decrease in the need for fertiliser usage.

2. Nutrients are cycled into the right forms at the right rates for the plant. The correct ratio of fungi to bacteria is needed for this to happen, as well as a balanced level of natural predator activity.

3. Building the soil structure, so that the oxygen, water and other nutrients can easily absorb into the soil thus enabling plants to develop a deep, well-structured root system. When the biology is functioning properly, water use is reduced, the need for fertilizers is reduced, and plant growth is increased.

4. Suppression of disease-causing organisms via competition with beneficials, by setting up the soil and foliar conditions so as to assist the beneficials as opposed to diseases.

5. Protection of plant surfaces, above or below ground, This is achieved by making certain the foods created by the plant surfaces release into the soil and are used by beneficial, not disease organisms, thereby ensuring that infection sites on plant surfaces are occupied by beneficial, and not disease-causing organisms. This also ensures that the certain predators that prefer disease-causing organisms are present to consume them.

6. Production of plant-growth-promoting hormones and chemicals that assist in plants developing larger stronger root systems.

7. Control of toxic compounds through the breakdown or decay of these organic materials.

THE PRODUCTS & APPROX. PRICES

PRODUCT	AGE	COST
Finished compost from GRO, Dutson Downs	26-28 weeks maturity	**$45 to $60/tonne**
Aged feedlot manure from Charlton feedlot	>30 weeks	$24/tonne
Food organics, green organics (FOGO) supplied from Melbourne source by CORE (fresh)	fresh	$30 to $40/tonne
Compost tea	fresh	8-16c/L

Compost tea made from thermal aerobic compost made by Agpath Pty Ltd (fresh)

THE EXPERIMENTAL DESIGN - TREATMENTS AND REPLICATES

Two soil types were selected for the pasture replicated trials and field experiments: one at Labertouche and one at the Agpath site in Garfield. The Labertouche soil is mainly free draining red dirt, grey loam, volcanic ash, peat and some gravel. The Agpath farm has dark brown loam with high amounts of peat and organic matter.

Labertouche farm is ploughed annually with annual application of conventional synthetic chemical input and annual seeding with annual ryegrass and clover. The soil had poor structure and water-logged with little rain.

Agpath farm has been managed biologically for 48 years. No synthetic chemicals have been applied in that time. Fish and kelp hydrolysates, low sulphur molasses, rock dust and compost tea have been the annual applications following 100mm and 300mm depth passes with a Yeoman's plough. Natural phosphate rock was applied around 1978 but not since.

Vegetable farms were approached initially but neither was available during the very wet 2022. SV determined that the project was better served by applying two different soils to 1200x900x300mm above ground beds with open bottoms. A mountain soil and a garden soil were used to fill the beds.

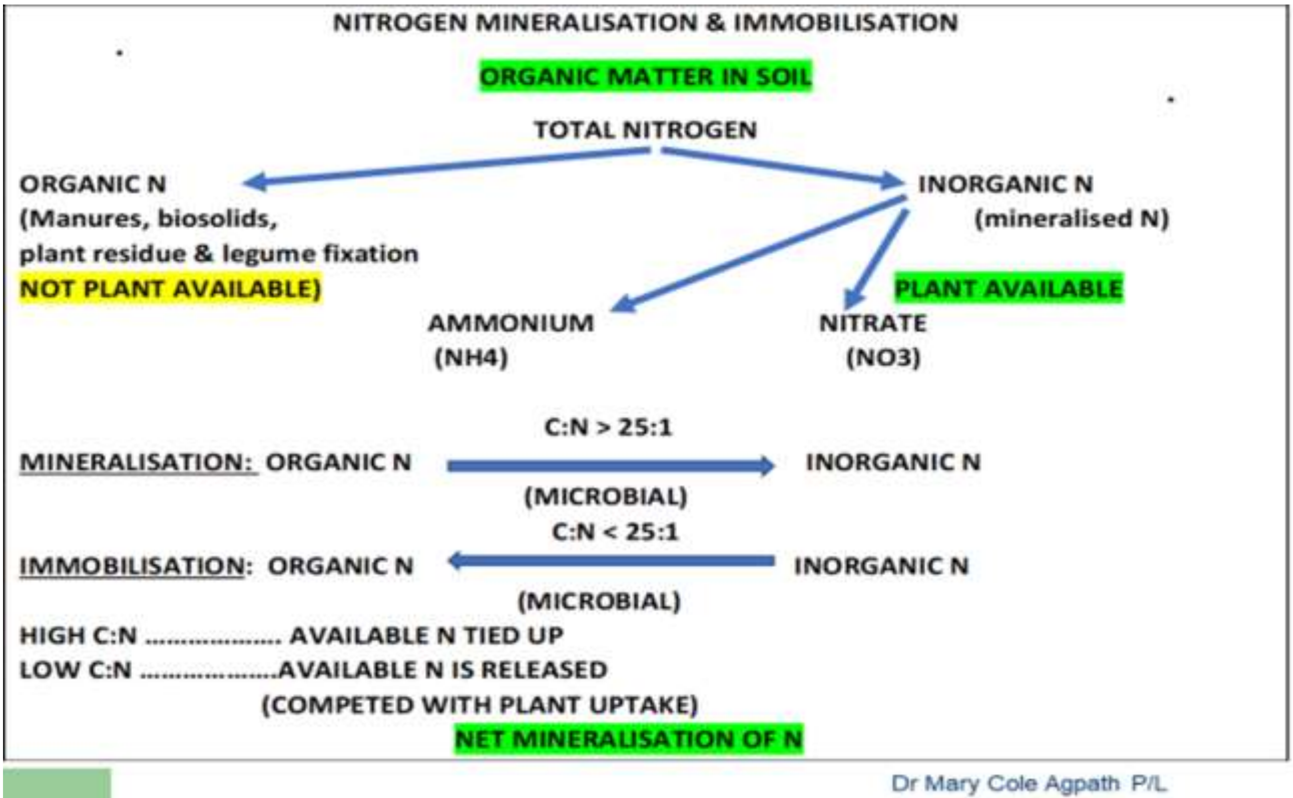
Random block design (RBD) was used for the replicated plots both in the pasture trials at Labertouche and Agpath, and vegetable trials at Agpath. Each RBD replicate is 2x15m. The field plots are 25x100m each.

Treatments were applied at the rate of 3 tonnes per hectare on the field and replicated pasture plots and 14 tonnes per hectare for the vegetable plots. These rates were based on discussion and advice from reputable farmers and SV advisors.

Agpath carried out the biology testing based on an international data base to which Agpath has a licence. All chemistry was carried out at the Environmental Analysis Laboratory at Southern Cross University, Lismore.

Biological activity changes with the seasons and the plant being grown. Attached are the seasonal ranges for compost, soil and vegetables so that the data in the results can be interpreted better.

MINERALISATION OF NUTRIENTS TO BE PLANT AVAILABLE



Nitrogen is a major element among others in agriculture and horticulture. Carbon to nitrogen ratio of 20-30: 1 is important for thermal aerobic compost making for the pasteurisation period to be as short as possible per unit volume. Maturation following the end of the pasteurisation period and return of temperature to close to ambient should be as long as possible. This final product is then a true stable humus/compost ideal for all agriculture. Perennial systems require a fungal dominance while annuals such as vegetables prefer closer to 1:1 or bacterial dominance.

Organic nitrogen in raw materials such as manures, biosolids, plant residues is not plant available until it has been mineralised to inorganic forms by soil biota (see the schematic above (Cole, 2022).

The aim in a biological/regenerative system is to have more nitrogen produced than is necessary for the particular crop being produced. A diverse protozoan population consumes bacteria, in particular, to release plant available nitrogen, more than enough for any crop assuming the residues from each crop go back to the soil as mulch or is composted and returned as compost or compost tea. Annual plants are happy with more nitrogen in a nitrate form while perennial crops prefer nitrogen in the ammonium form or at least 1:1 for healthy production.

SEASONAL RANGES FOR BIOLGICAL RESULTS

RANGES FOR SOIL BIOTA RESULTS FOR PASTURE BY SEASON								
	Active fungi ug/g	Total fungi ug/g	Active bacteria ug/g	Total bacteria ug/g	Protozoa/g	Nematodes/g	Mycorrhizae % root infestation	TF:TB ratio
WINTER	>30ug/g	>30ug/g	>300ug/g	>30ug/g	>5000/g	>10/g	>15%	1 to 2
AUTUMN	>45ug/g	>300ug.g	>45ug/g	>300ug/g	>5000/g	>10/g	>15%	1 to 2
SUMMER	>30ug/g	>300ug/g	>30ug/g	>300ug/g	>10,000/g	>10/g	15 to 30%	1 to 2
SPRING	>75ig/g	>300ug/g	>75ug/g	>300ug/g	>10,000/g	>10/g	15 to 30%	1 to 2

RANGES FOR SOIL BIOTA RESULTS FOR VEGETABLES BY SEASON								
	Active fungi ug/g	Total fungi ug/g	Active bacteria ug/g	Total bacteria ug/g	Protozoa/g	Nematodes/g	Mycorrhizae % root infestation	TF:TB ratio
WINTER	>30ug/g	>300ug/g	>40ug/g	>400ug/g	>5000/g	>10/g	>10%	0.75 to 1
AUTUMN	>45ug/g	>300ug.g	>60ug/g	>400ug/g	>5000/g	>10/g	>10%	0.75 to 1
SUMMER	>30ug/g	>300ug/g	>30ug/g	>300ug/g	>10,000/g	>10/g	15 to 30%	0.75 to 1
SPRING	>75g/g	>300ug/g	>100ug/g	>300ug/g	>10,000/g	>10/g	10 to 15%	0.75 to 1

RANGES FOR BIOTA RESULTS FOR COMPOST BY SEASON							
	Active fungi ug/g	Total fungi ug/g	Active bacteria ug/g	Total bacteria ug/g	Protozoa/g	Nematodes/g	TF:TB ratio
WINTER	>3ug/g	>300ug/g	>3ug/g	>300ug/g	>10,000/g	>10/g	0.01 to 10
AUTUMN	>45ug/g	>300ug.g	>45ug/g	>300ug/g	>5000/g	>10/g	0.01 to 10
SUMMER	>3ug/g	>300ug/g	>3ug/g	>300ug/g	>10,000/g	>10/g	1 to 2
SPRING	>75ig/g	>300ug/g	>75ug/g	>300ug/g	>10,000/g	>10/g	1 to 2

Research project #358827 C-12300 Quantifying Mineralisation and Biological Status from Organic Amendments and Soil.

Random Block design for pasture & veg reps.

Set 1	Set2	Set3	Set4	Set5
4	3	6	2	6
3	2	1	3	5
1	6	2	5	1
5	4	4	4	3
2	5	5	6	4
6	1	3	1	2

1	2	3	4	5	6
UTC	FM	DD	CORE	BLEND	CT

KEY:

1	UTC	UNTREATED CONTROL
2	FM	FEEDLOT MANURE PARTLY COMPOSTED
3	DD	DUTSON DOWNS COMPLETELY COMPOSTED
4	CORE	CORE FOGO
5	BLEND	BLEND CORE + FEEDLOT MANURE (50:50)
6	CT	COMPOST TEA

Pasture Agpath & Labertouche & vegetable Agpath replications

Plots					
1	4	3	6	2	6
2	3	2	1	3	5
3	1	6	2	5	1
4	5	4	4	4	3
5	2	5	5	6	4
6	6	1	3	1	2

	Field Replications Agpath & Labertouche	
1	Plots	6 = CT
2		2 = FM
3		4 = CORE
4		5 = BLEND
5		1 = UTC
6		3 = DD

TESTING

Soil and leaf material were tested at each harvest.

PASTURE FIELD TESTS	PASTURE LABORATORY TESTS
Percentage plant cover & species diversity	Pasture grass wet & dry weight
Soil temperature	Soil wet & dry weight
Air temperature max & min	Salinity
Rain fall data	Soil pH
Penetrometer data	Soil water holding capacity
Leaf brix	Quantitative analysis of active & total fungi
Visual soil assessment - VSA	Quantitative analysis of active & total bacteria
	Quantitative analysis of nematode functional groups
Chemistry EAL: Soluble, exchangeable & total pools	Quantitative analysis of protozoa functional groups
Nutrients	Quantitative analysis of mycorrhizae
Digestibility	
Tonnes/dry matter/hectare	
Average protein	
VEGETABLE TESTS	**PASTURE LABORATORY TESTS**
Leaf brix	Leaf wet & dry weight
Soil temperature	Soil wet & dry weight
Air temperature max & min	Salinity
Rain fall data	Soil pH
	Quantitative analysis of active & total fungi
Chemistry EAL: Soluble, exchangeable & total pools	Quantitative analysis of active & total bacteria
Nutrients	Quantitative analysis of nematode functional groups
Average protein	Quantitative analysis of protozoa functional groups
	Quantitative analysis of mycorrhizae

COST OF PRODUCT PER APPLICATION

APPROXIMATE COSTINGS CONVENTIONAL INPUTS COMPARED WITH BIOLOIGAL/REGENERATIVE INPUTS						
CONVENTIONAL INPUTS (information received from chemical supplier)						
PRODUCT	PASTURE			PRODUCT	HORTICULTURE	
	Per tonne	Per hectare			Per tonne	Per hectare
Urea 80-100kg/ha	$960	$77 to $96		Organic Bounce back	$600	$300 to $600
NPK 20:4:10 80-100kg/ha	$1010	$81 to $101		NPK 12:5:14	$1800	$900 to $1350
NPK 12:8:19 80-100kg/ha	$1070	$86-$107		Blend 8:11:10	$1000	$500 to $1000
NPK 12:5:24 80-100kg/ha	$1050	$84 to $105				
Average cost /Ha	**$1022.50**	**$82 to $102.25**		**Average cost /Ha**	**$1133.30**	**$566.60 to $983.30**

APPROXIMATE COSTINGS CONVENTIONAL INPUTS COMPARED WITH BIOLOIGAL/REGENERATIVE INPUTS			
BIOLOGICAL/REGENERATIVE INPUTS (calculated from 40 years of inputs for Agpath) Cost/ha at 50L/ha compost tea/application for pasture & 250L/ha for horticulture			
	PASTURE		HORTICULTURE
INPUT	Cost/1000L		Cost/1000L
EXCELCROP $110/20LITRE DRUM 2L	$2.20	10L	$11
TRACTOR	$10		$10
ELECTRICITY for 48hrs	$15		$15
MOLASSES 1L	20c	5L	$1
LABOUR MAKING COMPOST	$15.00		$15
10KG COMPOST/1000L (if purchased & not made on site)	0.075c		0.075
DEPRECATION	$2.00		$10
KELP 2L	$21	5L	$53
Fish 2L	$15	5L	$45
ROCK DUST	1c		2c
Total Cost/1000L	$80.60		$163.00
Total cost/L	8c		16.3c
APPLICATION AT 150L/HA	$12.00	APPLICATION at 250L/HA	$40.75

ELECTRONIC NOSE

An electronic nose was used on the fresh FOGO to determine volatiles emitting from the freshly decomposing material.

As FOGO is going into transfer installations in urban areas for processing, the Environmental Protection Authority (EPA) is interested in odour management as the food organics becomes incorporated into kerbside collections. University of Melbourne Soils Department modified an electronic nose to measure volatile gasses coming from the decomposing food waste. These gasses were measured with the nose on delivery of the food waste and material was taken back to University of Melbourne laboratories for further analysis by gas chromatography.

Use of electronic noses for gas sensing of odour from composting Food-Organic Waste – update

Introduction

The use of electronic noses (e-nose) is being trialled for odour detection and monitoring of Food Organic Green Organic (FOGO) co-composting process in windrows at AgPath (Gunn Road, Garfield, VIC) as part of Project SV046. Important malodour-causing Volatile Organic Compounds (VOCs) from composting include ammonia, amines, dimethyl sulfide, acetic acid, limonene, 2-butanone, ethylbenzene and trimethylamine (Font et al, 2011). Electronic noses (e-noses) provide a viable solution to meet this need; an example e-nose array of nine sensors, mounted on circular board 93 mm in diameter, developed by the University of Melbourne suitable for this application has been described in detail by Gonzalez Viejo, et al. (2020) (Figure 1).

Figure 1. Electronic nose and sensor assembly

Figure 2. Electronic nose in compost.

Table 1 lists the gases measured and sensitivity levels of the e-nose sensors (Source: Gonzalez Viejo, et al. (2020)). Temperature and humidity are also monitored.

Measurement	Sensitivity
Ethanol	0.05 mg L^{-1} – 10 mg L^{-1}
Methane	200 – 10,000ppm
Carbon monoxide	20ppm – 2,000ppm
Hydrogen	100 – 10,000ppm
Ammonia Alcohol Benzene	10–300 ppm 10–300 ppm 10 – 1000 ppm
Hydrogen sulfide	1 – 100 ppm
Ammonia	5 – 200 ppm
Benzene Alcohol Ammonia	10 – 1000 ppm 10 – 1000 ppm 10 – 3000 ppm
Carbon dioxide	350 – 10,000 ppm
Humidity Temperature	0 – 99 % -40 – 80 °C

The sensors detect and report gas concentrations in Volts (V) with positive relationships between increased concentrations are indicated by higher V values. V values are recorded in one-second timesteps giving very high temporal resolution data. V values can be converted into ppm (or for Ethanol, mg L-1) values using well-calibrated equations.

PUBLICATIONS AND PROMOTION TO DATE.

September 2023: University of Melbourne Masters degree completed and passed for Wenyi Chen. Title: Evaluation of electronic nose (e-nose) technology and machine-learning for low-cost odour measurement of Food Organic Green Organic (FOGO) compost. Wenyi Chen Ms Agric.

September 2023. Pakenham Gazette Rural Matters "Science for Soil". Wednesday Sept 20th.

September 2023. Pakenham Gazette Business Profile "sustainable Practices". Wednesday Sept 27th.

The information in this brochure is preliminary because the project is still on going. We have given examples of biology results between the Labertouche conventional management site and Agpath biological site and some compost type results. As you can imagine there is a massive amount of data to be analysed by the statistician that is not available at this early stage in the project. Please enjoy walking around the plots. The Agpath team is available to answer questions. The final report for this project will be available from Sustainability Victoria after June 30th 2024.

Thank-you,

Dr Mary Cole, project leader

VERY PRELIMINARY RESULTS

CHEMISTRY OF COMPOST & BLENDS 1st harvest after application				
	C:N RATIO	TOTAL N	Protozoa plant available N Kg/ha equiv potential	BRIX
DD	11	2.28	<6	5.3
100% FOGO	15	1.44	56-84	
75%FOGO25%FLM	15	1.71	56-84	
50%FOGO50%FLM	12	1.46	28-56	
25%FOGO75%FLM	18	1.45	56-84	
100%FLM	8	1.56	<6	6.4

	Dry Weight	Active Bacteria	Total Bacteria	Active Fungi	Total Fungi	Flagellates	Amoeba	Cilliates	Nitrogen	Nematodes	Endo Mycorrhizae	TF:TB
Agpath Field Baseline	**0.66**	**11.05**	**99.96**	**0.00**	**41.26**	**421.78**	**700.43**	**0.00**	**<28**	**4.53**	**3%**	**0.41**
Labertouche Field Baseline	0.69	10.39	399.53	0.00	251.14	39967.60	51462.28	66.31	112-168	1.57	1%	0.63
Agpath Field UTC Final	0.64	24.60	54.00	4.47	985.61	720.43	9011.65	2119.01	28-56	2.90	11%	18.25
Labertouche Field UTC Final	0.65	26.98	333.49	0.00	456.17	4298.15	2363.75	265.05	28-56	9.86	2%	1.37
Agpath Field FLM Final	0.73	31.39	107.59	0.00	226.17	234.89	19042.58	1858.52	56-84	10.82	21%	2.10
Labertouche Field FLM Final	0.70	21.03	521.73	2.04	704.14	65481.31	11825.30	65.40	112-168	9.96	3%	1.35
Agpath Field DD Final	0.70	15.91	83.03	1.57	481.35	6108.54	39719.83	1985.56	112-168	6.51	14%	5.80
Labertouche Field DD Final	0.65	29.34	463.99	0.00	829.40	8785.47	432.10	2844.51	28-56	11.26	8%	1.79
Agpath Field FOGO Final	0.68	26.54	150.15	0.00	254.83	1219.64	40643.80	6250.64	112-168	5.79	17%	1.70
Labertouche Field FOGO Final	0.72	26.31	346.89	0.00	249.59	21175.95	5920.93	38.88	84-112	6.64	3%	0.72
Agpath Field BLEND Final	0.62	20.44	155.81	0.00	323.41	22224.81	13335.21	9224.67	112-168	14.35	13%	2.08
Labertouche Field BLEND Final	0.61	25.60	339.91	12.57	552.36	7021.76	45657.88	228.90	112-168	4.27	15%	1.63
Agpath Field CT Final	0.70	10.42	249.08	0.00	308.06	6052.51	19677.76	19677.76	84-112	10.16	18%	1.24
Labertouche Field CT Final	0.61	34.62	332.19	0.00	324.66	22705.97	22705.97	9.83	112-168	3.83	18%	0.98

Preliminary data for soil biota. Mycorrhizal biomass was better on the organic farm and the ratio F:B was closer to the 1to2:1 range for healthy soil.

EXAMPLES OF RESULTS

Compost rings for compost tea
– observing composting capacity after 6 months.

Left to right: 100% FLM; 75%:25%FLM:DD; 50%FLM:50%DD; 25%FLM: 75% DD; 100%DD

FLM –aged Feedlot manure

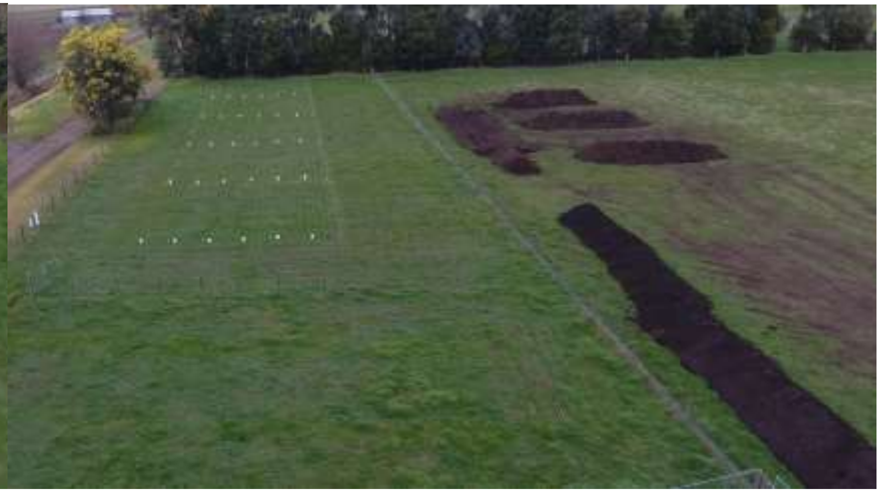
DD -mature compost from Dutson Downs, Gippsland Recycled Organics

Example of approx. 2000kg contamination taken from 1 load of FOGO >80 hours to clean load

DRONE PICTURES OF AGPATH FIELD PLOTS

DRONE PICTURE OF AGPATH COMPOST WINDROWS

AGPATH REPLICATED PLOTS & WINDROWS



PLANTING PLOTS – MARISSA

HARVESTING PEAS Ashley

HARVESTING PEAS – Alan

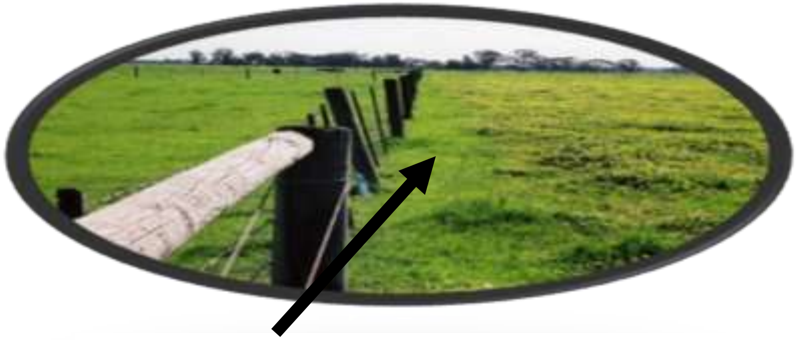
TEAM PROCESSING HARVEST DATA COLLECTING

AGPATH REPLICATED PLOTS AS GROUND LEVEL

COMPOST TEA AT CANNIBAL VINEYARD – NO CAPEWEED

7

AGPATH NORTH PADDOCK. NO CAPEWEED INSIDE OUR BOUNDARY.



COMPOST TEA APPLIED 1 M INSIDE NEIGHBOURS FIELD OF CAPEWEED. C/T HAS ERADICATED CAPEWEED WHERE IT HAS NOT BEEN APPLIED.

LABERTOUCHE REPLICATED PLOTS BEFORE & AFTER RAIN IN 2022

MOUNTAIN SOIL SPINACH GERMINATION (random block design)

MOUNTAIN SOIL SPINACH HARVEST (random block design)

GARDEN SOIL PEAS GERMINATION (random block design)

GARDEN SOIL PEAS HARVEST (random block design)


I'M A
farmer
FOR
CLIMATE
ACTION
SUSTAINABILITY VICTORIA 2022-2024
Contract ID-C-12300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Contract ID-C-12300
Quantifying mineralisation and biological status
from organic amendments and soil.
AGPATH
Sustainability Victoria
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 farms