Humus Technology®

Composting 101

Humus Compost Production

Putting life back into the land

The Start of it All

Ocala Florida October 2005

The Latin meaning of compost is ‘to put together

Putting life back into the land

10th Anniversary of Aeromaster in Australia

2006 - 2016

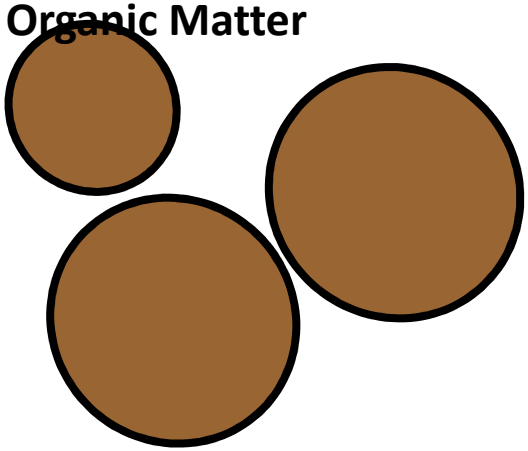
Goals, Economics & Your Approach

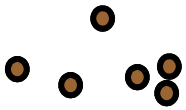
Goals

Value

What is Most Compost?

Organic Matter





Broken Down
Organic Matter

Often Smelly & Hot

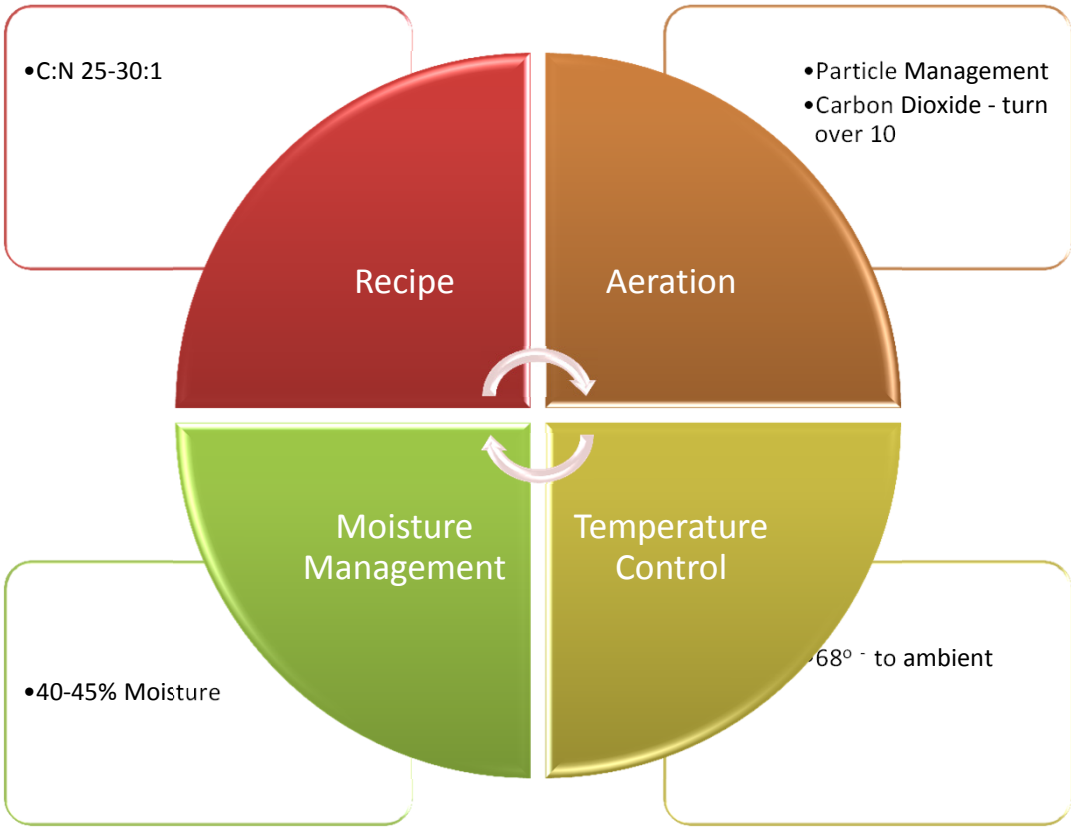
Most compost is organic matter that has broken down by heat and microbes

What is Humus Compost?

Humus Compost is organic matter broken down by microbes then polymerized by microbes into Humus.

Four Management Metrics of Compost Production

The Advanced Composting System of high quality compost production is based on applying a on a set of management metrics to the four distinct principle phases of the composting cycle



Available Feedstocks

- Straw, Bagasse, Filter Mud, Green Waste, Silage

Carbon Source

Nitrogen Source

- Chicken Manure, Pig Manure & Dairy Manure, Food Scraps

Recipe Management System

Unit of Measure is *Metric*

Compost Recipe

Peter LeFeuvre

Recipe 1

04-Aug-10

Tutorial

Material	% of Volume	Volume cu Meter	Density Kg./cu Meter	Weight Kg.	Structure 1 to 4	Moisture %	Nitrogen (% Dry Basis)	C:N Ratio xx:1
Carbon Sources								
Compost, Unfinished	10.0%	26	415	10,790	2	50%	1.7%	15
Hay, Rough Grass	20.0%	51	104	5,304	1	50%	0.8%	97
Bagasse, Old	5.0%	13	208	2,704	2	70%	0.4%	115
Nitrogen Sources								
Sweet Corn, Shredded	10.0%	26	291	7,566	2	85%	1.2%	40
Manure, Cow	40.0%	102	498	50,796	2	79%	2.0%	27
Clay SubSoil, (Crumb structure building materials)								
Clay	10.0%	26	1,003	26,078	2	1%	0.2%	5
Mud, Filter Press	5.0%	13	712	9,256	4	30%	0.1%	21
TOTALS	100%	255	441	112,494	2	53%		26
Desired Values					< 2.5	45 to 55%		25 to 30

- C:N 25-30:1

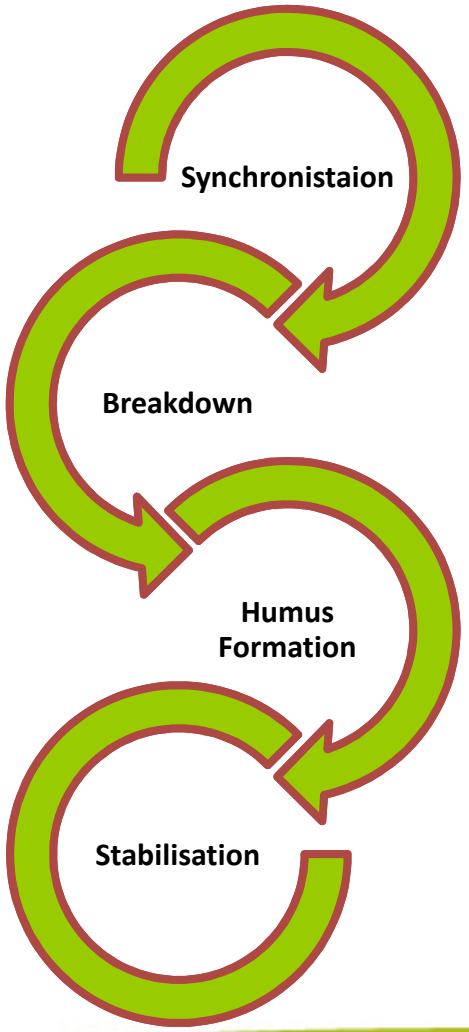
Recipe

Pad Site and Windrow Positioning

- 2 x 100 metres long windrows are made simultaneously

Four Phases to Humus Compost Production

A key to making humus compost is to ensure that all feedstock begin to break down at the same time. To accomplish synchronization, individual feedstock may require specific preprocessing before the windrow is built kicking off breakdown



Phase 1 - Synchronisation

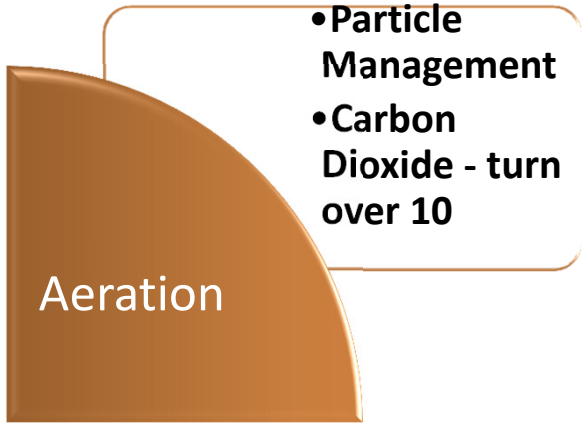
Windrow Building

The Role of Clay in Compost Production

Phase 2 - Breakdown

Aeration

The primary function of the Aeromaster Compost Turner is to create and maintain the optimum environment for microbes to do their work.



The compost turner must:

- **Remove CO_2 and replace with O_2**
- **Manage Temperature**
- **Maintain Moisture**
- **Mix without pulverizing**

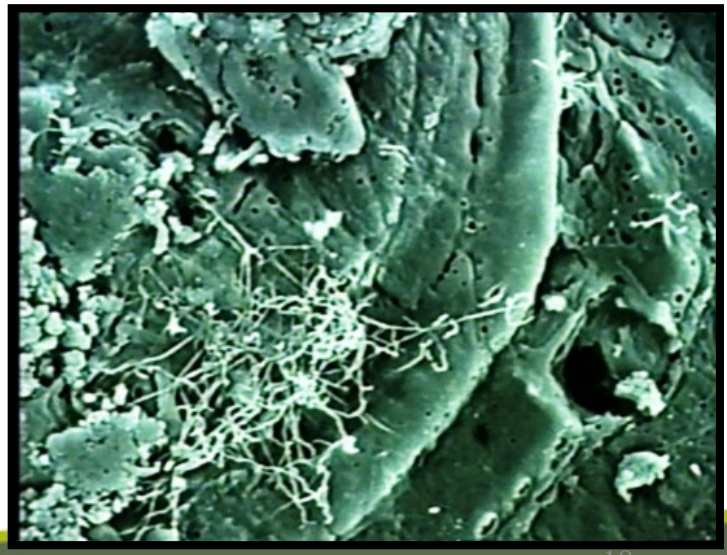
Moisture Management

- 40-45% Moisture

Breakdown - Weeks 1 - 3

Organic matter breakdown occurs in weeks 1 - 3

Aerobic microbes, water, oxygen and heat breakdown organic matter reducing the volume by around 50%



Daily Monitoring of Compost Windrows

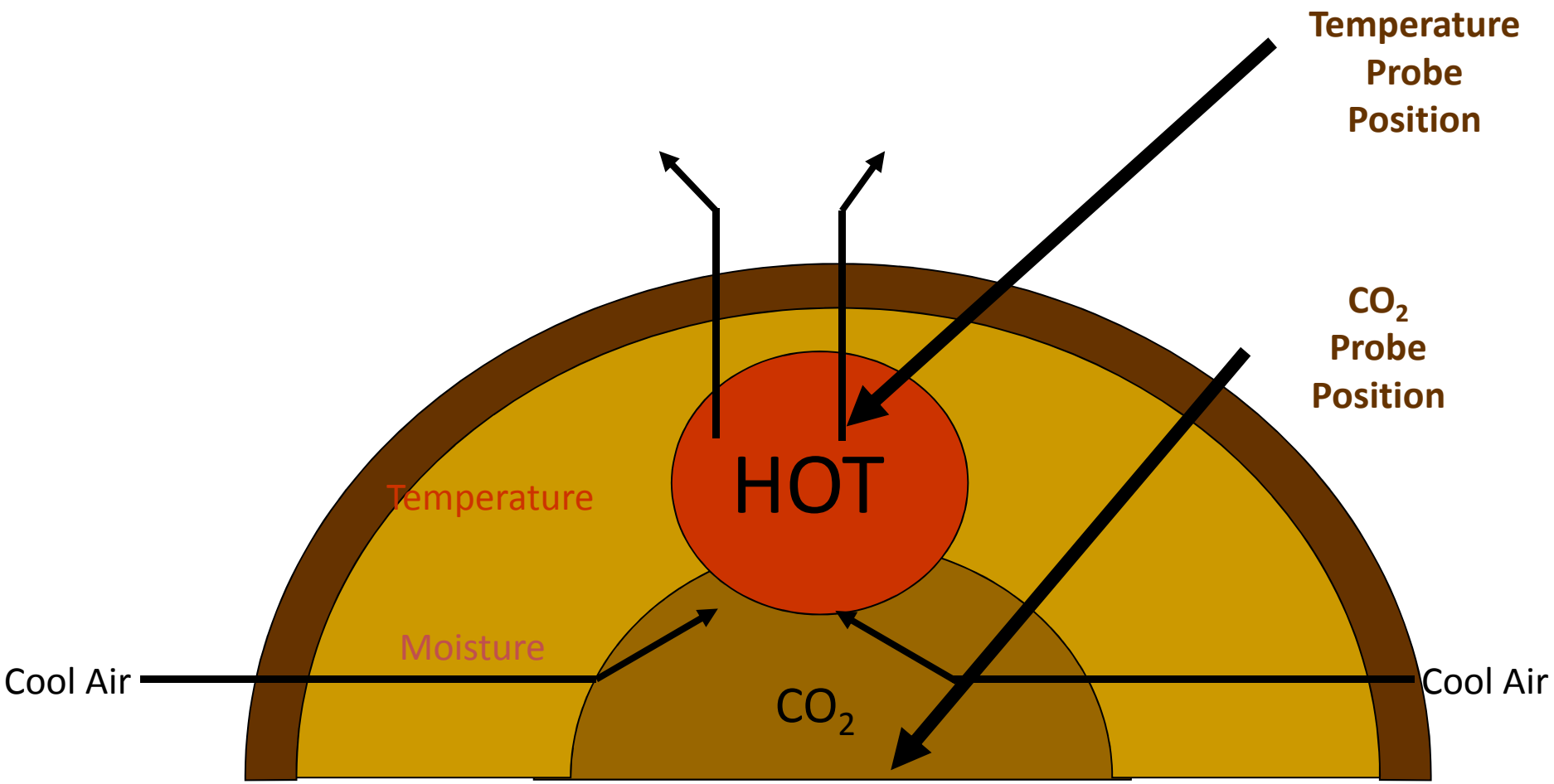
Temperature is measured with a probe instrument inserted into the center of the row . A digital readout displays the row's internal temperature.

Moisture is best measured by observation and maintained at 35-45%

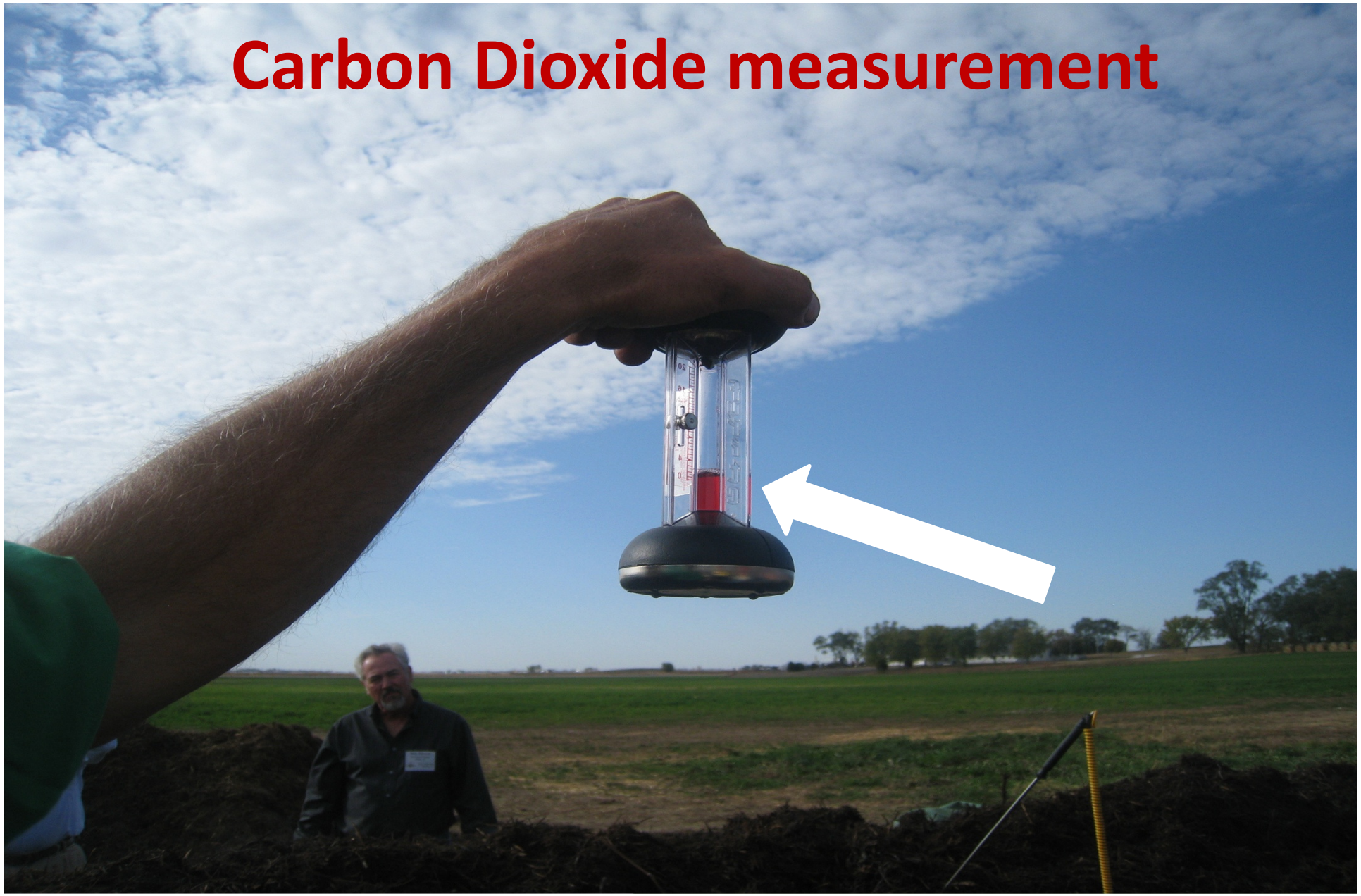
The CO_2 readings will range from 0 to 21% CO_2

Putting life back into the land

Temperature & CO_2 Monitoring Positions



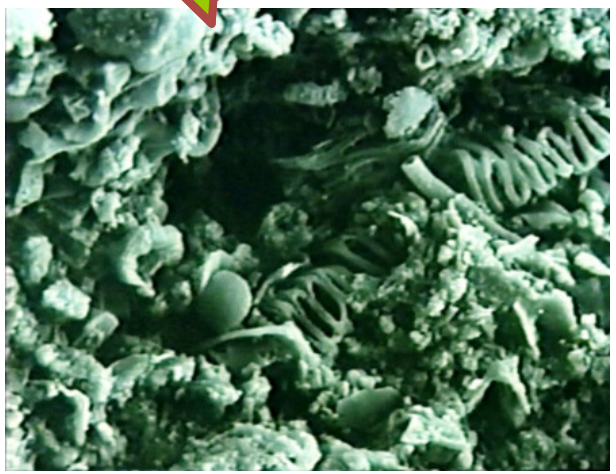
Carbon Dioxide measurement



Phase 3 – Humus Formation

Weeks 4 – 8

An microbial inoculum is added with each turning from week 4 – 8 to build humic ions into long-chain polymers of Humus or carbon



★ ★ ★

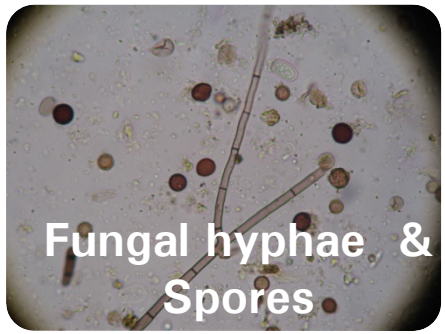
Our defining difference

Phase 4 – Humus Stabilisation

Composting converts organic material into a stabilised products that builds soils and releases plant nutrients gradually

What is Humus?

Humus is the final product of the composting process where the organic matter that was broken down is microbially polymerized or built-up into long molecular chain humic compounds – active carbon



Aeromaster Composting Equipment

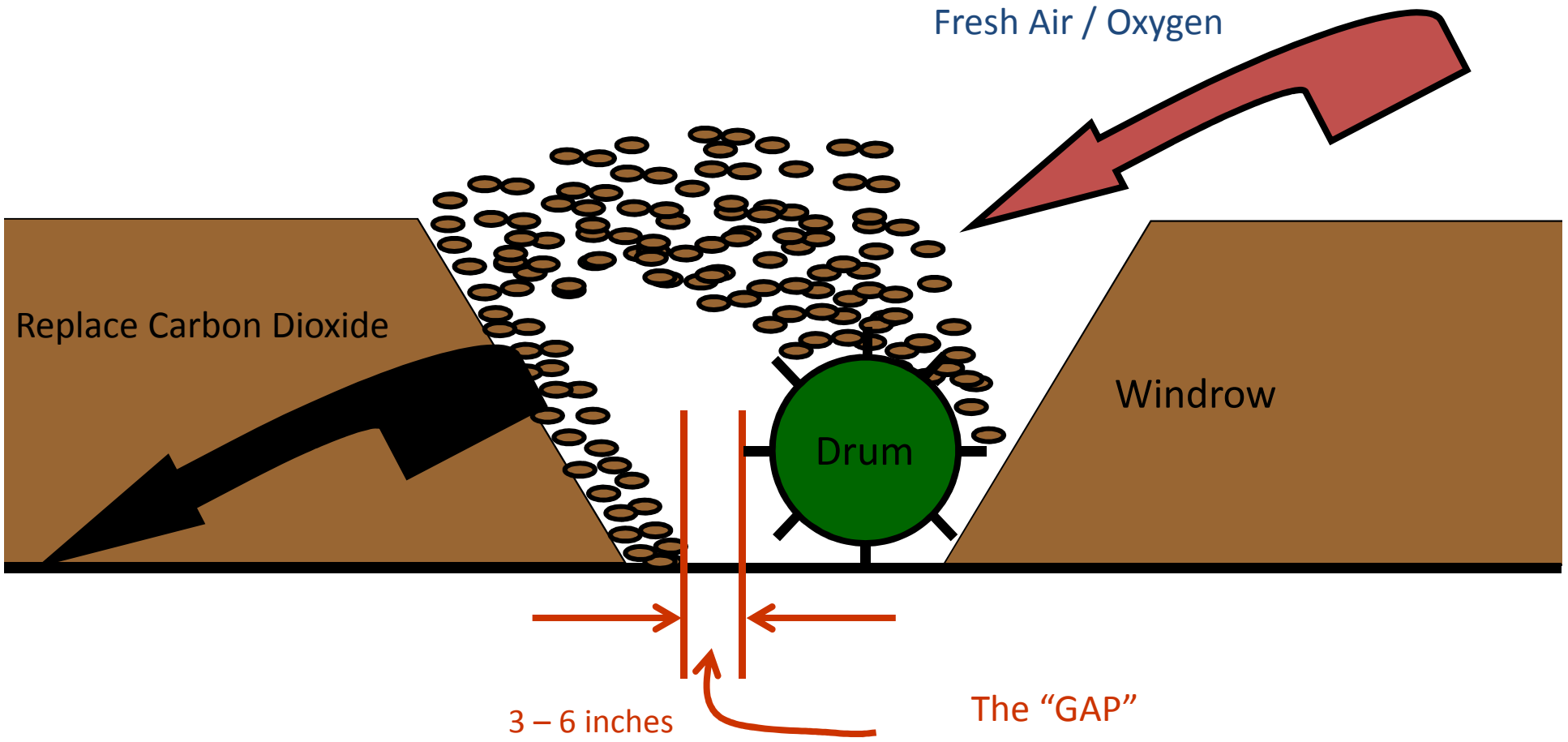
Putting life back into the land

Windrow Turning – Equipment Settings, Ground Speed, & RPM

Run Drum @
270-540 PTO RPM

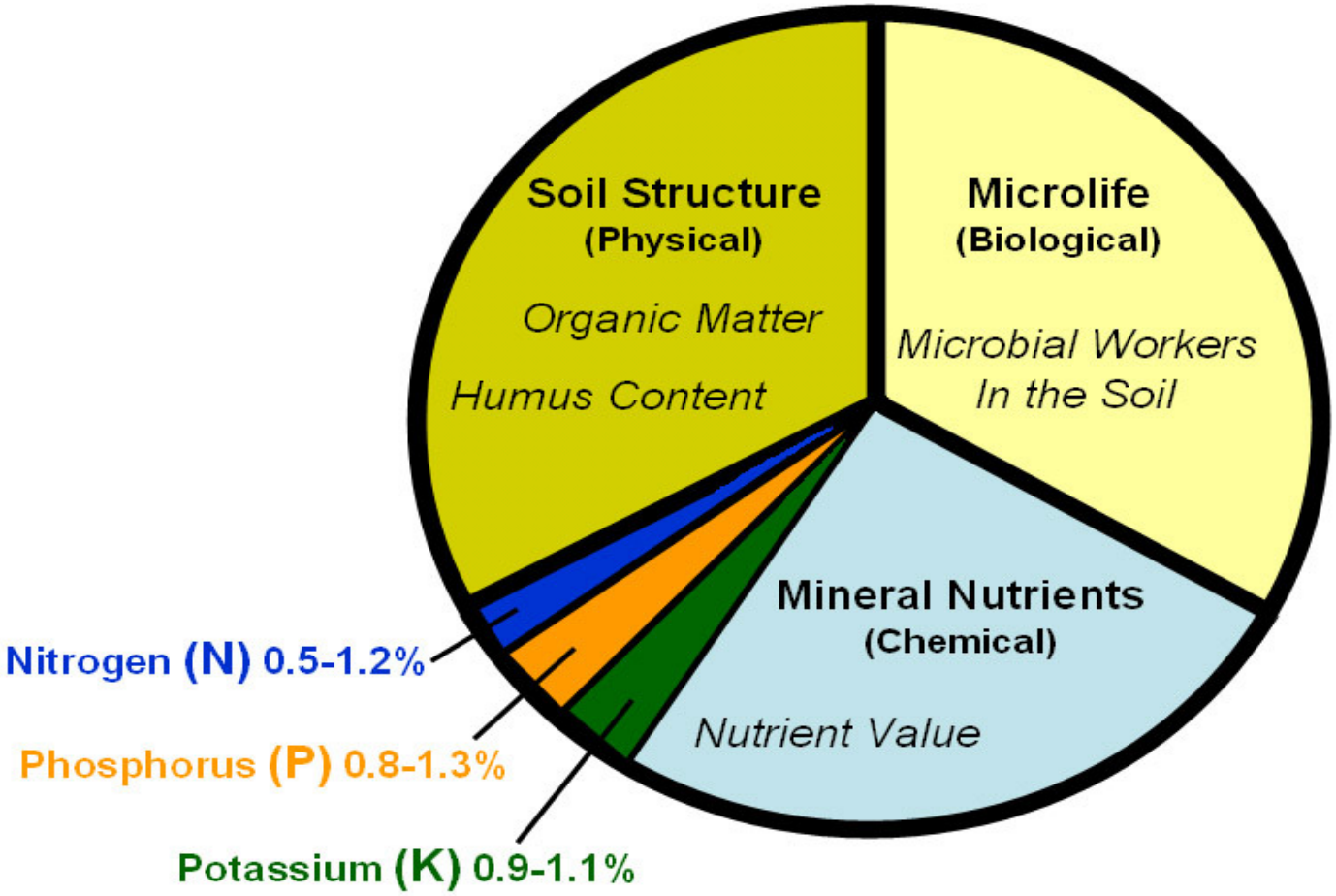
Forward Ground Speed – 20- 35 feet per minute

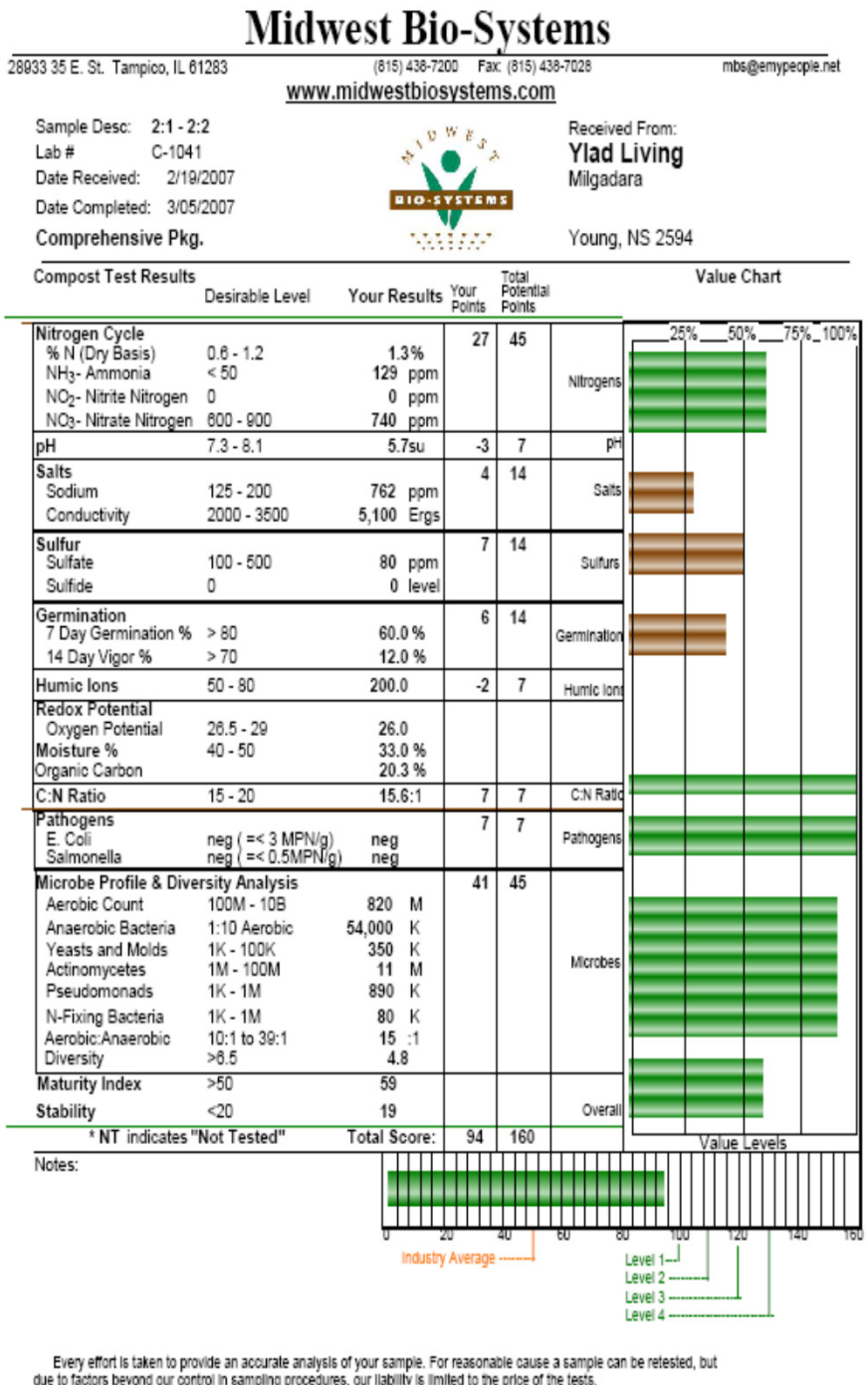
Adjust Ground Speed vs. Drum RPM to Create a “GAP”



Time to Test

Humus Compost - More then NPK





Midwest Bio-Systems

28933 35 E. St. Tampico, IL 61283 (815) 438-7200 Fax: (815) 438-7028 mbs@emypeople.net

www.midwestbiosystems.com

Sample Desc: 2:1 - 2:2
Lab # C-1041
Date Received: 2/19/2007
Date Completed: 3/05/2007
Comprehensive Pkg.

Received From:
Ylad Living
Milgadara
Young, NS 2594

Compost Test Results	Desirable Level	Your Results	Your Points	Total Potential Points	Value Chart
Nitrogen Cycle			27	45	Nitrogens
% N (Dry Basis)	0.6 - 1.2	1.3 %			
NH_3- Ammonia	< 50	129 ppm			
NO_2- Nitrite Nitrogen	0	0 ppm			
NO_3- Nitrate Nitrogen	600 - 900	740 ppm			
pH	7.3 - 8.1	5.7su	-3	7	pH
Salts			4	14	Salts
Sodium	125 - 200	762 ppm			
Conductivity	2000 - 3500	5,100 Ergs			
Sulfur			7	14	Sulfurs
Sulfate	100 - 500	80 ppm			
Sulfide	0	0 level			
Germination			6	14	Germination
7 Day Germination %	> 80	60.0 %			
14 Day Vigor %	> 70	12.0 %			
Humic Ions	50 - 80	200.0	-2	7	Humic Ions
Redox Potential					
Oxygen Potential	26.5 - 29	26.0			
Moisture %	40 - 50	33.0 %			
Organic Carbon		20.3 %			
C:N Ratio	15 - 20	15.6:1	7	7	C:N Ratio
Pathogens			7	7	Pathogens
E. Coli	neg (=< 3 MPN/g)	neg			
Salmonella	neg (=< 0.5MPN/g)	neg			
Microbe Profile & Diversity Analysis			41	45	Microbes
Aerobic Count	100M - 10B	820 M			
Anaerobic Bacteria	1:10 Aerobic	54,000 K			
Yeasts and Molds	1K - 100K	350 K			
Actinomycetes	1M - 100M	11 M			
Pseudomonads	1K - 1M	890 K			
N-Fixing Bacteria	1K - 1M	80 K			
Aerobic:Anaerobic	10:1 to 39:1	15 :1			
Diversity	>6.5	4.8			
Maturity Index	>50	59			
Stability	<20	19			Overall
* NT indicates "Not Tested"		Total Score:	94	160	

25% 50% 75% 100%

Value Levels

Notes:

0 20 40 60 80 100 120 140 160

Industry Average

Level 1
Level 2
Level 3
Level 4

Every effort is taken to provide an accurate analysis of your sample. For reasonable cause a sample can be retested, but due to factors beyond our control in sampling procedures, our liability is limited to the price of the tests.

Establishing Compost Quality

1. Absence of sulphides, nitrites & heavy metals
2. Aerobically produced
3. Absence of pathogens – e-coli & salmonella
1. High ratio of humus
2. N fixed into stable humus and microbial bio-mass
3. Abundant and diverse range of 5 functional groups of microbiology
4. Stability and maturity Index
5. Germination and vigour %

YLAD Humus Compost Test

COMPOST COMPLETE ANALYSIS REPORT- Chemical, Bacteriological

4 samples supplied by YLAD Living Soils - Lab Job No. B2337

Analysis requested by Rhonda Daly

				Block ID: Crop: Client:	Sample 2 Row 6 Compost Rhonda Daly
	Nutrient			Units	B2337/2
TOTAL Nutrients (Acid Digest/ Combustion)	Nitrogen	N		%	0.93
	Phosphorus	P		%	0.74
	Potassium	K		%	0.74
	Sulphur	S		%	0.23
	Carbon	C		%	9.0
TOTAL Salts (Acid Digest)	Calcium	Ca		%	3.82
	Magnesium	Mg		%	0.81
	Sodium	Na		%	0.11
TOTAL Metals (Acid Digest)	Copper	Cu		ppm	86
	Zinc	Zn		ppm	269
	Manganese	Mn		ppm	570
	Iron	Fe		ppm	15,061
	Boron	B		ppm	9.5
	Molybdenum	Mo		ppm	2.5
	Cobalt	Co		ppm	9.7
	Silica	Si		ppm	1,724
Calculations/ Ratios	Nitrogen : Sulphur Ratio			units	4.0
	Nitrogen : Phosphorus Ratio			units	1.3
	Nitrogen : Potassium Ratio			units	1.3
	Carbon : Nitrogen Ratio			units	9.7
	Crude Protein[see note 5]			%	5.8
Additional Compost Validation Testing	**Germination- 7 Day**			%	100
	Germination- 14 Day Vigor			%	100
	Pathogens- Ecoli			cfu/g	Nil detected
	Pathogens- Salmonella			cfu/g	Nil detected
	Moisture %			%	33.2
	pH			units	7.7
	Conductivity			dS/m	4.0
	Sulphide			%S	0.00
	Humate			%	38
	Humic acid			%	8.0
Available Compost Nutrients (leachable)	NH3- Ammonia			ppm	5.4
	NO3- Nitrate			ppm	324
	Redox Potential - SHE			mV	419

Notes:

1: Sample digested with Aqua Regia acid for total nutrients/ salts and metals (NOT COMBUSTED PRIOR TO DIGESTION)
2: ALL ANALYSIS IS DRY WEIGHT - Samples dried at 60°C for 24hours prior to fine grinding
3. ppm = mg/Kg; **1% = 10,000ppm**
4. Carbon/ Nitrogen/ Sulphur using a LECO CNS2000 Analyser
5. By Calculation:- Crude Protein = %N x 6.25
6. In regard to soil guidelines, geology and soil bedrock typically dictate the 'totals' in soil - Fertiliser programs should not be designed using 'totals'
7. The redox values have been standardised to the Standard Hydrogen Electrode (SHE = +199mV)

Humus Compost Microbial Counts

microbiology laboratories australia

MICROBE WISE FOR COMPOST

Name: YLAD Living Soils | Sample: ROW 6 166-167 | Analysis no.: 432-1 | Date: 20/02/2014

Key Microbe Groups

Group	Biomass (mg/kg) Yours	Guide
Total microorganisms	100.8	50.0
Total bacteria	31.3	15.0
Total fungi	66.4	33.8
Bacteria		
Pseudomonas	1.889	1.000
Actinomycetes	3.213	1.000
Gram positive	23.295	11.250
Gram negative	7.963	3.750
Methane oxidisers	1.889	0.500
Sulphur reducers	BDL*	< 0.005
True anaerobes	BDL*	< 0.005
Eukaryotes		
Protozoa	3.122	1.250
Mycorrhizal fungi (including VAM)	18.778	10.000

Useful indicators	Yours	Guide
Microbial diversity	77.5	80.0
Fungi : Bacteria	2.1	2.3
Bacterial stress	0.0	< 0.5

Nutrients held in microbes	Concentration (mg/kg) Yours	Guide
Nitrogen (N)	7.471	3.450
Phosphorus (P)	3.025	1.500
Potassium (K)	1.008	0.500
Sulphur (S)	1.008	0.500
Calcium (Ca)	0.504	0.250
Magnesium (Mg)	0.504	0.250
Carbon (C)	47.087	22.688

Key *BDL = Below Detectable Limit (0.001 mg/kg)

Poor | Fair | Good

Comments

Total microbial biomass was good. Biomasses of other key desirable microbial groups were also good, including Mycorrhizal fungi (VAM) and Protozoa. VAM fungi require a living plant host to survive, so their good levels in this compost is an excellent result. Protozoa often appear after composts have aged for some time, and their presence and also the maturity indicator showed that this compost is at a mature stage. The Disease suppression indicator was good, indicating good levels of disease suppression microbes such as Pseudomonas, Actinomycetes, etc.. Microbial diversity was good. These results indicate that this compost would be an excellent amendment as microbial levels were all good.

Aeromaster TE500 – Compost Tea Extractor

Aeromaster TE250 Compost Tea
Extraction Unit

Extracted Compost Tea

Extracted Compost Tea is a water based solution/suspension of the microbes, enzymes, nutrients and humus polymer (carbon)contained in compost.

High Quality Compost + Water + Air = Liquid Compost Tea Extract

75 kg compost makes 2000 litres extracted compost tea

Putting life back into the land

YLAD Living Soils

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YOUNG NSW

Transform your farm business from the soil up

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