



United States Department of Agriculture
Natural Resources Conservation Service

Composting and the Hole Picture (intended as an educational guide only)



This is only a small portion of the puzzle for developing
Healthy Soils

By Clarence L. Chavez, Soil Scientist

Warning:

- This practice as is intended with the application of local and site-specific regulation requirements. As per New Mexico law – Farmers and Ranchers are exempt from being certified, unless they are processing over 25 tons per day.
- This presentation is to be used as an educational guide only.



**COMPOSTING IS NOT AN EXACT
SCIENCE.**

**EXPERIENCE WILL TELL YOU
WHAT WORKS BEST FOR YOU...**



Compost Bulking Agents



Materials to Compost

Browns = High Carbon	Greens = High Nitrogen
Wood , Shredded	Alfalfa
Bark	Algae
Cardboard, shredded	Clover
Corn stalks	Coffee grounds
Fruit waste	Food waste (Carcass)
Leaves	Garden waste
Newspaper, shredded	Grass clippings
Peanut shells	Hay
Peat moss	Hedge clippings
Pine needles	Hops, used
Sawdust	Manures
Stems and twigs, shredded	Seaweed
Straw	Vegetable scraps
Vegetable stalks	Weeds*

*Avoid weeds that have gone to seed, as seeds may survive all but the hottest compost piles.

Other Additives to the Pile

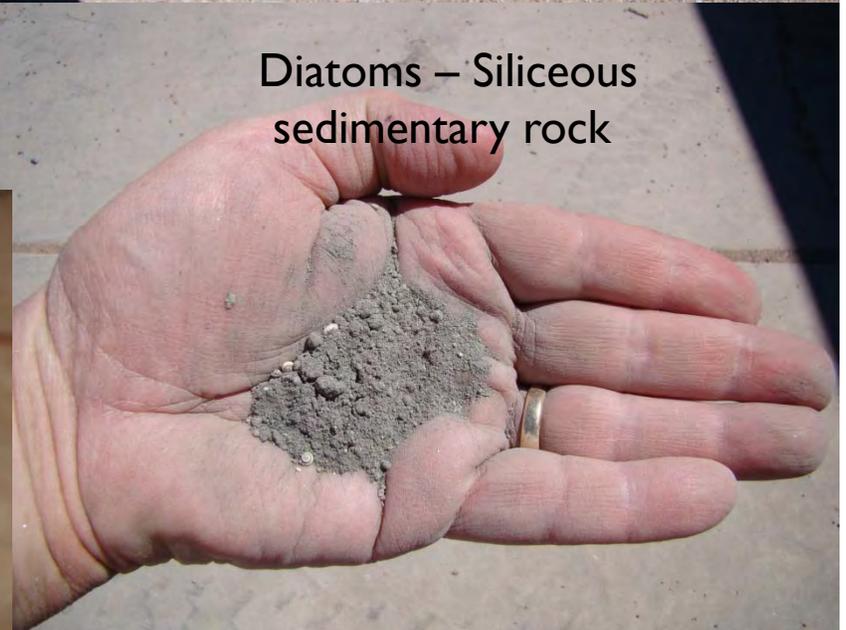
Manure



Finished Compost



Diatoms – Siliceous
sedimentary rock



Soil



Non-chlorinated



Estimated C:N Ratios of various products

- ▣ Clover 23:1
- ▣ Corn stalks 75:1
- ▣ Leaves 60:1
- ▣ Peanut shells 35:1
- ▣ Sawdust 325:1
- ▣ Wood chips 400:1
- ▣ Wood 25:1
- ▣ Food waste 20:1
- ▣ Grass clippings 20:1
- ▣ Manures 15:1
- ▣ Vegetable scraps 25:1
- ▣ Animal carcass 5 :1
- Cardboard, shredded 350:1
- Fruit waste 35:1
- Newspaper, shredded 175:1
- Pine needles 80:1
- Straw 75:1
- Alfalfa 12:1
- Coffee grounds 20:1
- Garden waste 30:1
- Hay 5:1
- Seaweed 19:1
- Weeds 30:1

C:N Ratios between 15:1 and 35:1 should be used.

High cellulose should be shredded – Corn, Branches, Newspaper etc...

Wood Chipper and Wood products



Woody is used for aeration and drainage



Equipment – for turning compost



Components to a compost mix by Volume

C:N Ratio of different ingredients

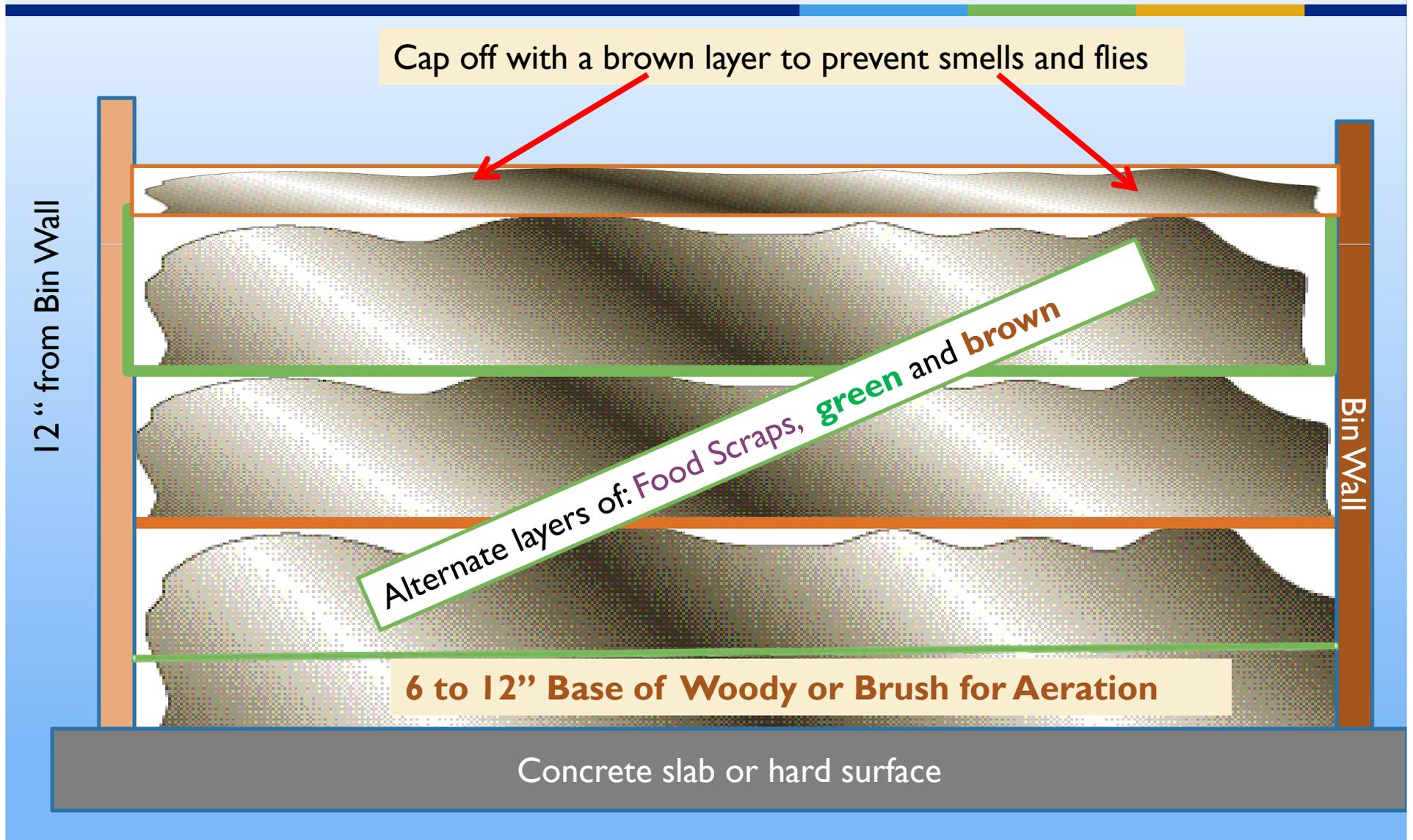
- Fungal driven food source:
 - 25% high nitrogen (carcasses) , 25% green (grass, hay), 50% Brown (sawdust, woody)

- Bacterial driven food source:
 - 50% high nitrogen (carcasses), 25% green (grass, hay), 25% Brown (sawdust, woody).

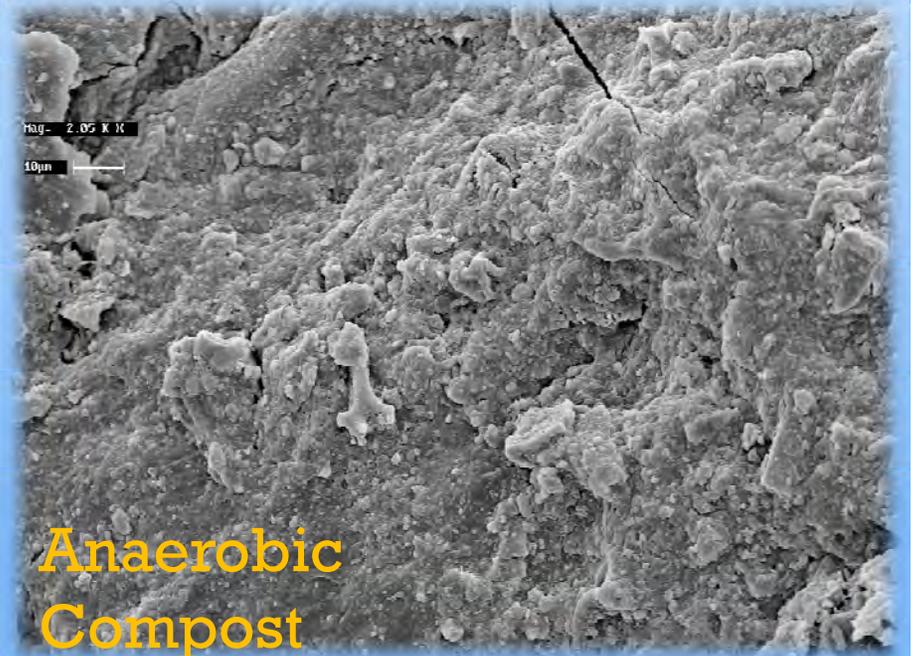
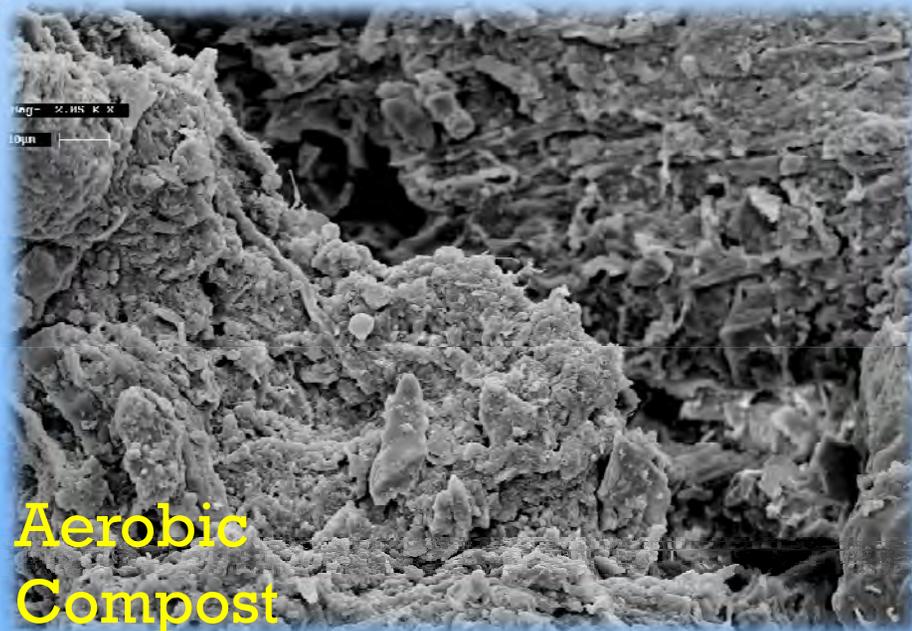
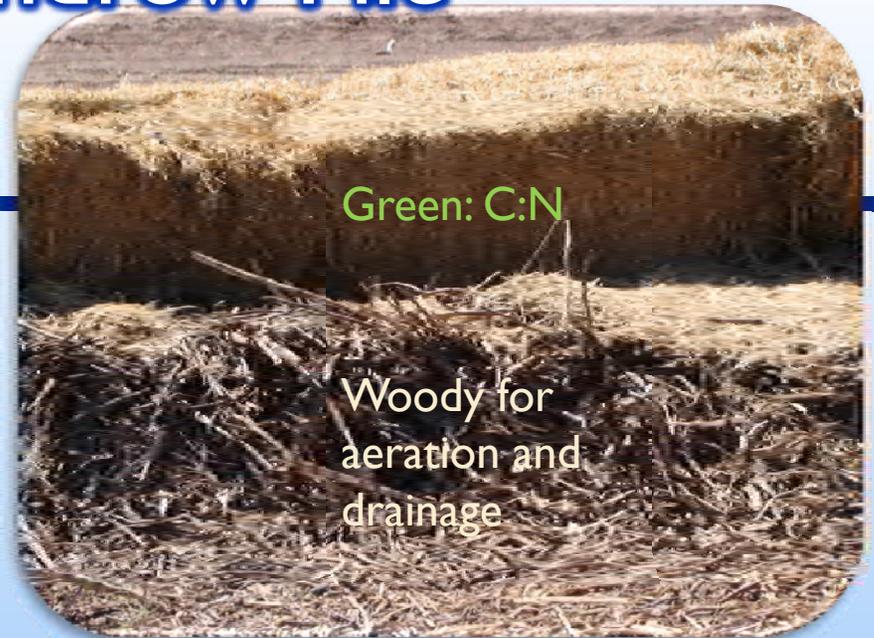
- Balanced food source: (recommended)
 - 33% high nitrogen (carcasses), 33% green (grass, hay), 33% Brown (sawdust, woody).

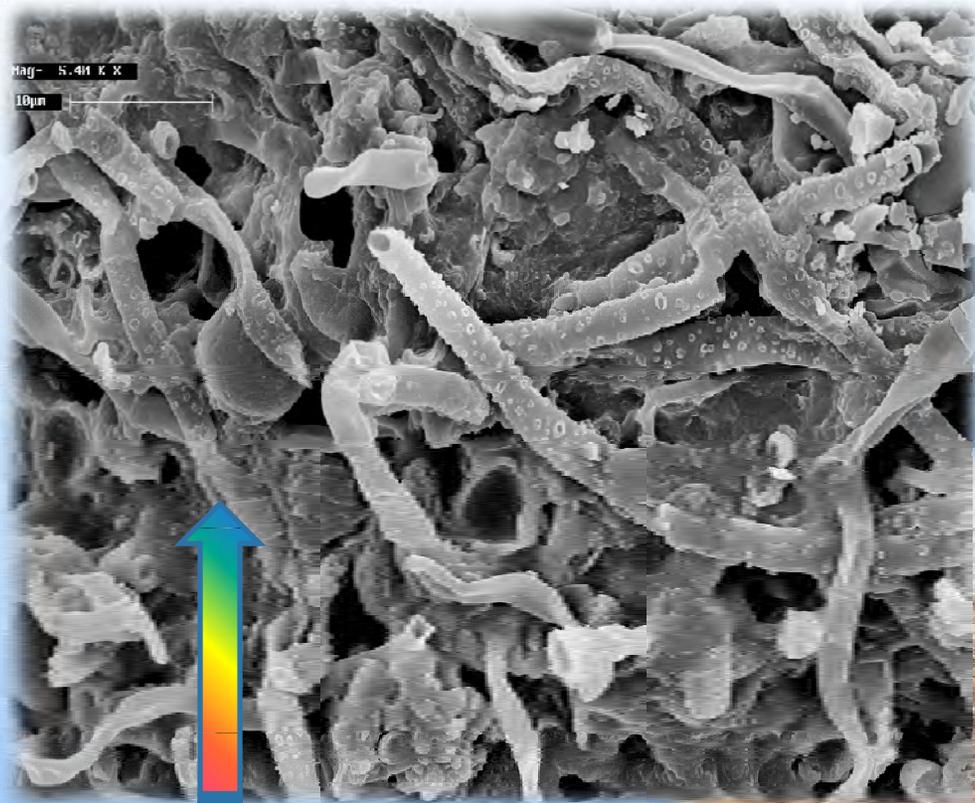
See Part 637 Environmental Engineering National Engineering Handbook, Chapter 2. USDA-NRCS for exact numbers.

Layering the Compost Pile



Compost Windrow Pile



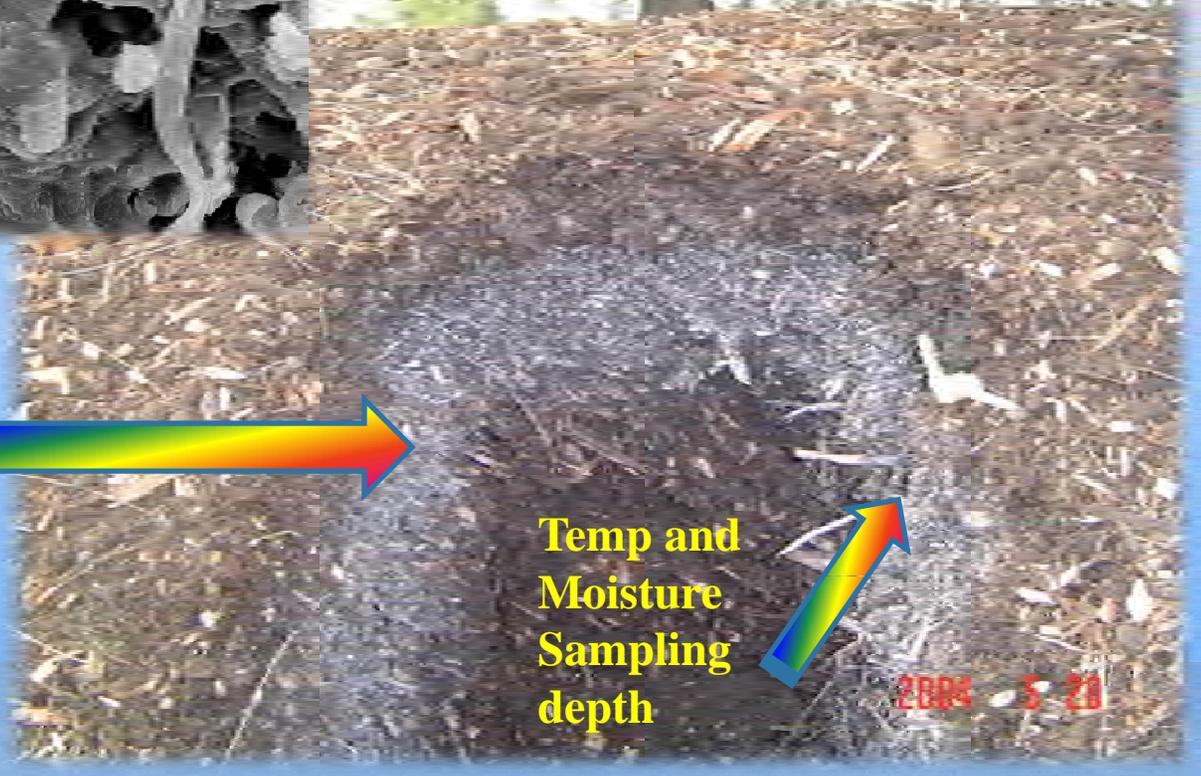
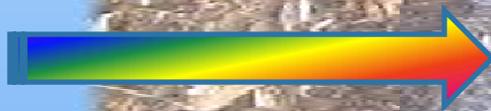


Fungi with Ca crystals
in aerobic compost

Actino-bacteria in thermal
compost

Others in the Pile:

- Protozoa
- Nematodes



Temp and
Moisture
Sampling
depth

2004 5 20

What Does It Smell Like

- Should smell like fresh Earth or have no odor



- Smells caused by anaerobic conditions

- Acetic Acid - Vinegar
- Butyric acid – Sour milk
- Valeric acid - Vomit
- Putrescine – Rotting flesh



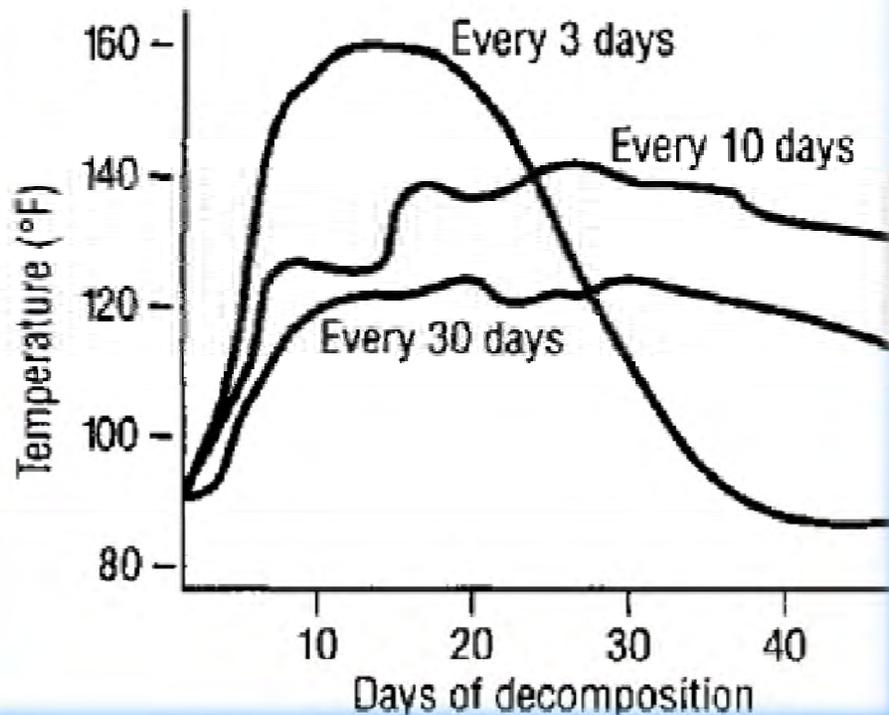
Management of Compost Pile: Temp, Time, Turning & Moisture



This compost is not finished – needs to be turned and moisture added.

Temperature and Turning

Turning Frequency Effects on Composting



Note: Turn when Temp reaches 131 degrees Fahrenheit for at least 5 times..
Do not let the temp go over 160 degrees Fahrenheit – it starts to kill beneficial microbes.

Compost Moisture

- Must maintain 45%-85% moisture content
 - Ensures healthy environment for organisms
 - Too much moisture creates anaerobic conditions
 - Too little will slow decomposition



Moisture Meter \$25 to \$60



Compost Fires

If Compost Management is done 10 to 15 min a day: "Record Temperature, add Moisture and turning compost when needed then - **piles will self ignite and create fire piles.**

CAUTION

This Compost Pile may

Self Ignite

If Not Maintained



Kinds of Compost Piles



Cover to minimize excess moisture and minimize evaporation of moisture.

Plus protect from sun damage or microbial degradation.



Raw Materials
Organic matter
(in the form of,
Protein, Bones,
Grass and Woody)

Minerals: including
nitrogen, carbon,,
and other nutrients.

Water

H₂O

Heat

CO₂

Finished Compost
includes organic
matter, protein,
plant nutrients,
nitrogen, minerals,
water and
microorganisms.

Also other
nutrients that can
be taken up by the
roots or stored in
the soil.

Water
CO₂
Heat

Microorganisms / Soil Biota

O₂

O₂

It takes at least 4 to 8+ months for a finished product

Low Cost

Can be Any Size

Animal Bones
are not
Recognizable

No Flying
Pests

Can Be Done in
Winter

Can be done
with any Animal

Minimal
Labor

No Smell

Use any kind
of Bulking
Agent: Leaves,
Grass,
sawdust etc...

No Varmints:
mice, skunks,

No Spread of diseases
or pathogens as long
as it is 130 degrees F
for 2-3 days

If the compost pile is built and
managed correctly, Then...



Finished Compost VS Manure (Applied based on agronomic rates)



Finished compost can be 1/3 the volume of the original manure pile

No Seed Source (weeds)
No Disease (Pathogens)
Helps to Retain Water
Variable Salt Content
Good Nutrient Source / Increase Microbes

Potential Seed Source (weeds and other)
Potential disease (Pathogens)
Can seal the top soil if not incorporated
Potentially higher Salt Content
Good Nutrient beneficial microbial Source s

Both are based on an Integrated Cropping System



USING COMPOST OR MANURE IS A
MAJOR COMPONENT OF NUTRIENT
MANAGEMENT TO SUPPLEMENT CROP
NUTRIENTS AND APPLY BENEFICIAL
MICROORGANISMS.

APPLICATION OF ORGANIC MATTER IS
ONLY A SECONDARY BENEFIT.



Uses of Compost



As a Nutrient Amendment and Increase Microorganisms.

Introduction to Section 1 (1b – Managing Organic Matter & Nitrogen Inputs to Improve the Soil Resource)



When using compost in a Integrated Cropping System along with Irrigation Water Systems :

You will see a -

- Suppress disease in plants and soil
- Retain nutrients/prevent leaching
- Make nutrients available at rates plants require
- Decompose toxins
- Enhance soil structure/ potential of reducing run-off erosion
- Reduce water requirements, increase water holding capacity
- Increases rooting depth (minimum till, cover crops, crop diversity etc.)





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EXPERIENCE WILL TELL YOU WHAT
WORKS BEST FOR YOU.

YOU MAY HAVE TO TROUBLESHOOT
SOME PROBLEMS



Monitoring and Troubleshooting

Problem/ Symptom	Probable Cause	Suggestions
Improper Temperature	* Too Dry	* Add Water
	* Too Wet	* Add bulking agent and turn pile
	* Improper C:N ratio or bulking agent used is too porous	* Evaluate bulking agent and adjust amount as necessary.
	* Adverse Environment	* Ensure adequate cover with bulking agent to provide insulation.
Failure to Decompose	* Improper C:N ratio	* Turn Pile and adjust amount of bulking agent
	Carcasses placed on the outside of edge of pile	* Maintain 1' of apart and away from edges.
Odor	* Too Wet	* Add bulking agent and turn pile
	* Too low C:N ratio	* Evaluate type of bulking agent used. Add bulking agent.
	* Air flow restricted	* Maintain one 6 - 12 inches of bulking agent near outside of bin & turn the pile.
	* Extended periods of low temperature	* Follow steps in temperature section

Monitoring and Troubleshooting

Problem/ Symptom	Probable Cause	Suggestions
Oder	* Inadequate cover over carcasses	* Cover carcasses with 1 foot of Bulking Agent
Flies	* Inadequate Brown over pile	* Add bulking agent and turn pile.
	* Poor sanitation conditions	* Avoid leaching from pile. Maintain a clean, debris free area near the pile.
	* Failure to achieve proper temperature	* Follow steps in temperature section
	* Too Wet	* Open/remove pile contents and add additional bulking agent.
Scavenging Animals	* Inadequate cover over carcasses	* Maintain one 1' of bulking agent near outside of bin & turn the pile.
		* Avoid initial entry by establishing a fence or barrier



Compost is only one part of the puzzle it
in a
Soil Health Management System
along with a
Irrigation Water Systems

Crop Production and Irrigation



<http://www.nm.nrcs.usda.gov/technical/handbooks/iwm/nmiwm.html>



Main Sources for this presentation:

USDA-NRCS Policy:

Part 637 Environmental Engineering National Engineering Handbook, Composting, Chapter 2, Page 52.

<http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=28910.wba>

Minnesota Board of Animal Health:

<http://www.mda.state.mn.us/news/publications/animals/compostguide.pdf>

[Additional Resources](#)

www.compostcouncil.org

www.soilfoodweb.com

www.attra.gov

www.composting101.com

www.earthfort.com

Any Questions?



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