

Compost Use

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Confined Animal Manure Managers Workshop

January 16, 2020



Landscape soil characteristics that would benefit from compost:

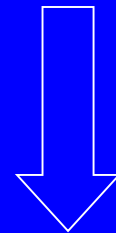
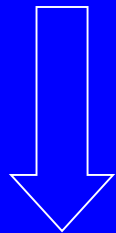
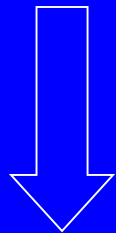
- **Compacted**
- **Acidic**
- **Low organic matter**
- **Low nutrient content**

Compost Effects on Soil Properties

(McConnell et al. BioCycle Apr 1993, p 61-63)

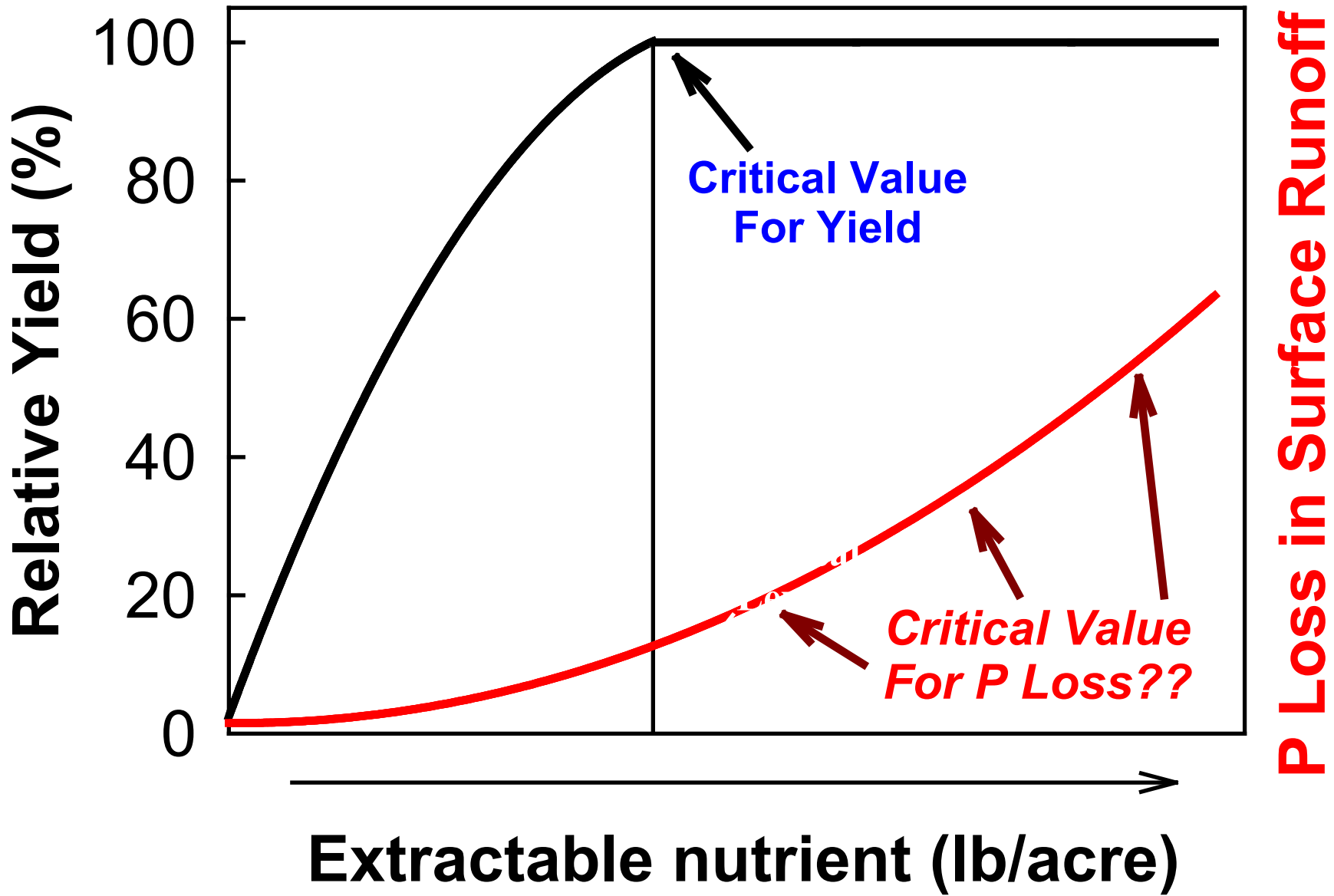
Parameter	Rate (cy/1000sf)	Effect
Organic Matter	1.0-6.5	6-163% ↑
Water Holding Capacity	0.5-6.5	5-143% ↑
Bulk Density	1.0-6.5	4-71% ↓
pH	1.0-6.5	0.8-1.4 ↑

Plant Available N (PAN) Forms



Source	% Available N		
Pellets	100	35-50	5-10
Compost	100	5-15	0-8

Relationship between Soil P and Water Quality



Total avoided GHG emissions associated with fertilizer displacement with compost

Total avoided MTCE/ton organic input	Source
-0.022	Hansen, T.L., G.S. Bhandar, T.H. Christensen, S. Bruun, and L.S. Jensen, 2006. "Life cycle modelling of environmental impacts of application of processed organic municipal solid waste on agricultural land (Easewaste)." <i>Waste Management Research</i> . 24:153-166.
-0.019	Smith, A., K. Brown, S. Ogilvie, K. Rushton, and J. Bates, 2001. <i>Waste Management Options and Climate Change: Final Report</i> , European Commission, DG Environment, 137-159.
-0.019	U.S. LCI Database is available at: http://www.nrel.gov/lci .

Turf and Landscape Soils



- Urbanization is major cause of disturbed, poor quality soils.
- Organic soil amendments improve vegetation establishment in disturbed soils by supplying nutrients and organic matter.

Compost Use for Turfgrass Establishment



- Apply 1-2 inches
 - 3-6 cy/1000 sf
 - 135-270 cy/acre
- Incorporate 5-7 inches (20-30% by vol)
- Establish vegetation by seeding, sprigging or sodding

Case Study: Compost for Turfgrass Establishment on Disturbed Soil



- Lynchburg, VA
- Soil organic matter ~1%
- Soil Test P = 3 ppm (v. low)

Compost composition

Property	Value
¼ in screen size (%)	94
EC (mmhos cm ⁻¹)	3.0
pH	7.9
C:N	18:1
Total Organic C (%)	30
Total N (%)	1.7
P (%)	1.0
K (%)	1.4
Maturity (Solvita)	Very Mature



Applying & Incorporating Compost

1



Compost

2



Aerovate

3



Seed, roll



3/28/2009

2 in compost
PPI

1 in
compost
PPI

Standard Fert

SCT+Straw Mat (back)
0.25 in com blanket
(fore)

1 in
compost
blanket

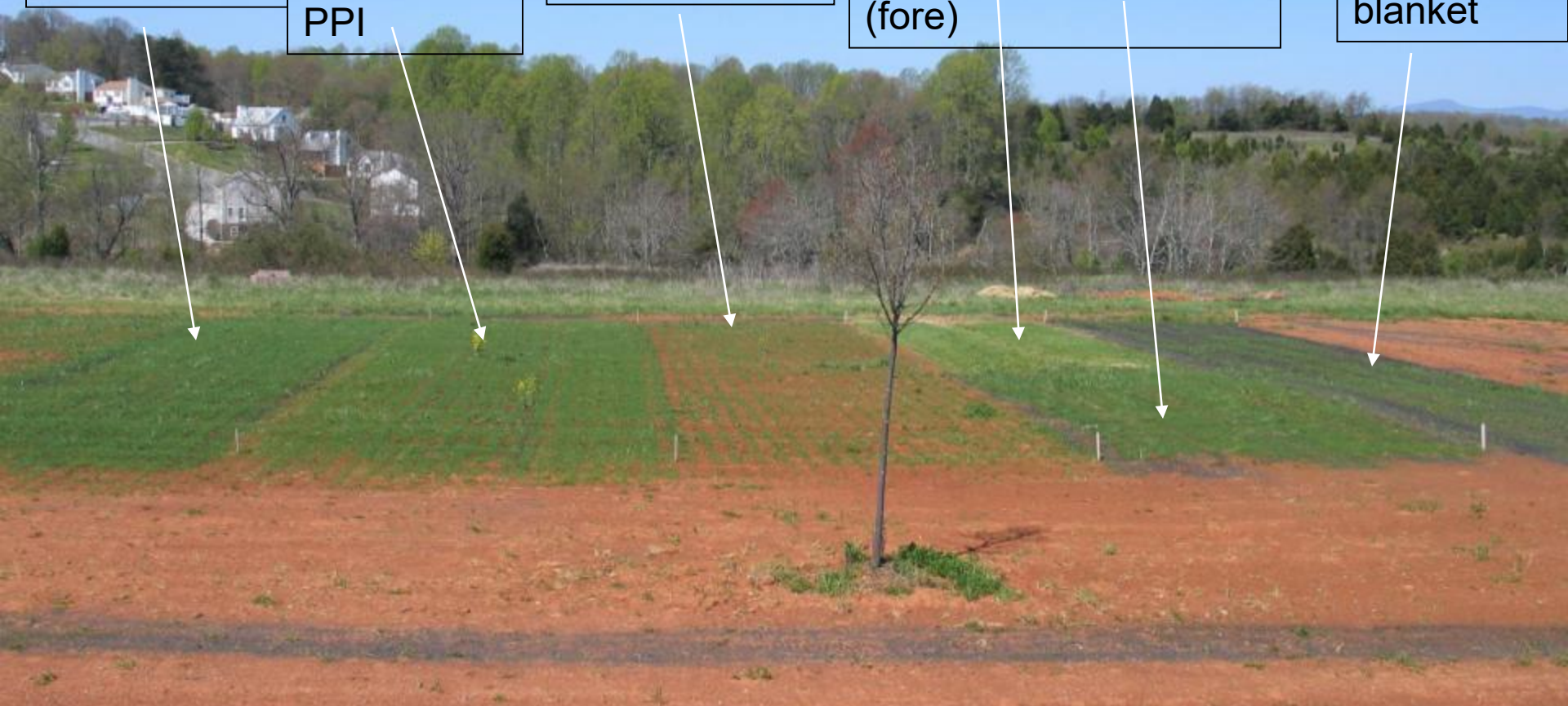


Photo taken April 17, 2009; Plots Seeded March 24, 2009.

Compost Application Estimator

Thickness	CY/1000 ft ²	CY/ac
¼ inch	0.75	34
1 inch	3.0	134
2 inch	6.0	269

Nutrients Recommended and Applied by Treatments

Treatment	C	N	P	K
	lbs acre ⁻¹			
Fertilizer	0	40	87	100
0.25 inch compost	2,848	117	98	140
1.0 inch compost	11,392	466	349	558
2.0 inch compost	22,784	932	698	1116

2 Years after Treatment

Fertilizer
Rep 3

1" compost, PPI
Rep 3

2" compost, PPI
Rep 3

Treatment	TOC (%)	BD (g/cc)	M1-P (ppm)
Fertilizer	1.22b	1.25a	16c
1" compost, PPI	2.82a	1.24ab	22b
2" compost, PPI	3.20a	1.18b	26a

July 5, 2011

Turf Topdressing

Compost can replace topsoil, peat, and wood fines mix in conjunction with aeration and reseeding.



Apply $\frac{1}{2}$ inch and rake.

Inexpensive source of nutrients and organic matter.

Promotes seed germination and improves soil properties.

Biological Suppression of Turfgrass Diseases with Topdressed Compost

(Nelson and Boehm. Compost induced suppression of turf grass diseases. BioCycle 43:51-55)

Treatment	Dollar spot	Brown patch	Red thread	Pythium root rot
	Spots/plot	% plot area diseased		
Untreated	19.8	72	47	38
Leaf compost	18.9	44*	53	---
Turkey litter compost	13.8	18*	10*	18*
Fungicide std	0.6*	8*	---	22

* Significantly different than untreated control.

Erosion Control

Apply compost at 135-400 cu yds/acre (1-3 inch layer).





**Acid sulfate soil near I-295
in Mechanicsville, VA**



**Soil amended with
fertilizer and seeded.**

Marginal Land Reclamation



Site after 3 years.



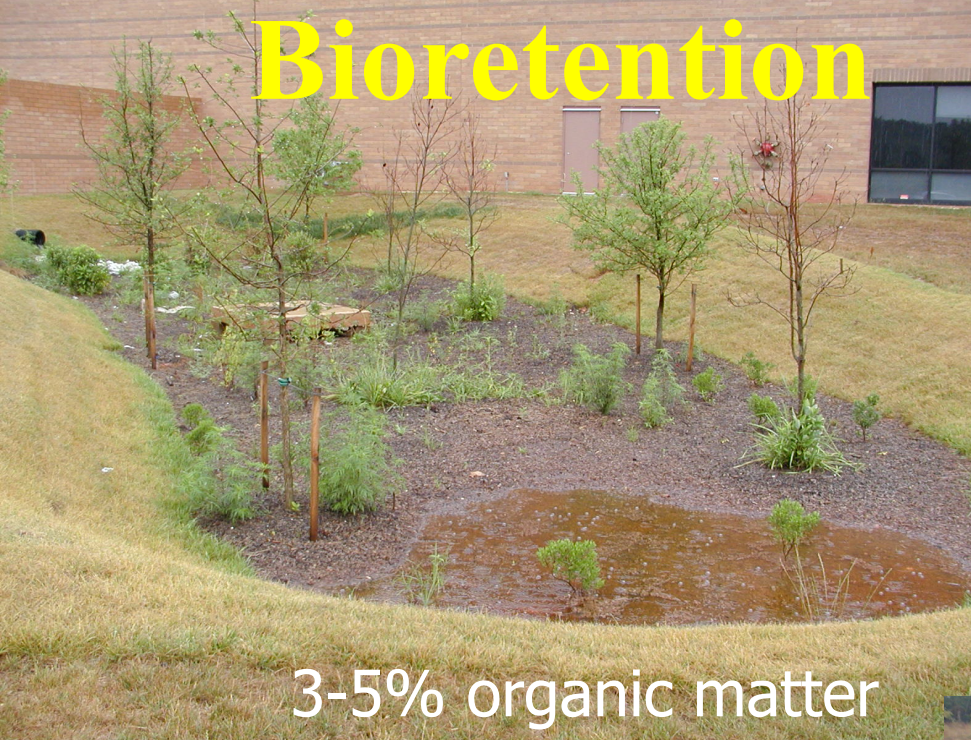
**Soil amended with compost
and lime and seeded.**

Compost in filter socks reduces runoff and protects stormwater quality



FLOW THROUGH RATE:	16 GALLONS PER MINUTE
LEACH TEST:	NPK: NONE
CHEMICAL REMOVAL:	TOTAL N: 29% REDUCTION
	TOTAL P: 14% REDUCTION
	TOTAL K: 14% REDUCTION
MOTOR OIL TEST:	98.5% REDUCTION (ABSORPTION)
TURBIDITY:	27% REDUCTION
LARGE SOLIDS REMOVAL:	100% REDUCTION
SUSPENDED SOLIDS REMOVED:	52% REDUCTION
SUSPENDED SOLIDS W/ FLOCULANT:	96% REDUCTION
<p>NOTE: THIS PRIVATE TESTING AND CERTIFICATION PROGRAM IS CURRENTLY IN PROGRESS.</p> <p>MORE TESTING IS AVAILABLE ON A QUARTERLY BASIS VIA EITHER YOUR</p> <p>LOCAL INSTALLER OR OUR HEADQUARTERS AT</p> <p>FILTREXX INTERNATIONAL, LLC</p>	

Bioretention



3-5% organic matter



Production of Topsoil from Luckstone Hardrock Mining By-products and Compost



- Recipe
 - Mineral rock fines
 - Saprolite
 - Papermill sludge compost
- Marketed >50,000 cy annually since 2004 (\$10-25/cy)

Potting Media



Fig 1. Left: lettuce growing in unamended soil.
Right: lettuce growing in 50% compost.



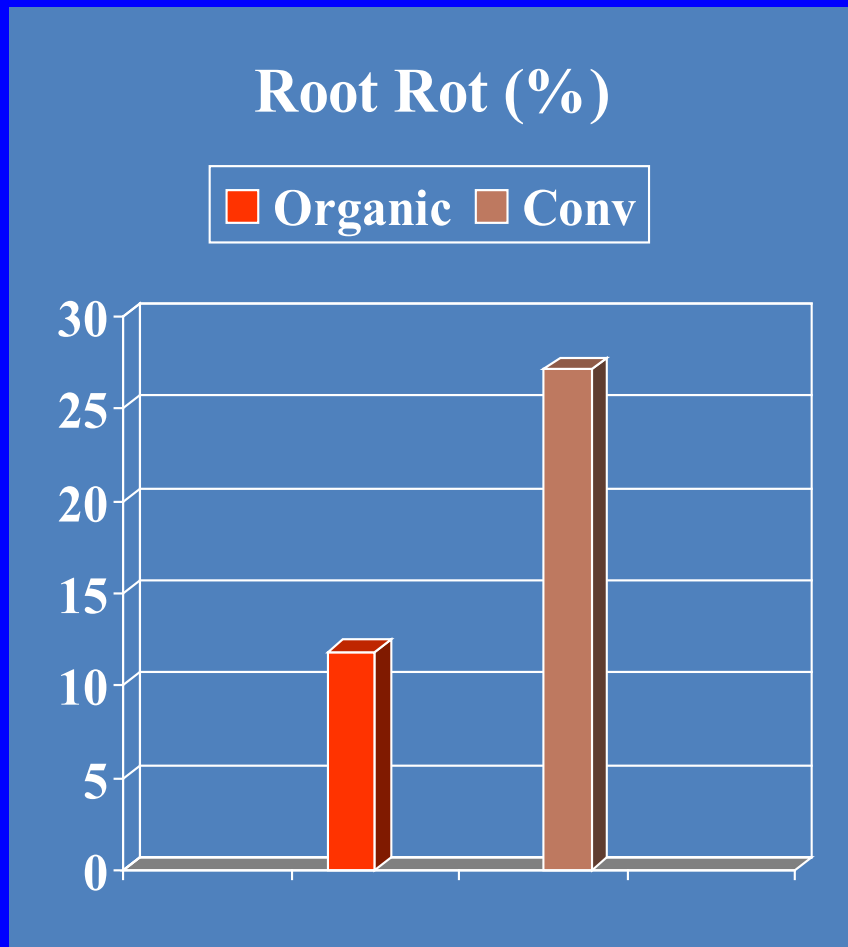
Comparing composted yard trimmings and ground wooden pallets as mulches



Treatment	C:N ratio
Wood mulch	> 100:1
Compost	< 20:1

- Lloyd, Herms, Stinner, and Hoitink. 2002. BioCycle, Sep. 52-55, 69.
- Results: WM and compost conserved soil moisture and increased soil organic matter, but compost increased and WM decreased soil N and plant growth.

Compost Use in CA Vineyards (Granett, U. of CA, Davis)



- Studied 6 organic and 7 conventional farms
- Higher populations of *Fusarium* antagonists (i.e., *Pseudomonas*, *Trichoderma*) in compost-amended soil
- Further evidence for disease suppression

Compost, Manure and Fertilizer Effects on Agricultural Crops

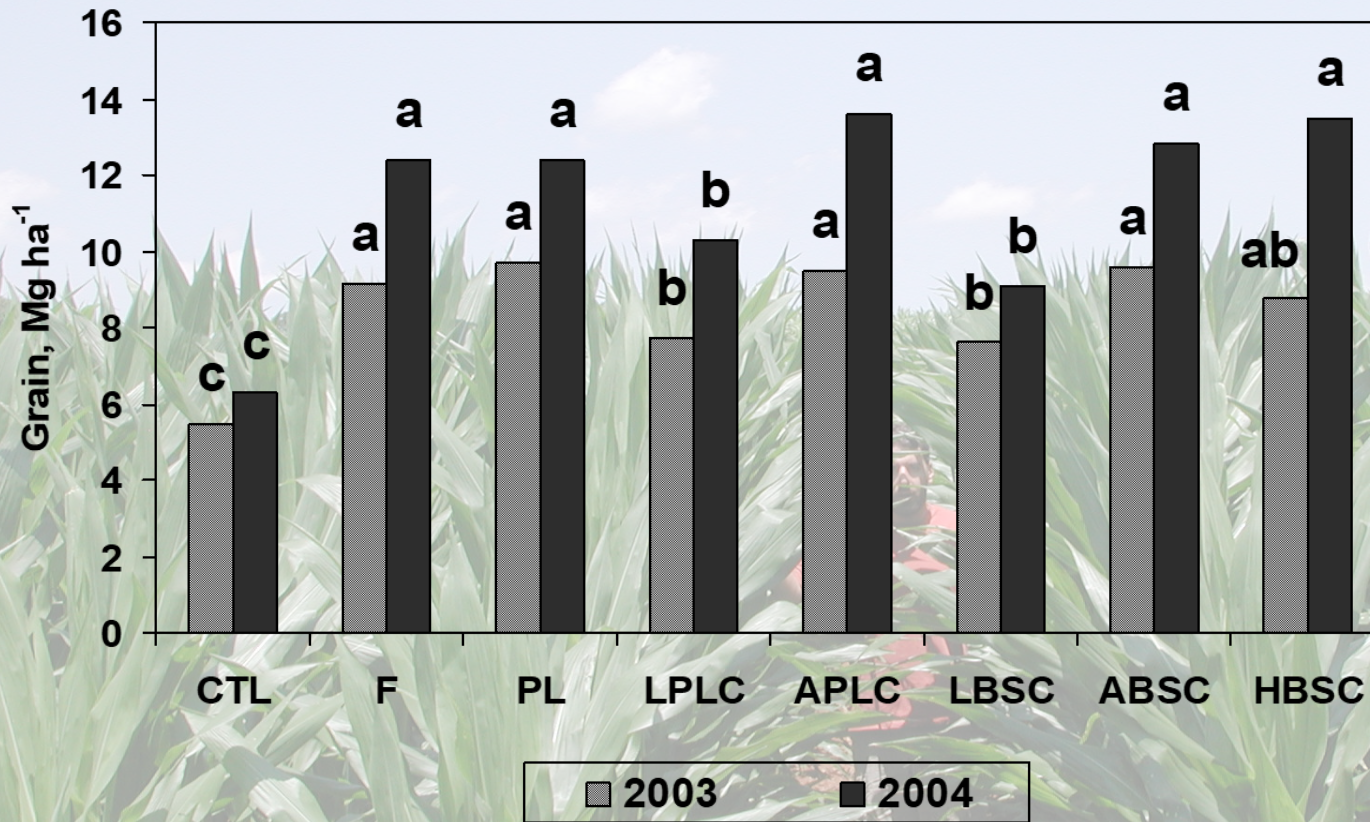


- Site: Orange, VA
- Dates: 1999-2005
- Soil: Fauquier silty clay loam (fine, mixed, mesic Ultic Hapludalfs)
- Treatments
 - Compost (5)
 - Poultry litter
 - +/- Fertilizer

Compost, Manure and Fertilizer Effects on Vegetable and Agronomic Crops



Yield



Soil Test P

Surface 5 cm

Treatment

M3P

WSP

-----mg kg⁻¹-----

CTL

23

1.2

F

69

2.2

PL

77

4.1

APLC

247

28

ABSC

218

5.9

LSD

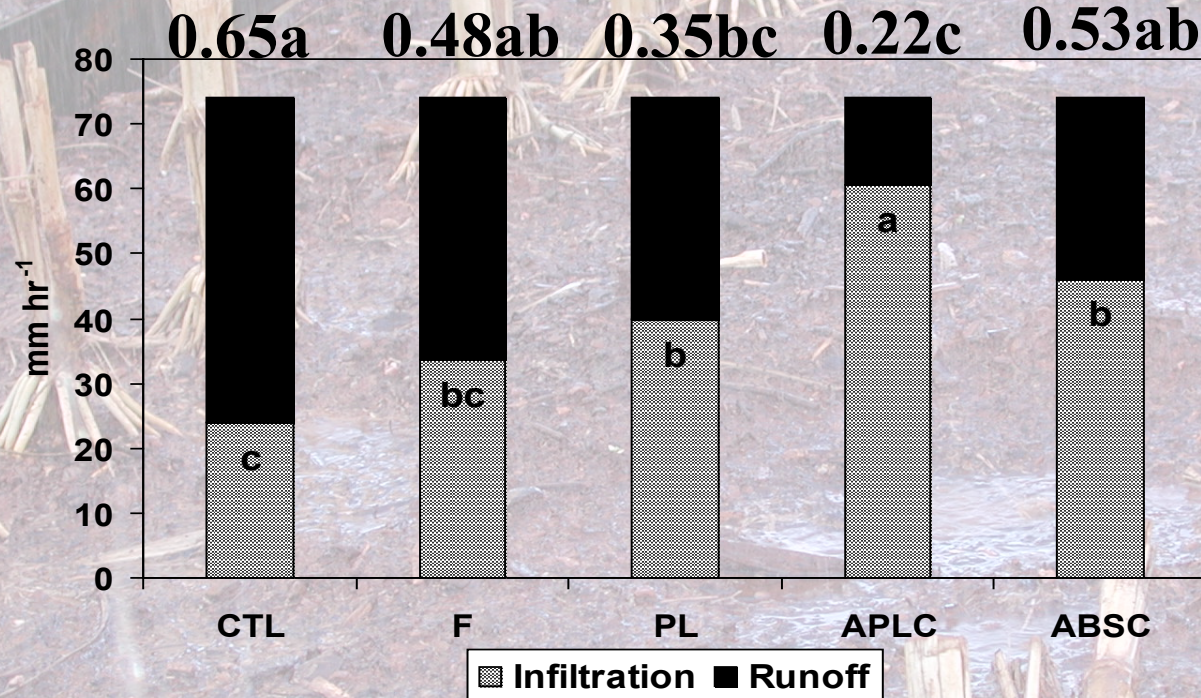
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2.3

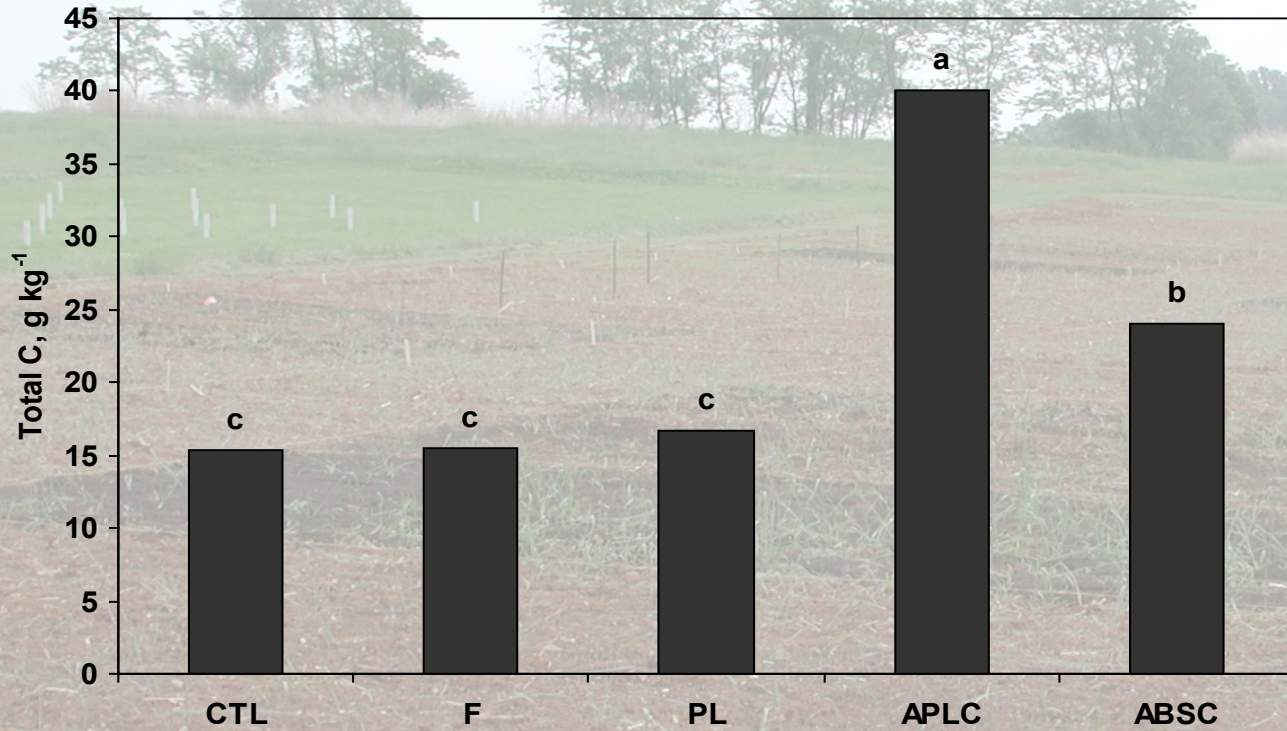
Rainfall Simulation and Runoff Collection and Analysis



Runoff/Infiltration & TP (kg/ha)



Total Soil C



USDA National Organics Program (NOP) Compost Standards

- Allowed feedstocks
 - Plant and animal materials (and their ash)
 - "Natural" non-agricultural materials (e.g., yard debris, food residuals?)
 - Mined substances of low and high solubility
- Prohibited feedstocks
 - Biosolids, including ash, grit and screenings from sewage sludge
 - Any synthetic materials not on "national list"

NOP Standards-Process

- 2002 addendum—guidance document to allow greater flexibility
 - Achieve 55°C for more than 3 days
 - Mixed or managed to ensure all of mixture achieves 55°C
- Vermicompost approved
 - Aerobic, moisture and time minimums

Compost vs Other Media

Parameter	Compost	Manure	Peat	Topsoil
Nutrients	M-H	H	vL	L-M
Soluble salts	M-H	M-H	vL	L
pH	M	M-H	L-vL	L-M
Bulk density	M	H	L	H
Water hold cap	M	L-M	H-vH	L
Oorganic matter	M-H	M-H	H-vH	L