Using Compost and Animal Manure as a Florida BMP on Vegetable Production

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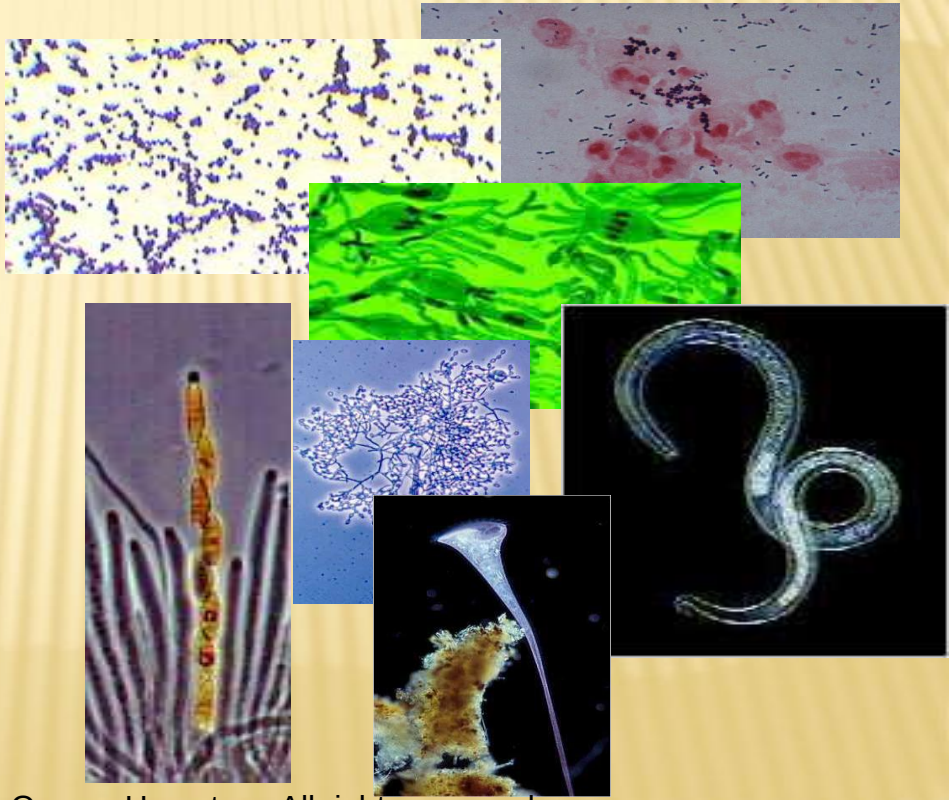
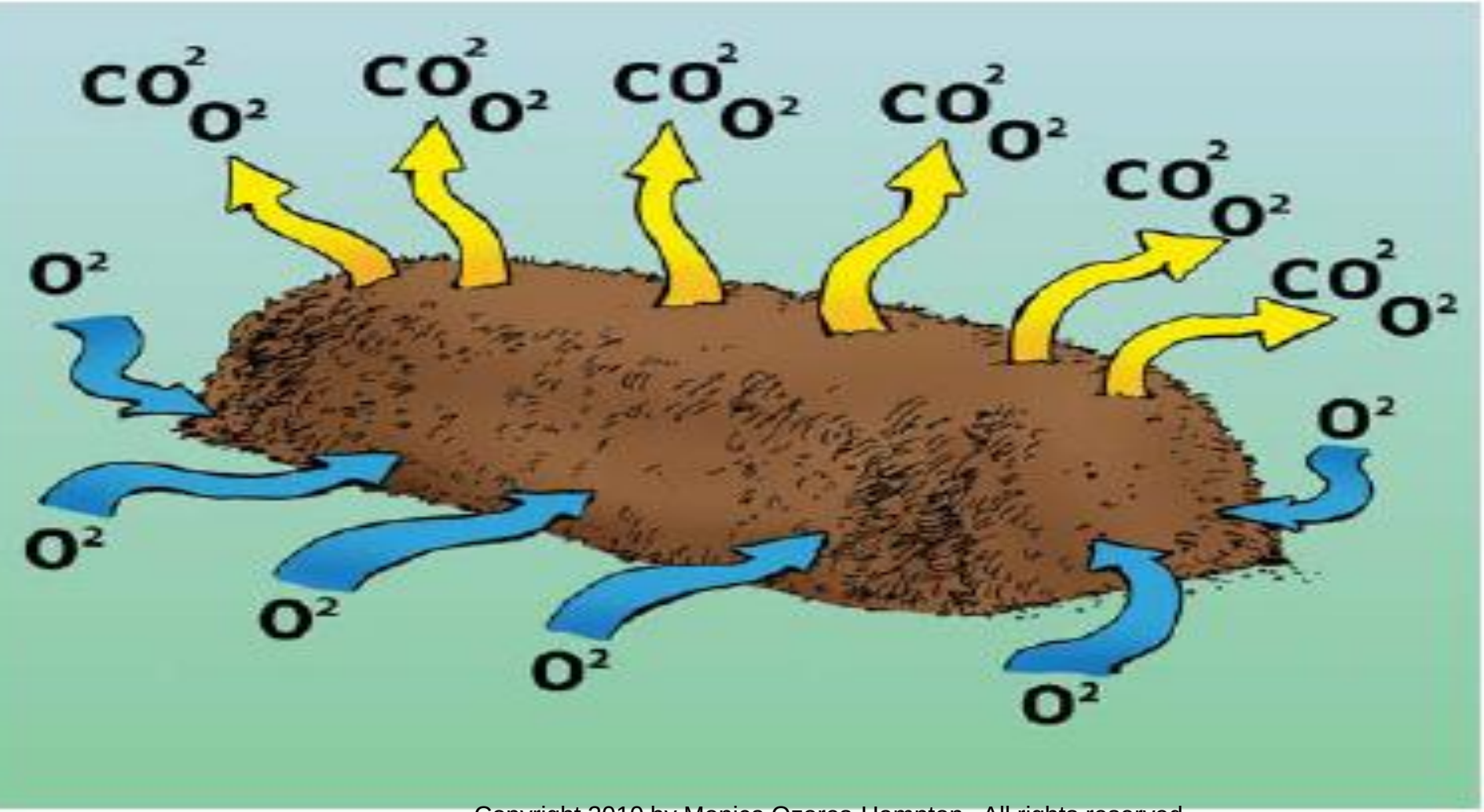
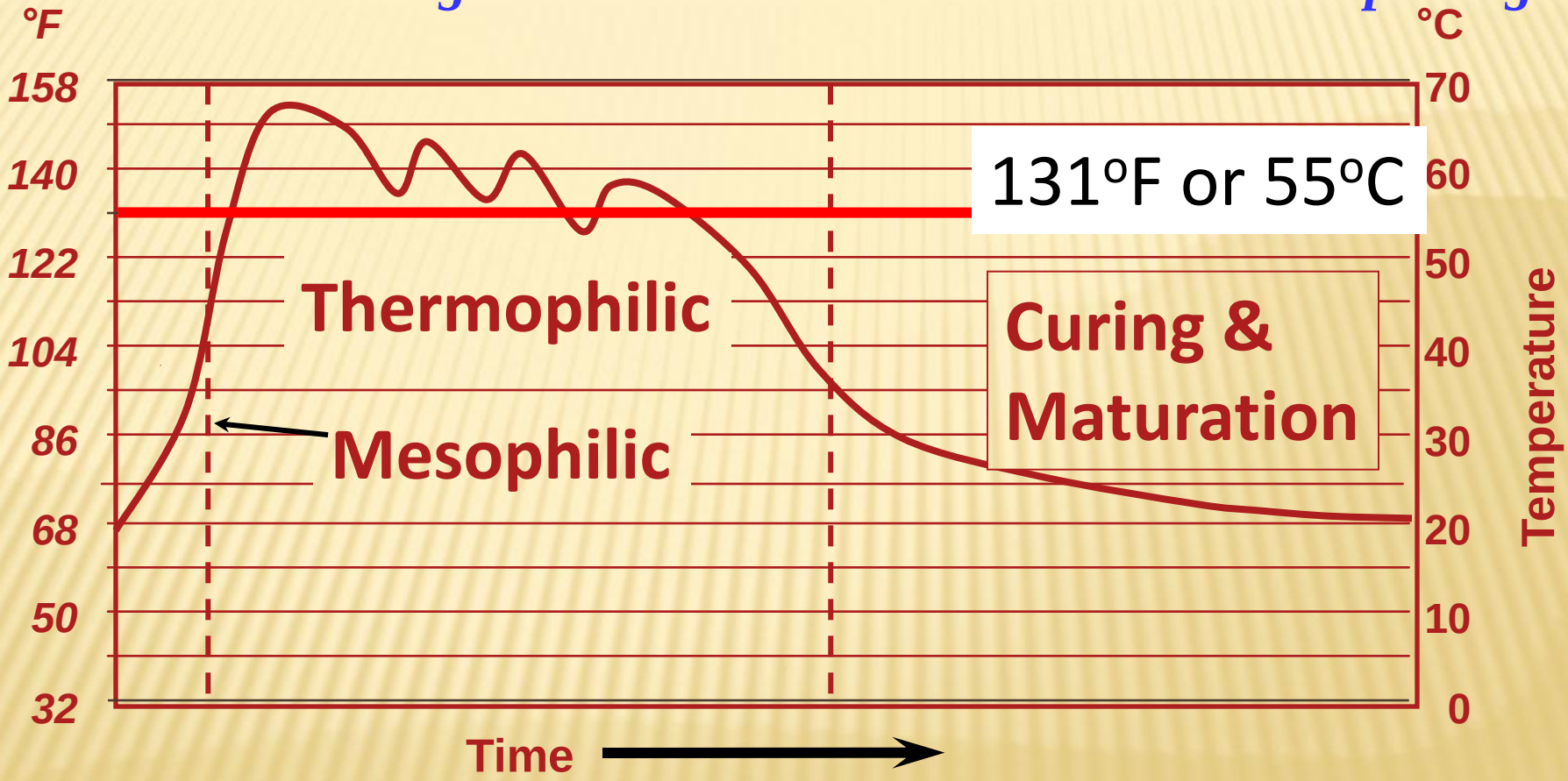
WHAT IS COMPOSTING?

'it's a biological decomposition process where microorganisms convert raw organic materials into relatively stable humus-like materials'





Under USEPA regulation 40 CFR Part 503 windrow composting



Temperatures of 131 °F or 55°C for the first 15 days and turned 5 times will eliminate human and plant pathogen and kill weed seeds

THERMOPHILIC STAGE

- Usually 130-150°F
- Heat should be controlled

Temperature: Thermometer $140 3 feet long
REOTEMP www.reotemp.com

pH meter and EC:
http://www.specmeters.com/pH_Meters/index.html

Compost Analysis $150
CONTROL LABORATORIES
http://www.controllabs.com/compost.htm


Manure Collection

FERTILIZER VS. COMPOST OR MANURE

- A fertilizer is applied specifically to provide known nutrients to a plant.
- Compost or manure is applied to improve or enhance soil characteristics for plant growth, but also may contain required plant nutrients.

FERTILITY PROGRAM: INORGANIC VS. ORGANIC SOURCES

- **Inorganic nutrients:**

  Majority derived from synthetic chemical compounds. Mainly content the N-P-K and micronutrients that are essential for the plant growth.

  - Easily dissolving in water, fast nutrient release rate, high analysis, low cost per unit of N.
  - Leaching, require energy for manufacturing.

- **Organic nutrients:**

  Derived from animal or vegetable matters. Many of the nutrients present in organic soil amendments must be transformed by soil microorganisms before they can be utilized by crops.

  - Increase soil OM, increased water holding capacity and CEC, recycle nutrients.
  - High cost per unit of N, low analysis and low nutrient release rate (affected by environment), high application rate.

COMPOST OR MANURE SHOULD BE APPLIED TO VEGETABLES BECAUSE:

- Vegetables root zone soil OM concentration usually only 0.5 to 1.5%.
- Availability of non-hazardous organic waste materials is increasing.
- Using organics as nutrient sources can be economically favorable.
- Benefits such increasing soil quality.
- Applying plant nutrients in an organic form may be considered a BMP.

DEVELOPMENT OF NUTRIENT MANAGEMENT PLAN

- We can combined the use of organic and inorganic nutrient sources.
- The goal: increase crop yield, reduce leaching, improve plant nutrient use efficiency and reduce environmental impact.

COMPOST AS AN ORGANIC AMENDMENTS

- **Compost**

  Advantages: soil physical/chemical/biological property ↑, recycle nutrients, leaching↓.

  Disadvantages: cost, availability, spreading equipment, compost quality.

Versus

- **Raw animal manure**

  Advantages: Soil physical/chemical/biological property ↑, recycle nutrients.

  Disadvantages: food safety, availability, odors

COMPOST

Sources	N	P	K	Rate of N Release
	----------(%)----------			
Poultry	1.3-5	3.0	2.0	23
Mushrooms	2.5	1.3	0.9	10
Horse	0.5	0.2	0.4	10
Yard waste	1.0-1.2	0.2-0.3	0.2-1.4	6.0-10
Dairy	1.2-1.5	0.3	0.9	15
Gin trash	1.2-3.8	0.2	1.2	10
Feedlot	1.9-2.2	0.3	0.8	10

MANURE

Sources	N	P	K	Rate of N Release
		-------(%)--------		
Poultry litter pellets	4.0	2.0	2.0	21
Beef (no bedding)	0.6 – 0.7	0.35-0.45	0.5-0.65	35
Dairy (no bedding)	0.5	0.15-0.3	0.3-0.45	35
Dairy (with bedding)	0.45	0.2	0.6	25
Poultry broiler house litter	3.6	3.9	2.3	45
Poultry stock piled litter	1.8	4	1.7	45
Poultry layer-under cage	1.3	1.6	1	50
Swine (fresh)	0.6	0.5	0.3-0.5	50
Swine (with bedding)	0.6	0.3	0.5	25
Horse (fresh)	0.6	0.3	0.6	20
Rabbit (fresh)	1.2	1.2	0.7	20
Sheep (fresh)	1.1	0.5	1.0	25
Sheep with bedding	0.9	0.4	1.0	20
Goat fresh	1.1	0.6	0.9	25

NUTRIENT APPLICATION CONSIDERATIONS

To prevent groundwater contamination by nitrate, compost, animal manures and inorganic fertilizer should be applied at a rate that is equal to or less than the agronomic N-P-K rate for the site.

SETTING UP THE NUTRIENT MANAGEMENT PLAN

Take representative soil sample for nutrients analysis

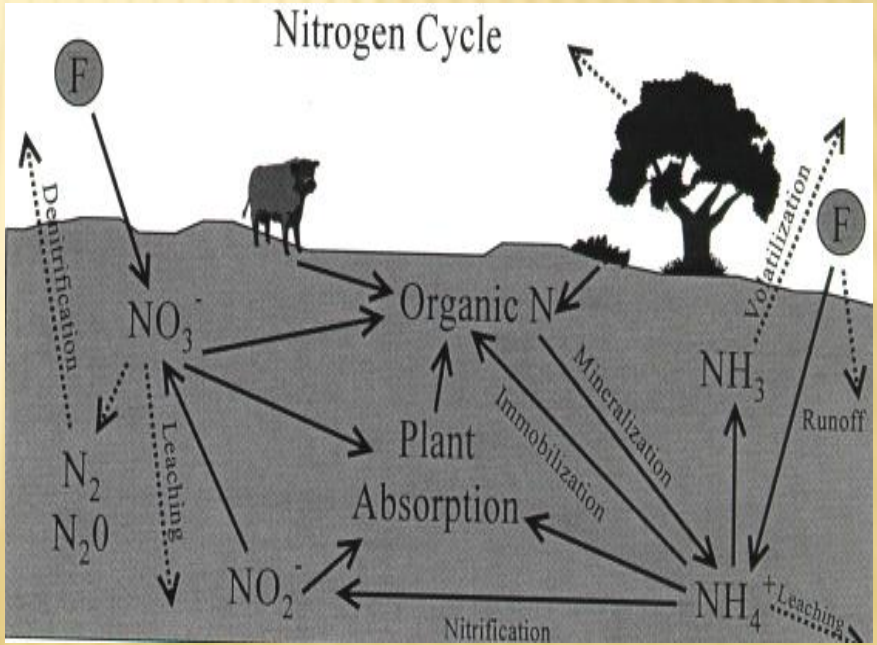
Compare with local crop N-P-K recommendation or agronomic rates

Determine the inorganic fertilizers and compost or animal manure rate based on moisture, nutrient content and mineralization rate

N-Mineralization

Forms of N compost: Organic N > 90% and mineral N (NH_4-N, NO_3-N) < 10%

- Critical in determining N application rate.
- Depends on material type, soil, and environmental conditions.
- Decomposition occurs in phases (first-order kinetics). Rapid and slow.



WHAT IS A CROP NUTRIENT BUDGET?

Balance of nutrient entering and leaving the field or area

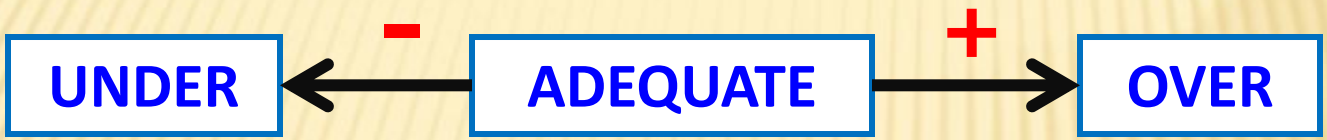
Sources of Nutrients

- N fertilizer
- N in irrigation water
- Residual soil N
- N from cover crops
- N from compost and animal manures
- Mineralization of soil OM

Losses of nutrients

- Crop removal
- Leaching
- Denitrification
- Volatilization

CROP NUTRIENT BUDGET



Reduce crop yield
Reduce crop quality
Deficiency

Inefficient and expensive
Nutrient run off
Ground water pollution
Pest/disease susceptibility
Excess foliage
Reduce vegetable quality

Florida nutrient budgeting for tomato production. Tomato nutrient requirements based on 200 lb/acre of N; 100 lb/acre of P_2O_5 and 100 of K_2O lb/acre with a medium soil test levels of P and K (lb P x 2.29 = lb P_2O_5 and lb K x 1.2 = lb K_2O)

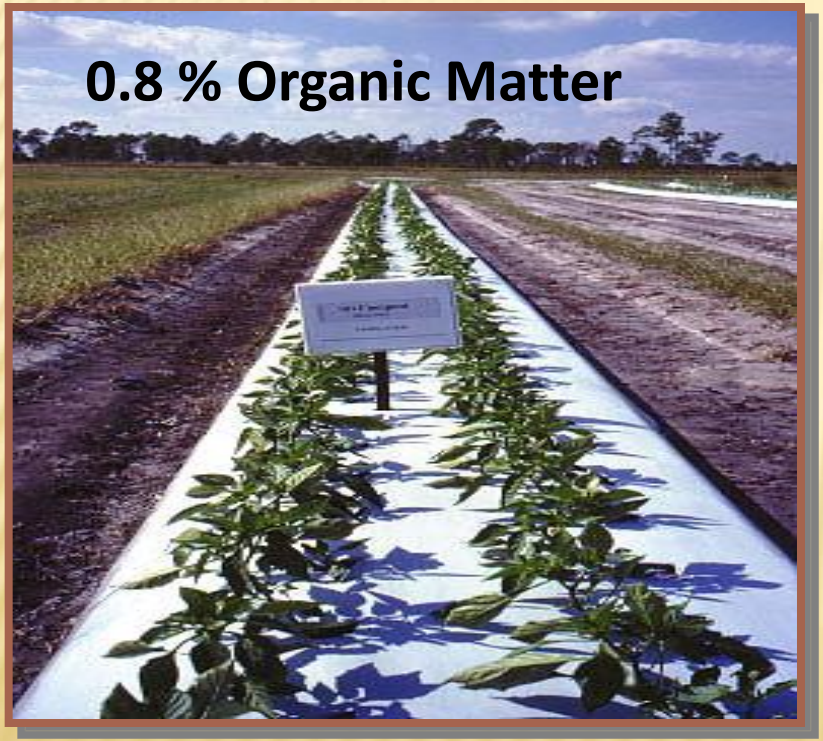
Material Inputs	Application rate (lb/acre dry weight)	N Rate (lb/acre)	N Mineralization Rate (%)	Total (lb/acre NO_3)	Total (lb/acre P_2O_5)	Total (lb/acre K_2O)
Sorghum-sudangrass with 1.5% N, 0.2 % P & 2% K with 70% P and 80% K availability)	**6,047**	**91**	**23**	**27**	**25**	**151**
Poultry manure compost at 5 tons/acre (40% moisture and 3% N, 3% P & 2% K with 70% P and 80% K availability)	**6,000**	**180**	**10**	**18**	**288**	**115**
Sub-total	**12,047**	**271**	**-**	**45**	**313**	**266**
Fertilizer (ammonium nitrate 34% N)	**-**	**-**	**-**	**155**	**0**	**0**
Total	**-**	**-**	**-**	**200**	**313**	**266**


No Organic Amendment

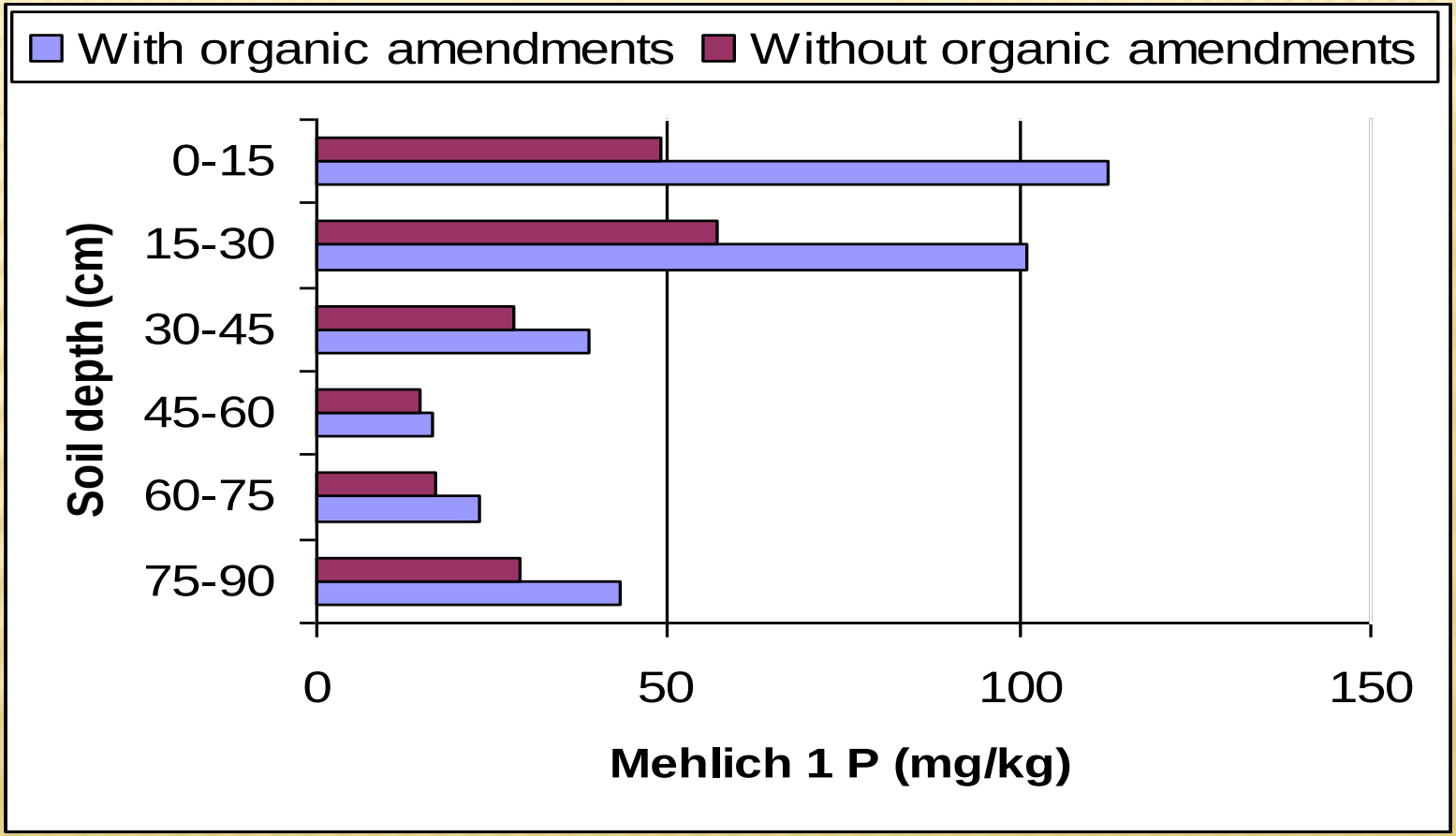

Organic Amendment

Treatments	OM (%)
YTC	2.9**
Non-YTC	0.8
Cover crops	
Perennial peanut	2.2
Control	2.1
Sunn hemp	2.1
Sorghum sudan	2.1
Cow peas	2.0
Significance	ns

Long Term Application of Organic Amendments
10 years



Phosphorous Accumulation in the Soil

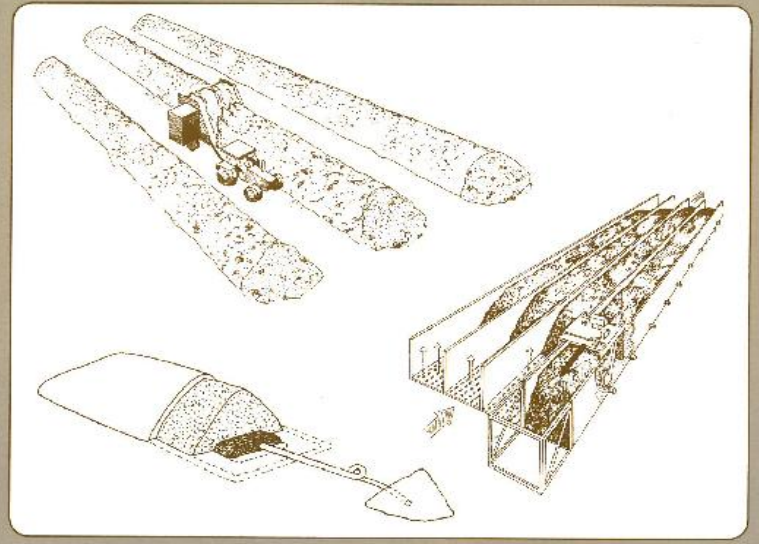


CONCLUSIONS

- Compost and animal manures can improved soil physical, chemical and biological properties.
- N contribution can be low to medium, but P and K may be high to very high, so caution!!!
- Crop nutrient budget can be useful tool to account for nutrient inputs and outputs.

NRAES–54

On-Farm Composting Handbook



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