



Board Meeting - June 28-29, 2018, Santa Barbara, CA

Composting and Possibilities of Unharvested Crop Material

Dan Noble

President

Noble Resources Group

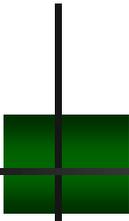
Bioproduct Market Development

Executive Director



**ASSOCIATION OF
COMPOST
PRODUCERS**

"We Build Healthy Soil"
www.healthysoil.org



Topic Outline

- Association of Compost Producers
- **Compost Production**
- **Benefits of compost**
 - Soil Health → Watershed Health
 - Water and Nutrient Management
- **Issues and Trends**
 - Short Lived Climate Pollution (SB 1383)
 - Plastic & Glass Contamination
 - Healthy Soil Initiative
- **Composting vegetative ag material**
 - Considerations - Agronomic & Environmental
 - Next Steps – Agronomic and Economic

Association of Compost Producers

A Public/Private Association - 501(C)6 – Calif. State Chapter of US Composting Council

- Public and Private Organics Residual Generators
 - Green Waste, Manure (*into and out of animals*)
 - Food Waste, Biosolids (*into and out of people*)
- Public and Private Compost Producers
- Public and Private Compost Marketer/Distributors

Our Vision:

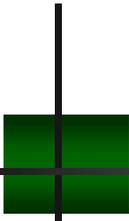
- Support beneficial reuse of organics in California, compost playing a central role to
- Build and maintain sustainable healthy soils,
- Keeping our state's lands productive, green and biologically diverse for generations to come.

Our Mission:

Increase the quality, value and amount of compost being used in California.



- Burrtec
- CalPoly SLO
- CR&R
- Engel and Gray
- Filtrexx
- Inland Empire Utilities Agency
- Kellogg Garden Products
- Liberty Compost
- Los Angeles County Sanitation Districts
- P.F. Ryan and Associates
- Republic Services
- Serrano Creek Soil Amendments
- Scott Brothers Dairy
- Soiland
- Synagro
- University of California, Cooperative Extension
- Vision Recycling



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The Organics Value Cycle

Haul, Pre-process:

Generate:

- Landscape trimmings
- Food/Ag waste
- Biosolids
- Manure

Communicate & Report

Use:

- Landscape
- Agriculture
- Environmental
- Bioenergy

Communicate (Sell!) & Report

Communicate & Report

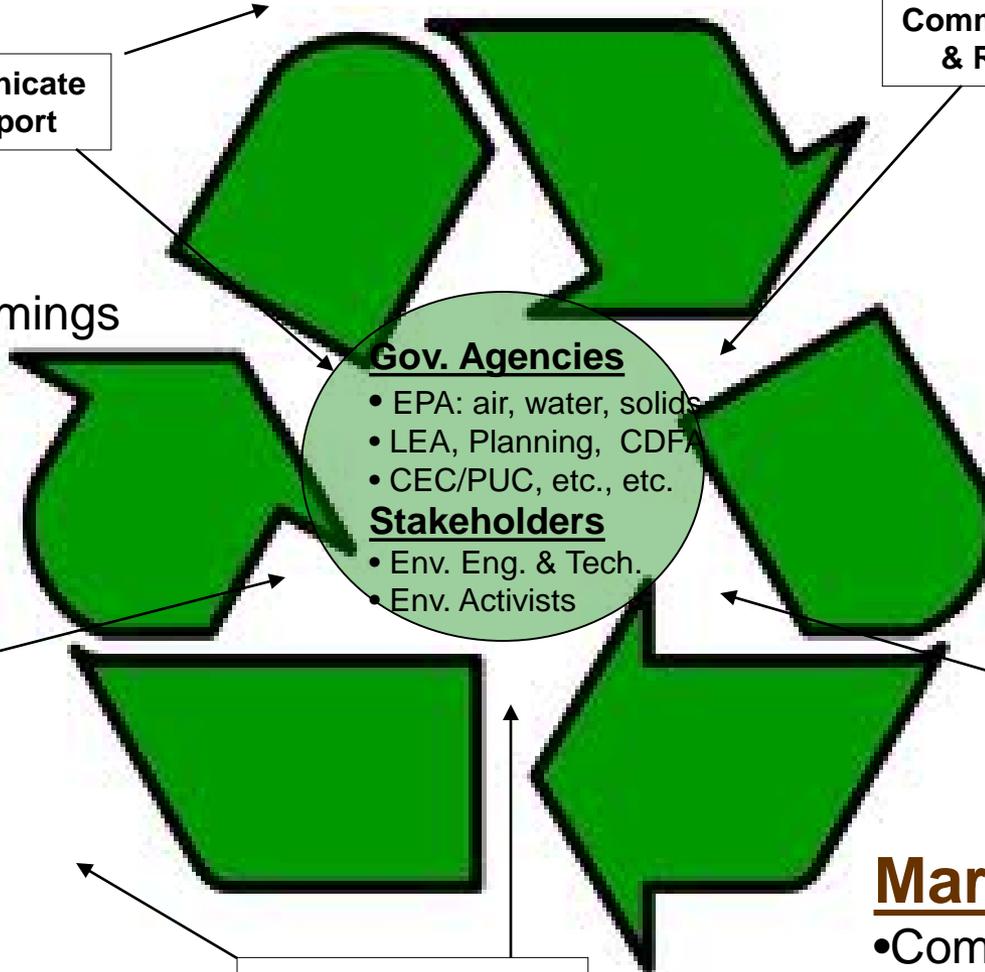
Process:

- Compost
- Chip and Grind
- Anaerobic Digestion
- Biofertilizer
- Energy (biofuel, electricity)

Communicate & Report

Market:

- Compost
- Fertilizer
- Energy



Gov. Agencies

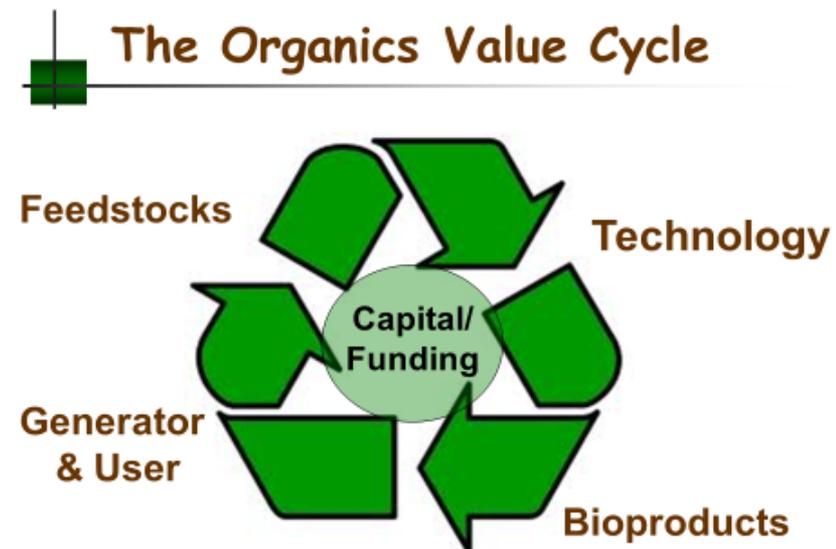
- EPA: air, water, solids
- LEA, Planning, CDF
- CEC/PUC, etc., etc.

Stakeholders

- Env. Eng. & Tech.
- Env. Activists

The Organics Value Cycle

- **Organics Residuals** = carbon (C) & nitrogen (N) compounds
- **Organics Recycling** = renewable carbon (& nitrogen) management



Feedstocks to Bioproducts

Feedstock(s) (organic residuals)



→ **Process train**



→ **Bioproduct(s)**



Thermophilic, On-farm Composting



Industrial Composting



Options - Compost Technology Advancements

Current Windrow Technology



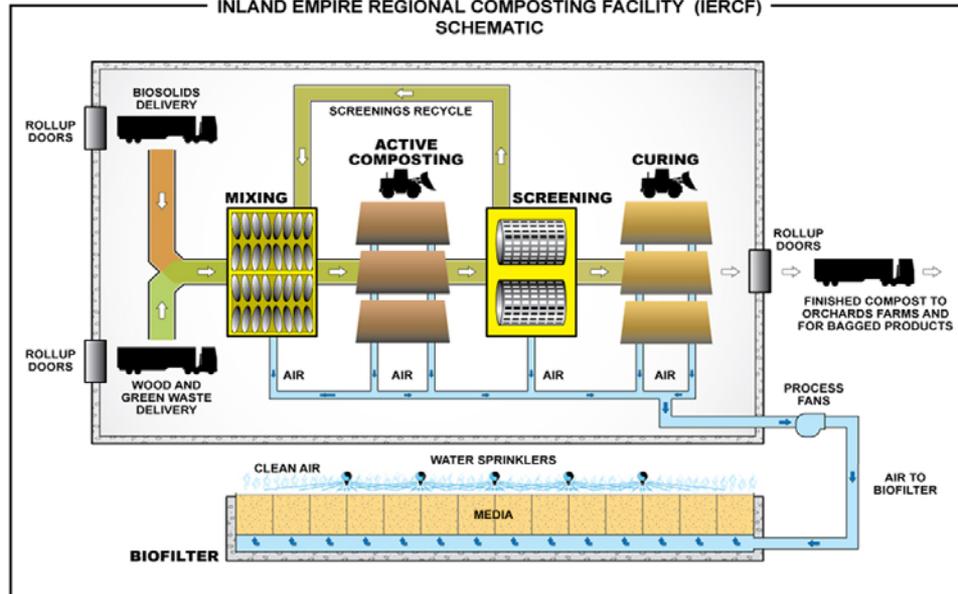
Solar Powered, Control Irrigated Aerated Static Pile



Largest Indoor Compost Facility in North America, IERCA.org



INLAND EMPIRE REGIONAL COMPOSTING FACILITY (IERCF) SCHEMATIC





**US COMPOSTING
COUNCIL**

*Seal of Testing
Assurance*

If it isn't STA Compost..... What is it?



US COMPOSTING COUNCIL

Seal of Testing Assurance

Barnes – Regional Composting
3511 West Cleveland Ave.
Huron, OH 44839
Telephone: 800-421-8722
Fax: 419-433-3555

Sample Date: 8/14/02

COMPOST TECHNICAL DATA SHEET

Compost Parameters	Reported as (units of measure)	Test Results	Test Results
<i>Plant Nutrients:</i>	%, weight basis	%, wet weight basis	%, dry weight basis
Nitrogen	Total N (TN or TKN+NO ₃ -N)	.72	1.12
Phosphorus	P ₂ O ₅	.13	.21
Potassium	K ₂ O	.32	.50
Calcium	Ca	2.34	3.64
Magnesium	Mg	.57	.89
Moisture Content	%, wet weight basis	42	
Organic Matter Content	%, dry weight basis	31.31	
pH	unitless	7.4	
Soluble Salts <i>(electrical conductivity)</i>	dS/m (mmhos/cm)	3.49	
Particle Size	screen size passing through	½"	
Stability Indicator <i>(respirometry)</i> CO ₂ Evolution	mg CO ₂ -C/g TS/day, AND	.14	
	mg CO ₂ -C/g OM/day	.5	
Maturity Indicator <i>(bioassay)</i> Percent Emergence, AND Relative Seedling Vigor	average % of control, AND	92	
	average % of control	86	
Select Pathogens	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.32(a)	Pass	
Trace Metals	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3.	Pass	

Participants in the US Composting Council's Seal of Testing Assurance Program have shown the commitment to test their compost products on a prescribed basis and provide this data, along with compost end use instructions, as a means to better serve the needs of their compost customers.

Directions for Product Use:

New Lawns: Apply a 1-2" layer to soil and incorporate to a depth of 5-7", apply seed, then rake and water.

Flower Beds: Apply a 1-2" layer to soil and incorporate to a 6-8" depth. Condition soil this way every year to 2 years. Plant flowers and water.

Trees & Shrubs: Dig a hole 2/3 the depth of the root ball and at least twice as wide. Mix 1 part compost with 2 parts soil obtained from the planting hole. Place the tree or shrub in the planting hole and apply amended soil around the root ball. Firm soil occasionally and water.

Topsoil Manufacturing/Upgrading: Mix 1 part compost with 2 parts existing or purchased soil and blend uniformly.

Growing Mixes: Planter box or raised bed mixes can be produced by mixing 1 part compost to 1 part pine bark and 1 part soil, sand or expanded shale. Potting mixes should contain 1 part compost, 1 part peat moss or pine bark, and 1 part perlite, vermiculite, styrofoam, or other aggregate.

Mulching: Spread a 2-3" layer around trees, shrubs, and flowers. Always avoid placing mulches against plant trucks and stems.

Garden Beds (food crops): Apply a 1-2" layer to soil and till to a 6-8" depth. Reapply each year, or as per soil test recommendations.

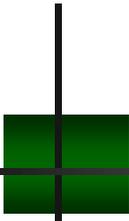
NOTE: The USCC does not assess whether or not, or to what extent, these directions are sound, sufficient or otherwise appropriate. It is the participant's responsibility alone to ensure that they are.

Compost Ingredients:

Yard trimming, food by-products

This compost product has been sampled and tested as required by the Seal of Testing Assurance Program of the United States Composting Council (USCC), using certain methods from the "Test Methods for the Examination of Compost and Composting" manual. Test results are available upon request by calling Barnes Nursery at 800-421-8722. The USCC makes no warranties regarding this product or its contents, quality, or suitability for any particular use.

For additional information pertaining to compost use, the specific compost parameters tested for within the Seal of Testing Assurance Program, or the program in general, log on to the US Composting Council's TMECC web-site at <http://www.tmecc.org>.



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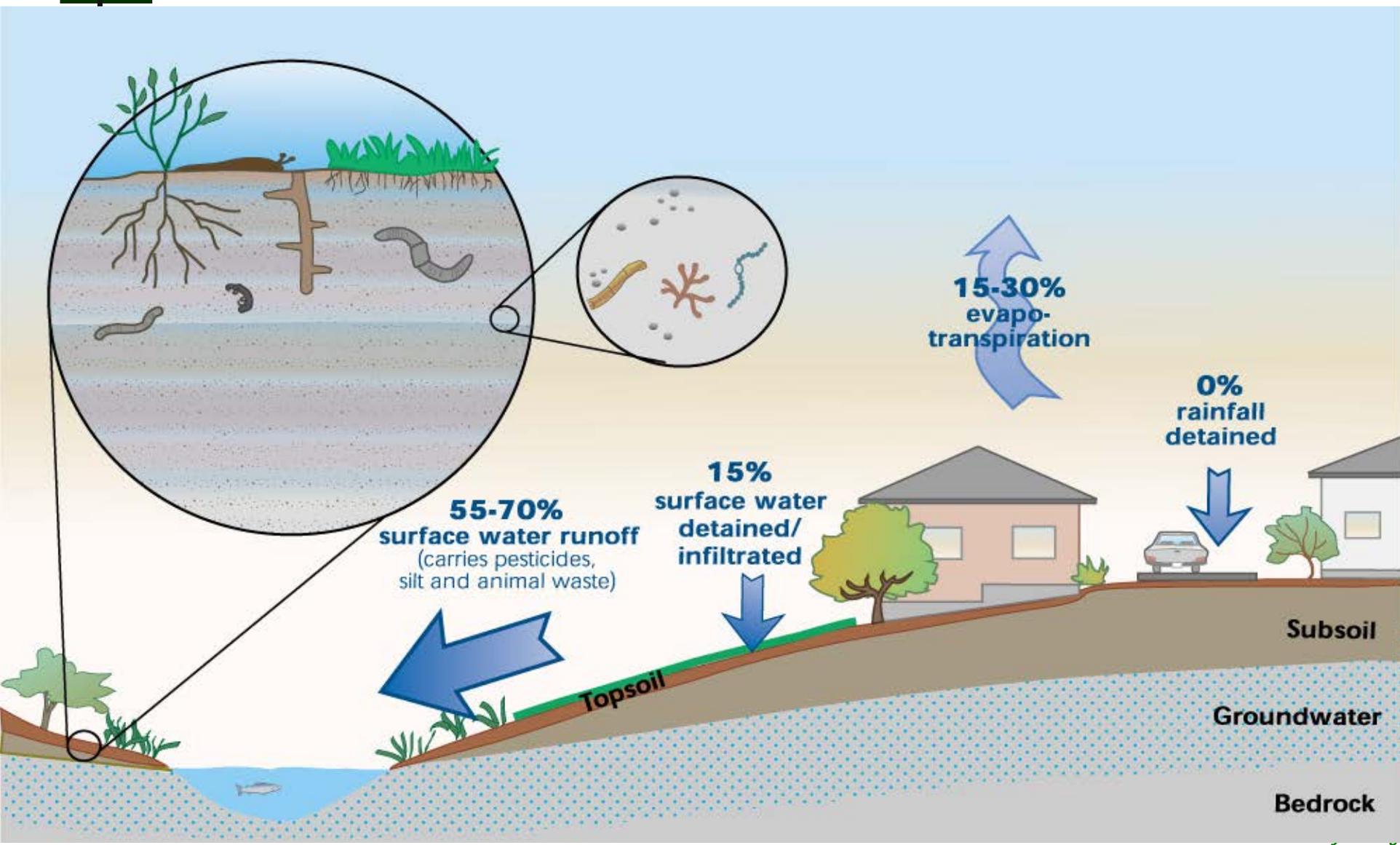
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Compost = Organic Carbon & Nitrogen, & Soil Organisms

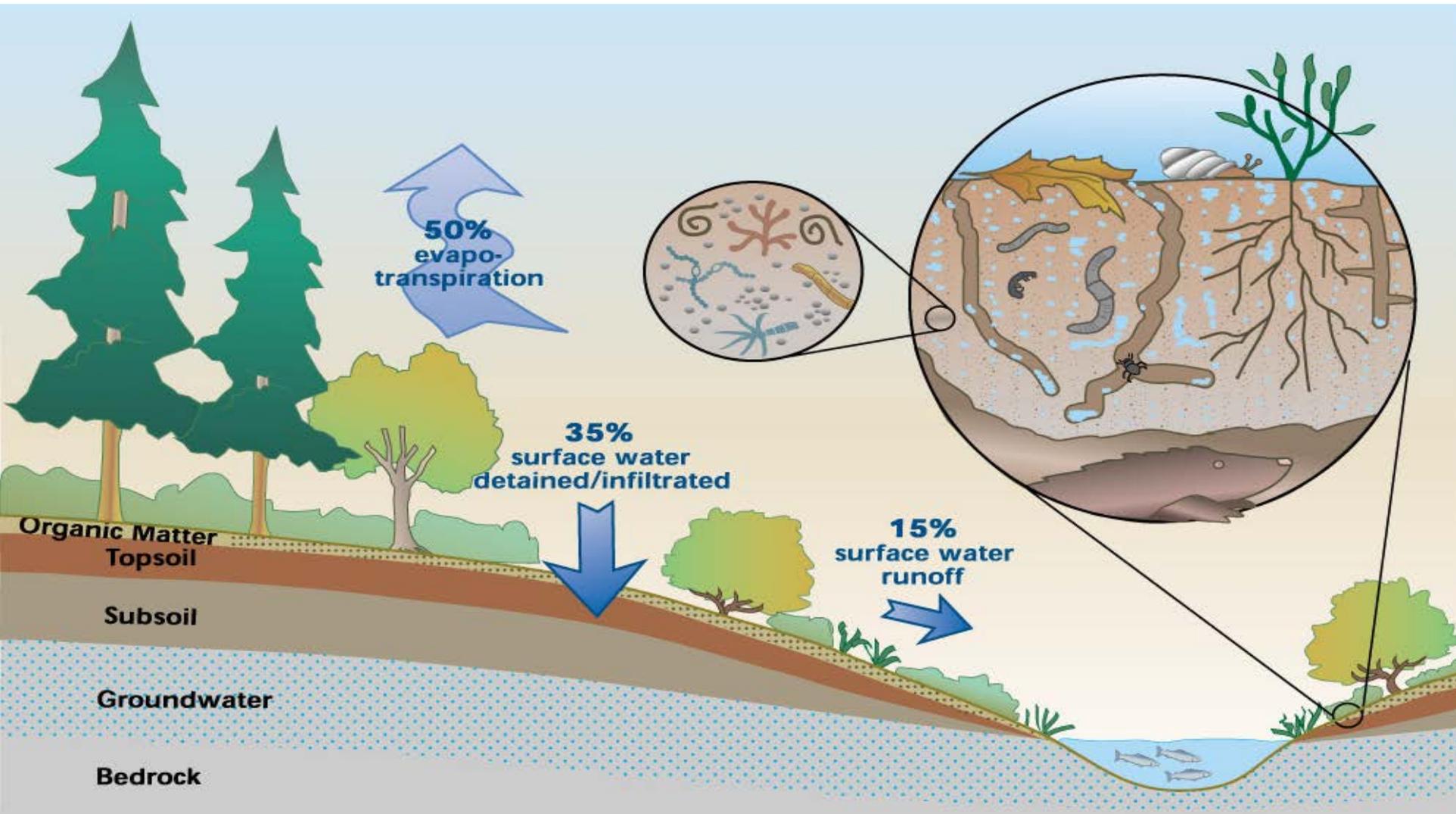


- *Pathogens killed, quick carbon (sugars and starches) metabolized and turned into "humus"*
- *Compost Contains ~50% Organic Matter by Weight*
- *Organic Matter is made of Carbon Compounds so it:*
 - Provides food (energy) to the soil organisms
 - Provides tilth for water infiltration, holding and oxygen penetration
 - Sequesters carbon
- *Must keep adding to the soil as it is eaten (degraded) by the soil organisms*
- *Also it provides Organic Nutrients ("NPK", i.e. nitrogen, phosphorous and potassium)*

Urban Environment Storm Water 101



Native Soil Environment Storm Water 201



Low Impact Development (LID) approach –
new hydrologic pattern mimics predevelopment patterns

Promise of Healthy Soil

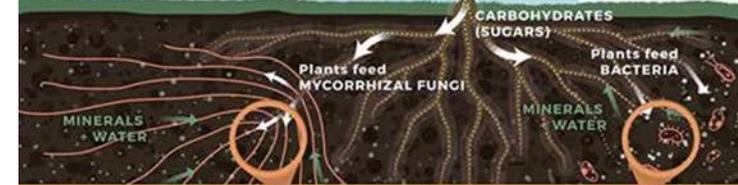
- *Infiltrates & retains water*
- *Holds nutrients in microorganisms and root bits*
- *Stores Carbon*
- *Can jump start with compost*

90% of our states managed water, used on soil first!

BUILDING HEALTHY SOIL SOLVES EVERYTHING!

PLANTS GROW BY MAKING CARBOHYDRATES (sugars) FROM CARBON DIOXIDE (CO₂) AND WATER (H₂O).

THEY SHARE THESE SUGARS WITH SOIL MICROBES WHO, IN EXCHANGE, FEED THE PLANT. THIS PROCESS BUILDS SOIL.



MYCORRHIZAL FUNGI attach to the roots to be fed and in return give nutrients + water to the plant, increasing root capacity x1000s.

The fungi help produce soil aggregates with a sticky protein called glomalin that can last for decades as soil carbon.

MYCORRHIZAL AGGREGATES

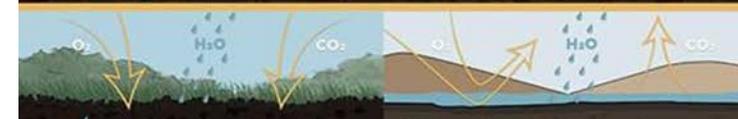
Roots exude sugars to feed BACTERIAL COLONIES whose enzymes break down soil particles into plant available nutrients.

Bacteria's life, death, and defecation create smaller soil aggregates or "humus" that can last for decades as soil carbon.

BACTERIA AGGREGATES

*humus and soil aggregates are also produced by earthworms, nematodes, protozoa and various arthropods.

HEALTHY SOIL IS FULL OF CARBON BASED SOIL AGGREGATES AND SOIL LIFE.



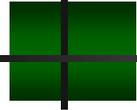
HEALTHY SOIL:

Increased Soil Carbon
(Reverses climate change)
Increased Water Holding Capacity and Infiltration
(Improves drought tolerance and restores water supplies)
Increased Soil Aggregation and Soil Life
(More fertility and ability to feed the world)
Increased Nutrient Availability and Retention

UNHEALTHY (DEAD) SOIL:

Decreased Soil Carbon
(Contributes to climate change)
Decreased Water Holding and Infiltration
(Increases water runoff and drought)
Decreased Aggregation and Soil Life
(Less fertility and more soil erosion causes desertification)
Decreased Nutrient Availability and Retention

COMPOST Turns Dead Dirt... to Living Soil



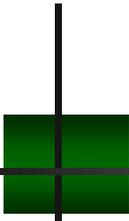
Main Applications

- Landscape
- Erosion Control and Restoration
- Agriculture

Specifications are Key

- User Driven Specifications
- Landscape Specifications (Manual)
- Agronomic Rates





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Plastic & Glass Contamination

Biggest issue with municipal food scrap compost

- *Disposal Education*

- Enforcement
- Market-based?!

- *Packaging Industry*

- *Onsite Monitoring*

- *Human/Mechanical Separation*

- *Regulatory Limits (0.5% by weight)*



Market Drivers - Env. Regulations

“Regs driving more municipal compost production”

- ***AB 876 – (2015) Organics Management Infrastructure Planning***
 - www.calrecycle.ca.gov/LGCentral/AnnualReport/OrganicInfra.htm
- ***AB 901 – (2015) Recycling and Disposal Facility Reporting***
 - www.calrecycle.ca.gov/Laws/Rulemaking/Reporting/default.htm
- ***SB 1383 – (2016) Short-Lived Climate Pollutants (SLCP): Organic Waste Methane Emissions Reductions***
 - www.calrecycle.ca.gov/Climate/SLCP/

Market Drivers - Policy

Governor's "Healthy Soil Initiative"

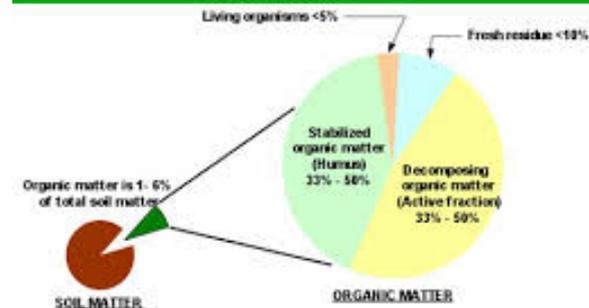
www.cdfa.ca.gov/EnvironmentalStewardship/HealthySoils.html

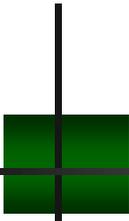
Several actions have been identified to:

- Protect and restore soil organic matter
- Identify sustainable and integrated financing
- Provide for research, education and technical support to facilitate healthy soils
- Increase governmental efficiencies to enhance soil health on public and private lands
- Ensure interagency coordination and collaboration



Components of Soil Organic Matter





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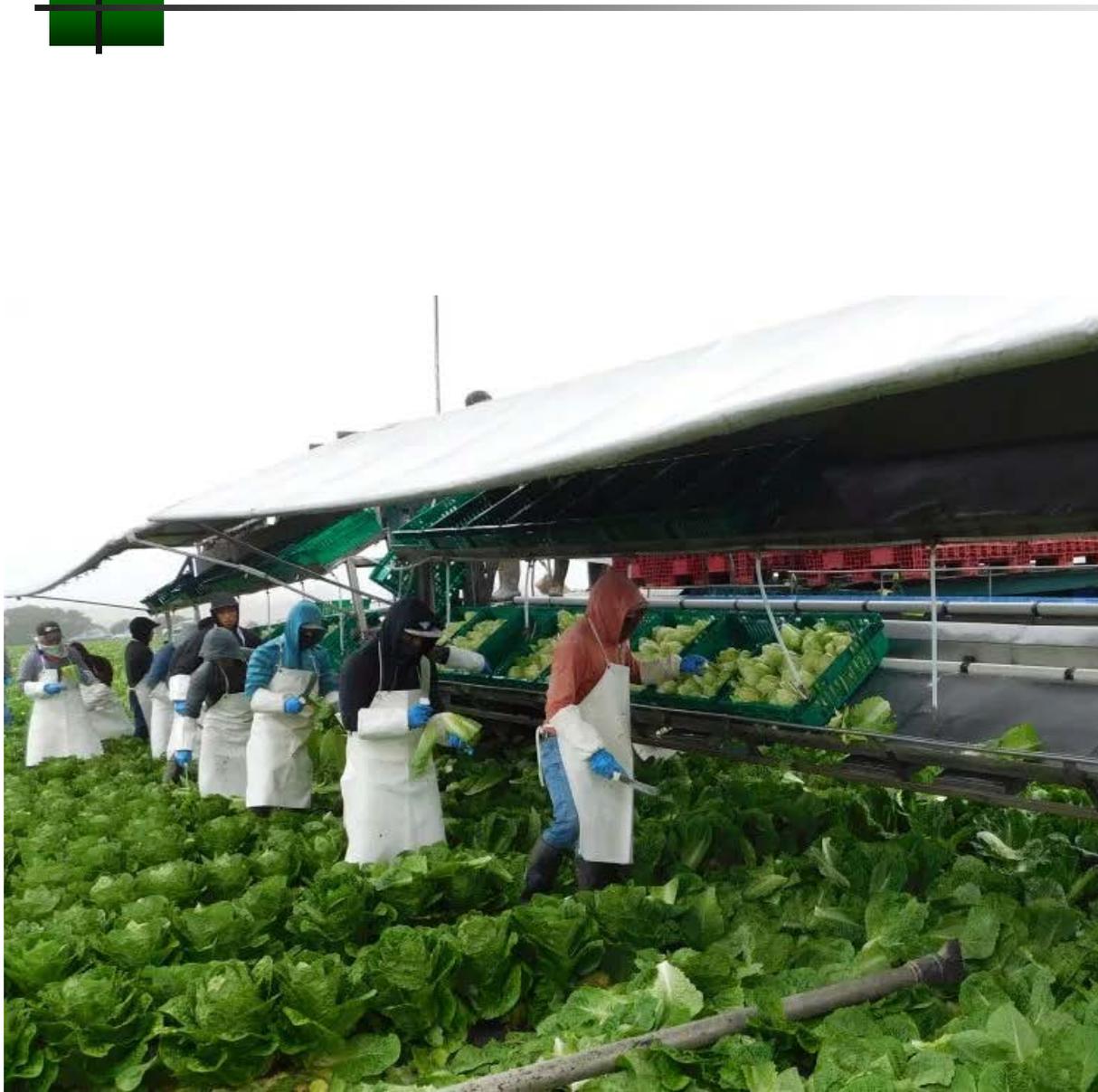
Broccoli Harvest



Post Harvest, ready to disk in



Romaine Lettuce Harvest



Pros & Cons of Composting Ag waste

Pros – Why do it?

- Clean the field
- Nutrient management
 - Capture
 - Control
- Decrease fertilizer use
- Sustainable land use practices

Cons – Why not?

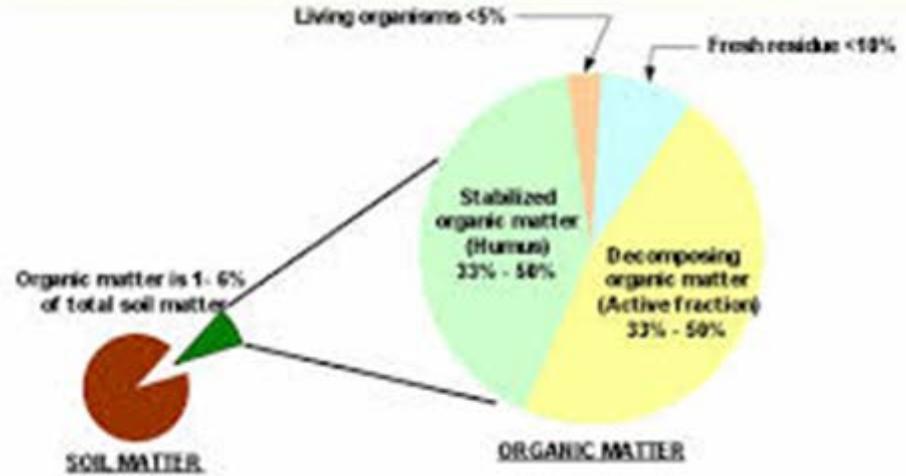
- Two more field passes
 - Collection
 - Compost application
- Composting is expensive (\$30-60/ton)
- Best management practices not widely known
 - Need field trials
 - Need analytical framework

Ag Compost Is Feasible ... but

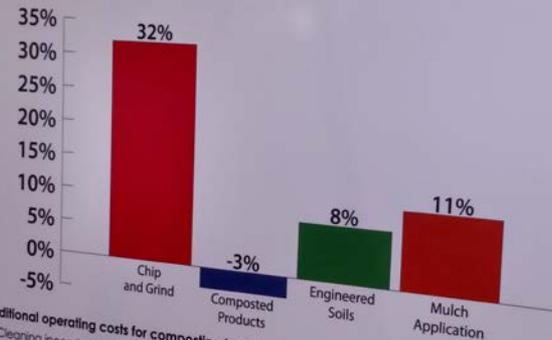
Needs the following:

- **Nutrient fate**
 - Which Nutrients?
 - Quick release (chemical)
 - Slow release (composted/biological)
 - What about biochar?
- **Economic Analysis**
 - Composting & Chemical Fertilizers
 - Biofertilizers & biochar
- **Best Management Practices**
 - Post harvest collection
 - On farm composting
 - Timing & Compost Analysis
 - Spreading & Nutrient analysis
- **Outreach**

Components of Soil Organic Matter



Net operating income as % of total income



Additional operating costs for composting include:

- Cleaning incoming feedstock
- Utility and water costs to operate picking station and aeration
- Labor time for turning and managing composting process
- Testing and regulatory requirements

Source: Agri Service, Inc 2017 Sales Data



Summary

■ *Compost Provides Benefits*

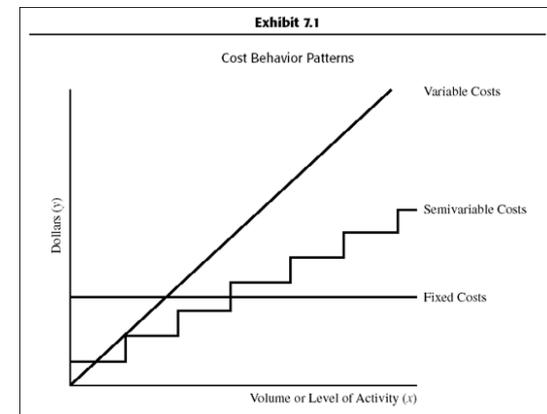
- Healthy Living Soil
- Nutrient control
- Water Quantity and Quality Management

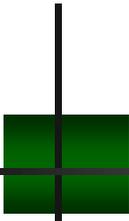
■ *Issues:*

- Analytics
- Contamination
- Cost

■ *Composting Ag Material*

- Feasible
- More organic nutrient control
- Regenerative





Questions? Comments? Discussion...

Dan Noble
(619) 992-8389

danwyldernoble@gmail.com



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