HARVEST QUEST

THE FINAL PUSH TO 75%

Using low-cost Organics Recycling Solutions

Environmental Solutions, Economic Sense

THE DEADLINE RAPIDLY APPROACHES

- Deadline for Florida's 75% recycling goal is rapidly approaching
- To meet that goal, we need to push the needle from current 56% to 75% in less than 3 years!
- Cities and counties will need to take significant strides to divert additional material from landfills
- With a focus on largely untapped organic materials

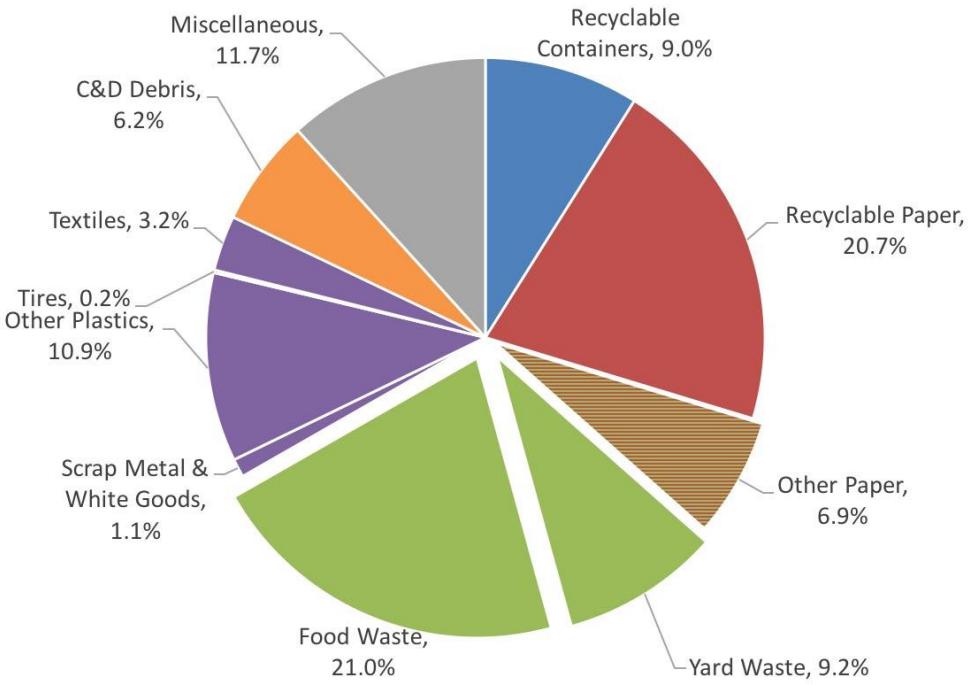
Food Waste

Yard Waste

Unrecyclable Paper

WASTE NOT, WANT NOT

- Organics account for up to 40% of MSW disposed in Florida
- Food waste alone is over 20% of the MSW in some areas



- Food waste is one of the most underutilized resources in our waste stream
- In 2016, only 8% of the total food waste was recycled

AN ECONOMIC CHALLENGE?

- Florida has historically struggled to establish organics diversion programs because of low disposal fees
- While a range of covered or enclosed systems and technologies are available, many require high costs to develop and operate, making them economically unviable for most Florida communities
- But recovering organics is not rocket science – a low tech organics recycling solution, such as open-air windrow composting, is a sustainable option for Florida

SO WHAT DO WE NEED?

- The only significant infrastructure required for windrow composting is a well-designed composting pad, provides:
  - ✓ Good working surface
  - ✓ All-weather functionality
  - ✓ Water quality protection
- Equipment requirements can be as simple as a front-end loader, a screener and possibly a windrow turner

2% Gradient

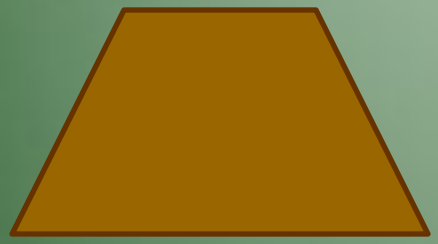
DON'T FALL FOUL OF ODORS

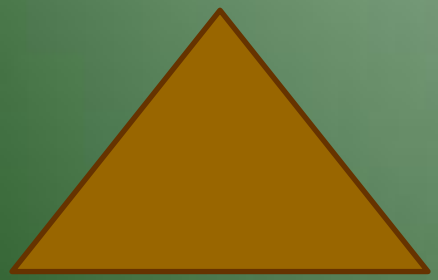
- An improperly located or managed compost operation can be shut down due to malodor
- Managing odor is one of the most important objectives for any composting operation and there are simple solutions and operating procedures that allow a facility to function and thrive
- Hundreds of open-air windrow composting facilities have operated successfully for decades in the U.S. and some excellent examples exist in Florida

INCOMING FEEDSTOCK'S

- A three-sided receiving bunker can be constructed from ground yard waste
- The bunker has a base layer to provide absorption of any free liquids
  - ✓ prevents souring of the ground
- DRIVE TIME SANDWICH – eliminate round rolling objects
- Mix and windrow promptly

ALL SHAPES & SIZES





The shape and size of a windrow will determine how it performs

- Is it too big? (anaerobic)
- Is it too small? (external influences)
- Do the feedstocks determine the size? (yes)
- How will the weather effect it? (shape)
- What is ideal?

USING A CAPPING LAYER

- The highest concentrations of odors and VOC's generally released in the first 48 hours of composting
- Cover windrows with a layer of previously composted material
- Capping layer provides:
  - ✓ Instant biofilter
  - ✓ Insulates the pile
  - ✓ Forms a barrier providing effective vector attraction reduction

UNDERSTANDING ODORS

- Odor is generally the most frequent and serious complaint from neighbors of compost facilities
- Yet implementing the process steps we are discussing and understanding how odors are generated, can mitigate any issues
- The first task for the operator is to determine what problematic odors are present and where they are being generated

Types of Odor

<u>Ammonia</u>

- Generated in a pile with to much nitrogen-rich material
- Too much nitrogen for the amount of available carbon (low C:N)
- Ammonia odor can also indicate a pH level that is too high

UNDERSTANDING ODORS (continued)

Reduced Sulfur Compounds *(hydrogen sulfide, dimethyl sulfide)*

- Indicates that anaerobic conditions are present in windrows
- Anaerobic conditions form if there are not enough air spaces through which air can flow

Volatile Fatty Acids (VFA's)

- VFA's are very offensive to the nose
- VFA odors are generated by microbial decomposition under anaerobic conditions
- Because VFA's are generated under anaerobic conditions, it is necessary to determine why those conditions exist and eliminate them

REMEDY THE SITUATION

The most common factors which result in anaerobic odors are:

1. Excess Moisture
   - oxygen diffuses so much slower in water than in air
   - excess moisture reduces oxygen penetration
2. Inadequate Porosity
   - the particle size distribution, bulk density, and porosity of a compost mixture can lead to anaerobic conditions
3. Rapidly Degrading Feedstock's
   - the oxygen content in a composting pile reflects a balance between oxygen supply and oxygen consumption
   - Rapidly degrading feedstock's like food waste or grass clippings, consume oxygen much more rapidly than dry leaves or wood

CAUSES & REMEDIES FOR ODOR PROBLEMS

Type of Odor	Possible Cause	Clues	Remedy
Ammonia Odor	High Nitrogen Level	C:N ratio less than 20:1	Add high carbon ingredients
	High pH	pH greater than 8	Lower pH with acidic ingredients, avoid adding more alkaline material
Reduced Sulfur Compounds or VFA's	Material too wet	Low temperatures	Add dry materials. Turn to remove excess moisture
	Poor structure		Add coarse materials and turn
	Pile compacted		Turn / remix pile. Add dry or coarse materials only if necessary
	Insufficient aeration		Add coarse materials and turn
	Airflow uneven or short circuiting	Falling / erratic temperatures	Turn the windrow. Add coarse materials

HARVEST QUEST

COMPOSTING FROM THE OUTSIDE IN

Diverse microbial inoculants developed specifically to increase **Production Capabilities, Composting Performance & Profitability**!

Make a superior compost in less time with fewer turns!

WHAT ARE THE INOCULANTS ?

- An extremely diverse blend of enzyme-producing **bacteria**
- A broad array of **fungi**
- Microbes are propagated and introduced into a precisely blended carrier material made from natural organic feedstocks
- Totally unique and unlike traditional bottled bugs

A living, breathing and highly robust product

PROLIFERATION OF THE MICROBES

- The microbes multiply and move rapidly
  - ✓ Outwards (horizontally) initially
  - ✓ Then inwards (towards the center of the pile)
- This activity generates high temperatures well in excess of pathogen destruction 131^{o}F (55^{o}C)
- Increased bacterial activity makes for hotter composting temperatures
- By not continually turning the rows, high bacteria densities are maintained, thus increasing efficiency

High Temperature Rapid Decomposition

ACCELERATED AEROBIC DECOMPOSITION

- Movement of the microbes from the outside in draws oxygen towards the core of the pile
- Windrows have the ability to largely remain aerobic without the need for frequent turning

HARVEST QUEST

Reverses the Dynamics of a Compost Pile

MODIFIED STATIC AEROBIC PILE (MSAP) METHODOLOGY

- Mix feedstocks (provide suitable C:N Ratio & adequate moisture)
- Construct windrow
- Apply inoculant (applied to surface of pile in 2 or 3 locations)
- Cap the windrow (unscreened compost, Over's, or ground yard waste)
- Pile remains undisturbed for approximately 4 weeks
- First turn (Day 30)
- Second turn (Day 45)
- Screen (Day 60)




Accelerates the Natural Biological Process of Composting

SUMMARY OF BENEFITS

- ✓ Largely eliminates mechanical turning
- ✓ Maintains aerobic conditions
- ✓ Provides excellent pathogen destruction
- ✓ Higher temperatures for longer time periods
- ✓ Mitigates odors
- ✓ Less nitrogen losses through ammonia volatilization
- ✓ Less overall composting timeframe & required footprint
- ✓ Can be utilized in any climate
- ✓ Requires minimal investment in infrastructure
- ✓ Results in a superior compost product

Environmental Rewards, Economic Sense

BAY MULCH – Plant City, FL

SOUTHEAST SOILS – Lake Panasoffkee, FL

HILLSBOROUGH COUNTY – Lithia, FL

EMERALD COAST UTILITY AUTHORITY - Pensacola, FL

HARVEST QUEST

THANK YOU !

Darren Midlane
V.P. & Chief Technical Officer
Harvest Quest International, Inc.

Tel: 321-246-7976
Email: darren@harvestquest.com

Environmental Solutions, Economic Sense