California Bioresources Alliance 11th Annual Symposium “Renewable Carbon Management in California”

**Compost - Healthy Soil Market Development**
November 2, 2016 3:00pm – 4:30pm

**Bioproducts Industry Development Strategy**
A Framework for Market Analysis

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Bioproduct Development

Executive Director

"We Build Healthy Soil”  
www.healthysoil.org
Topic Outline

- Association of Compost Producers
- Bioproducts
- Organics Residuals → Bioproduct Markets
- Integrated Market Analysis, Plan & Infrastructure Development
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.
Bioproducts: Development of a Circular Economy

Linear Economy*
“Value Chains”

Natural Resources & Resource Industries
• Air
• Water
• Land & Minerals
• Energy
• Biological

Industrial Processes, Distribution & Product Use

Waste & Pollution

Journey to Sustainability: Development of a Circular Economy

aka Zero Waste, Regenerative Economy*

“Value Cycles”

Natural Resources & Resource Industries
- Air
- Water
- Land & Minerals
- Energy
- Biological

Industrial Processes, Distribution & Product Use

Waste & Pollution

Environmental Industry
- Sanitation/Collection
- Env. Protection
- Recycling
- Remanufacturing

From Eugene Odum, Ecology, 1963
Emerging Circular Economy:

The circular economy—an industrial system that is restorative by design

Biological nutrients

Farming/collection

Biochemical feedstock

Restoration

Biosphere

Biogas

Anaerobic digestion/composting

Cascades

Energy recovery

Biological Nutrients “Biotic”

Technical Nutrients “Abiotic”

Extracted from biochemical feedstock

1 Hunting and fishing

2 Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation circular economy team
The Organics Value Cycle

Generate:
• Landscape trimmings
• Food/Ag waste
• Biosolids
• Manure

Haul, Pre-process:

Process:
• Compost
• Chip and Grind
• Anaerobic Digestion
• Biofertilizer
• Energy (biofuel, electricity)

Use:
• Landscape
• Agriculture
• Environmental
• Bioenergy

Market:
• Compost
• Fertilizer
• Energy

Gov. Agencies
• EPA: air, water, solids
• LEA, Planning, CDF
• CEC/PUC, etc., etc.

Stakeholders
• Env. Eng. & Tech.
• Env. Activists

Communicate (Sell!) & Report

Communicate & Report
Biological Nutrients

Carbon’s “6 F’s”

- Food
- Fuel
- Fiber
- Foliage
- Feed
- Fertilizer
Organic Residuals are...

From Agricultural Product to Organics Residual

Food → Disposer & Sewage → Biosolids

Fiber → Solid Waste → Food scraps

Foliage → Landscape Maintenance → Green material

Feed → Livestock Waste → Manure

Fuel → No Residual (except pollution!)

Fertilizer → No Residual (except pollution!)
Feedstocks to Bioproducts

Feedstock(s) (organic residuals) →

Process train →

Bioproduct(s)
Feedstocks to Process Train

Organic Feedstocks

- Green material
- Woody Material
- Food scraps
- Biosolids
- Manure

Processing

- Chip & Grind
- Composting

Feed Production

- Anaerobic Digestion
- Thermo-chemical
- Microbial Fermentation

Figure 4 - Diagram of the biomass gasification and syngas purifying system.
Bioproduct Portfolio, or Categories

aka Categories of Value

- Mulch
- Compost
- Biofertilizer
- Biochar
- Animal Feed
- Electricity
- Biofuels
- Chemicals

Product Materials
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Feedstocks to Bioproducts

5 interrelated and integrated MARKETS

Feedstock(s) (organic residuals) → Process train → Bioproduct(s)

Capital ($$, NatCap, Social, Informational)

Logistics (Hauling, Transport, Pipes)

BTW, these Bioproducts markets are, in turn, integrated with the WATER & ENERGY utility and product markets... but that’s another story! ... an important one!
John Chamberlain –
“When two subjective senses of value meet in an objective price, a market is born.”

Marketing is giving people what they want.

Sales is giving people what you have.
CREATE LOCAL “MONOPOLIES”

Rationale:

- Reduce redundant Investments
- Own/control the material
- Ratepayers and material ownership is BANKABLE!

Examples:

- Wastewater Treatment Plants, by law, control our poop, and therefore the biosolids, water and energy products that are produced
- Hauler Franchise Agreements/Contracts: Waste collectors serve the ratepayers, and take ownership of the discards
- Agricultural and Forest Residuals: Own both the cultivated products and the residuals
Programs: Developing the Organics Value Cycle

**Food Scraps Example**
- Become a biorefinery developer!!

**Source Separation**
- Disposers to POTW’s
- Food scraps in the Green Bin
- Onsite Processors

**MRF Separation (Materials Recovery Facility)**
- Food Scraps to Anaerobic Digestion
- Food Scraps & Green Material to Composting

**Processing**
- Composting
- Anaerobic Digestion
- Bio Products

**Marketing, Use (& Generation, again)**
- We are all “user/generators” (not “consumers”)
- Marketing Product Use within the Organics Value Cycle
CREATE LOCAL “MARKETS”

Rationale:
- Generator is the primary “owner”
- Reduce transportation if managed onsite
- Ratepayers and material ownership is BANKABLE!

Examples: - onsite/neighborhood
- Wastewater: Greywater and composting toilets
- Solid Waste: Reduce, compost or biogas and/or self haul
- Agricultural and Forest Residuals: Reduce, compost or biogas and/or self haul
Process Technology Train

Technology Categories

- Chip & Grind
- Composting
- Animal Feed
- Anaerobic Digestion
- Thermochemical
- Microbial Fermentation

Competitive Dimensions

**SCALE:** small, medium or large; <12.5K ↔ 50K ↔ >200K/year

**CAPITAL COST:** per ton of annual throughput

**OPERATING COST:** per ton of annual throughput

**REGULATORY DYNAMICS:** develop and change of state, region and local regulations

**LOCAL ACCEPTANCE:** of both the bioproducts & env. impacts
## Local Bioproduct Markets

<table>
<thead>
<tr>
<th>Organic Product Category</th>
<th>Technology Options</th>
<th>Technology/ Facility Capital Cost Range</th>
<th>Current Market Value Range of Finished Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulch</td>
<td>Chop &amp; Drop, Chip/Grind &amp; Reuse, Chip &amp; Ship</td>
<td>$2-10/tpy</td>
<td>$0-$15/ton (FOB)</td>
</tr>
<tr>
<td>Compost</td>
<td>Backyard, Container, Windrow, eASP, Gore, ECS, enclosed, AgBag, Vermicompost, etc.</td>
<td>$25-$450/tpy</td>
<td>$10-$30/ton - bulk (whsl), $80-120/ton - bagged (retail)</td>
</tr>
<tr>
<td>Animal Feed</td>
<td>straight foodscraps, food dehydrator/cooker, aquaponics</td>
<td>$10-$750/tpy</td>
<td>$50-$150/ton</td>
</tr>
<tr>
<td>Biofertilizer</td>
<td>High nitrogen composting, biosolids pellets, manure pellets</td>
<td>$100-$800/tpy</td>
<td>$80-200/ton</td>
</tr>
<tr>
<td>Electricity</td>
<td>Anerobic Digestion --&gt; Methane --&gt; gas turbine</td>
<td>$200-$850/tpy</td>
<td>$150-$300/ton</td>
</tr>
<tr>
<td>Biofuel</td>
<td>Anerobic Digestion --&gt; Methane Pyrolytic Conversion --&gt; methanol, ethanol, biodiesel, etc.</td>
<td>$250-$900/tpy</td>
<td>$250-$750/ton</td>
</tr>
<tr>
<td>Chemicals</td>
<td>Distributed Biorefinery (emerging)</td>
<td>$300-$1,000/tpy</td>
<td>$500-$10,000/ton</td>
</tr>
<tr>
<td>Product Materials</td>
<td>ecorUSA.com</td>
<td>$500-$1,500/tpy</td>
<td>$500-$10,000/ton</td>
</tr>
</tbody>
</table>
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- Bioproducts
- Organics to Bioproduct "Markets"
- Integrated Market Assessments & Plan
Integrated Market Assessments & Models

Product quality
the best product, for
the lowest price

Trashy vs.

Premium

Selling the whole, integrated “value cycles”
e.g. LOOP

LOOPforYourSoil.org
We are creating a new narrative, a new story, for our food AND discards:

- **Addressing key new questions** -

  - Where did our food and other products come from?
  - How healthy is it, are they?
  - Was it made with love ... and compost?!
  - Where do our discards go?
  - Do we keep it clean, for the compost pile?
  - Do we make/buy & use compost?
Education and Marketing

**Education:**
- *Teaching or training people to “do it themselves” (DIY)*

**Pros:**
- Empowers people, & low cost solution
- Government & industry doesn’t have to deal with it
- Organics value cycle is already personal

**Cons:**
- Requires attention, higher burden
- Can be inconvenient and messy

**Marketing:**
- *Providing a specific solution “for a price” “We’ll take care of it” – Burrrtec*

**Pros:**
- Convenience - others do the dirty work
- Can leverage economies of scale

**Cons:**
- Disconnects users from resource cycle, still feels like consumer, not user
- Must now market use of material
The Organics Value Cycle

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Communicate (Sell!) & Report

Communicate & Report

Communicate & Report
Build a Sustainable Enterprise Model: Strategy/Policy into Products

Assess Markets → Plan → Invest → Launch → Operate

- **Feedstock Assessment**
  - Residual Generation Sources
  - Catalogue of Options

- **Technology Assessment**
  - Product Appropriate
  - Scope to Scale Specific
  - Value and Investment Desired

- **Bioproduct Market Assessment**
  - Product Specific
  - Brand Value Options
  - Channel Availability

- **Capital Assessment**
  - Capital Elements Available (4 types: monetary, natural, social, info)
  - Sources Available & Alignment

- **Enterprise Plan**
  - Manufacturing & Operations
  - Marketing & Sales
  - Finance & Accounting

- **Invest & Build**
  - Venture, Debt, Bond, User Fees
  - Operational Training
  - Merchandising & PR

- **Commission Facility(s)**
  - Trial Runs
  - Hiring
  - Press Releases, Sales

- **Launch & Operate**

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Bioproduct Industry Database
### Enterprise Planning \(\Rightarrow\) PLAN

#### Develop Models and Scenarios

**Enterprise Type**

<table>
<thead>
<tr>
<th>Enterprise Type</th>
<th>FEEDSTOCK (Type &amp; Rev.)</th>
<th>SCALE (tpy)</th>
<th>PROCESS TRAIN</th>
<th>MARKET MODEL</th>
<th>BIOPRODUCT PORTFOLIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public (wastewater)</td>
<td></td>
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<tr>
<td>Public (municipal solid waste)</td>
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<td>✔</td>
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<tr>
<td>Private (waste hauler/recycler)</td>
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<tr>
<td>Private (agriculture)</td>
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<tr>
<td>Public/Private (forest)</td>
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</table>

**Develop your unique enterprise business model... which becomes your BRAND!**
Questions?
Comments?
Discussion...

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