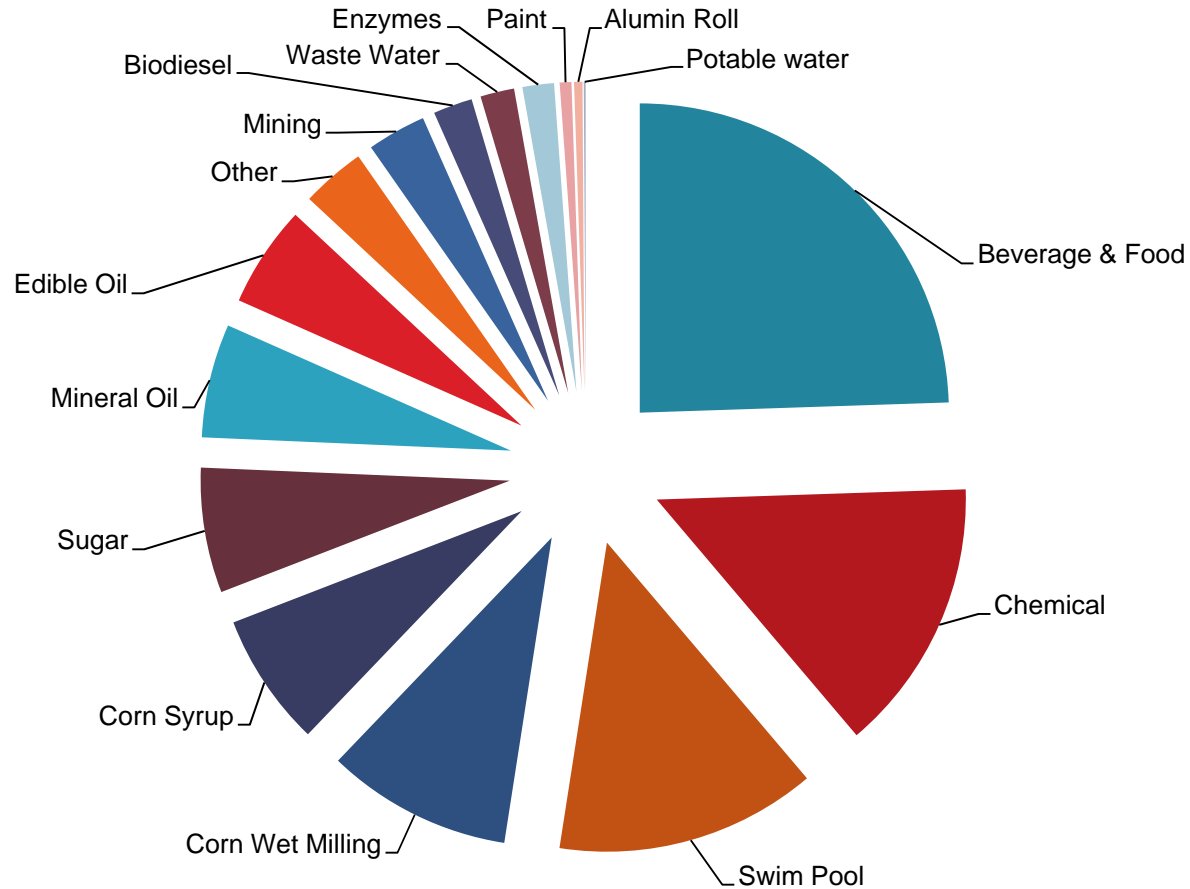




## Spent Cake Recycling - 2014

Andrew Welford

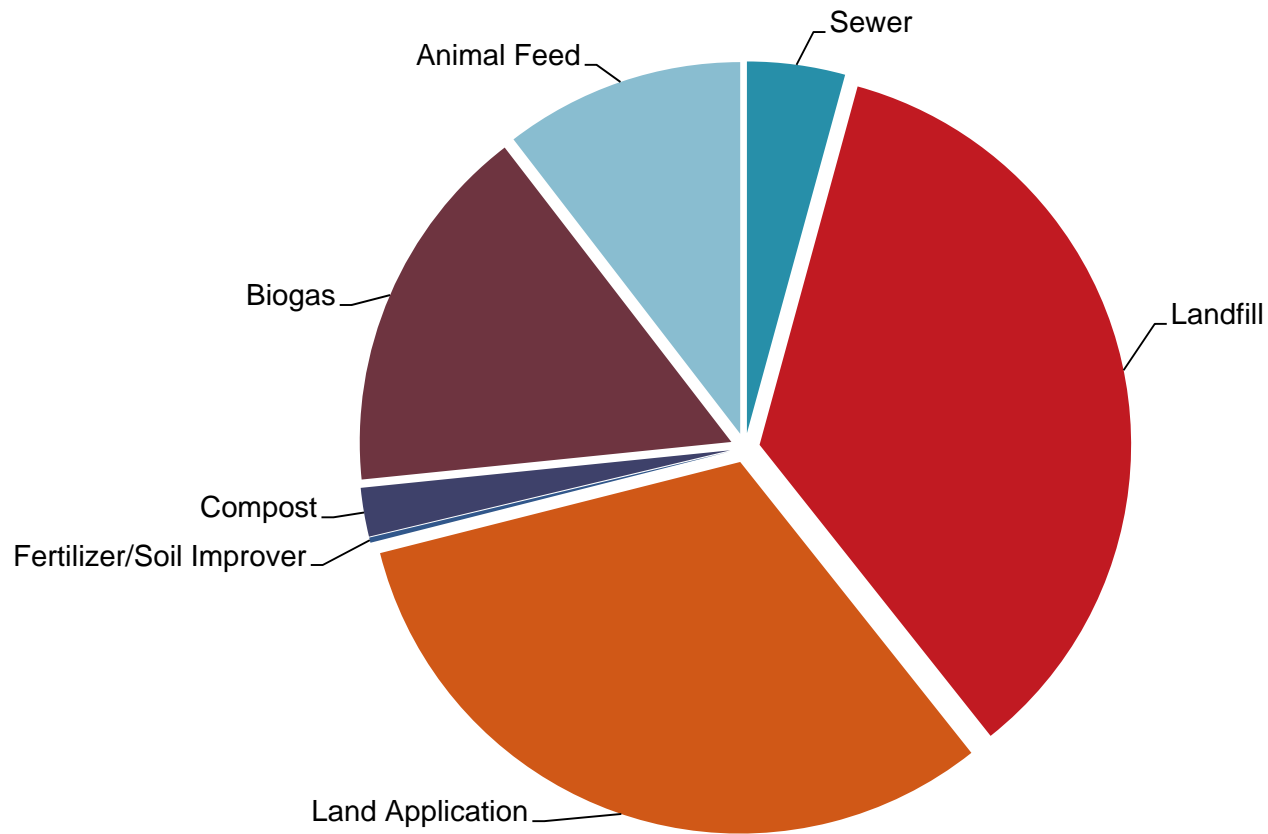
# Spent Cake Production By Sector



**Breweries make up around 20% of the business.**



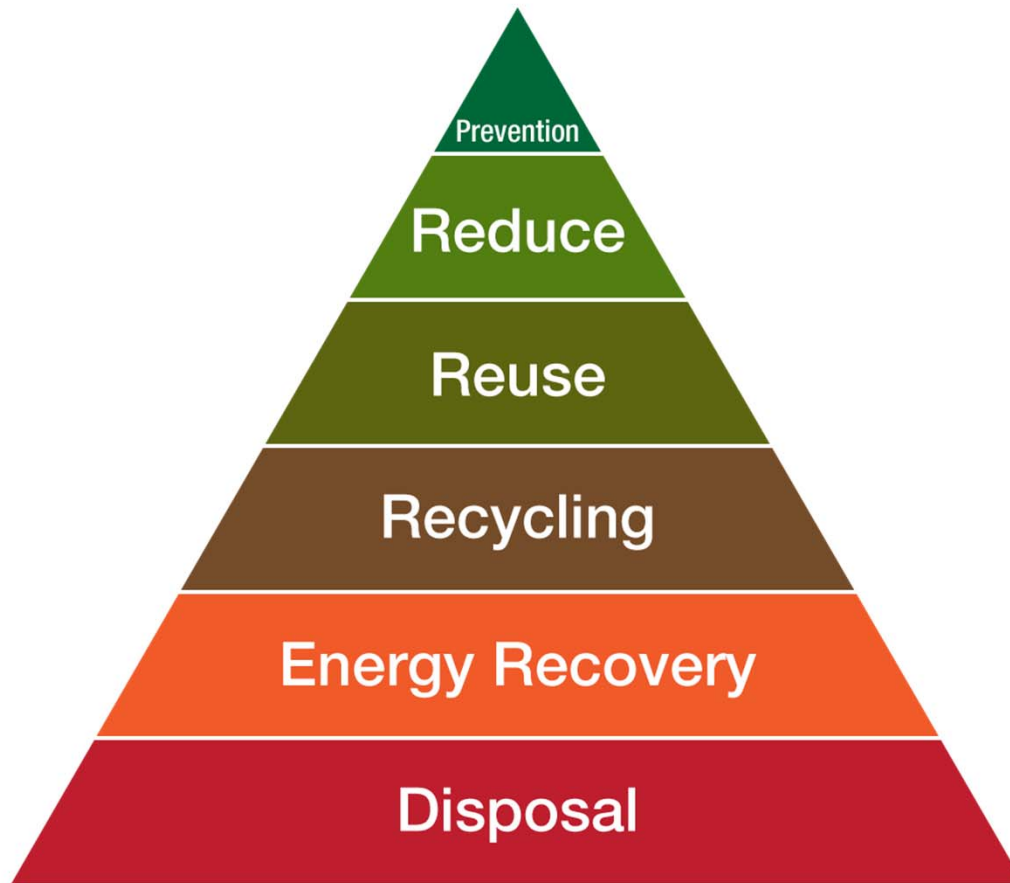
# Brewery Spent Cake Recycling/Disposal Routes









A lot of options are being used today, but still more work to do.

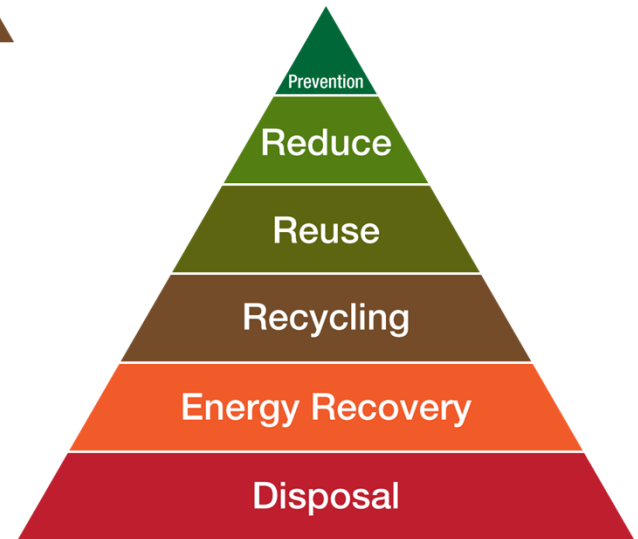


# The Waste Hierarchy



# Sustainable alternatives:

- ▶ Solid Biofuels –  Energy Recovery
- ▶ Anaerobic Digestion/Biogas –  Energy Recovery  Recycling
- ▶ Composting – Recycling –  Recycling
- ▶ Land Application – Recycling –  Recycling
- ▶ Absorbent/Aggregate Products –  Reuse



# Sustainable Alternatives - Solid Biofuel

Blended pellets



Gasification Technology



Renewable energy production



# Sustainable Alternatives - Anaerobic Digestion/Biogas

**For small and Independent breweries**



**For large scale breweries and multiple feed stocks**



## Sustainable Alternatives – Case Studies

The two most popular  
and “implementable”  
options for brewing



- ▶ Composting  
&
- ▶ Land Application





# Sustainable Alternatives - Compost



Haul waste to site



Shred debris and mix DE



10% blend of DE in windrows



# A case study: Composting

## Challenges:

- Environmental regulations
- Cost of landfilling
- Disposal logistics
- Recycling operations wary of new waste streams



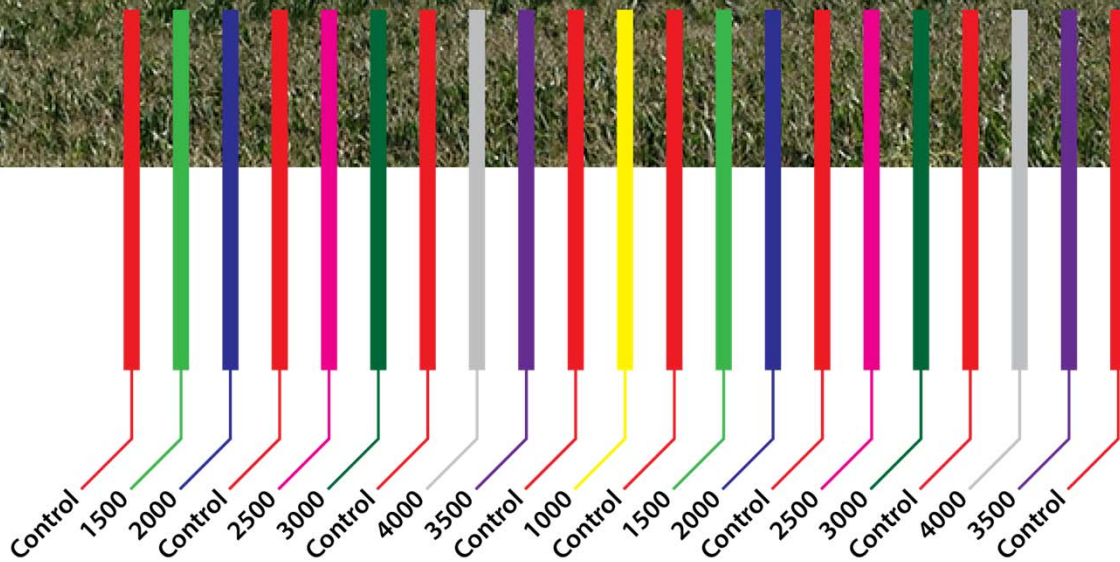
## Solutions:

- Local, sustainable disposal process
- Permitted sites
- Competitive composting gate fees
- Auditable recycling route

## Results:

- Cost reduction on the landfill gate fee
- Processed, accredited compost available from site
- Fully auditable and compliant recycling route achieved
- The compost has a higher nitrate content and lower ammonia levels

# Sustainable Alternatives - Land Application



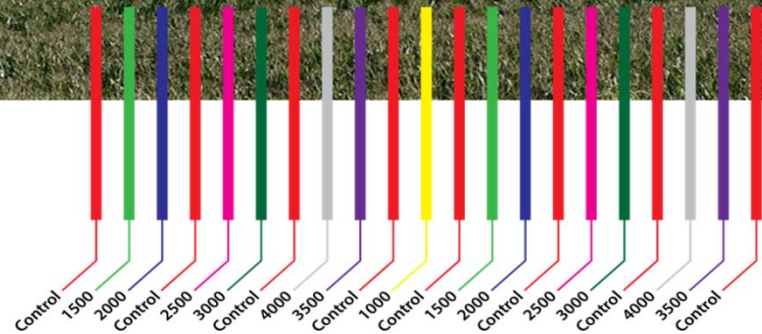
Commercial Field Trial – Layout and application rates (lbs./acre)



# A case study: Land Application

## Challenges:

- Recycle spent cake rather than send to landfill
- Low cost of landfill
- Requirement to prove agricultural benefit of spent cake
- Establish independent crop growth trials
- Identify and develop a working relationship with an agricultural company



## Solutions:

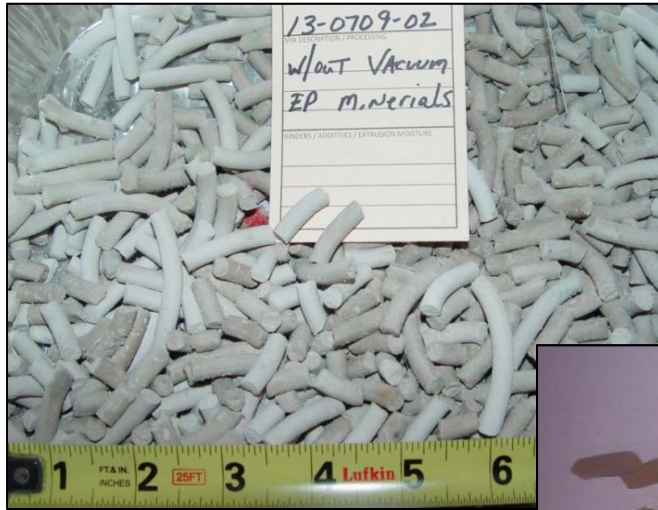
- Local, sustainable, and beneficial
- Cost effective
- Regulatory compliance
- Auditable recycling route
- Develop a product with value

## Results:

- Lowered cost of disposal with plan to eventually remove costs
- Produced a fertilizer with a marketable value
- Fully auditable and compliant recycling route achieved
- Identified optimum application rate for spent cake to achieve best results
- Quantified Maximum Economic return for recycling spent cake

# Sustainable Alternative - Absorbents/Aggregates

Pellets



Extrusion



Compression



## Recycling project plan:

- ▶ The starting point is to collate some analytical data:
  - Individual waste analysis. Must be conducted by:
    - An approved laboratory
    - Contact the local regulatory authority for certified laboratories they have approved
  - Make up a composite sample
    - Take three (3) random samples from a bin of spent cake
    - Samples will only need to be a pint in size
  - Submit for analysis



# Recycling project plan: Sample analysis requirements

## Nutrients

- ▶ Nitrogen
- ▶ Phosphorus
- ▶ Potassium
- ▶ Calcium
- ▶ Magnesium
- ▶ Sulfate

## Heavy Metals

- ▶ Arsenic
- ▶ Mercury
- ▶ Selenium
- ▶ Barium
- ▶ Nickel
- ▶ Silver
- ▶ Cadmium
- ▶ Lead
- ▶ Chromium
- ▶ Molybdenum

## Other

- ▶ Sodium
- ▶ Chloride
- ▶ pH
- ▶ Conductivity
- ▶ Total Carbon
- ▶ Ash
- ▶ C/N Ratio
- ▶ Moisture
- ▶ Solids
- ▶ Volatile solids

## Trace Elements

- ▶ Copper
- ▶ Zinc
- ▶ Iron
- ▶ Manganese

Complete Characterization



## Recycling project plan:

1. Discuss recycling/treatment options
2. Identify suitable recycling sites
3. Contact state regulatory body, if required
4. Complete permit applications as required
5. Monitor and assist record keeping as required to ensure regulatory compliance



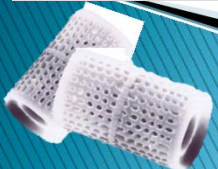


# Evaluate alternatives thoroughly:

## Kg/Annum of CO<sub>2</sub> equivalents for a 2.3M HL/Annum Brewery:

Operation	DE	Membrane	
Electric consumption	149,500	471,500	kg/a
Water consumption	5,520	10,695	kg/a
CO2 consumption	115,000	184,000	kg/a
Beer losses	312,800	156,400	kg/a
Filter Aid	27,669		kg/a
heat	345,000	172,500	kg/a
Retentate cycle Cooling		74,175	kg/a
Silica gel/stabilisation	5,534	8,300.70	kg/a
<b>Environmental aspects</b>			
Waste water	5,175	4,658	kg/a
Filters disposal		1,198	kg/a
Retentate		14,000	kg/a
<b>Sum</b>	<b>966,198</b>	<b>1,097,426</b>	<b>kg/a</b>
Retentate		9,900	
Disposal of Waste Kieselguhr	91,080		kg/a
<b>Sum</b>	<b>875,118</b>	<b>1,087,526</b>	<b>kg/a</b>
transport			
road	8,625		kg/a
sea	7,590		kg/a
	891,333	1,087,526	

Prevention may or may not be the most beneficial solution for the environment



## Summary:

- ▶ 90+% of spent cake in the EU is recycled through many and varied routes. This is achievable in the Americas, too.
- ▶ Government drivers, regulatory controls, cost, knowledge, and local availability of options are all factors.
- ▶ There must be a benefit to the customer to encourage them to recycle ... financial or environmental.
- ▶ Work with us to allow our expertise to assist you in making sustainable decisions for your business.



# Thank you!

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