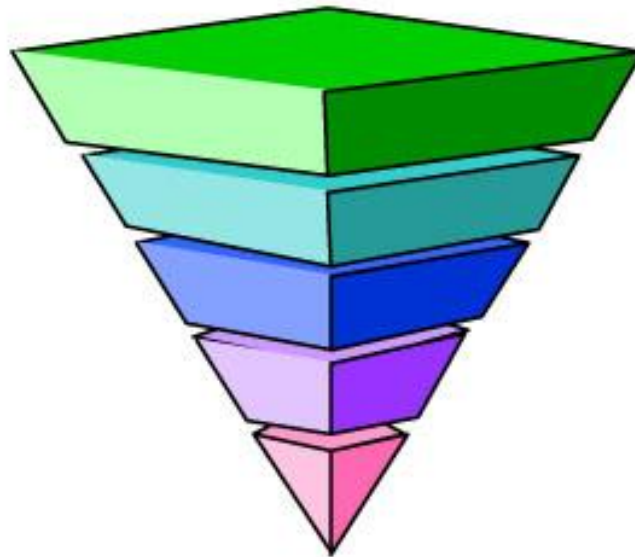


# The Business of Food Waste

Dr Tom Dugmore

# Waste Hierarchy



## Prevention

If you can't prevent, then....

## Prepare for reuse

If you can't prepare for reuse, then....

## Recycle

If you can't recycle, then....

## Recover other value (e.g. energy)

If you can't recover value, then....

## Disposal

Landfill if no alternative available.

£80/ €100 per tonne

# Breakfast



# Spent Coffee Grounds

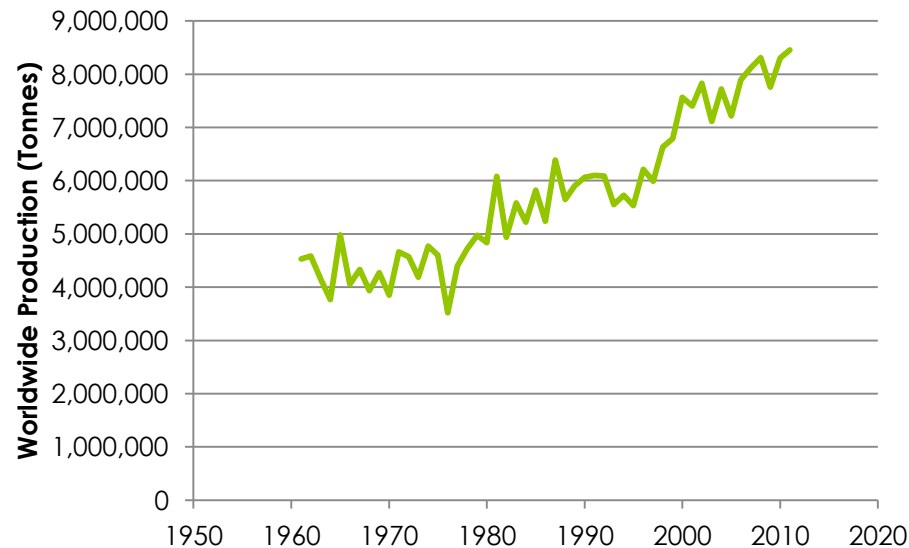
- 0.91 g wasted grounds per g of coffee produced
- 32,000 tonnes coffee consumed per year
- 29,000 tonnes spent coffee grounds per year





# Coffee as a commodity

- 2<sup>nd</sup> most traded commodity after petroleum
- 8 million tonnes produced in 2011



# Oil Contents

Source	Oil Yield
<b>Spent Coffee Grounds</b>	<b>18.3%</b>
Rapeseed and Palm	40%
Olives	10 – 30 %
Sunflower	22 – 36%
Soybean	20%
Cotton	20%
Corn	2.8%
Jatropha	25 – 40%

# Oil Usage

- Cooking
  - Some oils inedible
- Biodiesel
  - Food vs fuel debate
- Soap and Cosmetics
  - Concerns over sustainability

# Coffee oils for biodiesel and cosmetics

- Biodiesel
  - Meet all EN and ASTM criteria
  - More pleasing odour than used cooking oil
- Cosmetics
  - Similar fatty acid profile to palm oil
  - More sustainable
  - Source locally rather than import



# Residual Grounds

- Composting
  - Extracting oils reduces acidity and concentrates other nutrients
- Biomass burning
- Fermentation

# Commercial Value



- ~52p / L (before tax, delivery etc)
- 132.9 – 153.0 p / L (pump price)
- 136.0p 25/03/2014



- £9.50 / m<sup>3</sup> (WRAP)



- Average 60 – 70 p / 100g
- Range 12.5p - £1.50 / 100g

# Spent Coffee Grounds

- In 2013 –
  - 29,000 Tonnes SCG produced
- £73 per tonne landfill tax
  - Cost of £2,117,826
- 5,000 Tonnes of oil for further use
- Potential pre-duty price of £2.6 million
- Potential pump price of £6.8 million
- Over £2 million potential tax revenue generated

# Spent Coffee Grounds



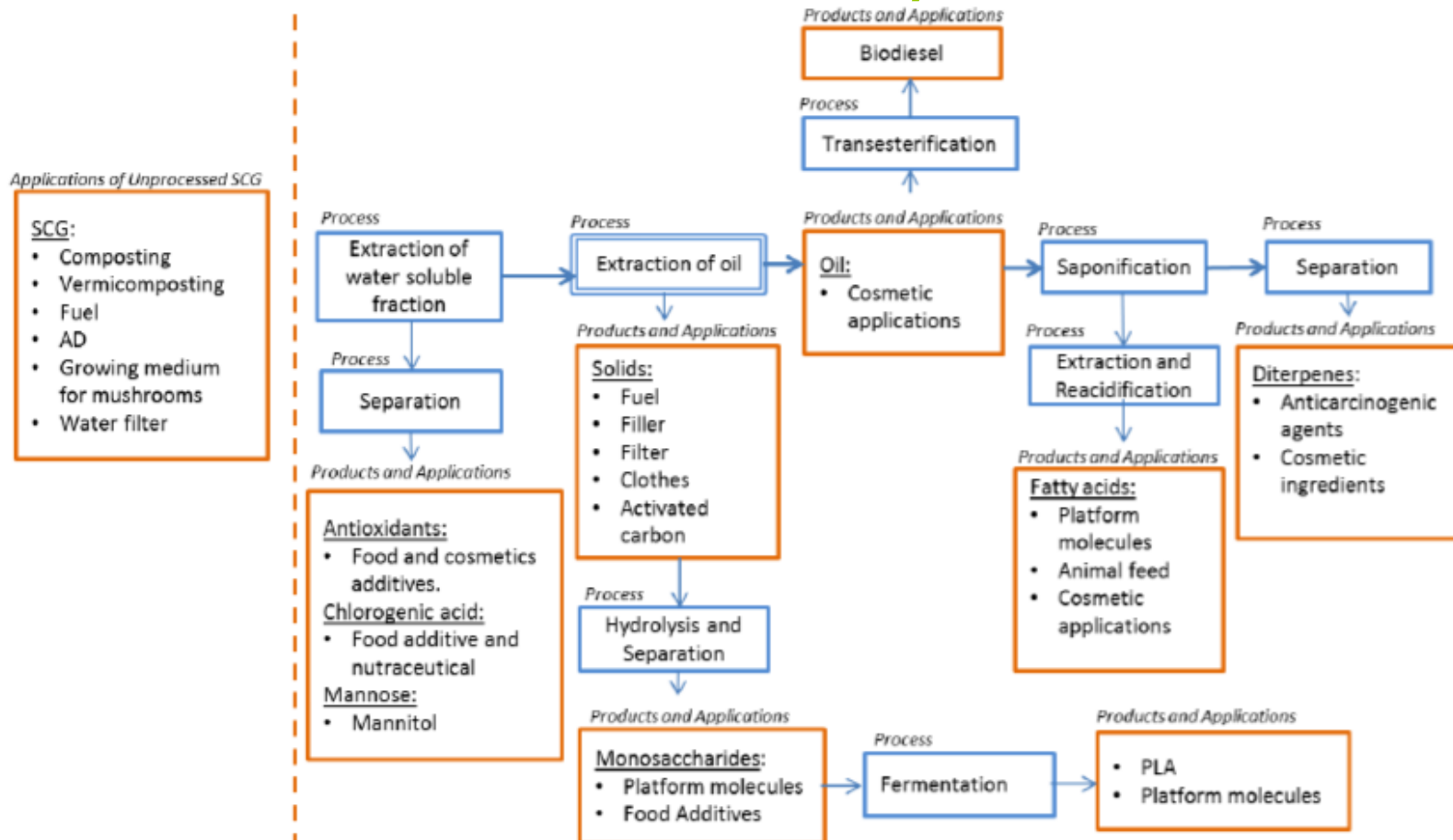
Recycled coffee grounds are transformed by a patented process into our special fibers, which we call S.Café™ fabric.



● [www.Inhabitat.com](http://www.Inhabitat.com) [www.scafefabrics.com](http://www.scafefabrics.com)



# Coffee Biorefinery



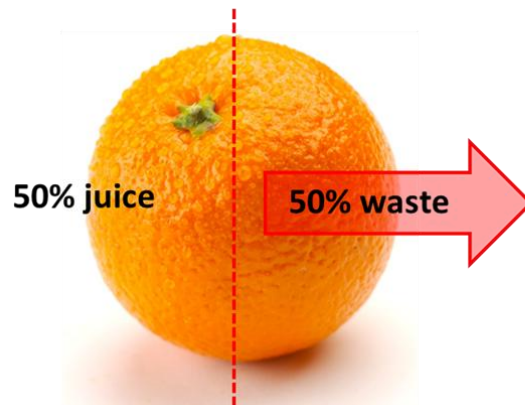


# OPEC

- ~~Organization of the Petroleum Exporting Countries~~
- Orange Peel Exploitation Company

# OPEC

Valorisation of a million ton scale pre-consumer waste  
to bio-chemicals, bio-materials and bio-fuels.



**8,069,705 T/y**  
*of waste orange peels  
available in Brazil*

**BIO-CHEMICALS**

- bio-solvents
- natural fragrance chemicals
- chemical intermediates
- acid catalysts

**BIO-FUELS**

- sugars
- chars
- bio-ethanol

**BIO-MATERIALS**

- catalysis
- separations
- water purification





# Pectin

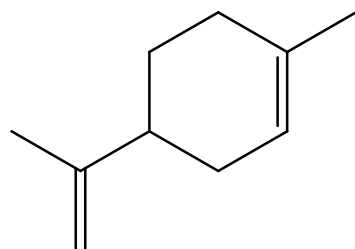
- 20 – 30% of orange peel





# D-Limonene

- Main component of essential oils



- Natural fragrances
- Strong apolar solvent
  - Replacement for, e.g. benzene, hexane
- Cleaning Products
- Anti-bacterial and anti-microbial properties

# D-Limonene



# OPEC project

- Developed in-house methods to extract pectin and d-limonene
- Microwave Technology
  - No harsh acids or solvents
- Industrial investment agreed to develop pilot-scale equipment

# What can York do for you?

- Food Waste Producers
  - Find alternative uses for waste and unwanted by-products
  - Reduces landfill and other disposal costs
  - Potentially turn an unwanted waste stream into a new source of revenue
  - Network with companies that can make it happen for you

# What can York do for you?

- Manufacturers
  - Help source new raw materials for your processes
    - Cheaper, safer, more secure
  - Safeguard supply chain
  - Address sustainability issues

# What can York do for you?

- Processors
  - Reduce/recover energy costs
  - Increase customer base

# What can York do for you?

- Industrial Engagement Facility
  - Meeting and seminar rooms for networking
  - Desk and lab space for visiting staff
  - Facilities to aid company start up
  - Access to additional funding and grants

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