

Technological solutions for waste reduction and energy saving

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Major challenges for the food industry

Meet the European consumer's desires for healthy, safe, varied and affordable food, produced in a period of increasing concern about the environment

- Improve health, well-being and longevity
- Build consumer trust in the food chain
- Supporting sustainable and ethical production
- Food versus Fuel **OR** Food & Fuel & Materials

Source: ETP Food for Life, 2008

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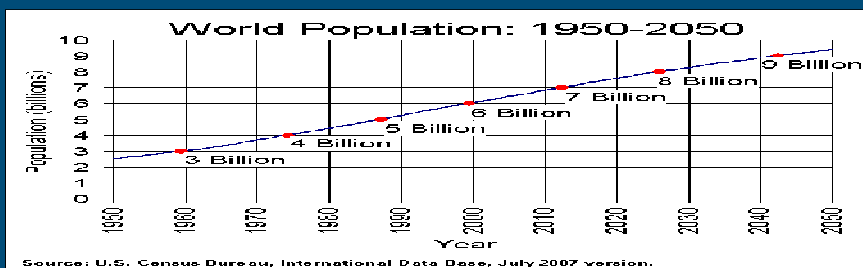


Sustainability

- “Sustainable development is development that meets the need for the present without compromising the ability of future generations to meet their own needs.”
(Brundtland, 1987)
- Issues People, Planet & Profit: Climate change, fossil energy, non-renewable resources, water reduction, chemicals, poverty, animal welfare, rural development, social economic development, nature, biodiversity, etc.



Challenge: Feeding the world



- Enormous differences world wide; from malnutrition to abundance of food and obesity
- Global food challenge demands for international approach for sustainable and integral solutions



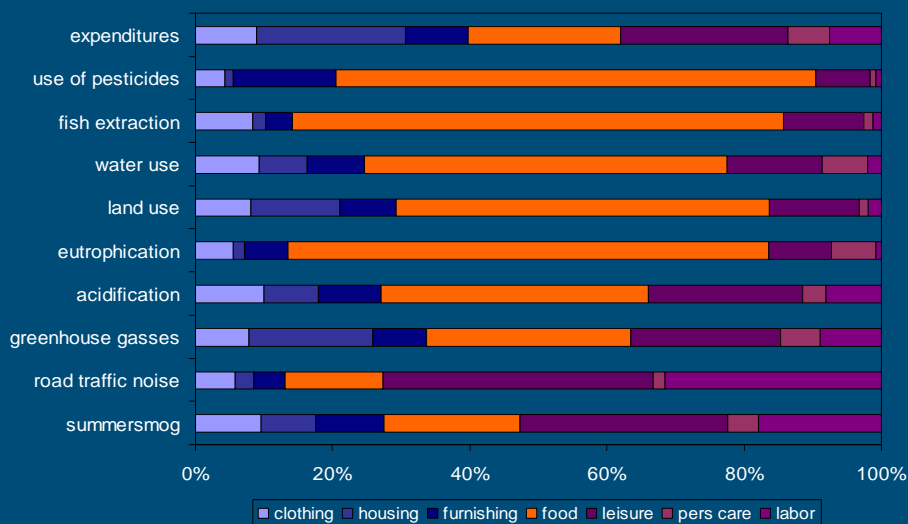
Challenge: Feeding the world

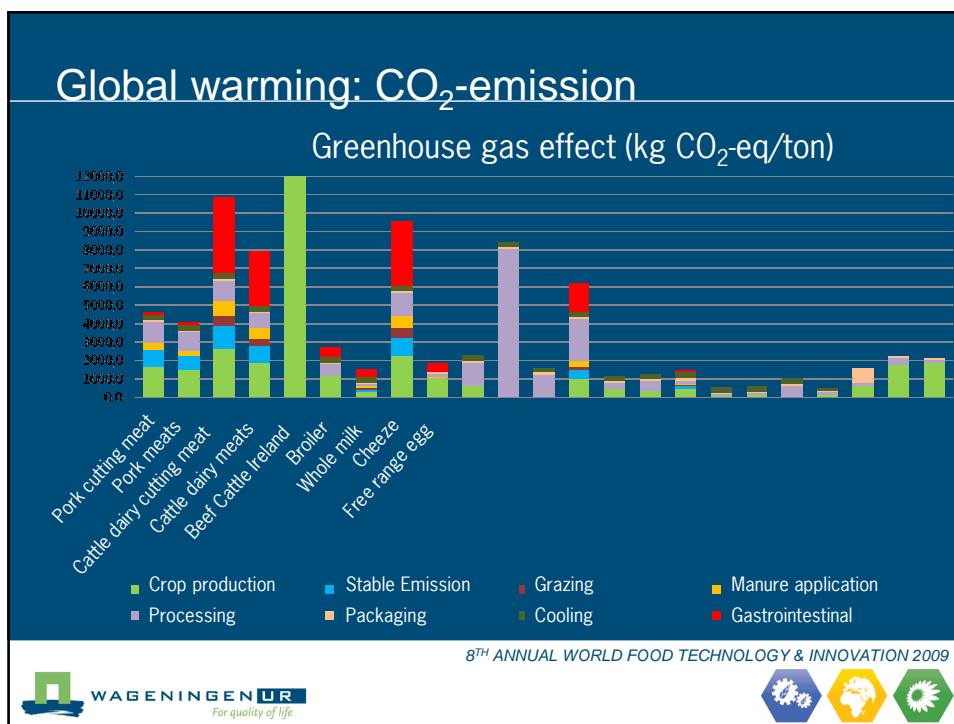
Efficiency of current food system:

- US: 7.3 units of (fossil) energy used to produce 1 unit of food energy
- EU: 30% of Greenhouse gas emission and 25% of energy use is related to our food system




Environmental impact consumption






Global warming: CO₂-emission


Livestock and Climate Change



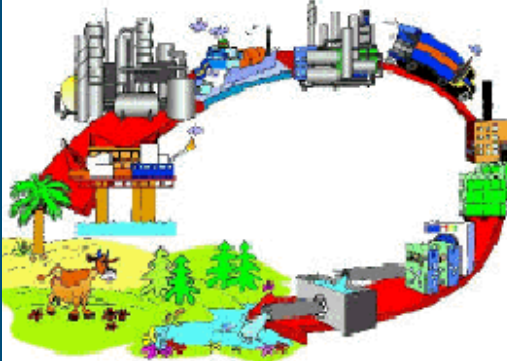
What if the key actors in climate change are...



cows, pigs, and chickens?



10 World Watch | November/December 2009 www.wri.org/wwi



- Animals raised for food account for at least half of all human caused GHGs

Robert Goodland, Jeff Anhang
World Watch, 2009

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Sustainable Food Chains

- Fresh Logistics
 1. Cold chain management
 2. Transport modality shift
 3. Protective packaging
- Mild processing & process intensification
 1. Emerging food technology
 2. Replace ingredients, e.g. vegetable based proteins
- Intelligent Systems
 1. Reduce food wastage in the chain
 2. Packaging life cycle
- Agro Green Parks
 1. Integral Logistic chain networks
 2. Zero waste: valorization of by-products

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QUEST: Energy reduction in reefer transport



- Energy savings without reducing quality compared to standard storage conditions
- Shown for: apple, kiwi, pear, grape, mango, bell pepper, melon, mandarin, banana, avocado, pineapple Sweet Cayenne



QUEST helps fight global warming

- QUEST reduces CO₂ emissions for cooling by 50%
- After complete implementation by the end of 2008 the Maersk Line fleet will save 325,000 ton CO₂ per year!
- An enormous amount of savings! Compare to:
 - 0.2 ton CO₂ savings for the life span of a saving lamp
 - 2 billion car km's emission equivalent



Transport modality shift

Standard transport modality: air freight

- Fast transport times
- High tariff; fuel surcharges
- Flexible volumes



Alternative marine (Reefer) transport:

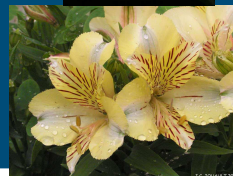
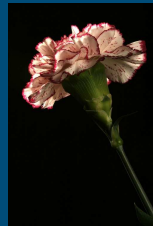
- Longer transport time
- Closed cool chain
- Lower costs
- Large capacity
- Large volume per shipment
- Sustainable



Transport modality shift

Starflower: development of sea freight distribution concept for cut flowers

- Hypericum
- Carnation
- Gypsophyla
- Rose
- Alstroemeria
- Chrysanthemum



Modified Atmosphere Packaging for chilled meals

■ Cook and Steam meals

- Double fresh dilemma
 - 5 days shelf life -> 20% shrinkage -> 5 €/meal



■ Post-pasteurized meals

- Improve appearance
 - New packaging technologies
 - New pasteurization technologies



Technological hurdles hamper the implementation of packaging technologies for chilled meals



Double Fresh
Double Fresh

EU funded project
FOOD-CT-2006-23182



Emerging technologies for food preservation

Extend Shelf life !

Non-thermal *volumetric* processing techniques:

- High pressure processing
- Pulsed Electric Field, Radio Frequency

Non-thermal *surface* processing techniques:

- High intensity pulsed light technology
- Cold plasma treatment



HPP



Plasma



PEF



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Product development plant based proteins

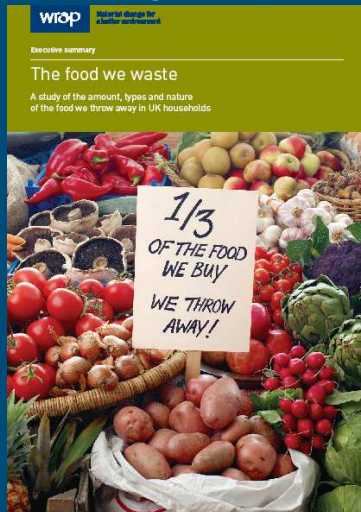
- Development of innovative protein rich products, meat alternatives, ..
- Technological solutions: shear cell, extrusion, high pressure spinning, ..
- Technology up-scaling
- Sensory evaluation
- Marketing & profiling



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Intelligent systems: Reduce food wastage

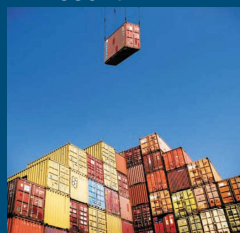


- \$35 billion in annual global waste from perishable goods
- 56% of all shrink in the US comes from the perishables department
- Total value of temperature related perishable shrink per supermarket is \$79,808
- Across a 500 store chain: \$40 million
- In the Netherlands total shrinkage in the food chain values 3.6 billion €



Intelligent systems: RFID in the cool chain

Present



Bulk-management

2010-2015



Multi-item management

>> 2015



Item management

> 1 \$

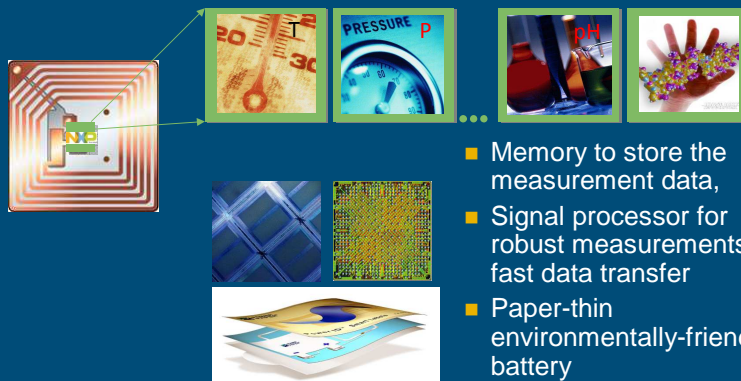
Price per tag

< 5 c\$

of items to be tagged



The “Smart” RFID chip



Targeting integration of sensing and RFID functions on sub-10mm² Si chip

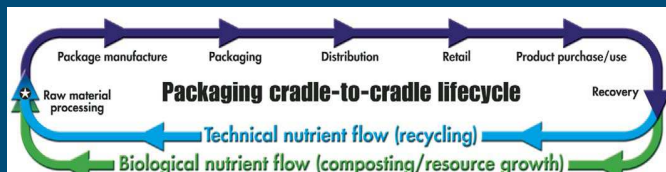
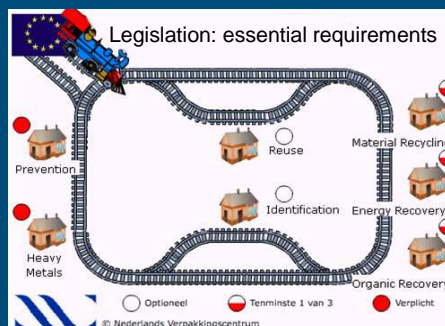


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Sustainable Packaging Lifecycle

- Integral research driven approach to design and achieve a sustainable packaging lifecycle



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Sustainable Packaging lifecycle

Commingled collection and centralized recovery

■ Plastics can also be automatically be separated

- High investments
- Low market prices for recovered plastics
- Rigid and Flexible packaging recovered

■ Challenges:

- Few waste companies can add a separation system to their incinerator
- New recycling processes needed



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Sustainable Packaging Lifecycle

Bio-degradable packaging:


- Price: always (a bit) more expensive
- Performance: sometimes equal, often less, but improving.
- Environment: sometimes better, sometimes not
- Much innovation and improvement expected

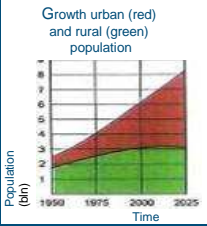


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The world is urbanizing






Growth urban (red)
and rural (green)
population

- Metropolises are the nodes of the 21th century network economy
- Agro production is in transition towards metropolitan agriculture
- The distinction between urban and rural areas within metropolises is vanishing
- Spatial organization of industrial agro production systems is still based on traditional land dependant forms



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Agro Green Park

An innovation in urban agrofood production and processing:

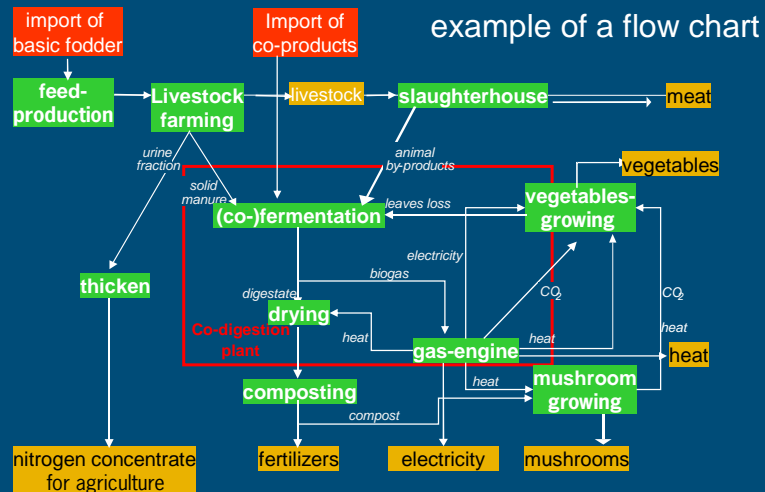
- Application of the C2C principle: waste is a valuable resource
- Spatial clustering of different agro-production chains
- Spatial combination of agro- and non-agro functions (buildings, industrial and city waste etc)
- Scale increase through industrial production and processing
- Reduction of transport and by doing this: reduction of veterinary risks
- Integral part of an Intelligent Agri Logistic Network



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Waste is a valuable resource



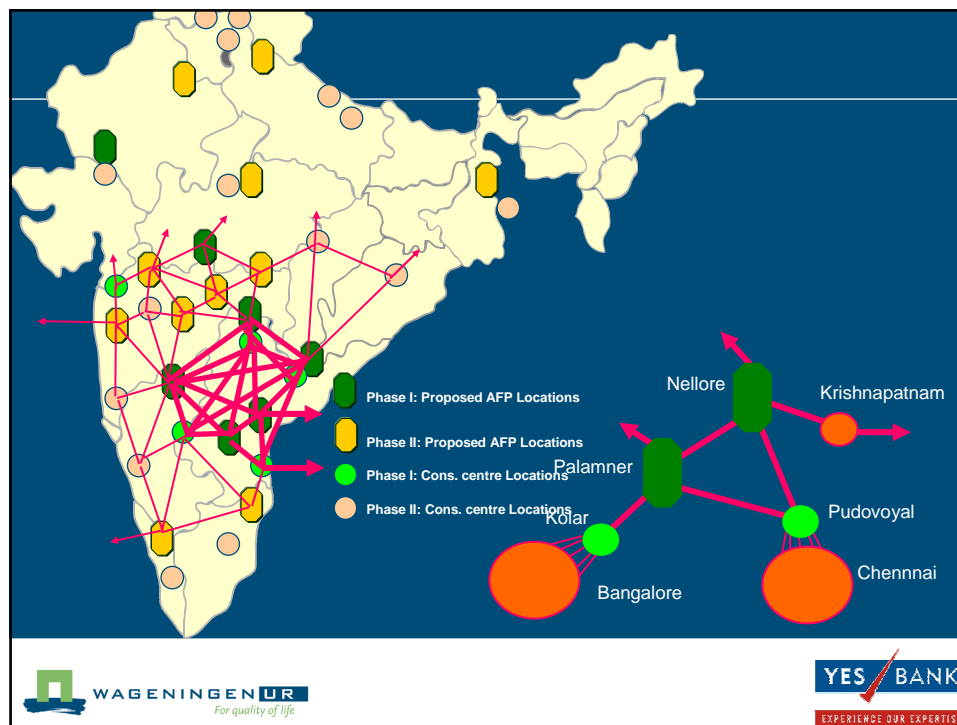
Agro Green Park: Greenport Nellore



Why Agro Park?

- Higher primary productivity
- Reduced spoilage/wastage
- Higher price realisation
 - Aiming:
 - at top market segments
 - out of season products
 - new products

For up to 6 mln consumers
(growth rate 8 – 10%/y)
in Bangalore-Chennai region



Concluding & remarks

- Challenges and opportunities for the Food industry in “healthy & delicious” and “sustainable & ethical” production
- Innovate to fulfill consumer needs and to strengthen consumer thrust in the food chain (transparency)
- Sustainability is not a hype, it's a high priority global issue
- Need for integral innovation and design approach -> closing the lifecycle and be eco-effective
- For the short and longer term new technologies and concepts are in the pipeline
- A sustainable business model holds a strategy on how to become a (more) sustainable company and industry

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Thanks for your attention !

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