Reducing postharvest losses

Wageningen UR's Food & Biobased Research

Henry Boerrigter

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Presentation

- Short introduction: speaker + institute
- The Dutch agrifood system <-> knowledge system
  - Evolution of 50 years
- FBR's activities and views regarding PHL
  - Differences developed & developing markets
- The WUR Metropolitan Food Cluster approach
- Establishing a NoE: a first step towards a CoE

Intro Henry Boerrigter

- Background: Process Technologist by education
- 35 years research history in PH-Technology at WUR
  - Ethylene management in cold stores: ripening
  - Low energy storage (drying): bulbs, tubers, fruits, vegetables
  - Precooling system design: cut flowers and vegetables
  - CA technology: Reefer containers; N_2 generators; CO_2-scrubbers
  - MA-packaging: fresh (horticultural) products
  - Containerization: vine tomatoes, bell peppers, exotic fruits, cut flowers
  - Supply chain optimization: local and global system integration
- Current role: Bus.Dev. Sustainable Fresh Chains; Post-harvest consultant

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FOOD & BIOBASED RESEARCH inst. of Wageningen UR

…To explore the potential of nature, to improve the quality of life…

Supervisory Board

Executive Board

Concern Staff + *Facilities & Services*

Agrotechnology & Food Sciences Group	Animal Sciences Group	Environmental Sciences Group	Plant Sciences Group	Social Sciences Group

Wageningen University

Agrotechnology & Food Science	Animal Sciences	Environmental Sciences	Plant Sciences	Social Sciences

Specialized Research Institutes (CRO's)

Food & Biobased Research	Livestock Research Central Veterinary Institute	Alterra	Plant Research International Applied Plant Research	LEI Centre for Development Innovation

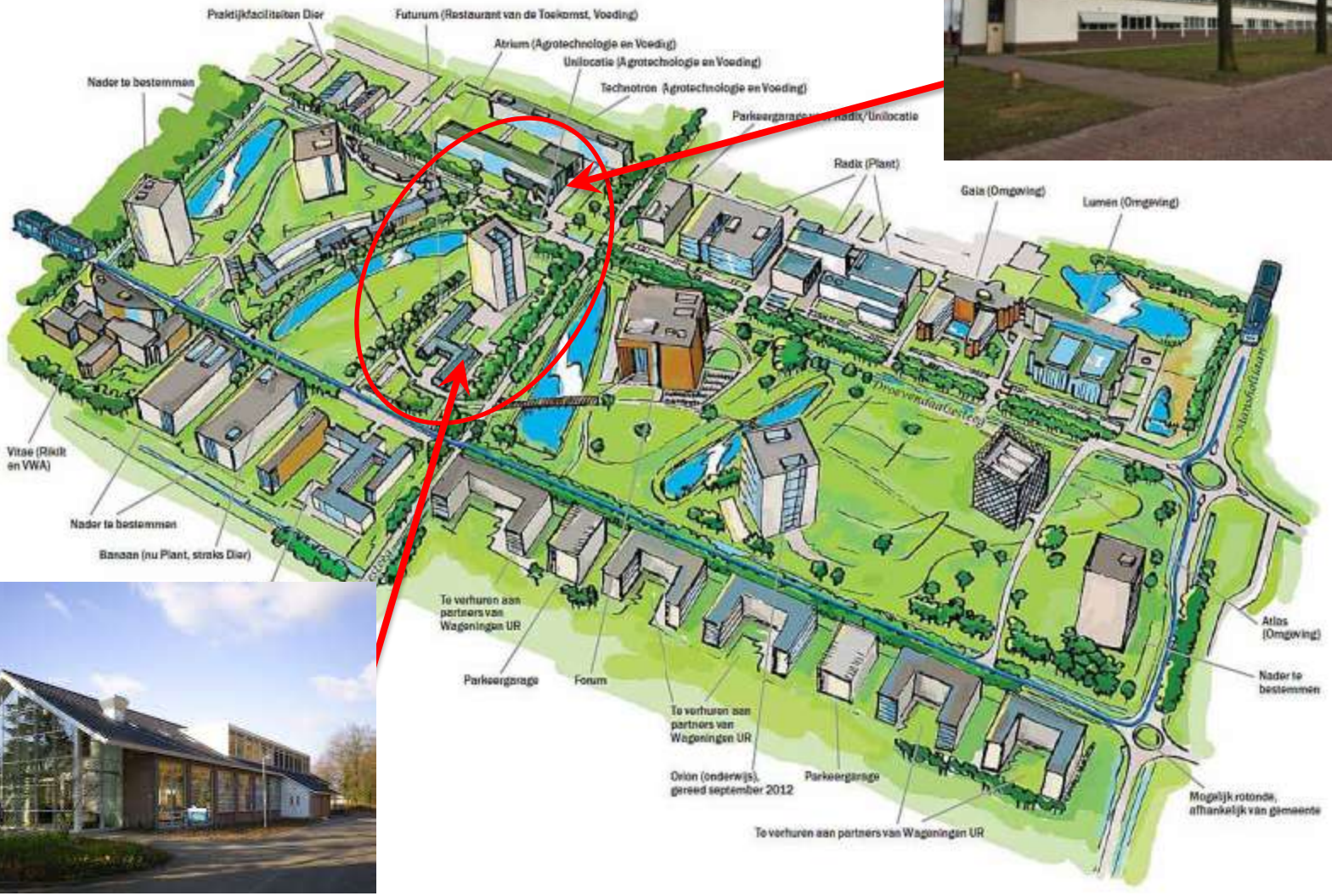
Wageningen International

IMARES

Wageningen Business School

RIKILT

Tomorrow's field trip: more info!



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The Dutch agri-food system evolution

- Second world war destroyed NL. food production system
  - Nl. Gov.: secure food production for fast growing population!

- Ministry of Agriculture created 'OVO' triangle
  - Agricultural education: responsibility of Min.Ag.
  - R&D: Wageningen inst. and regional test stations
    - 2 postharvest institutes: agri & horti
  - Extension services: network of expert agencies
    - farming, entrepreneurship, finances, post harvest, others

Farmers alliances as critical succesfactors

- Dutch (small) farmers & growers formed cooperatives
  - Banking: Enabling agricultural investments (Rabo)
  - Centralised buying: farming aids, feed, minerals
  - Marketing products: Auctions! Ware houses!

- Sector affairs were handled by boards:
  - Example: “horticultural board”
    - Market survey/data, int. affairs, lobby, R&D funds
    - Membership & fee was obliged (by law)
    - Employees + Farmers + Traders

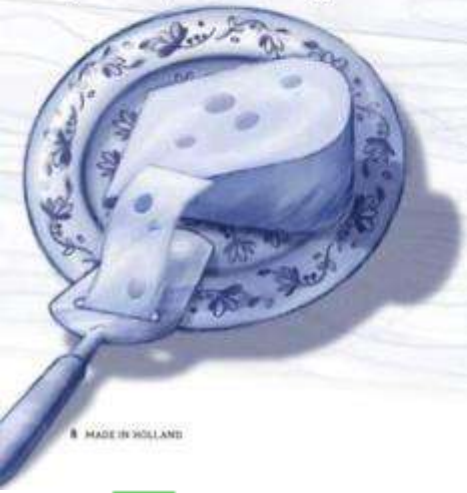
Bits & bites

Dutch production efficiency is high. In the Netherlands the added value per hectare is up to five times higher than the European average.

The Netherlands is the **second-largest** exporter of agri-food products in the world, surpassed only by the US (which has a surface area 296-times greater).

654,000,000 kg

of cheese exports, the 4th-largest worldwide.



Global top 40

4 Dutch companies are included in the global top 40 food & beverage companies: Unilever, Heineken, VION and Royal FrieslandCampina.

80%

More than 80% of exports are destined for Europe, primarily Germany and other neighbouring countries.

4,100 supermarkets

serve around 17 million Dutch inhabitants

*Amsterdam is the **largest cocoa port** in the world.*

1.5 million dairy cows

occupy 19,200 farms (2011).

Academic

2 Dutch universities feature in the European top 10 with regard to the number of publications related to the agri-food sector.

R&D

Number 2 (as a % of GDP) in Europe for private R&D investments made by companies located in the Netherlands.

€ 48 billion

added value for the Dutch economy

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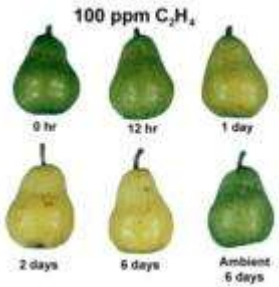
Exponential grow of food production

- Dutch food production is now 48 billion euro
  - Horticulture: 18 billion euro (rank 3 export)
- Food security guaranteed + huge export volume
- The OVO/R&D system is generally recognized as the key for this ultimate success
- Progress of Post harvest research: from storage systems towards a complete integral chain approach (demand driven) and use of side streams (industrial applications)

OVO was a full public service

- All organisations in the OVO-triangle:
  - Research: fully paid by government
  - Extension service: gratis
  - Employees: civil servants

- R&D: much open source information + publications
  - Product properties F&V Sprenger Institute
  - Product fact sheets UCD



Situation 2013 is very different

- Full support from government to agro-industry not accepted any longer: political issue
- Since 1985-1990:
  - Privatisation extension serv. & R&D institutes (not education!)
  - Less govern. funding: shift towards private funding
  - In 2012: formal end of NL "product boards"
  - Golden triangle policy in place: PPP (top sectors)
    - Funding research: 50%-50%
  - Industry plays a stronger role in programming

How this affects PH-research

- Effects:
  - More B2B contract research: confidential, not published
  - Industry controls R&D programming: horizon nearby
  - Less open source information: not refreshed, outdated
  - PHT: Shrinking knowledge domain: experts ageing!
    - Scientific career options limited
  - EU R&D options important for 'knowledge' generation
    - Horizon 2020: Postharvest not on the list (yet!?)

Conclusion/lessons learned/remarks

- 'Knowledge system' essential for "food security"
  - Postharvest is an important part of the food chain
  - Postharvest deserves a strong knowledge position

- PH-expertise demands from industry/regions/chains
  - Must fit in a supply chain approach: holistic
  - Supply Chain Solutions = multidisciplinary R&D teams
    - Techn.-Physiol.-SCM-Microbiol.–Econom-ICT.
    - Food processors and biorefinery (side streams)
  - WUR chain approach noticed by developing countries
    - MFC, NoE, CoE initiatives, courses etc.

Presentation

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  - Evolution of 50 years
- FBR's activities and views regarding PHL
  - Food processing & biorefinery excluded!
  - Differences developed & developing markets
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Food Waste – A global opportunity

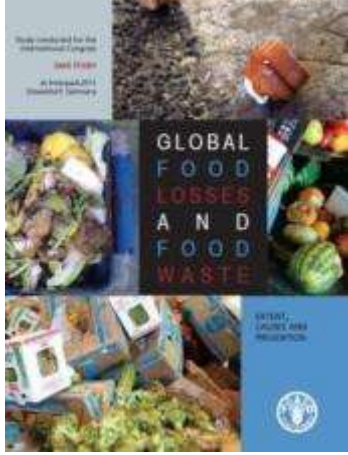
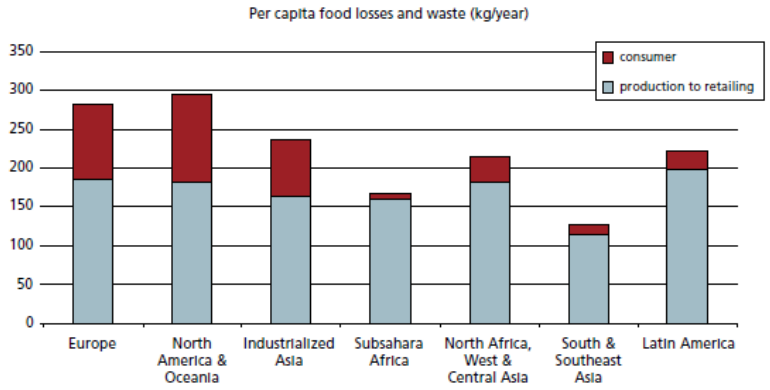
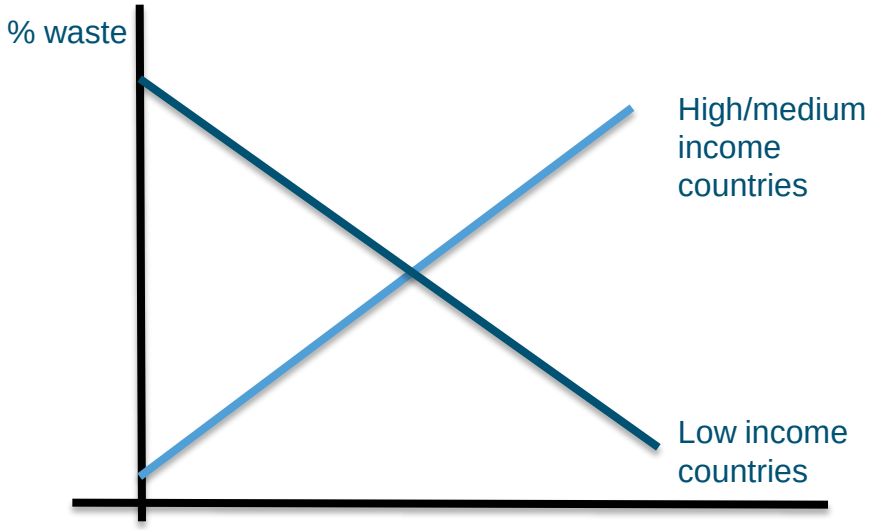


Figure 2. Per capita food losses and waste, at consumption and pre-consumptions stages, in different regions





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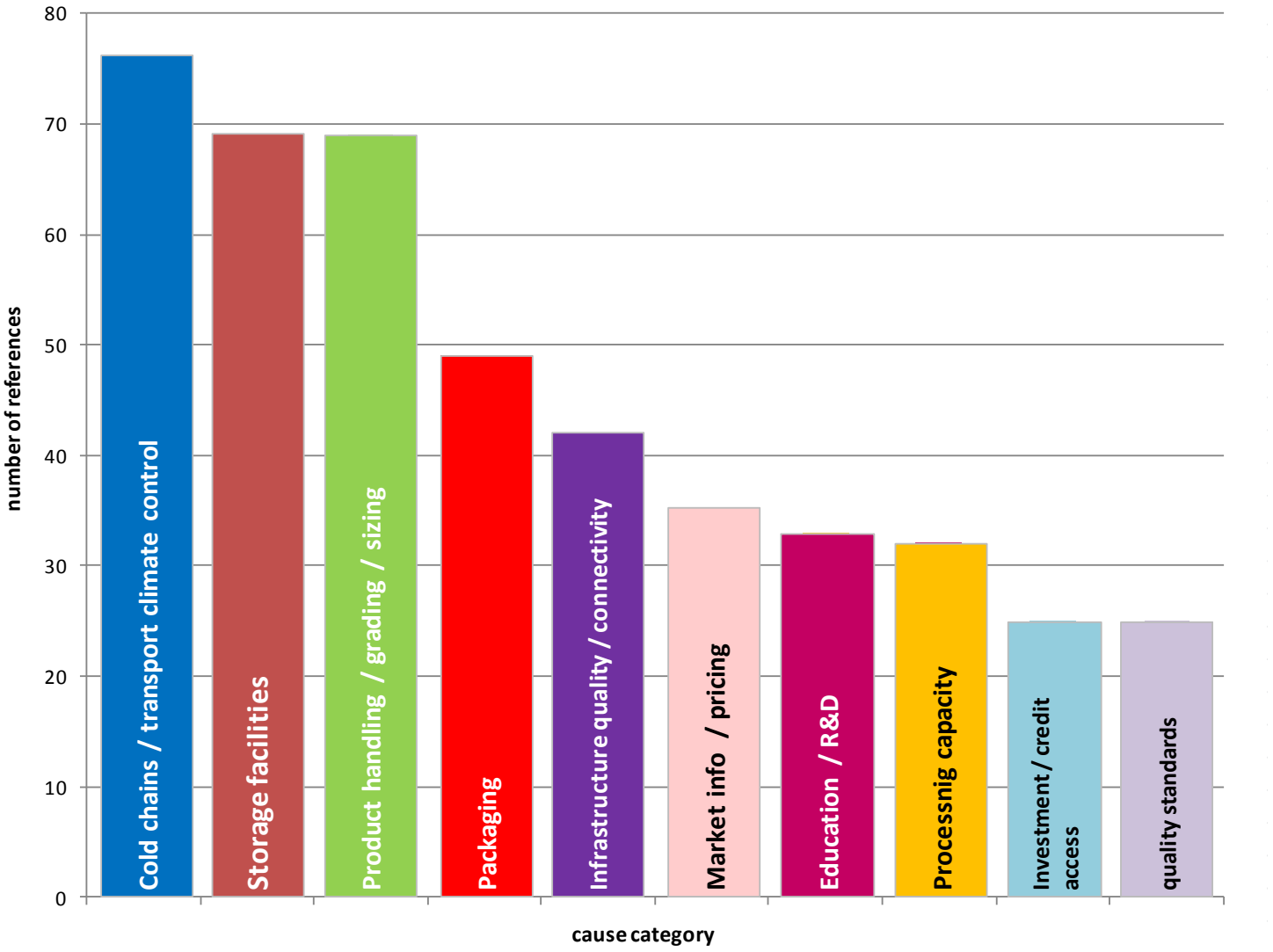
Source: FAO, 2011

Top-10 causes postharvest losses F&V Supply Chains



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Different accents Postharvest losses

- Developing markets
  - Long term storage
  - Cold chain management incl. precooling
  - Global export: transport protocols
    - Single use sustainable packaging
    - Phytosanitary problems
- Developed markets
  - Longer shelf life (one stop retail shopper)
  - Tastier and Ready-to-Eat Fruits & Veges
  - Convenience: fresh cuts; fresh meals
  - Returnable and or recycable packaging

Year round pear storage at -1°C

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Recommended transport temperatures of tomatoes on the vine

	Temperature			
Distribution time (days)	8°C	10°C	12°C	18°C
9	+	+	+	---
11	+	+	+	---
14	+	+	--- / +	---
17	+	--- / +	---	---
19	--- / +	--- / +	---	---

Tomatoes on the vine NL are harvested ripe: stage 8-10

Real world pilot: Test of 2 air purification systems in CA-avocado transport

	No filter	Filter 1	Filter 2
After transport			
Shelf life			

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Peru – Nl.

Consultancy, Pack house design, Chain monitoring, Chain performance

Example: Small farmers (SAF) want to enter & supply EU market





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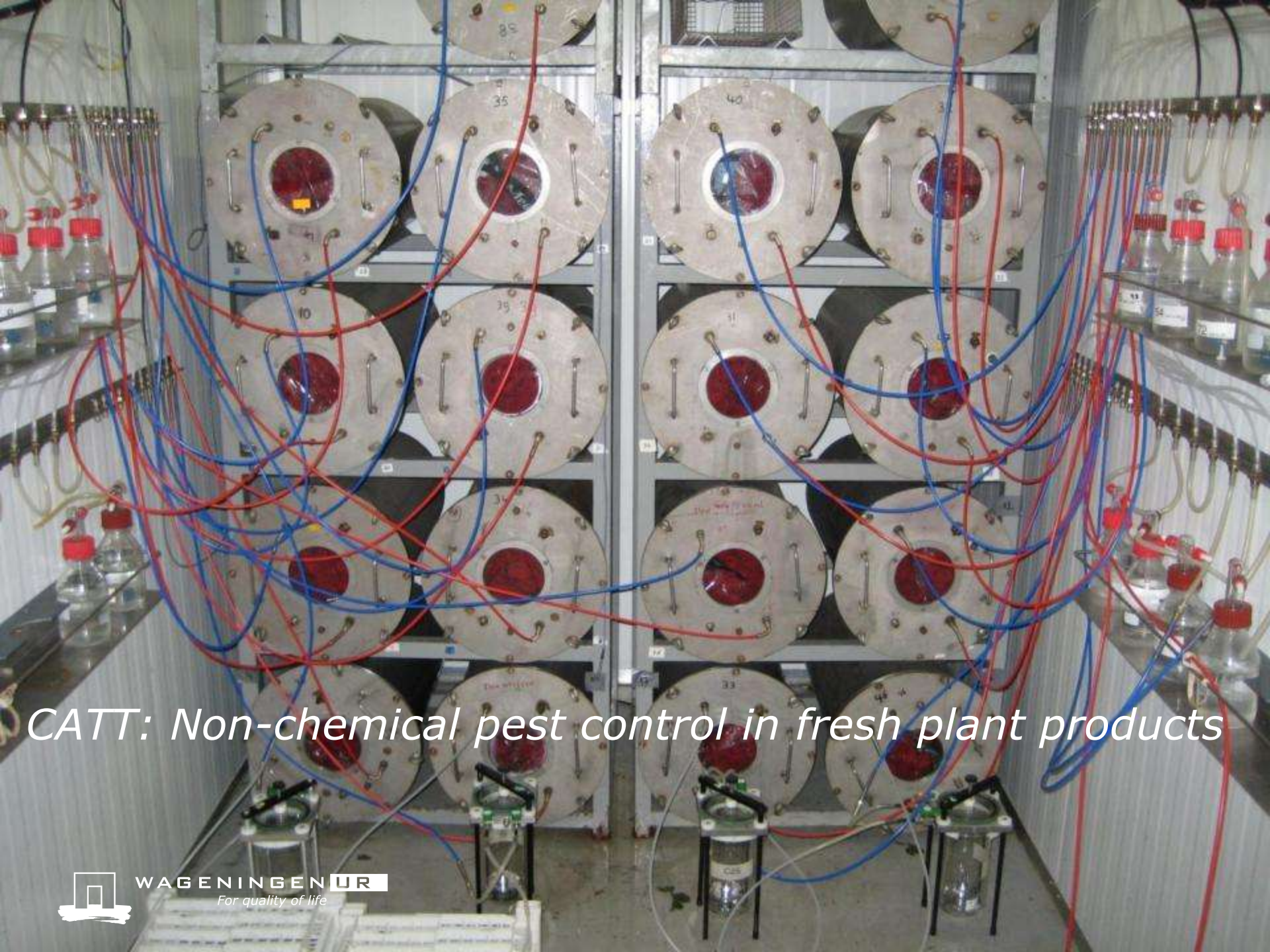

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CATT: alternative pest control method

- MeBr fumigation vs. CATT:
  - same effect on killing tarsonemids
- No differences in strawberry plant quality
- CATT = 48h 35°C; YCO_2 - XO_2

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More global sourcing by high-end markets

- Big vol.; year-round; high quality (fresh/tasty); safe food!
- Elongated storage & transport time: shelf life guarantee




- Prevention of disorders: rot, decay, injuries
  - None chemical disinfection: HWT, CATT, ozone, ess.oils
- Minimise post-harvest losses: social issue
- Close the cold chain; do not ship ripe prod.
  - In conflict with taste requirements

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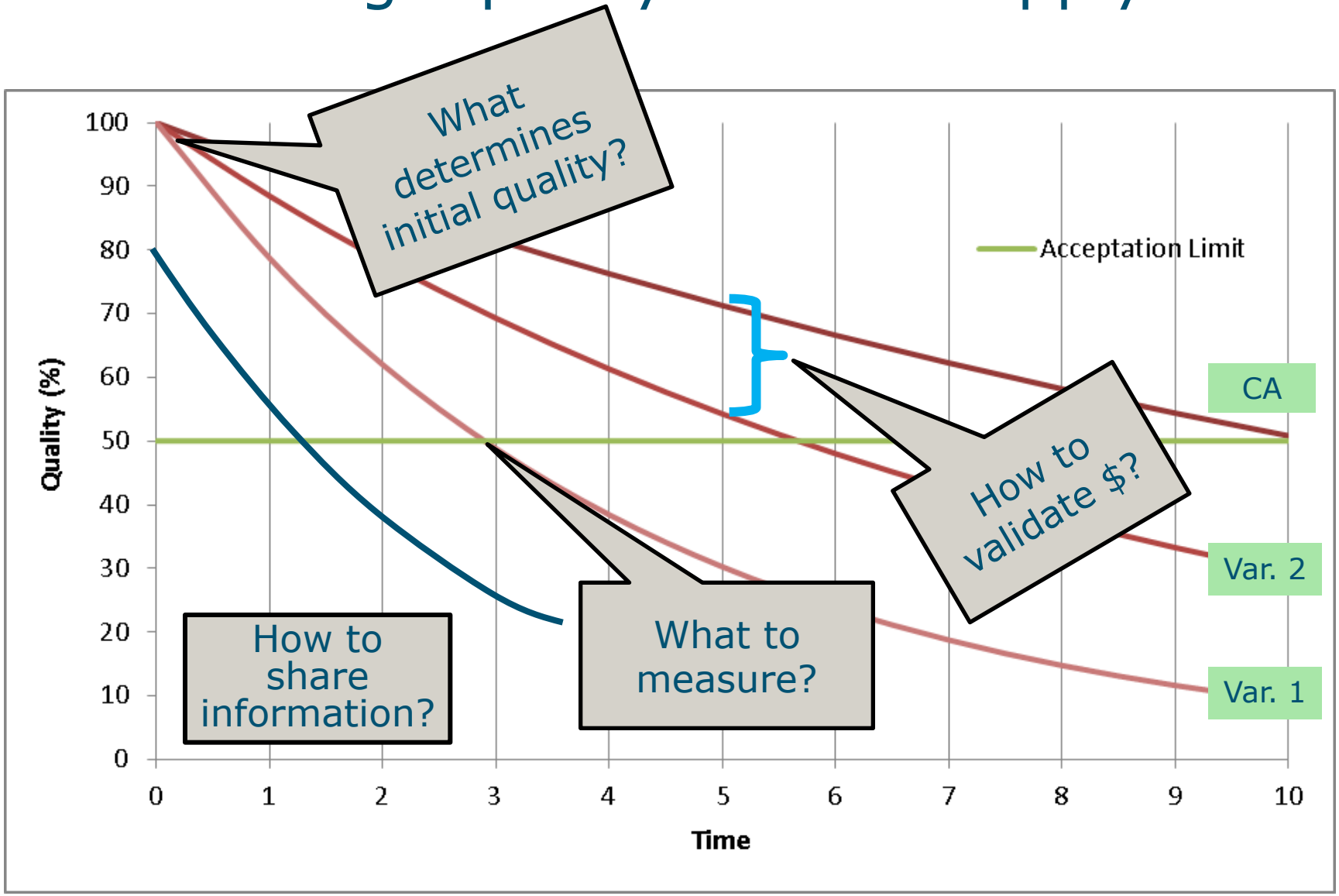
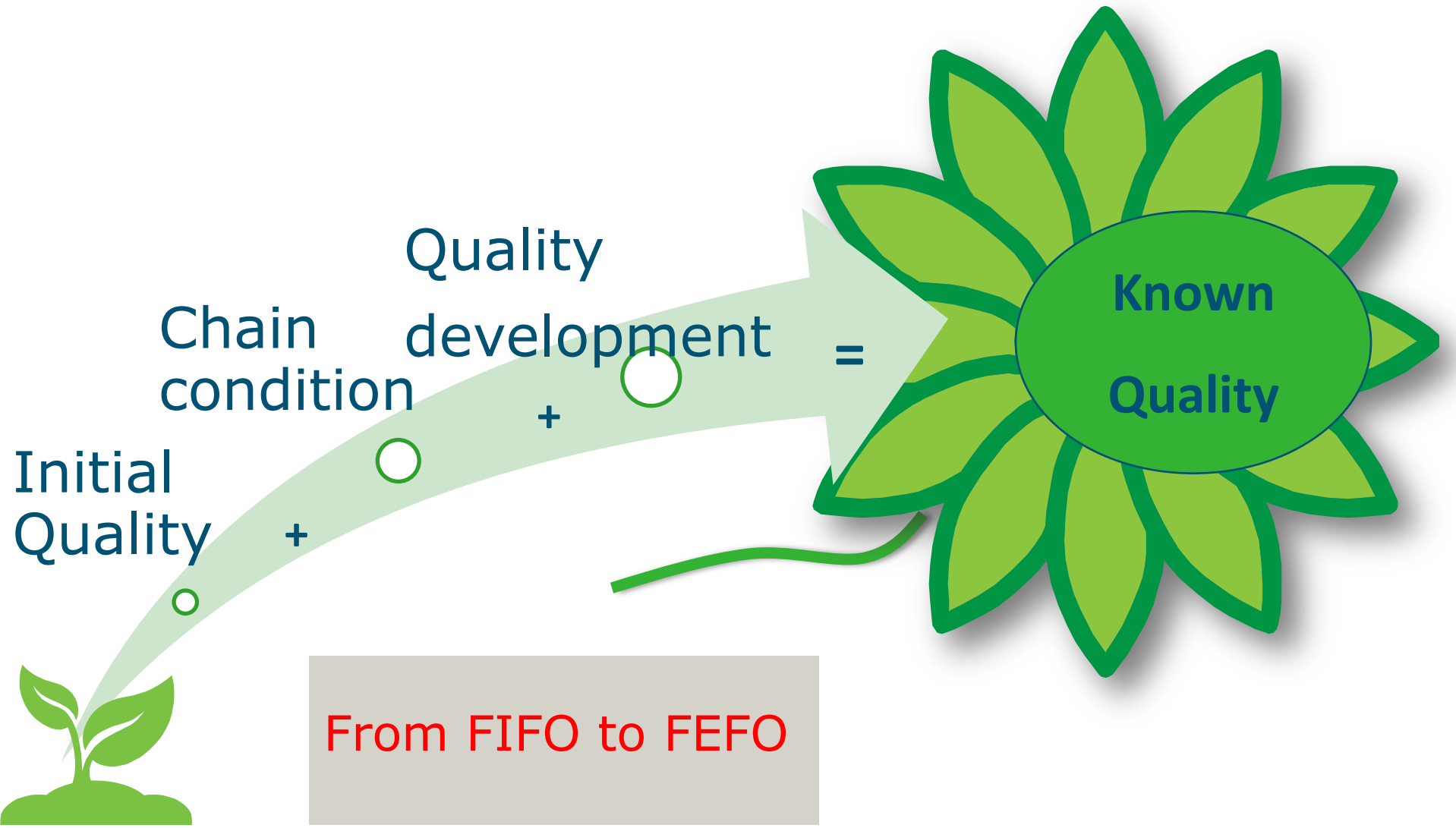
How to manage quality in fresh supply chains

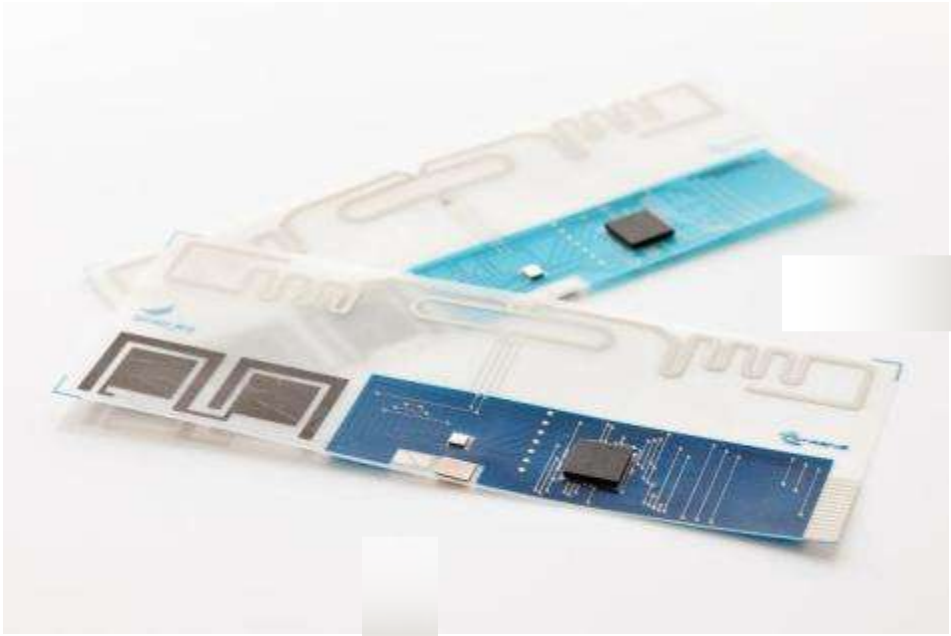


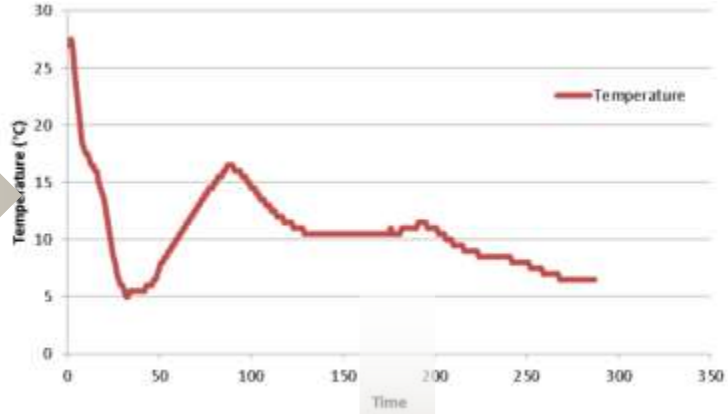
The FBR smart chain concept



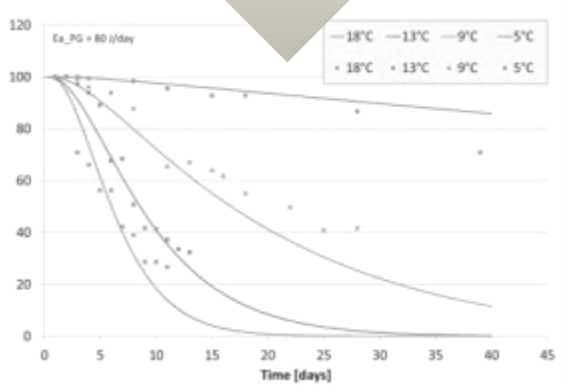
From FIFO to FEFO

Use of novel Technology (active RFID)





+ ID related information!
- Cultivar
- Grower
- Batch
- Brix, DM, F, Etc.



Q-models

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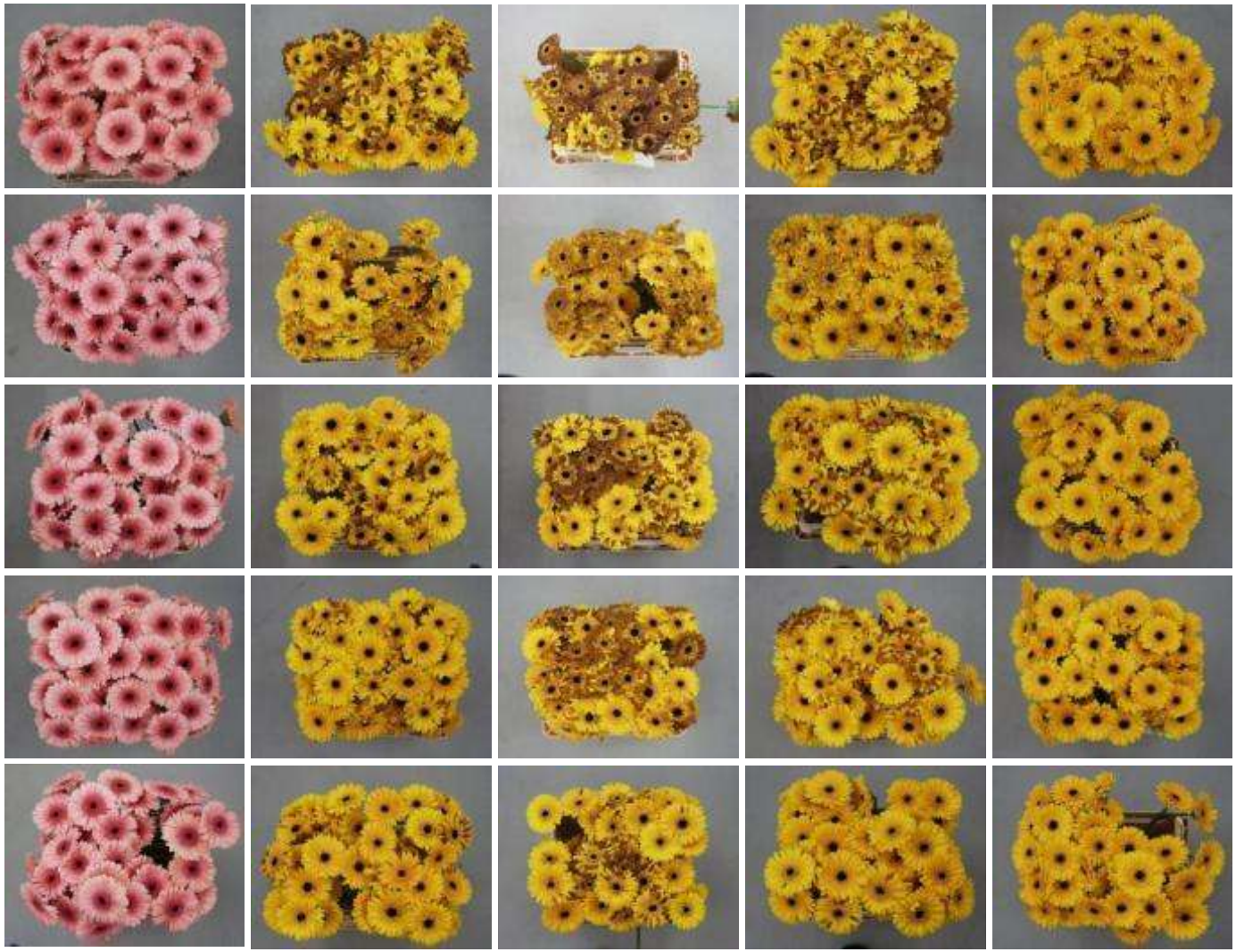
Gerbera example for visualisation



Improved keepability of fresh cut salads: successful conv. product

Packaging & optimal logistics key factors

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Postharvest side stream: recycling of plastic packaging materials (policy support: industry & government)

Fresh chain solutions by FBR

- Improved long term storage facilities: CA; ULO; DCS
- Transport protocols: specific for every transport modality
- Pre-cooling systems: process param. & package design
- Quality control systems, analysing methods, biomarkers
- Closed cold chain: monitoring systems (RFID)-> FEFO!
- Ripening control: marketable ready-to-eat, tasty products

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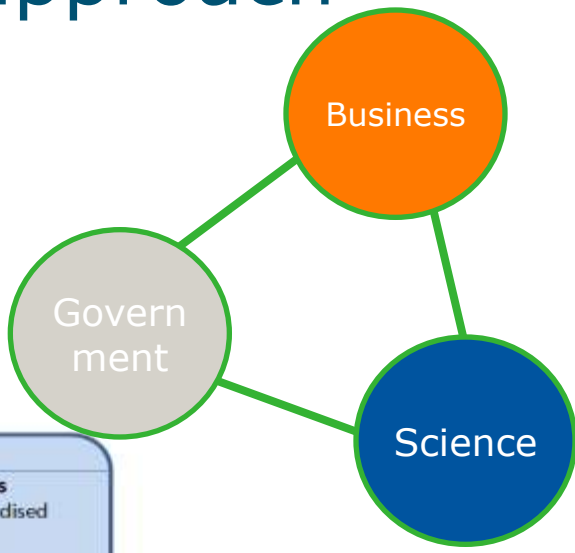
Food waste: a joint European approach

FUSIONS will enable, encourage, engage and support key actors across Europe in delivering a 50% reduction in food waste and a 20% reduction in the food chains resource inputs by 2020.



ESTABLISH

WP1 Reliable data and information sources

- Establish, develop, test and describe standardised quantification and reporting methodologies
- Comprehensive map existing trends
- Criteria for environmental and socio-economic impact
- Quantification manual and assess EU27 food waste

ENABLE

WP3 Policy recommendations:

- Map legislation and policies
- Identify measures & policy evaluation framework
- Design guidelines & recommendations

EXCHANGE

WP2 Multi-Stakeholder Platform

- Establish European Multi-stakeholder Platform
- Organise European and regional conferences and interactive meetings
- Organise feedback and consensus building process

EXEMPLIFY

WP4 Feasibility studies

- Identify initiatives and best practices
- Invite , co-design initiatives & evaluate
- Execute, monitor and evaluate feasibility studies
- Encourage additional pilot activities

ENGAGE

WP5 Dissemination:

- Share key deliverables through range of channels
- Organise events, campaigns and cooperate with external parties to create maximum impact
- Raise awareness , extend the ambassador network and provide tools & guides to support action

FUSIONS

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SEVENTH FRAMEWORK PROGRAMME

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MFC = concept dealing with urbanization, growing purchasing power and rural decline

A solution for Beijing

Safe food production system with COFCO

Challenge

Secure effective and safe food production and distribution in metropoles i.e. Beijing

Solution

Combine all Wageningen UR disciplines to come to one integrated advise

Food Park for sustainable, effective use of resources combined to safely provide food

Result

Blueprint of a Beijing food park respecting local constraints

Sustainable food production close to metropoles to adapt to urbanisation

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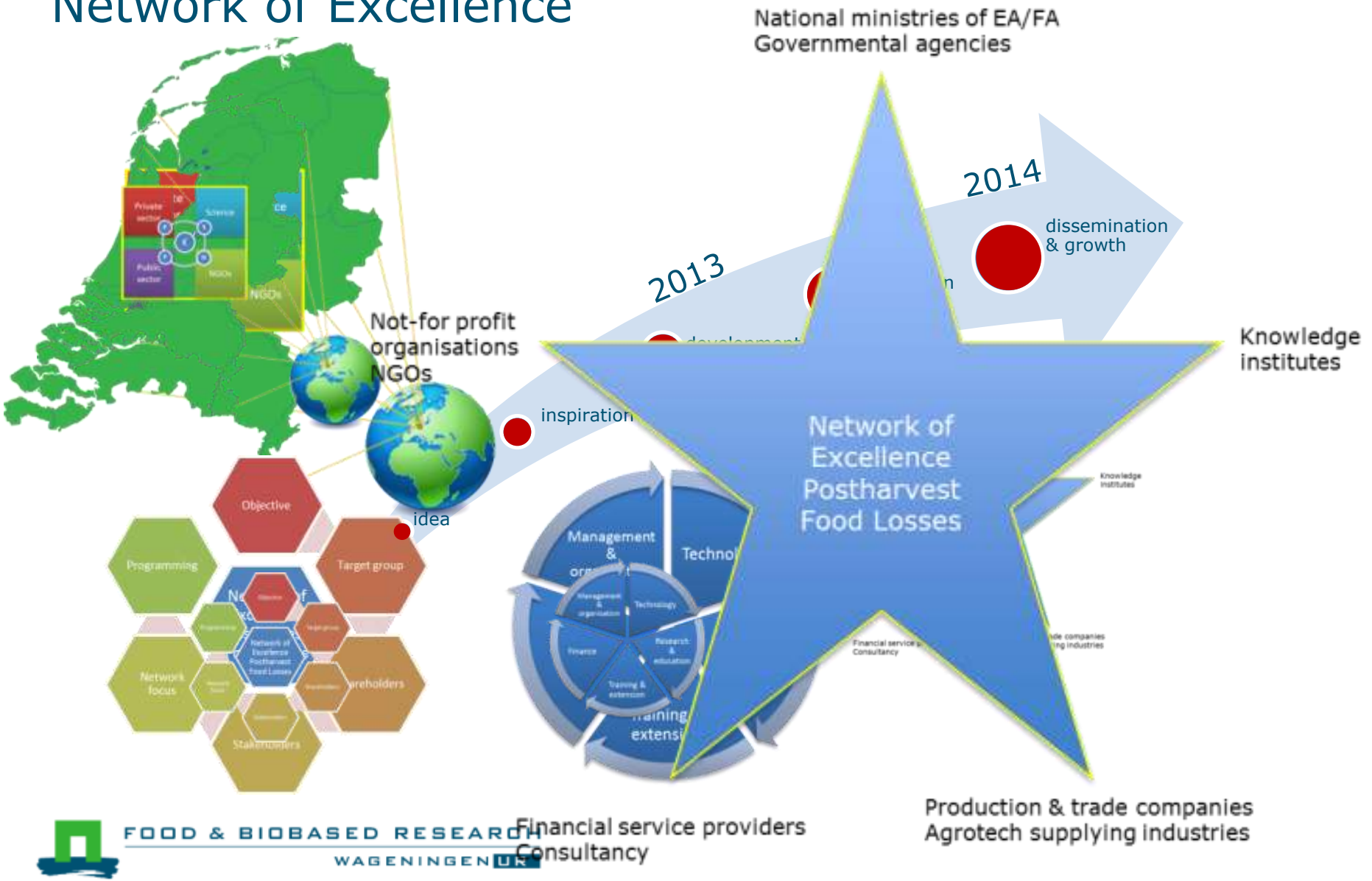
Reduction of postharvest food losses

Network of Excellence



Step-by-step approach to get to a CoE

- Start with a modern media based community: NoE
  - use of www-options (webinars), create platforms, moderator

- Train & Educate: post-harvest technology/physiology
  - Train-the-trainer; workshops at location; trainees at WUR
- Fund raising for establishing a CoE
  - Training, education ánd research combined: one location!
- Collaborate with agri-businesses & govern. & universities
  - Set up industry oriented post-harvest programs: chain approach

Support of Wageningen UR -> CoE

- CoE = long lead time before start
  - Feasibility - planning - fund raising – building – organisation = endurance
  - Narrow the time gap:
    - Use a mobile/floating lab (MFL) from FBR
    - MFL: idea!
    - Next: bucase-blueprint-design-realisation
    - Industry (makers and users): very interested
- Exchange of experimental design
  - Data + data-processing + publications
- WUR certification!!!

All this for the benefit of the consumer

- Year-round supply
- Safe food
- Excellent quality
- Tasty
- High nutritional value
- Not wasted
- Available
- Sustainable