Agri-Supply Chain Management

Toine Timmermans  
Wageningen UR  
Quality in Chains  
toine.timmermans@wur.nl

Agenda

- Introduction
- Developments & Consumer Trends in Europe
- Opportunities for export of Asian Fruits
- Post-harvest Technology
- Examples of Integrated Projects
- Conclusions
- Discussion
Food Safety: just a few words

EU Food Safety is Complex (GAP, Codex, General Food Law, Haccp, etc.), Reports of Exceedance of Maximum Residue Levels (MRLs) for pesticide residues in products from Thailand. Structural attention is needed!

Quality management as systems innovation

• From licence to produce towards licence to deliver

• From retail backwards quality management is forced upon every single link in the chain.

• Autonomous control in Control upon control system
Development of relationships

Producer driven

Retailer driven

Future

Co-makership: product development (global)

Retailer to farmer supply chain efficiency (continent)

Middleman (country)

Farmer to store (region)

Farmer sells (village)

Underdeveloped 3rd world country

Developing country

Developed country

Consumer driven

Choice: Market strategy

Produce as raw material supplier?

Produce by a market-oriented, demand driven strategy?

Optimal, cheap production location

International trade of raw materials

Key relationships with secondary processors

Cheap raw materials???

OR

Market-/product development

Category management

Key customer relationships

Optimal supply to customer/consumer

Market research and intelligence

Location close to demand
Power in the agrifood chain in Europe

Supply Chain Funnel Europe, J.W. Grievenk

- Retail and buyers organizations center of power & control in the chain.
- Processing industry and trading organizations leading in product innovation
- Breeding companies will gain influence (forward integration)

Trend in retail: “From dryware to fresh”
Market trends in food (Europe)

- **Cheap**
- **Pleasure**
- **Health**
- **Easy-to-use**
- **Consciousness**
- **on-the-Go**

Development of consumer trends

*Top 20 of most successful food introductions in the Netherlands*

Source: IRI, Zaltbommel
**Fruit consumption**

- Fruit consumption levels are low (and tend not to rise)
- Shares of organic & fair trade increase
- Fresh cut fruit salads & healthy/”easy to use” grows
- Most successful (processed) fruit products: branding & marketing
Opportunities for export of Asian Fruits

- Sustainability & Consciousness
  - Max Havelaar/Fair Trade
  - Organic
- Fruits are healthy
- Local taste & local supply chain organization
- Added value activities (pre-processing, product innovation, ready to eat concepts, packaging, traceability, chain certificates)
- Scale of operations, compliance with food-safety standards and pricing always will be important
- Crucial will be the ability to build partnership relations

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Post-harvest Technology

- Long term Storage
- Packaging Technology
- Cold Chain Management
- Energy efficient transport
- Quality Measurement

- Integral Logistic Solutions
  Session IV: Safety & Quality Assurance
  Fresh Logistics

Research facilities
SmartFresh:
An expanding new technology in storage and agro-distribution

Examples of current use:
- apple storage (Europe, USA, New-Zealand, China)
- avocado transport (South Africa)
- banana shelf-life (USA)
- kiwi (Chile)
- tomatoes (South-Europe)
- ornamentals (USA)

SmartFresh = 1-MCP

- Damp
- Treatment during 24 hours
- At room temperature: 10-14 days effect
- At low temperature: long-term effect
- 1 treatment after harvest in storage room
Packaging of perishables

- Complex mix of demands and wishes
  - Distinctive/attractive: shape, prints, material,
  - Protective: mechanically, biologically
  - Food safety: cooling; hygiene (anti-microbial)
  - Legislation: (GFL) - tracing and tracking
  - Logistics: modular/stackable/ machineable
  - Sustainable: low weight/recyclable/compostable

- Cost effective !!!

Special solid board box for bell peppers

Modified Atmosphere Packaging = MAP

Air freight replaced by sea freight
Quama = Equilibrium MAP

Effect MAP on fruits and vegetables:

- Slows down ripening process
- \( \text{CO}_2 \): Anti microbial action
- Low \( \text{O}_2 \) minimizes enzymatic discoloration

Optimal eq. gas conc. is specific for each product

Strawberry and Quama: storage 8°C
Quality effect: no SO2 pad included

Equilibrium ma-packaging: consumerpacks

MA-packaging concept for a range of fruits and vegetables:

- The natural respiration builds up a protective atmosphere
- Matching of respiration and gas permeability of the packaging
Modified Atmosphere Packaging

- MAP concept is beneficial in various distribution chains
- Packaging development needs a chain perspective
- Wageningen-UR step-by-step method: from idea, laboratory test to real world implementation
- Knowledge of quality behavior of fresh products in distribution chains is key issue

RFID\textsuperscript{+} - Datachat as futuristic integrated concept

**RFID\textsuperscript{+}**
This is RFID with extra information about fresh products, e.g. shelf life

**Aim**
To reduce shrinkage and OOS by better stock control

- Name
- Location
- How are you?

- ID (barcode)
- Location
- Shelf life
**QUEST: Energy reduction in reefer transport**

**Modeling toolbox**

- Network model
- Distributed model
Controlled avocado ripening

Goal:
To ripen avocados on demand in automated system

Task:
Develop an avocado ripening controller that manipulates storage temperature of avocados such that the given desired firmness is reached

Avocado Ripening Model

The Avocado Ripening Controller needs
- to estimate the firmness from ethylene production
- to know the expected firmness path at a chosen temperature

Task:
Develop an Avocado Ripening Model that describes:
the ethylene production and firmness of ripening avocados as a function of time and temperature
Product research for avocado ripening model

8000 ethylene production measurements
7000 colour measurements
7000 firmness measurements
4000 avocados tested

Cold Chain Management

Some Results of Keepability & Cooling project for Dutch commodities:

- Is cooling necessary? YES
- Is condensation bad? NO, if the quality is good
- Is slower cooling possible? YES
- Optimal temperature is the best: cooling always better
- Product with bad (initial) quality cannot be “rescued” with cooling
- After harvesting up to 48 hours to achieve optimal temperature
- Temperature changes can be tolerated
- Condensation with bad product shows product specific effects
Quality Measurement

Biochem. Analysis
Gas Analysis
Computer imaging
Firmness
Colour
Acid titration
Quality Measurement: Initial post-harvest quality

Present
• Measuring effects of biological processes
  – Secondary signal
  – Too late for acting

Using genomics
• Measuring initiation of cellular processes
  – indication of physiological status
  – early warning -> mRNA
**Translate genomics info into quality test**

- Combine selected genes into quality sensor
- Optimal test format depends on
  - test environment
  - customer demands
  - nr of genes needed

**Example: Storage quality apples**

- Apples are stored for months
- Sometimes taste/health profile deteriorates
- AFSG developed test for early prediction of mealiness in Cox apples

Batch can be sold before quality decay starts
Role of modeling & simulation

Robust Network design using the Supply Chain Optimiser

Simulation package
Chain-wide
Quality progress
Chain - product - combinations

A mirror to reality
Optimum chain design
To judge situations before they are implemented in practice

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FRUITFUL
Improved information exchange fruit supply chain South Africa -Netherlands

Network approach
standardisation of codes
harvest estimates
E-vessel booking
improved data capturing
vessel planning
E-bill of lading
exchange E-certificate
arrival notification trucks
time temperature readings
E-outrturn report
optimised collection

Grower → Pack house → Cold store → Terminal → Shipping line → Terminal → Importer → Retailer
Chain in pictures

Conclusion

- Better understanding of each others functions within the chain
- First steps have been made towards more integrated information exchange
- Both knowledge institutes and industry partners created a platform for further improvements
Full project title
Increasing Fruit consumption through a transdisciplinary approach leading to high quality produce from environmentally safe sustainable methods.

62 partners, 200 research staff, 16 countries, budget 21.1 MEuro, runs from 2006 to 2010.

www.isafruit.org
www.isafruit.eu
Conclusions & Recommendations (1)

- There are opportunities to increase export to the European market; especially with a demand driven strategy.
- Insight in the Market & Consumer trends is essential.
- Food-safety, price and efficiency are basic requirements.
- Added value makes the difference (robustness, innovation, local processing, chain certification and branding).
- Partnerships in the chain are crucial.

Conclusions & Recommendations (2)

- Use the latest developments in post harvest R&D: technology, scenario analysis, protocols, quality certification.
- Organize international arenas for interaction with stakeholders: What is the level of ambition and is there a corresponding budget?
- Essential role of private sector and entrepreneurs: Technology is available, it is setting out a strategy, invest & organize.
Thanks you for your attention!

Questions?