

# Packaging technology solutions for chilled meals

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# Double fresh dilemma

- Optimal gas mixtures for fresh meat and fish cause increased vegetable spoiling
  - *e.g.* 60% O<sub>2</sub>, 30% CO<sub>2</sub>, 10% N<sub>2</sub>
    - Increased respiration
    - Carbon dioxide damage
- Optimal gas mixtures for fresh vegetables cause increased meat and fish spoiling
  - *e.g.* 5% O<sub>2</sub>, 15% CO<sub>2</sub>, 80% N<sub>2</sub>
    - Discoloration
    - Microbial growth

# Double fresh meals

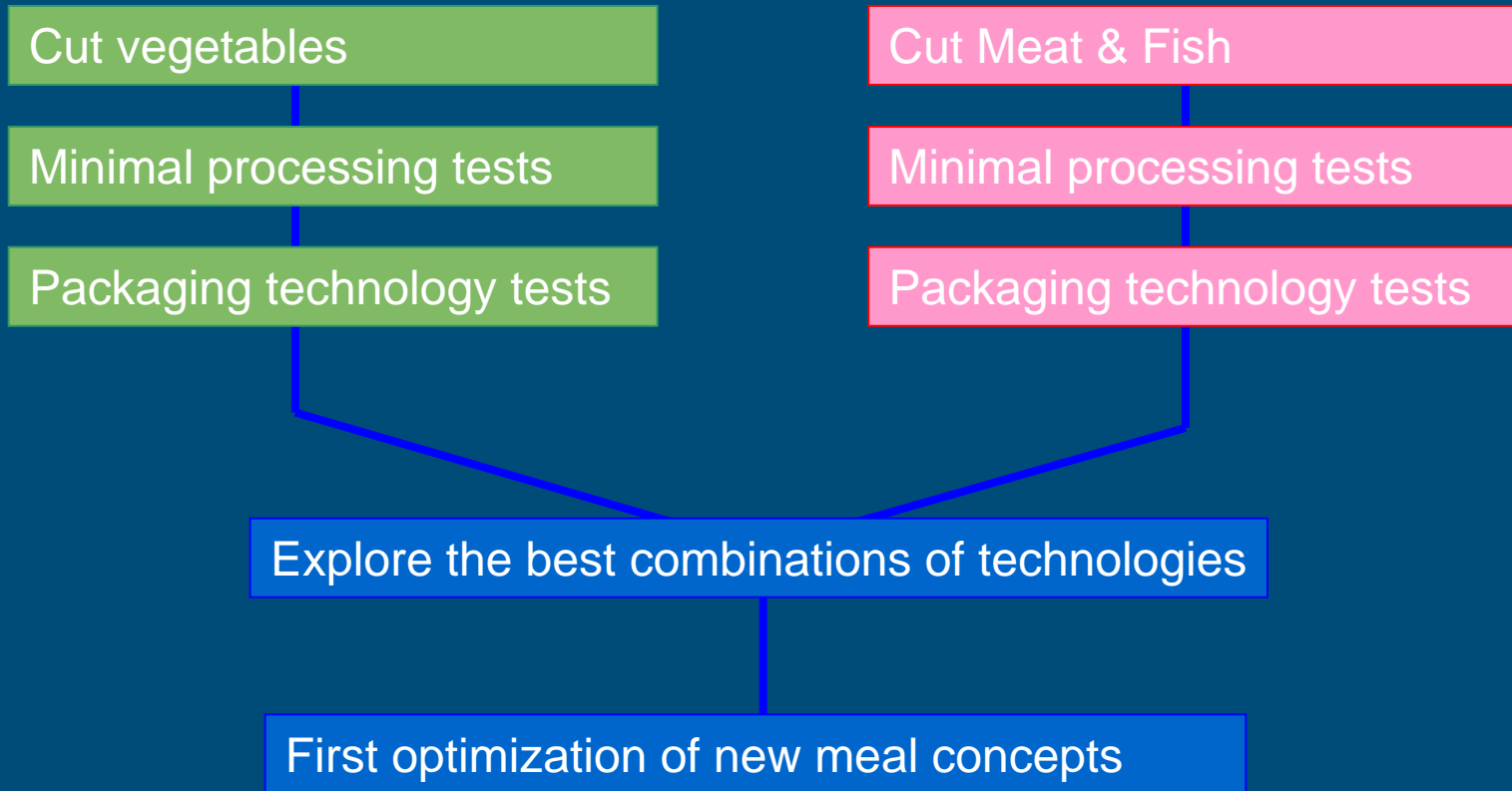
- Technological exploration double fresh meals



- To find **innovative technological methods** to extend the shelf life of double fresh meals from the current **5** → **9-14 days** without impairing **freshness & quality**



# ~2 years of work in Double fresh project



# Hard lessons

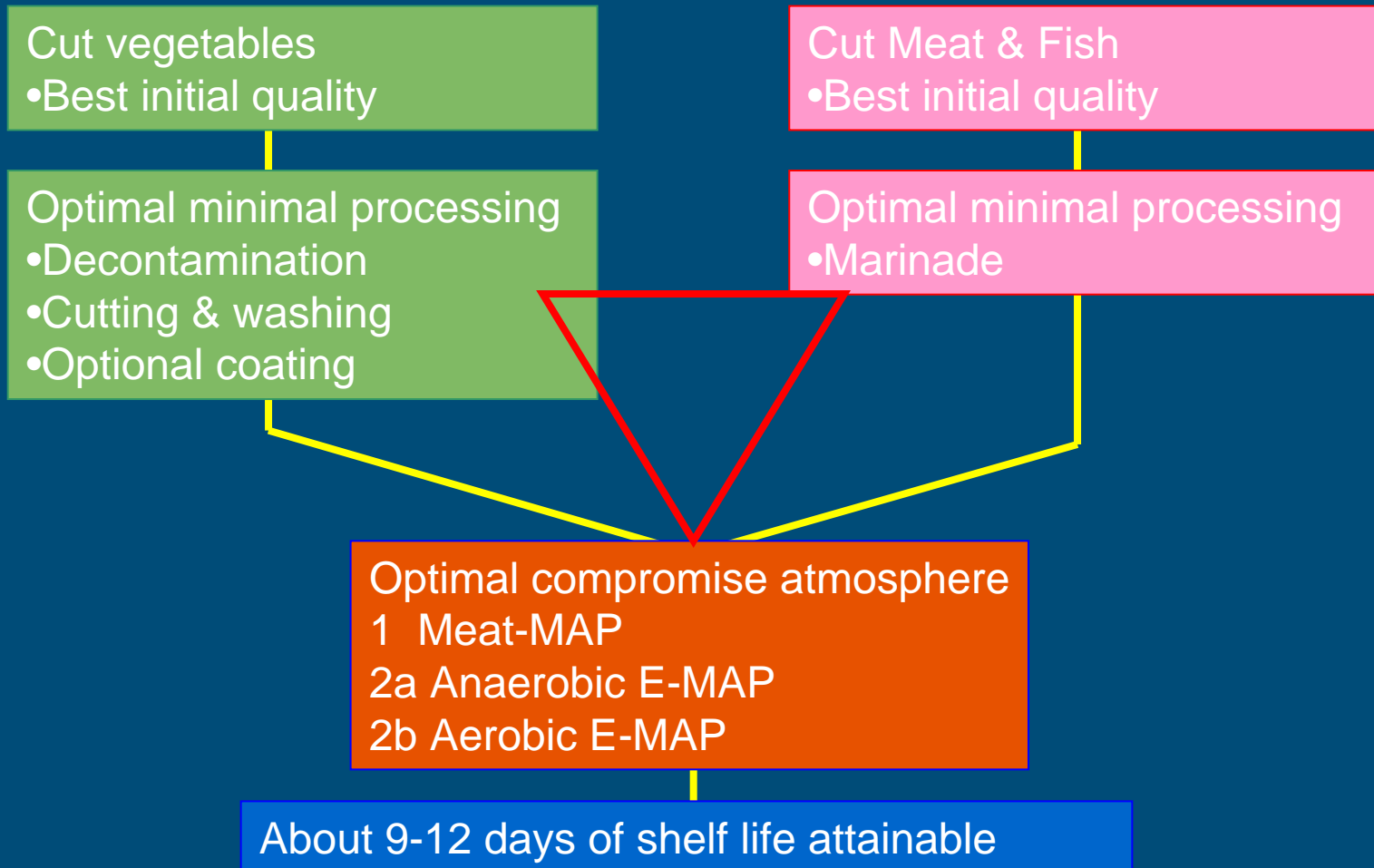
- Optimal raw materials!
  - Best quality and little variation
- For the cut vegetables:
  - Best supplier, decontamination method and coating
- For the best meat :
  - Best marinade, lowest initial count
- For best fish:
  - Aqua-cultured from reliably source and best marinade

# Two main solutions

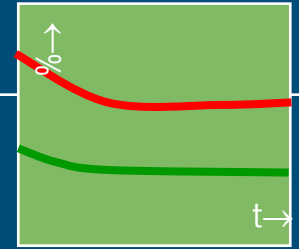
1. Meat / fish leads with slow respiring or blanched vegetables
  - Not always really fresh, but can work
2. Vegetable mixture leads and meat/fish is protected by marinade
  - Truly fresh and much more flexibility
    - Anaerobic E-MAP
    - Aerobic E-MAP



# Schematic result



# 1 Meat-MAP solution



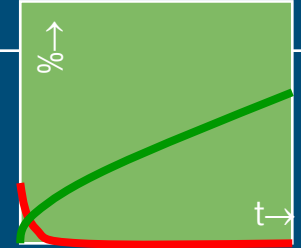
- *e.g.* 60% O<sub>2</sub>, 30% CO<sub>2</sub> present in headspace
  - Requires a standard barrier packages
- Limited fresh vegetables can be used
  - Cut cabbage
- Blanching is required for most other vegetables
  - Blanching process is critical
- Suitable for all types of meat and fish



# General approach new generation DF meals

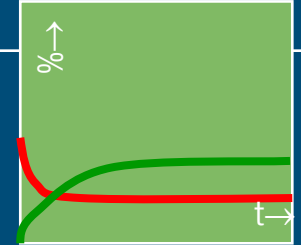
1. Decide on vegetable mix
  - Marketing and technological possibilities
2. Optimise packaging for vegetable mix
  - Optimise gas exchange
    - Type of film and # of perforations (OTR, CTR)
    - Initial gas flush
3. Marinade for meat / fish component
  - Additional protection against microbial growth and/or
  - Additional protection against discoloration

## 2a Anaerobic E-MAP solution



- Nett 0% oxygen present in headspace
  - Restricted O<sub>2</sub> influx is directly consumed by vegetables
  - CO<sub>2</sub> accumulates and gives late protection to meat
    - Requires well-designed packages for specific vegetable mixtures
  
- Suited for limited amount of cut vegetables
  - Onions, Courgette, Lettuce, Endive, Chicory, Egg plant...
  
- Suitable for whiter meats and fish
  - Chicken, Cod, Pollack, etc. not beef (purple)

## 2b E-MAP solution



- Interaction between vegetable respiration and package permeability yields an equilibrium
- Suitable for a larger range of vegetables:
  - Bell-pepper, Broccoli, Spinach...
- Suitable for whiter meats and fish
  - Protective marinade against discoloration, purge and microbial growth

# Examples



# Home preparation technology

- Most common:

- Microwave steam-cooking
- Melt-valve controls the internal steam pressure to about +0.3 bar
- Suited for most fresh foods, but not all (*e.g.* wraps)



- More luxurious

- Ovenable Alu-trays and stoneware



- More precise heating

- Culidish trays with dedicated microwave energy reflectors



Culidish

**Double Fresh**  
**Double Fresh**

# Freshly cooked meals

- Many fresh, raw meals are not appealing
- Essence:
  - Minimizing heat-load during cooking and post-pasteurisation



Cooking



Packing



Post-pasteurisation



# Two strategies

- Avoid post-pasteurisation
  - process optimisation and
  - packaging technologies
- Milder post-pasteurisation technologies
  - HPP
  - RF





# Avoiding post-pasteurisation

- Hot filling the meal, using:
  - Freshly thermoformed trays
  - Decontaminated top-film
  - Applying gas packaging / oxygen absorbers while hot
  - Filling and sealing in a special clean environment
- Requires dedicated packaging equipment
- Preliminary results show it can give good results
  - Tastier and better looking meals





# Milder post-pasteurisation

## ■ HPP

- Good scientific results
- Implementation
  - Relative large investment
  - Practical packaging issues still need to be resolved



## ■ Radio-Frequent heating

- Fast heating and cooling possible
- Difficult to get an even temperature distribution with particulate foods (read meals)



# Thank you

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