

THE FRUITS AND VEGETABLES INDUSTRY SERIES

23 May 2022

Session 3 – Technology innovations for fruit and vegetables quality control





Digitalization of the supply chain of fruit and vegetables

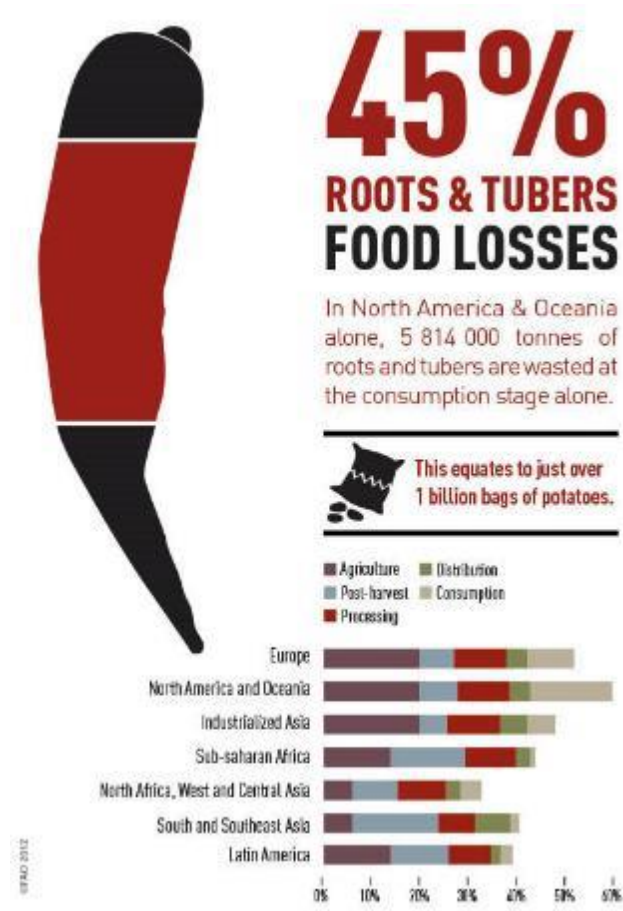
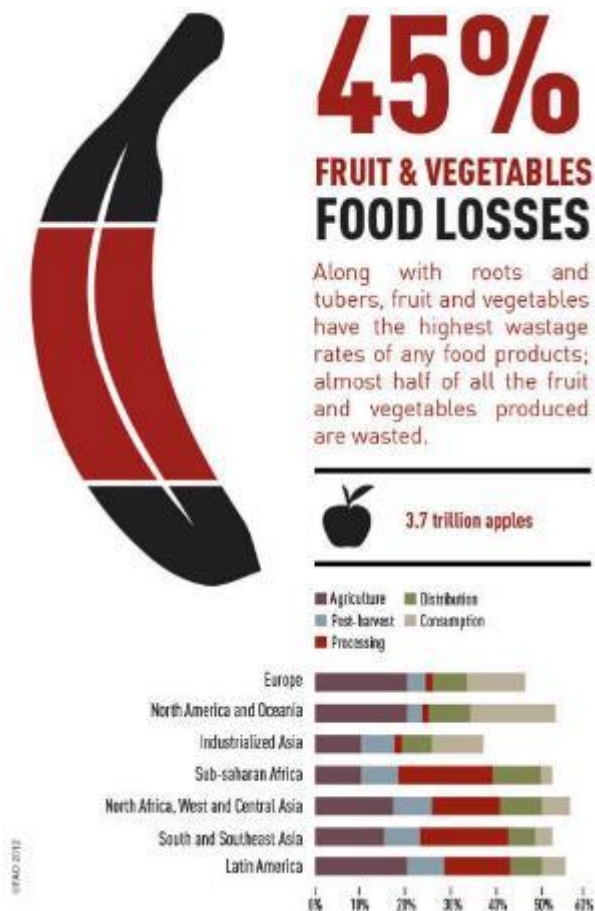
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Co-funded by the
European Union



Food waste



Source: FAO 2012

Shelf life monitoring: challenges

First in, first out
(FIFO)

First expired, first out
(FEFO)

Batch 1
Date of arrival: 13-Dec
Best before: 22-Dec

Batch 1
Date of arrival: **13-Dec**
Best before: 22-Dec

Batch 2
Date of arrival: 14-Dec
Best before: **20-Dec**

Batch 2
Date of arrival: 14-Dec
Best before: 20-Dec

Batch 2
Date of arrival: **14-Dec**
Best before: 20-Dec

Batch 3
Date of arrival: 15-Dec
Best before: **21-Dec**

Batch 3
Date of arrival: 15-Dec
Best before: 21-Dec

Batch 3
Date of arrival: **15-Dec**
Best before: 21-Dec

Batch 1
Date of arrival: 13-Dec
Best before: **22-Dec**

How to determine
shelf life of fresh
fruit & vegetables?

Digital twins

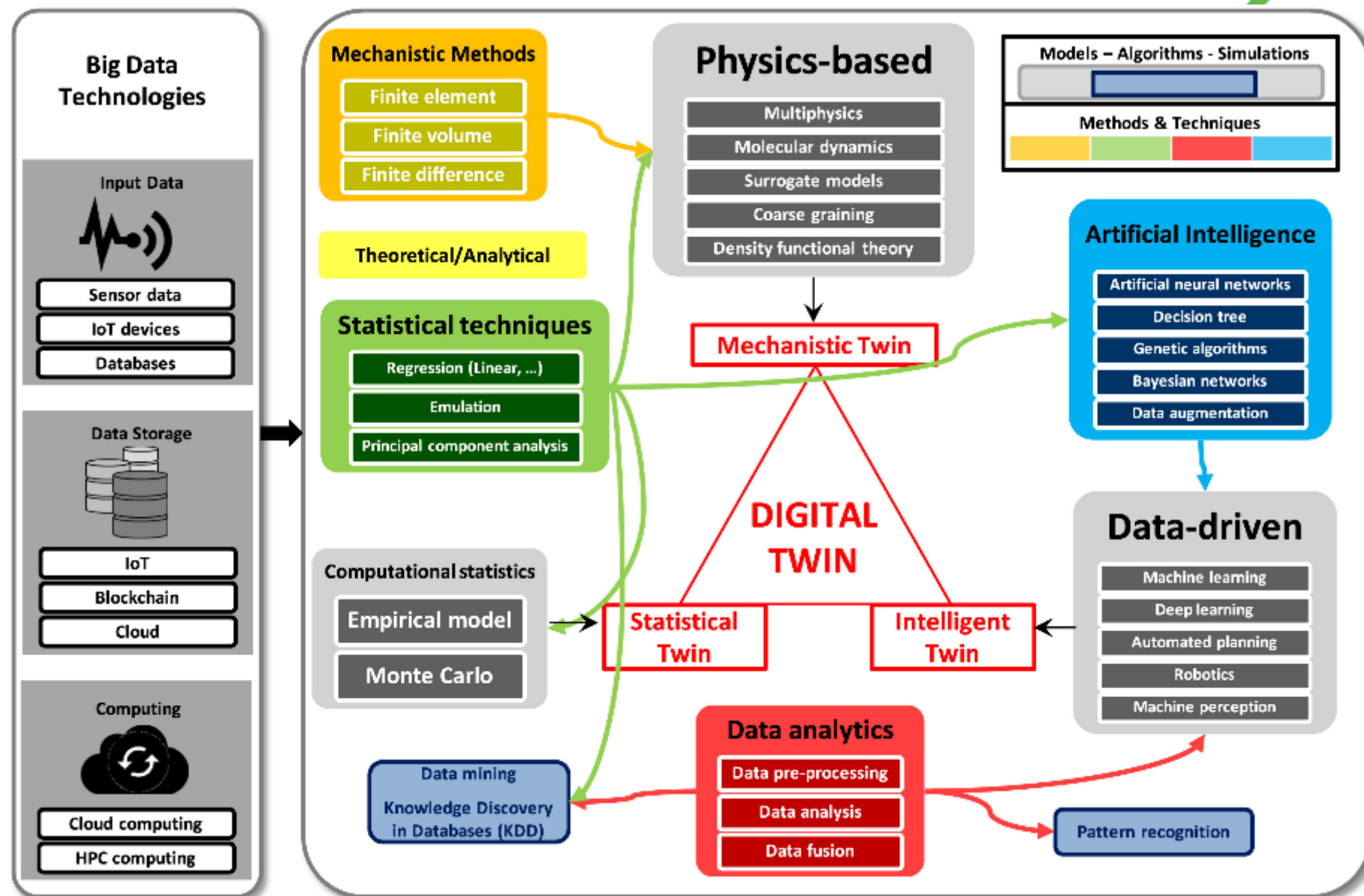
- Other names: digital shadow/mirror, virtual avatar/phantom, or synchronized virtual prototype.
- Definition (according to Defraeye et al., 2021):
 - Digital representation of a real product
 - Contains information about properties and geometrical components
 - Simulates accurately all relevant processes and reactions throughout the life cycle of the product
 - Uses as an input real data from sensors (preferably continuous and in real-time).

Open access!



Source: <https://doi.org/10.1016/j.tifs.2021.01.025>

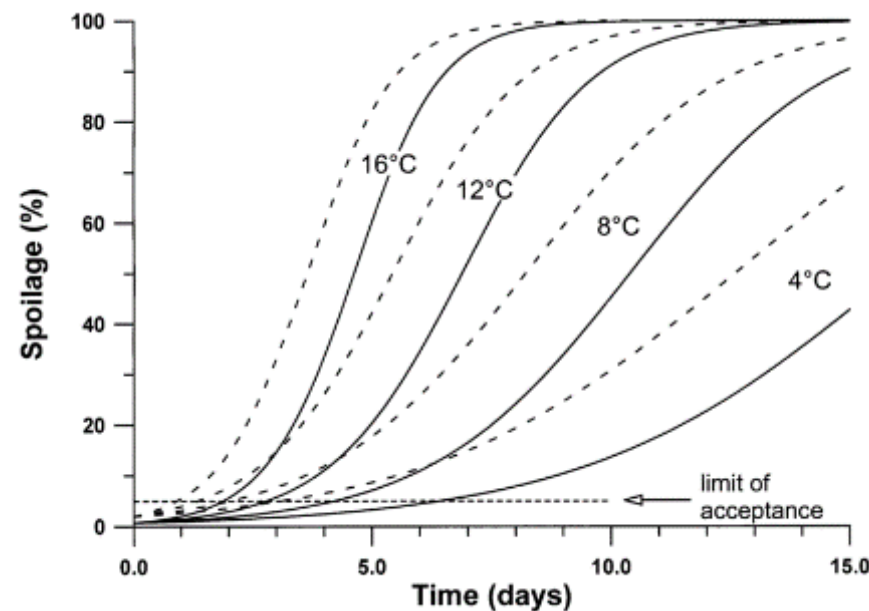
Digital twins



Sources:
<https://doi.org/10.1016/j.tifs.2021.01.025>

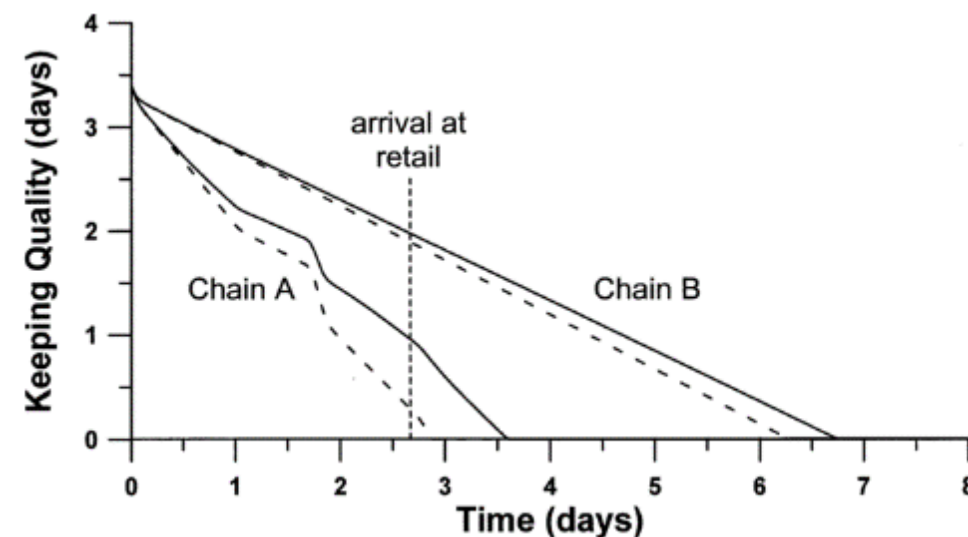
Generic shelf-life model

- Simple
- Generic
- Multiple Quality aspects
- Quality limits
- Multiple factors



$$k_i = k_{i,\text{ref}} e^{\frac{E_{a,i}}{R} \left(\frac{1}{T_{\text{ref}}} - \frac{1}{T} \right)}$$

Hertog et al. 1999-2014



Facts about the DigiFresh project

- EIT-FOOD innovation project
- Running 1. April 2021 – 31 December 2022
- Four partners, AU coordinator
- Co-funded by EIT-FOOD/European Union
- Builds on competences from academia & industry on postharvest storage, quality assessment, shelf life modelling, digitalization, food waste reduction, communication and dissemination.



The DigiFresh ambition

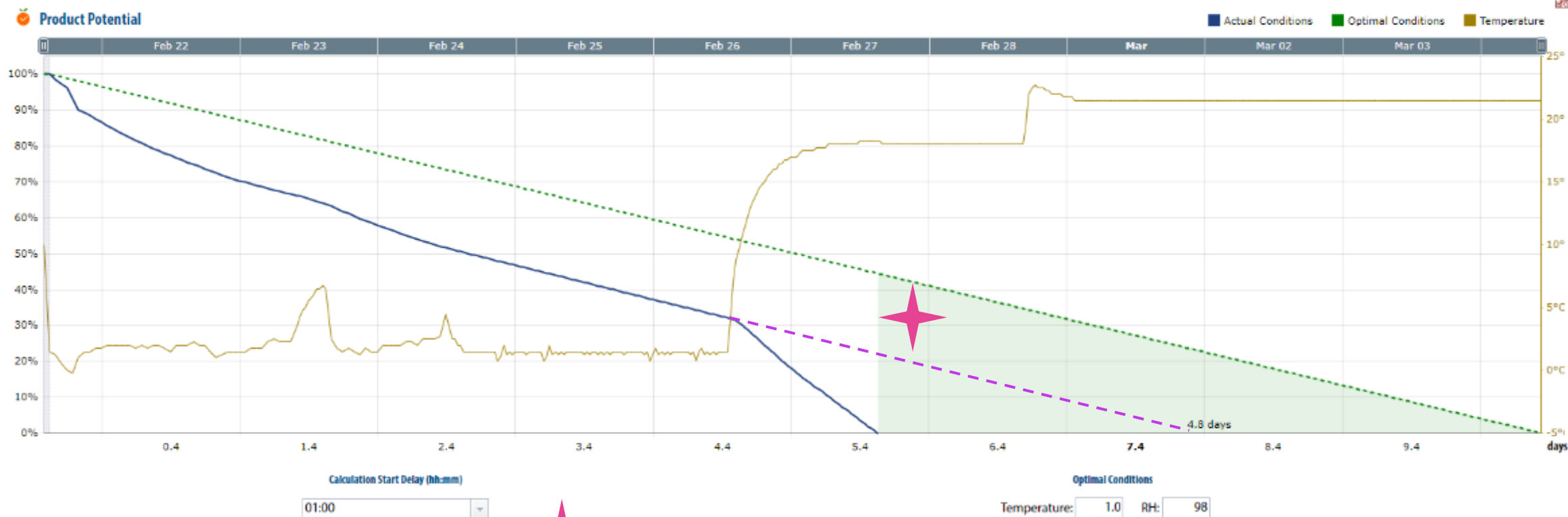
“... integrating existing commercial sensor technology and real time monitoring (T/RH) with smart digital twins,

.....

*to **translate storage conditions** in the supply chain into **remaining shelf life**”*

Outcomes of the DigiFresh project

Testing Strawberry Quality - Test 4



★ Quality lost due to rot on 27-Feb at 22:00 (7 h under predicted)



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THE FRUITS AND VEGETABLES INDUSTRY SERIES



The OECD-COLEACP Fruits and Vegetables Industry Series focuses on market access conditions and opportunities for the fruit and vegetable sector, especially for fruit and vegetables producers and exporters from ACP-countries. This activity is supported by the Fit For Market SPS programme, implemented by COLEACP within the Framework of Development Cooperation between the Organisation of African, Caribbean and Pacific States (OACPS) and the European Union.

Thank you



FRUIT AND VEGETABLES SCHEME

