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Traceability and Big Data applied to the agrifood chain

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Big data is a term for data sets that are so large or complex that traditional data processing application software is inadequate to deal with them. Challenges include capture, storage, analysis, data curation, search, sharing, transfer, visualization, querying, updating and information privacy. The term "big data" often refers simply to the use of predictive analytics, user behavior analytics, or certain other advanced data analytics methods that extract value from data, and seldom to a particular size of data set.

Applying Traceability and Big Data in the agrifood chain...

1. *in the "Lifecycles of the value chain":* Better measurement of the environmental footprint in the agri-food value chain
2. *in the "Smart monitoring of the value chain to improve the competitiveness in the agrifood sector":* Smart monitoring of the value chain to improve the competitiveness in the agrifood sector
3. *to "Incorporate consumer experience and of the various different operators of the food chain in decision-making processes":* Trend driven innovation and co-creation with consumers

1. Better measurement of environmental footprint

Main challenges for assessing environmental sustainability in the agrifood sector are :

- Complexity of food chains,
- Highly fragmented sector
- 90% of companies are SME's
- Large number of agents involved,
- Regional differences,
- Lack of agreed methodology
- Complexity of the current sustainability assessment tools - high data intensity, costs and expertise required.

Evaluating the environmental impact of products can lead to **great benefits** to the industries which, in most cases, can lead to **brand differentiation**.

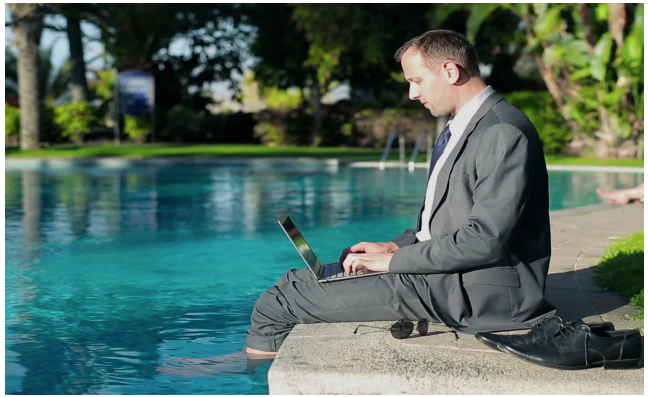
1. Better measurement of environmental footprint

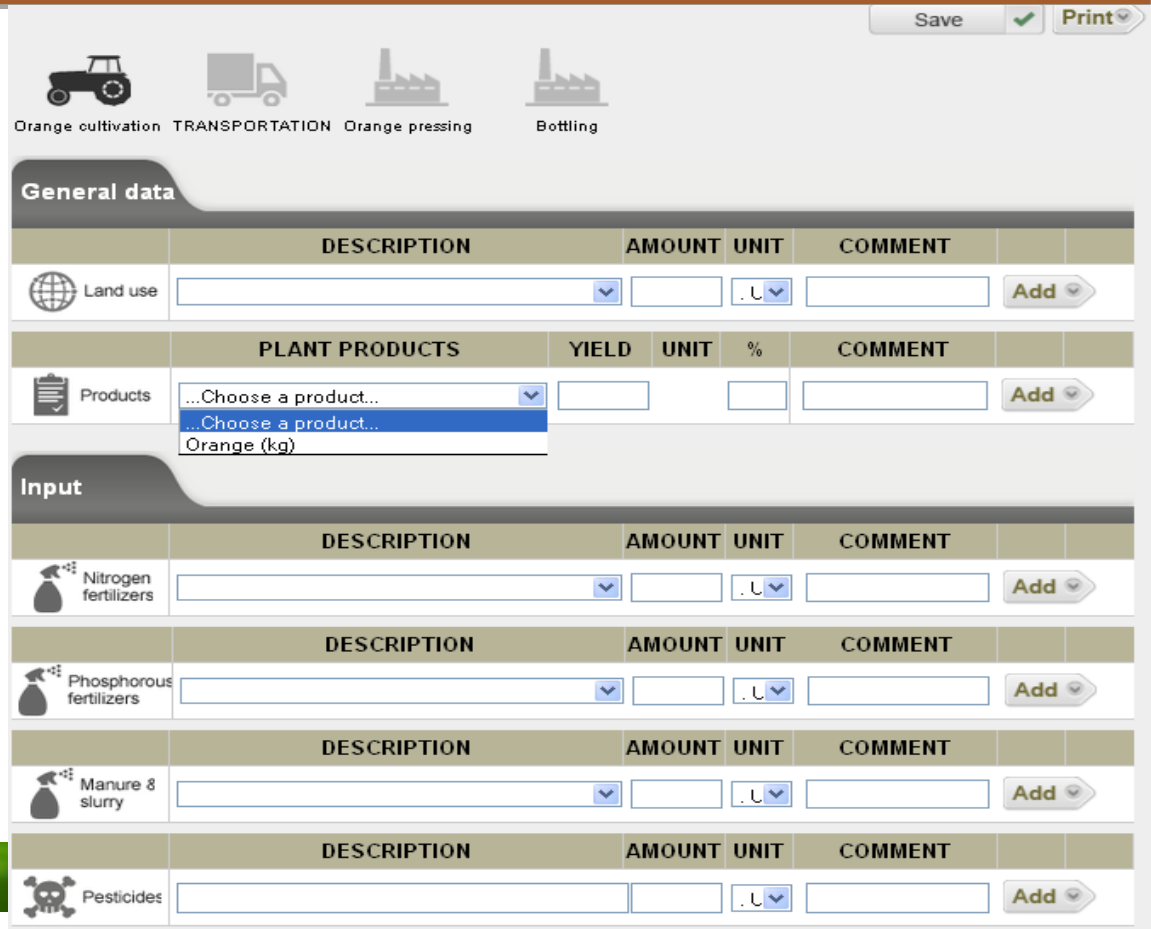
Result: **Harmonized system** for the assessment and reporting of the environmental impact of food products, including:

- Comprehensive and regionalized **system of data collection** to achieve comparable results;
- Standardized methodology for the environmental impact assessment
- A set of key **environmental performance indicators** (kepi)
- A **SENSE-Tool software** to measure environmental impact of products
- A system of B2B and B2C communication, and
- A **regulatory framework**

1. Better measurement of environmental footprint

Easy-to-use tool to introduce **real data** ON-LINE





2. Smart monitoring of the value chain to improve the competitiveness in the agrifood sector

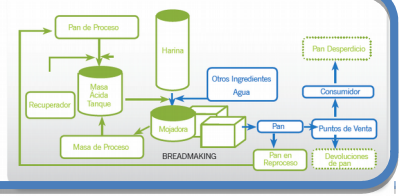
Increasing the profit margin of each product

Improving the production efficiency

Differentiating from competitors

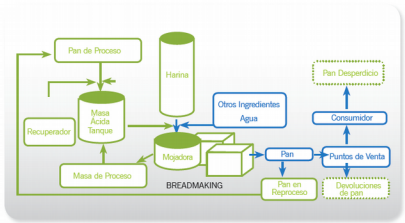
Quality standardization (homogeneous products)

Process Optimization



2. Process Analytical Technology (PAT) implementation

- A deep knowledge of the product and the manufacturing process:
  - **Critical Quality Attributes (CQA)**
  and
  - **Critical Process Parameters (CPP)**



- **Real time data** of the process and the product

- Real time **control critical parameters adjustment**

Non-destructive sensors are basic tools for PAT implementation

Multivariate analysis tools (chemometrics) for quality prediction, control models etc.

2. Non-destructive, ad-hoc monitoring solutions

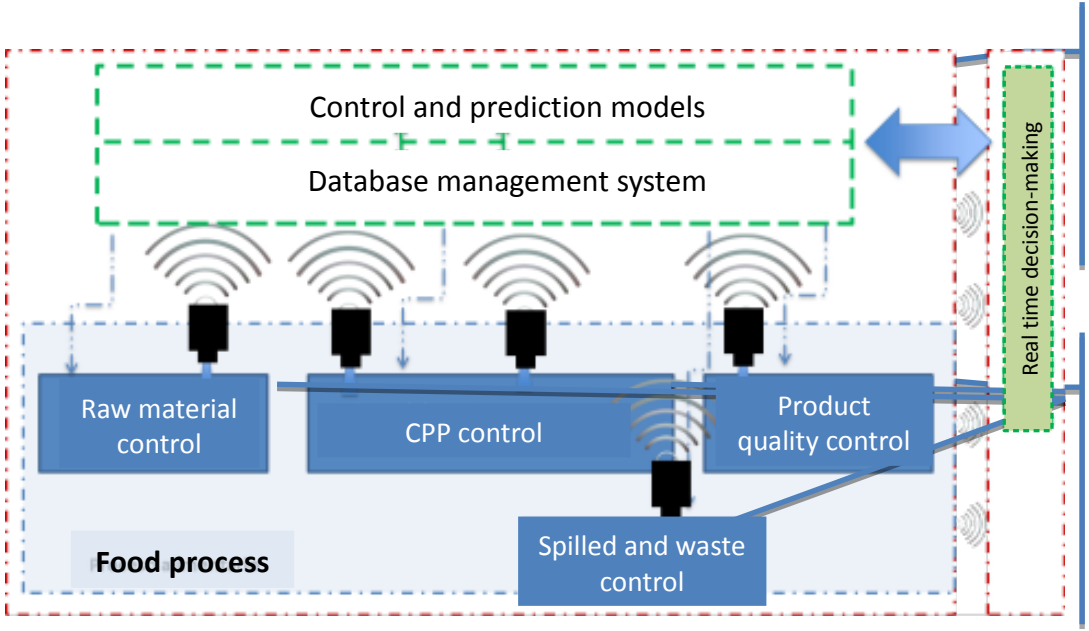
Ad-hoc

- **Type of food** (morphology, quality, shelf-life, processing, etc.)
- **Parameter to measure:** internal or external quality, ripeness, etc.
- **Measurement**: static or dynamic.
- Measurement area or sensor integration (time, place, etc.)

- Monitoring technique
- Sensor selection
- Measurement methodology definition
- Correlation and prediction models or algorithms

Technique	Sensor	Application
Image	Artificial vision	Size, shape, texture, external defects
	Hyperspectral	External and internal quality, quality evolution, contaminants
	OCT	External and internal quality, texture
	X-Ray and CT	Internal quality, foreign bodies
	MRI	Internal quality
Mechanic	Acoustic	Texture, ripeness, fruit internal quality
	Force	Texture
	Ultrasound	Internal quality
Spectroscopy	Vis	External quality
	NIR	Ripeness, quality, quality evolution, contaminants, etc.
	UV	

2. Intelligent monitoring solutions



Multivariate analysis tools

Multi-criteria predictive models to improving manufacturing processes

Non-destructive monitoring solutions, ad-hoc for different quality parameters

Multivariate analysis tools

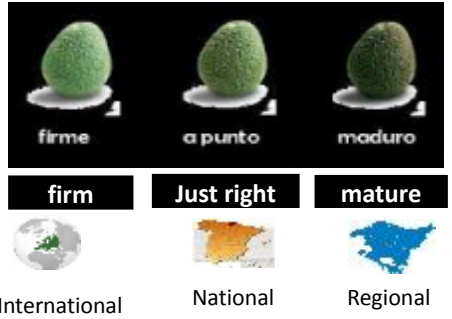
2. Smart monitoring of the value chain to improve the competitiveness in the agrifood sector

Towards intelligent food industry management

- ✓ Better control of raw materials
- ✓ Inspection of 100% of the production
- ✓ Decrease on the quality variability
- ✓ Decrease on food waste
- ✓ No need of expensive laboratory analysis
- ✓ Opportunity for product and process innovation
- ✓ Product traceability
- ✓ Real time decision-making

Standardization of food product quality

External
(Colour, texture…)
Internal
(Ripeness, soluble solid content, defects, acidity, fat content…)



Process optimization

Process parameters control

Industry trend: DIGITALIZATION --- CONECTIVITY

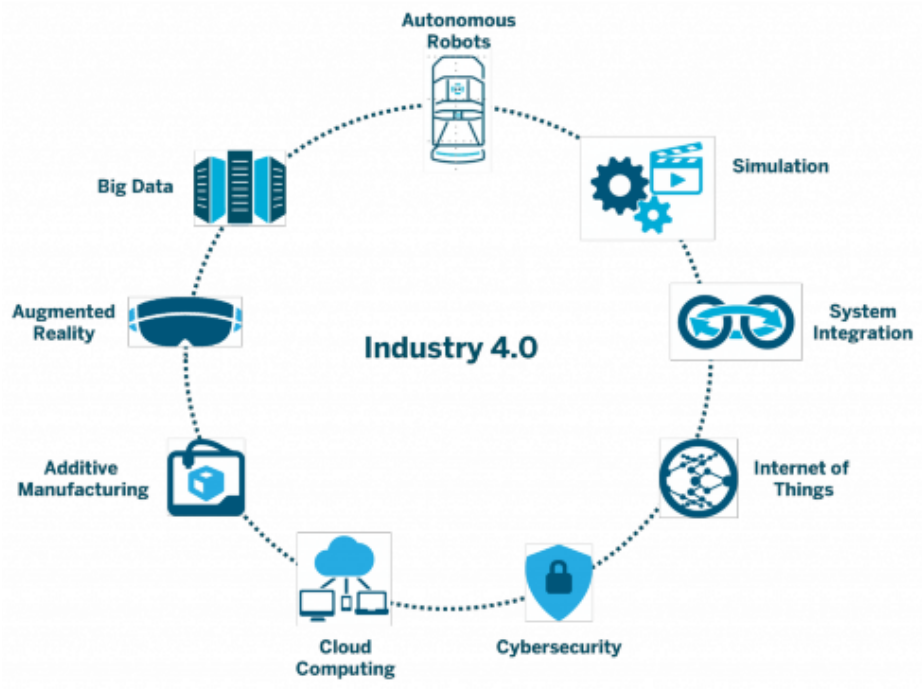
Smart data

One should not **focus** on the data gathering or in the technology as a first step….

… but **on the problem to solve**

Problem to solve? What do I want to control/classify/predict?

Data from intelligent industries → **Valuable and useful information**



Conclusion

To guarantee a correct diagnosis of each company and each process:

1. To understand the manufacturing process
2. To localize the critical parameters and process steps, needs for traceability
3. To analyse what is really happening in each company
4. To design the predictive model

Digitalisation is a transformation pace….

Needs strategic planning and cultural change inside our food industries….

…. But early adoption provides a **competitive advantage**

It is a pace where several factors converge which may affect:

- **Competitiveness**
- **Innovation**
- **Business models**

Muchas gracias!
Thank you!

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