CA18105

RIBMINS

Risk-based meat inspection and integrated meat safety assurance

Case study 1: Diagnostics, detection of hazards on the farm: direct & indirect detection methods

Marco De Nardi (SAFOSO)│ 22/06/2022 │ Online

Ana Carolina Abrantes

- Country: Portugal
- Affiliation: Animal and Veterinary Research Center (UTAD-Vila Real)
- Professional position: PhD student
- 3 keywords about your topics of professional interest:
  - 1. Game inspection
  - 2. Zoonoses
  - 3. Foodborne diseases

Michał Majewski

- Country: Poland
- Affiliation: Poznan University of Life Sciences / Veterinary Inspection
- Professional position: Assistant /Official Veterinarian
- 3 keywords about your topics of professional interest:
  - 1 Official control in abattoirs/cutting plants
  - 2 Meat inspection
  - 3 Poultry

Nikola Betić

- Country: Serbia
- Affiliation: Institute of Meat Hygiene and Technology
- Professional position: Research assistant
- 3 keywords about your topics of professional interest:
  - 1 Farm biosecurity and risk factors
  - 2 Parasitology
  - 3 Food safety

Pedro João Moura

- Country: Portugal
- Affiliation: Danish Agriculture & Food Council / Technical University of Denmark (DTU Food)
- Professional position: Research assistant
- 3 keywords about your topics of professional interest:
  - Antimicrobial resistance
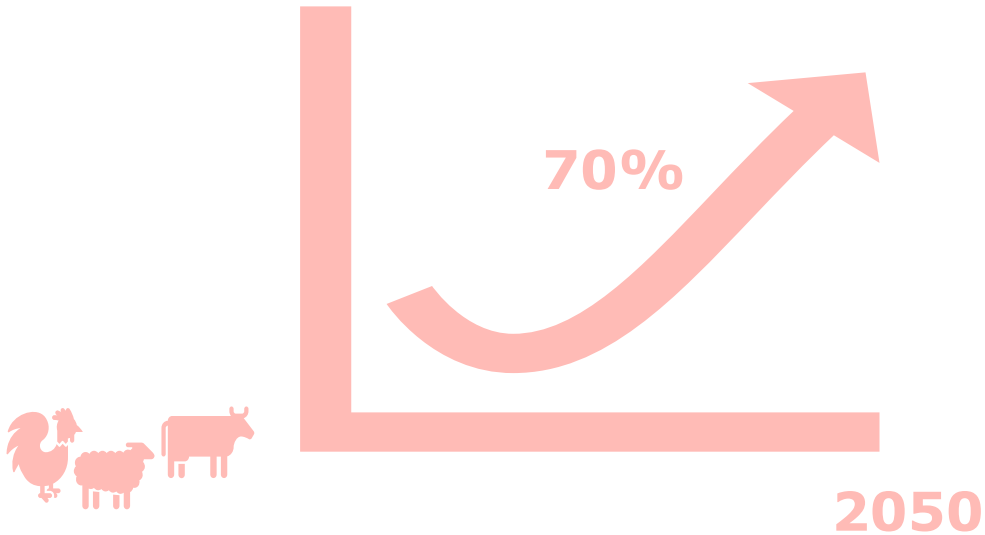 - Data engineering
  - Biosecurity

Goal of the workshop

- Gaining a **better understanding** on how surveillance and monitoring programs could be set-up in a more comprehensive way

- Gaining **new ideas** to set-up better surveillance systems that allow for <u>early detection</u> and a <u>more timely reaction</u>

- Allowing yourself to **think out of the box**, allow yourself to **see diagnostic in a broader sense**

2. The use of Point of care diagnostics: Where are they useful? What are their limits?
3. The use of new technologies for herd and flock health monitoring e.g. acoustics, cameras etc.
4. Taking samples at abattoir for herd and flock health monitoring: what are the benefits and what are the challenges.
5. Use of data and information: How we can use information and data from different sources? What information and data should be used?
6. Alternative samples: What kind of samples could be used for diagnostic purposes which are currently not or only used on rare occasions?

Overview

- Growing population
  - EU population has increased by ~25% since 1960
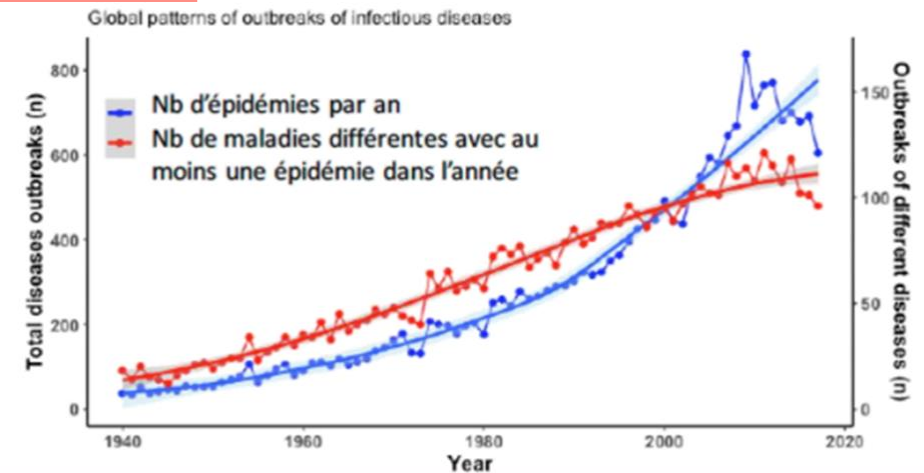 - World population has doubled since 1960

70%

2050

Welfare

Health problems in herds and flocks

Zoonoses

Environment

Global patterns of outbreaks of infectious diseases

- Nb d'épidémies par an
- Nb de maladies différentes avec au moins une épidémie dans l'année

New approaches are needed

- **Need to look at diagnostic in a broader perspective**

- Using different "**classic**" data sources
  - At the farm
  - At the abattoir
  - Consumers

- Use of "**non-conventional"**, non-traditional data
  - Air filters
  - Sewage
  - Feed and water intake
  - Movement of animals
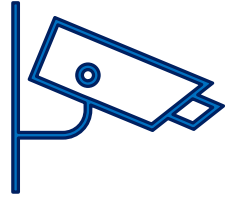 - New technologies

Precision Livestock Farming
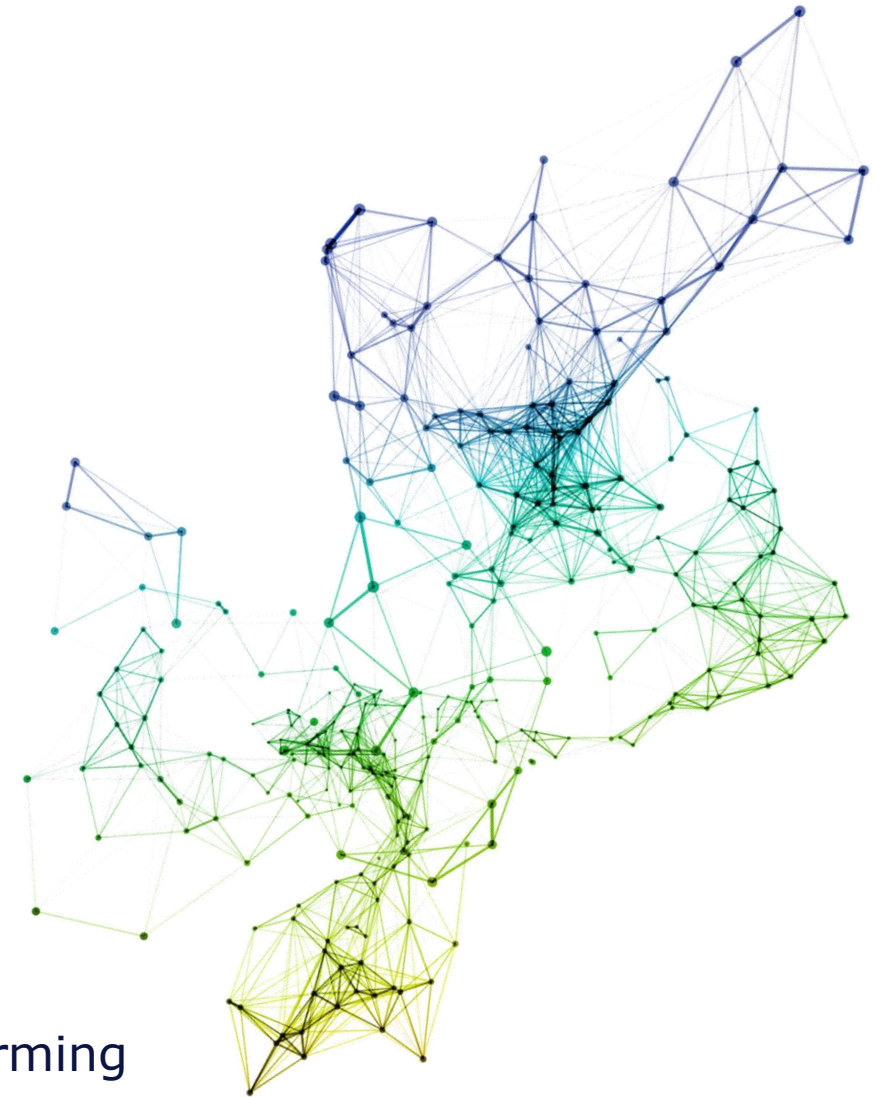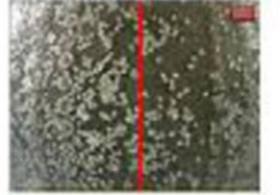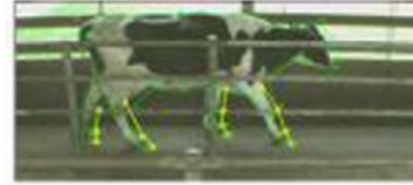
New technologies – New opportunities

Sound recognition
- coughing

RFID (Radio Frequency Identification) **Chips**
- feed and water intake

Camera system
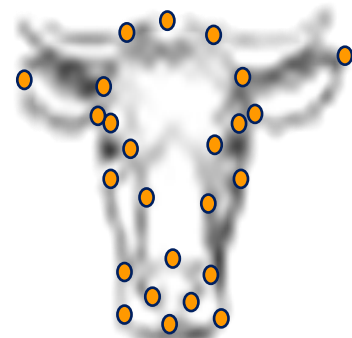- heat
- movement

Facial recognition
- identification
- fraud detection

Management of livestock by continuous automated real-time monitoring of production/reproduction, health and welfare of livestock and environmental impact.
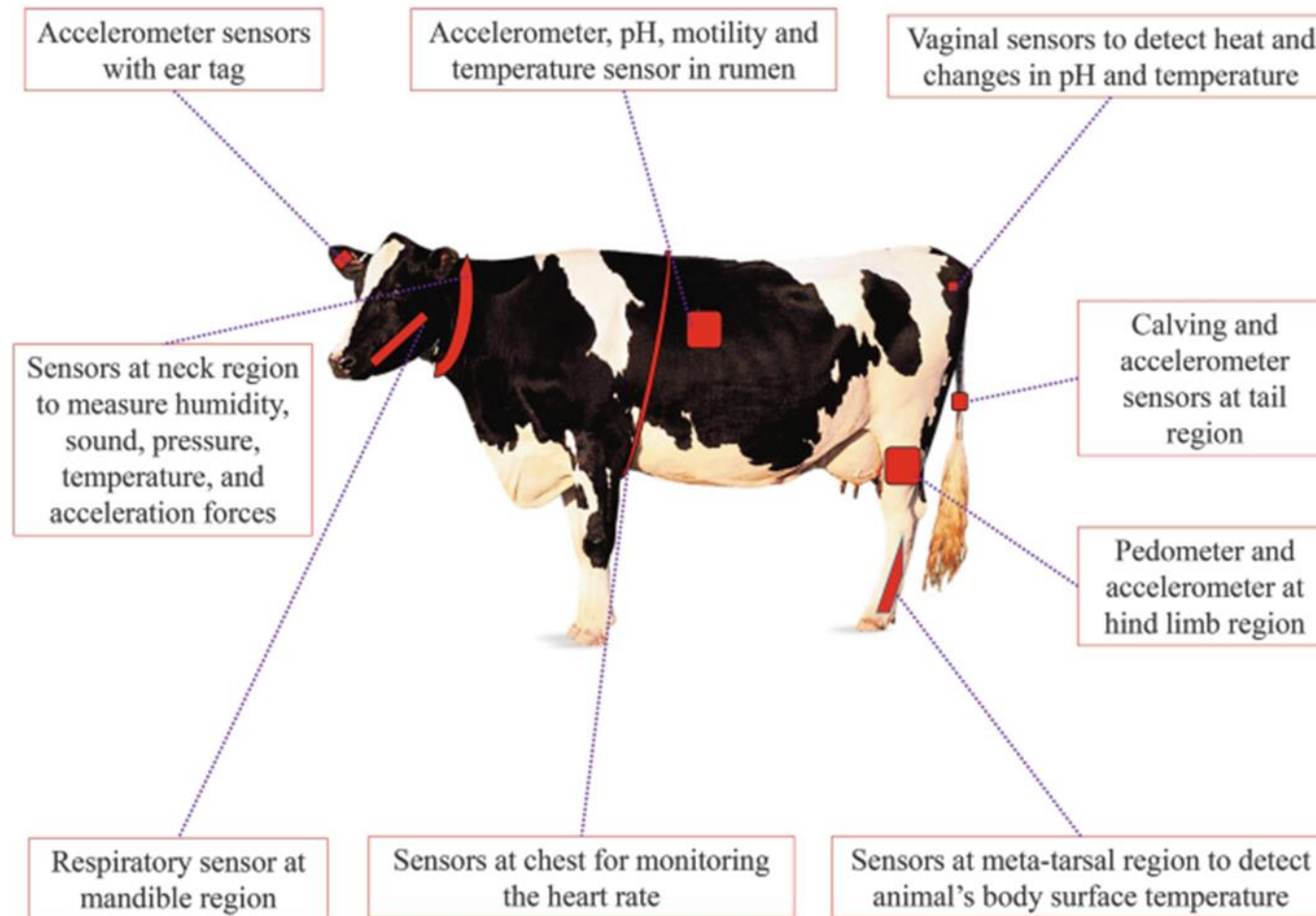
Berckmans, 2013

New technologies – New opportunities

Accelerometer sensors with ear tag

Accelerometer, pH, motility and temperature sensor in rumen

Vaginal sensors to detect heat and changes in pH and temperature

Sensors at neck region to measure humidity, sound, pressure, temperature, and acceleration forces

Calving and accelerometer sensors at tail region

Pedometer and accelerometer at hind limb region

Respiratory sensor at mandible region

Sensors at chest for monitoring the heart rate

Sensors at meta-tarsal region to detect animal's body surface temperature

New technologies – New opportunities
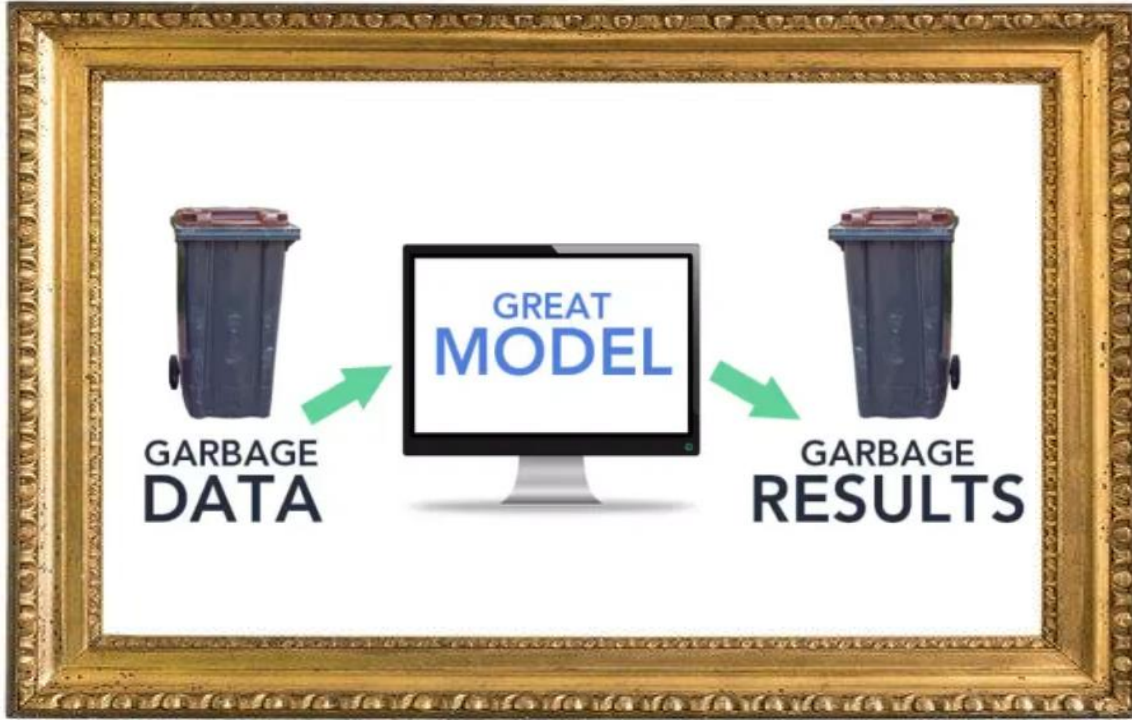
- Audio surveillance systems – detection of respiratory diseases (pigs)

- Classifying and quantifying cough

Normal (healthy) cough

Mycoplasma hyopneumoniae

Porcine reproductive and respiratory syndrome (PRRS)
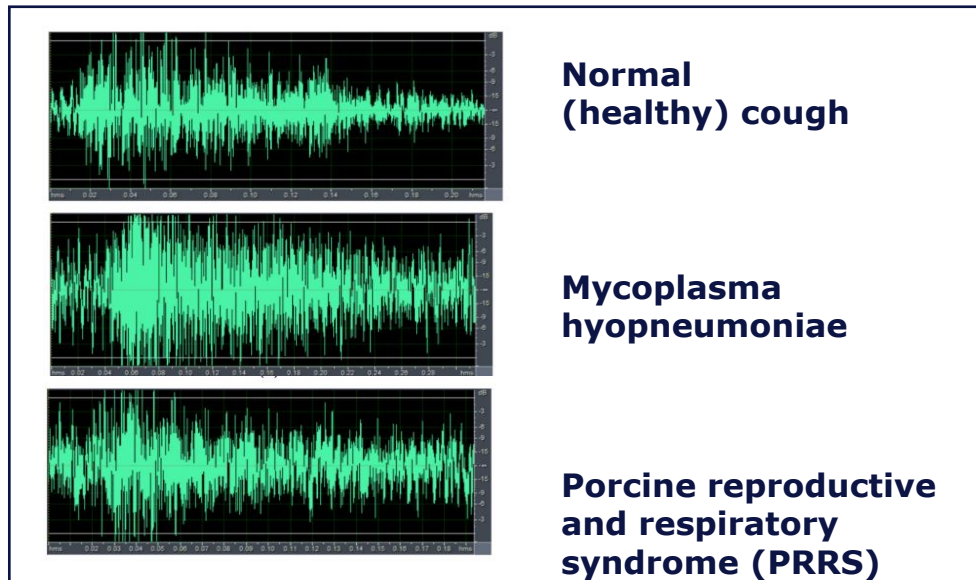
94% detection
91% classification accuracy
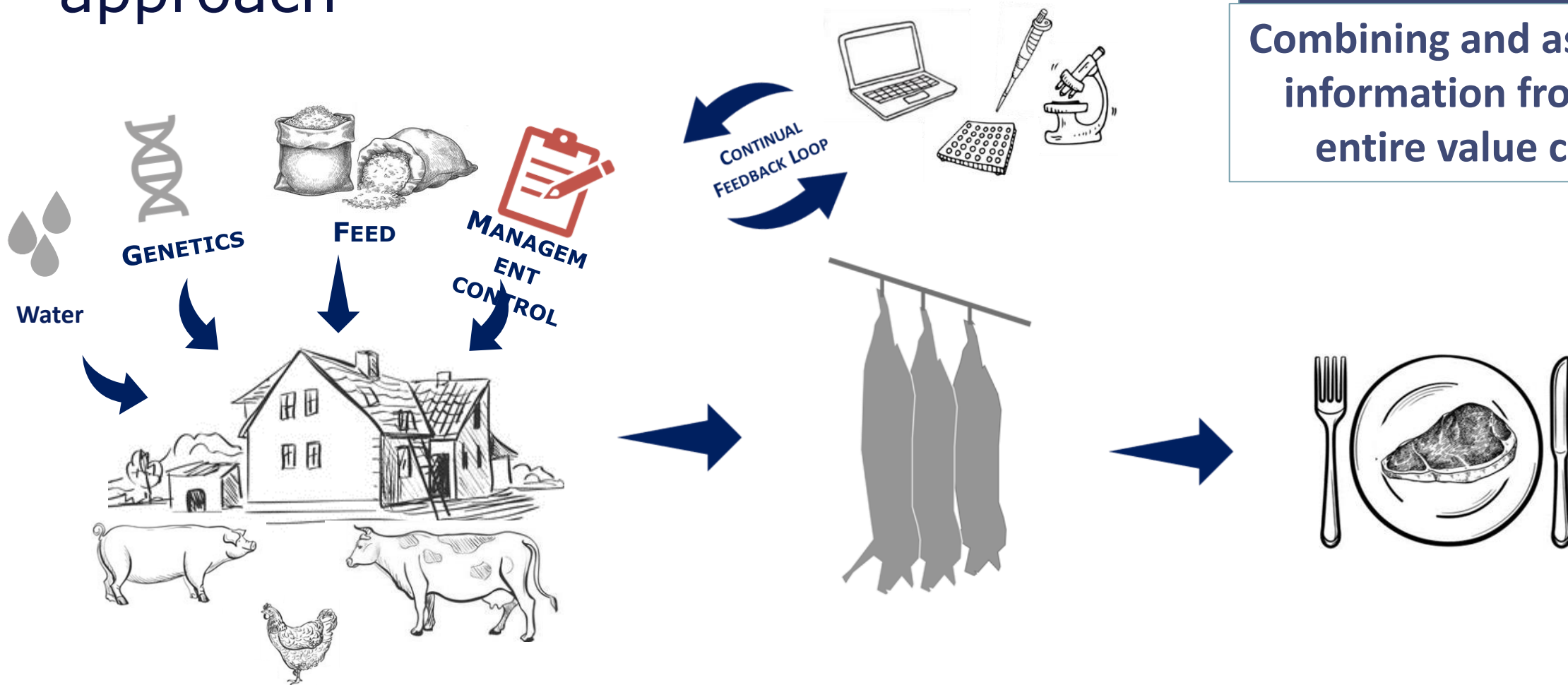
Data generation: Essential principles

Good data quality is the starting point for everything

Companies / Governments need to:
- justify the need to collect personal data
- prove that they can keep the data safe

Data generation: an integrated approach

Water

GENETICS

FEED

MANAGEMENT CONTROL

CONTINUAL FEEDBACK LOOP

Combining and assessing information from the entire value chain

SAFOSO

Where should we get the sample?

- There are many options to collect samples of all different kinds
  - Individual or herd level
  - Analysed at the point of collection or send to the lab
  - Taken at the farm or at the abattoir
  - Blood or oral fluids or feces or process fluids or milk
  - Environmental samples or sewage or bulk tank milk
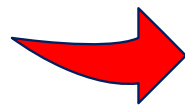
Taking the entire value chain into account

POCTs

- On-farm POINT-OF-CARE TESTs or rapid test of diagnotic

  - Simple and easy to use!
 - Majority with Antibodies target
  - Individual or herd contexto
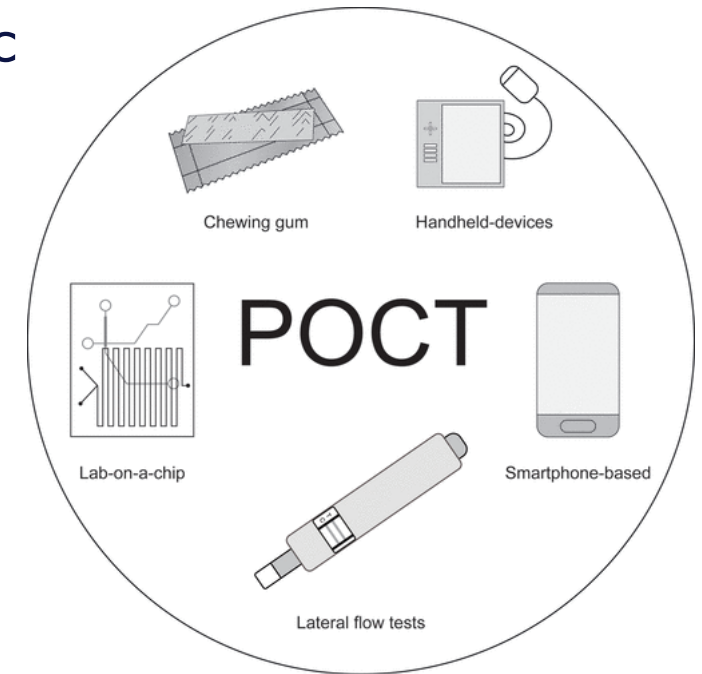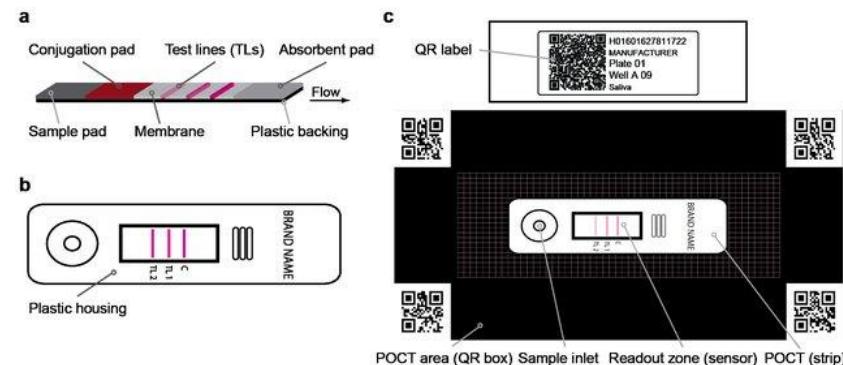
++ practical in developing countries

➢ **Salmonella spp** in a series of 50 samples n=50;c=3

Time and frequency of sampling are regulated according to:

➢ hygienic practice and technology for each slaughterhouse
➢ design of risk-based process control or harmonised monitoring programmes
➢ production volume
➢ epidemiological status of the area from which the animals originate
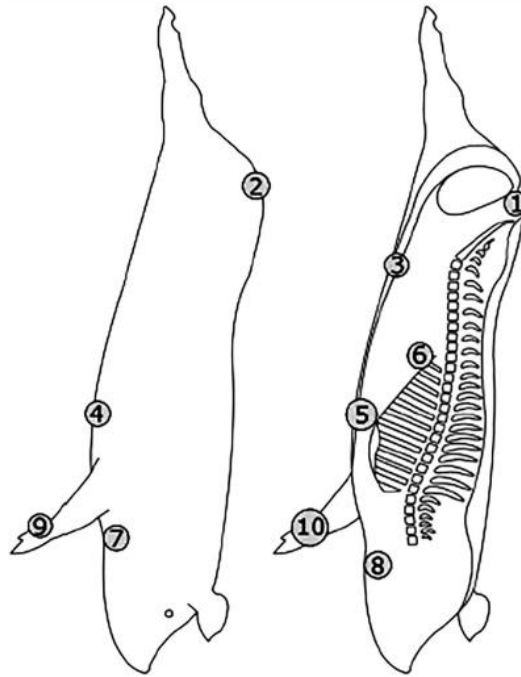
EU legislation establishes special rules for the control of trichinellosis including the requirement for systematic tests for ***Trichinella*** in all slaughtered pigs, wild boar and horses, except in pigs from holdings or compartments officially recognised as applying controlled housing conditions.

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22-Jun-22   WG# | Nikola Betič, DVM   13

Connect information from abattoirs to farms

➢ Risk factors for **_T. gondii_** infection in pigs in Serbia
  (with individual pigs as units of analysis)

Variables	Risk factor
Age group	Sows
Region	Western Serbia
Multispecies farming	Yes
Disinfection boot-dips at each barn	No
Farm type	Smallholders' finishing

➢ High rate of parasite isolation success by mouse bioassay **(22.6%)** points to the presence of a potentially high risk for human infection and public health in Serbia

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- **Overview:** What kind of samples could be used for diagnostic purposes which are currently not or only used on rare occasions?

Common samples

- Blood
- Serum
- Nasal swabs
- Feces
- Milk

Alternative samples?

- **Saliva** and Oropharyngeal swabs
- **Urine**
- **Environmental matrices**: soil, food, water…
- **Meat juice?**

Meat Juice Serology and Improved Food Chain Information as Control Tools for Pork-Related Public Health Hazards

E. Felin[1], E. Jukola[2], S. Raulo[3] and M. Fredriksson-Ahomaa[1]

**Advantages and disadvantages of the approach:**

- **- Misdiagnosis?** Take into account the production of Ab's, latency time, the survival time of pathogens in the matrices…

- **- False-negative results?** Sometimes unknown specificity and sensitivity

- **+** Like POCTs some matrices are simple and easy to use → without cold chain, easy conservation forms, long transport or pre-laboratory analysis processing

- **+** Some may be alternative matrices for POCTs → but it is necessary to test and validate under specific conditions!

Conclusion: Integration & Making better use of data

- A lot of **data** and **information** is available

- **Combining** data from **different sources is possible**

- **Analyse** data – **interpret** data

- **Using** the data – putting data into context

Berckmans, 2017
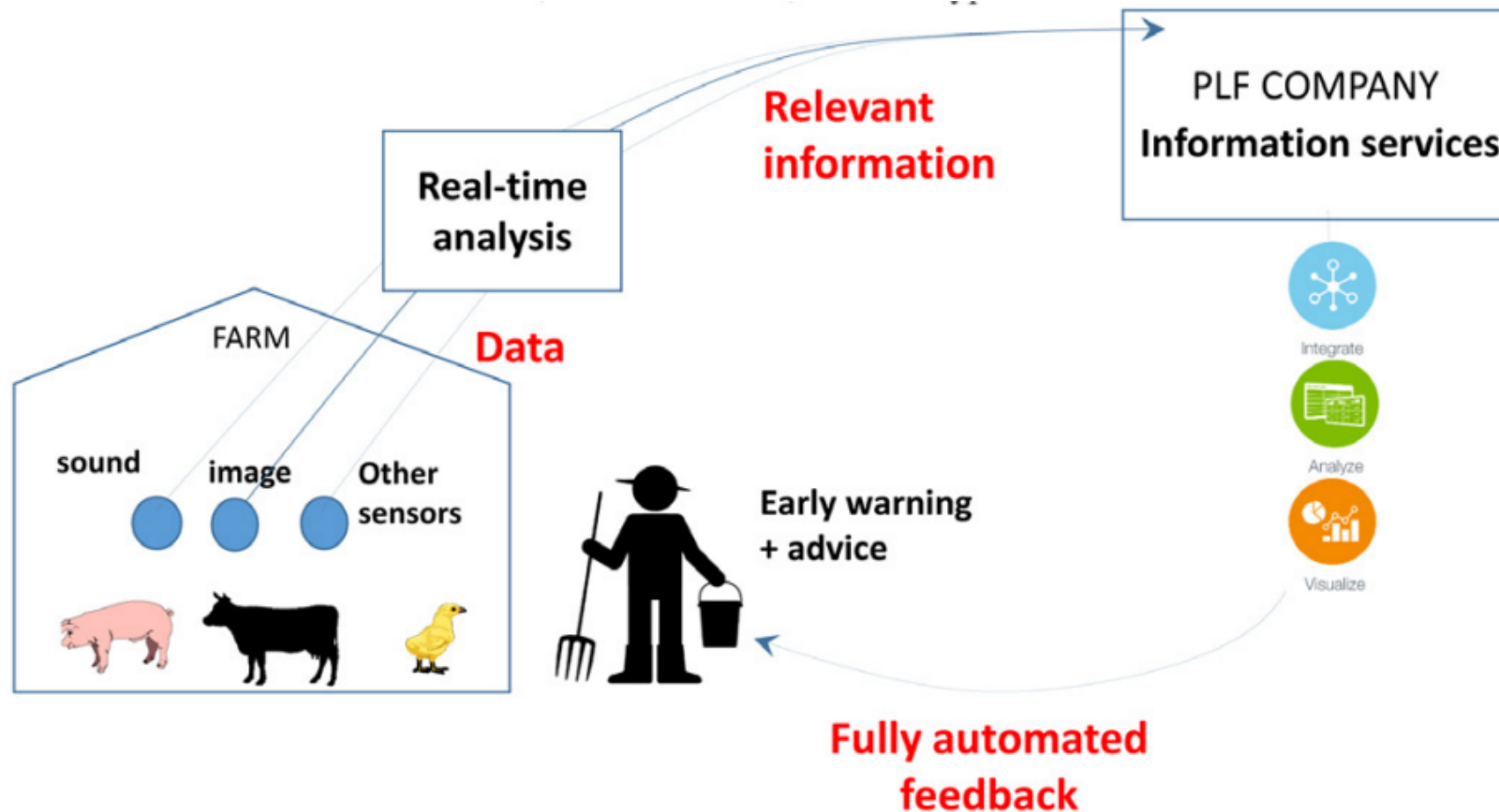
Integration
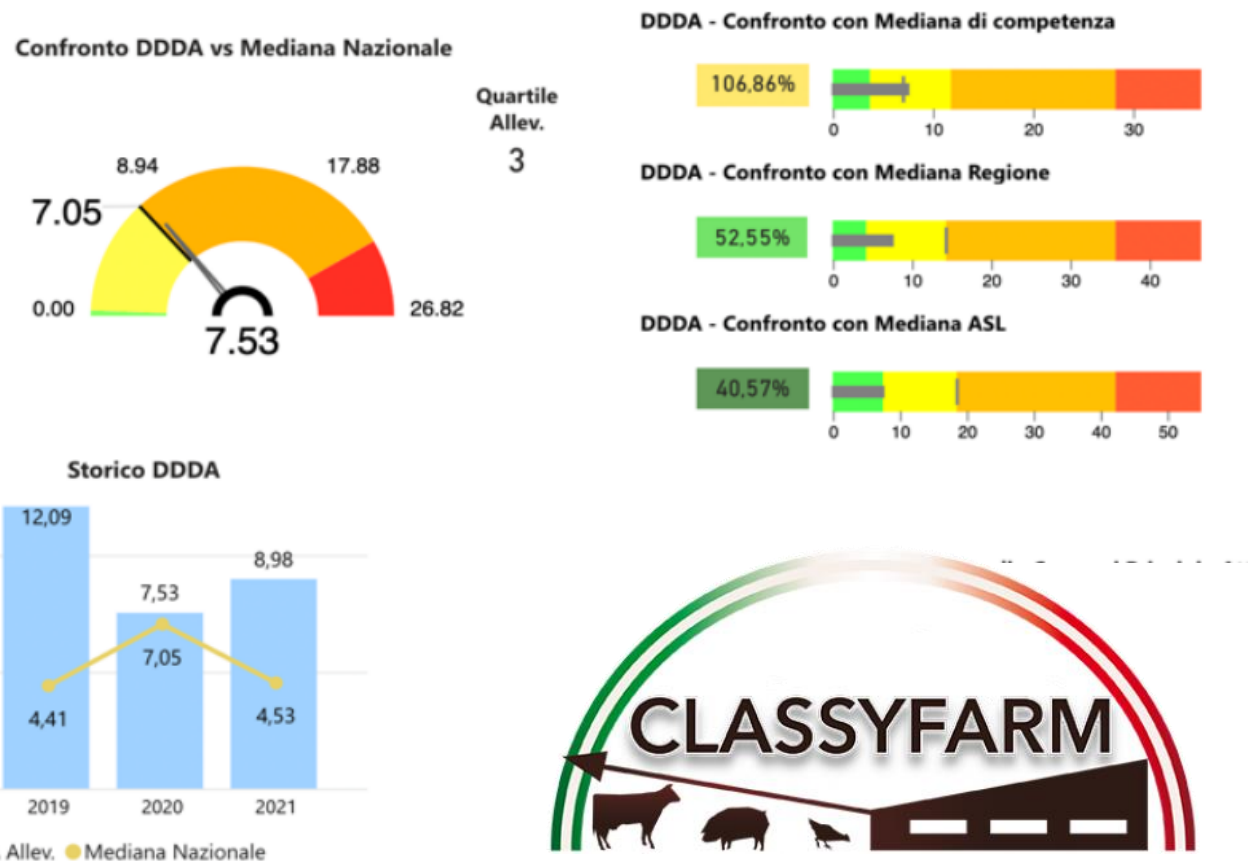
Antimicrobial usage

Biosecurity
(Biocheck.ugent)

Animal Welfare

Antimicrobial
resistance*

Environmental data
(residues) *

*under development

Figure 2: Classyfarm Dashboard, https://www.classyfarm.it/
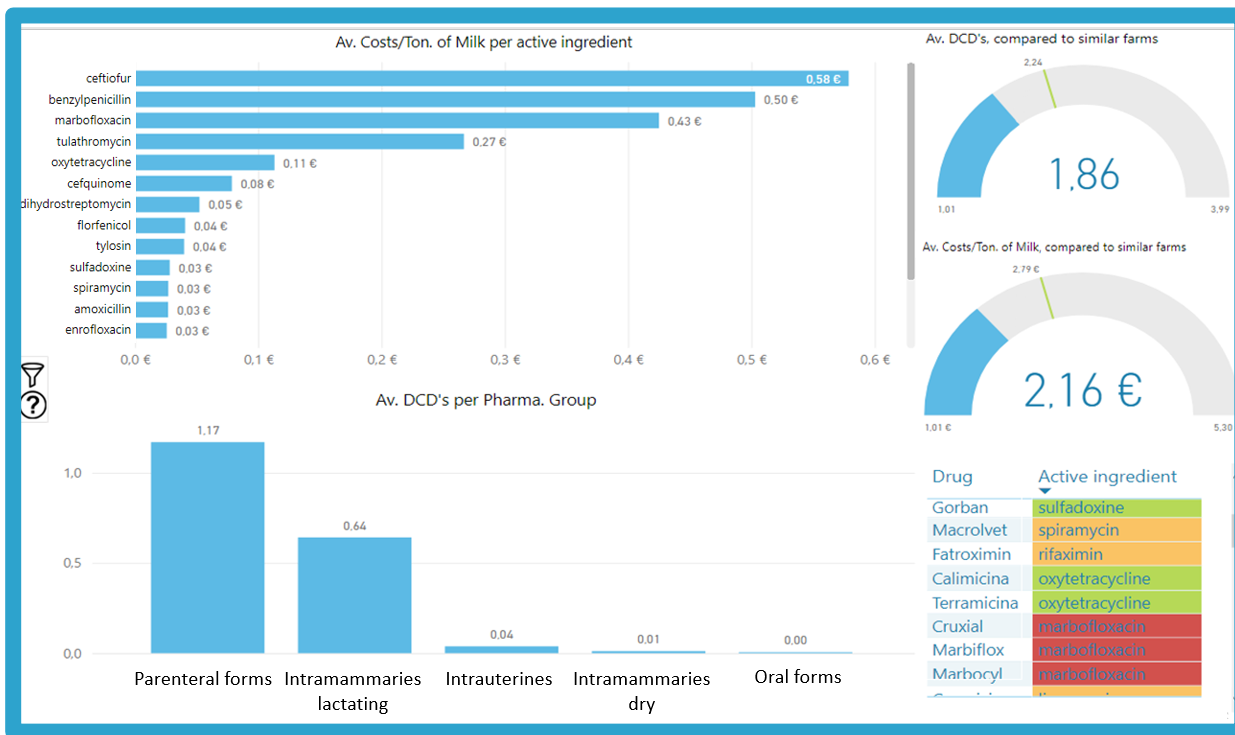
Targeted audiance

≠ Data requirements

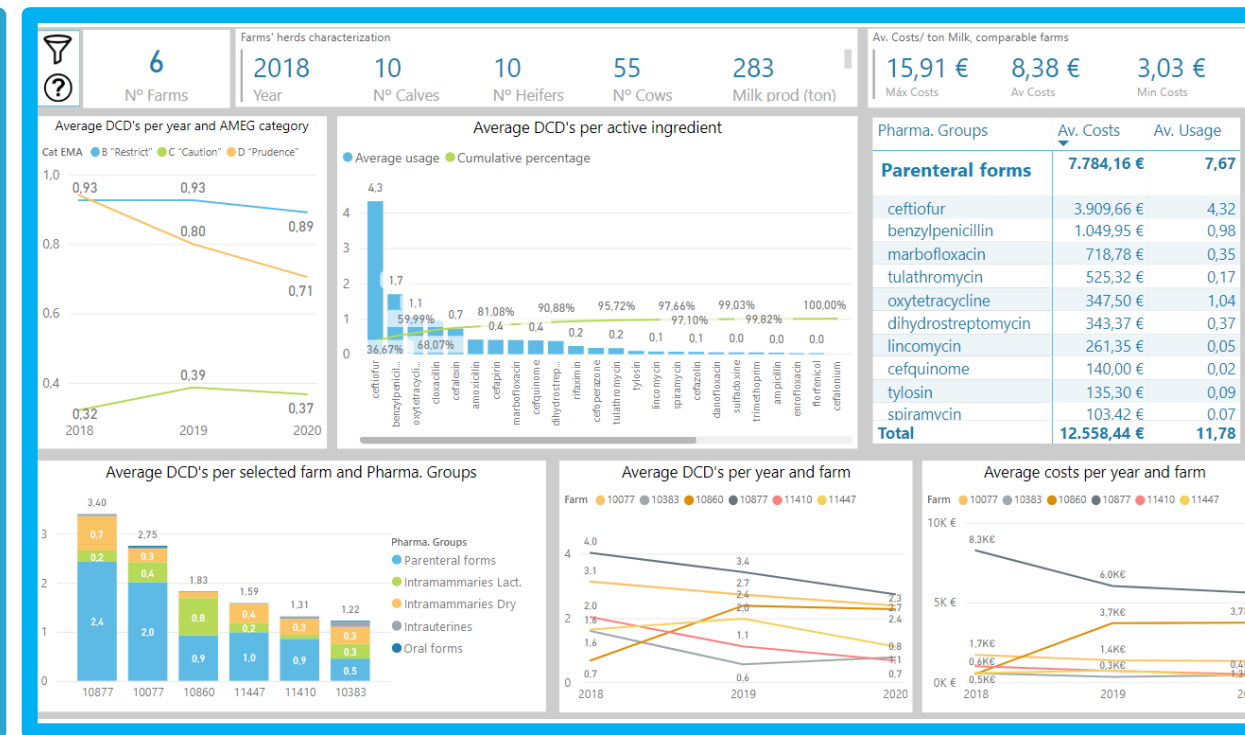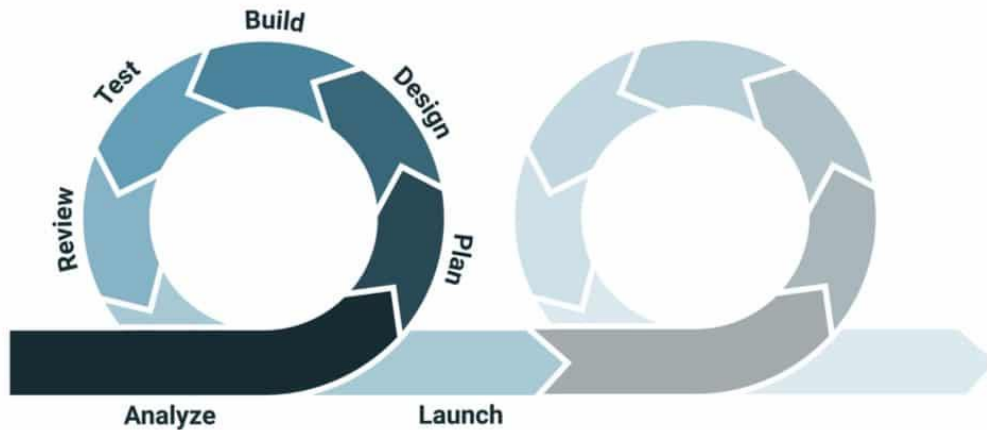**Figure 3:** Famer's Dashboard overview, Vet-AMNet

Figure 4: Veterinarian's Dashboard overview, Vet-AMNet

System evaluation

Iterative process (Data collection and analysis)
a lot of work can only start once the tools goes online

Everytime new functionalities are introduced

Access if the system is performing as it was expected:

- Cost-effectiveness

- User friendliness

- Precision of the results

- Integration

- One-health-ness

● ● ●

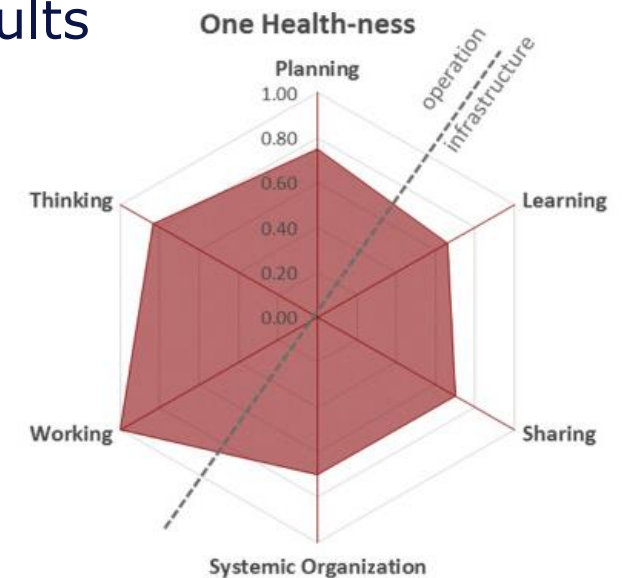**Figure 7**: example of an output generated by the NEOH tool after a full evaluation

Thank you!