

Farm biosecurity is critical to the **sustainability** of European livestock production. However, current levels of biosecurity are not sufficient.

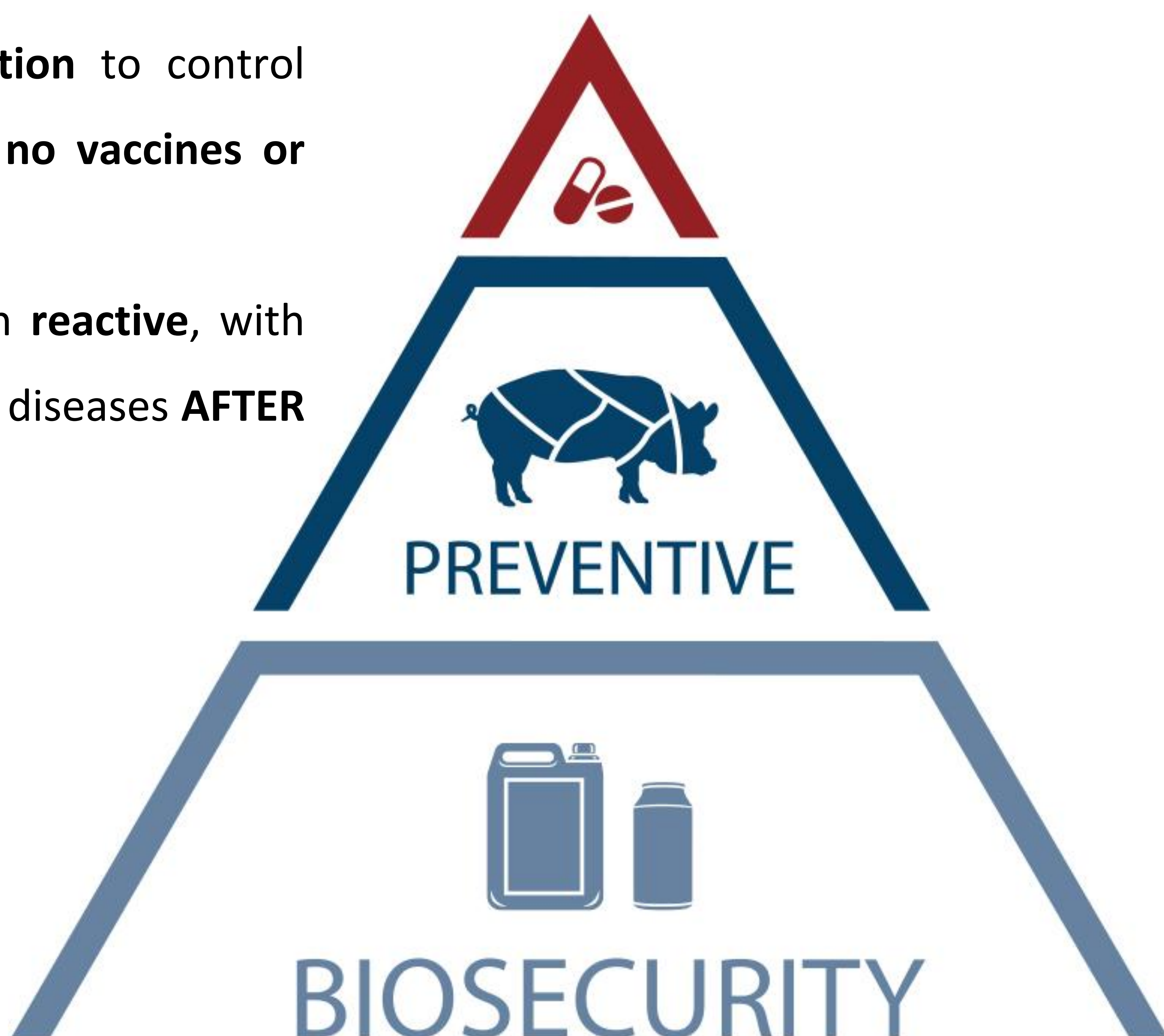
There are **ongoing and new outbreaks** of epidemic transboundary animal diseases including African swine fever (ASF) and avian influenza, which seriously threaten pig and poultry production. Peste des petits ruminants (PPR) and sheep and goat pox (SGP) have recently spread to Greece and Romania, threatening small ruminant production in those countries, and increasing the risk of spread further afield.

There is also ongoing risk and outbreaks of bluetongue and epizootic haemorrhagic disease in Western Europe. Finally, **endemic diseases** continue to have a **significant impact on productivity and animal welfare** throughout the European Union.

1. KEY MESSAGES

Biosecurity is critical to:

- **Preventing** the incursion of **transboundary diseases** into Europe
- **Slowing** the spread of both ongoing and new **epidemics** and outbreaks
- **Reducing antimicrobial usage**, maintaining the sustainability of drugs
- **Biosecurity** is the **only option** to control many diseases which have **no vaccines or effective treatments**
- **Research agendas** are often **reactive**, with research focused on specific diseases **AFTER major outbreaks occur**
- To tackle **emerging disease** research must be more **proactive**



Images source: Prof Dr. Jeroen Dewulf, Ghent University

2. KEY PROJECT RESULTS

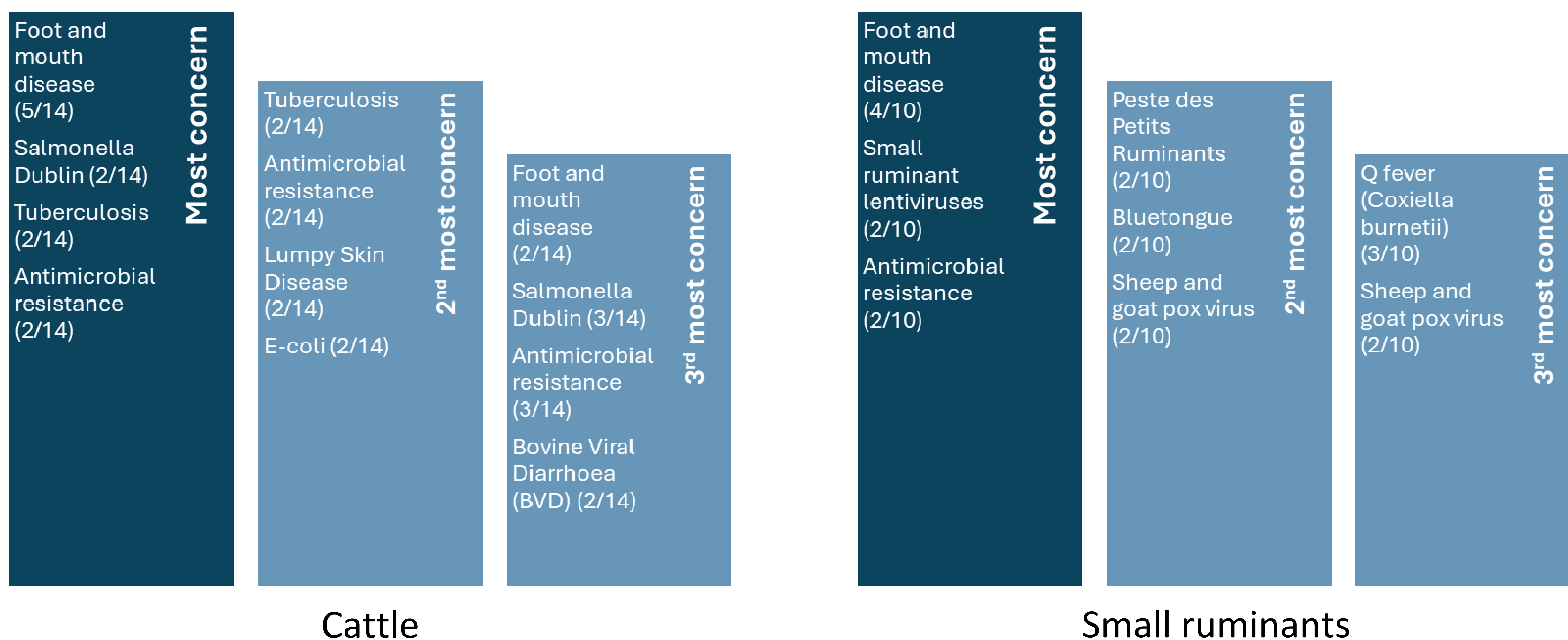
Stakeholder Driven Disease Prioritisation

To best understand the disease threats facing Europe, BIOSECURE completed a detailed disease prioritisation exercise for the four livestock species included in the project.

An important component of this was a stakeholder survey which identified important future policy directions, with implications both for research agenda funding and disease control efforts. EU level stakeholders report that transboundary diseases ASF, avian influenza, and foot and mouth disease are top priorities. However, stakeholders did not consider PPR to be a disease of most concern. PPR has recently spread to EU countries. This spread mirrors the previous spread of ASF into Eastern Europe from Ukraine and Russia in 2014.

This highlights the critical importance of improved external biosecurity in EU frontier countries.

BIOSECURE is committed to outreach in ITC countries. A stakeholder survey of vets and farmers has been conducted, with high participation in Eastern Europe.



Images source: Dr Aine Regan, Teagasc

Gathering Biosecurity Related Epidemiological Information

Advancing intelligence on livestock diseases is essential for deepening our understanding of the effectiveness of control measures. To support this effort, BIOSECURE has developed a comprehensive database of epidemiological and transmission data.

Comprehensive Transmission Modelling Database

This database, PARAMETRA, is a unique resource, gathering together for the first time a diverse set of transmission and epidemiological parameters for 20 priority livestock diseases. PARAMETRA will serve as an important tool for developing models of disease transmission and testing the effects of biosecurity measures using these models.

| | Basic reproduction number | Transmission parameter | Infectious period | Sensitivity | Specificity | Within herd prevalence | Latent period | Shape | Incubation period | Reproduction number | Herd prevalence | Probability of transmission via indirect contact | Pathogen survival/Disinfection | Probability of transmission via direct contact | Transmission on fomites | Probability fomite testing positive | Global Prevalence | Probability of reactivation of latent infection | Other |
|------------------------------------|---------------------------|------------------------|-------------------|-------------|-------------|------------------------|---------------|-------|-------------------|---------------------|-----------------|--|--------------------------------|--|-------------------------|-------------------------------------|-------------------|---|-------|
| Avian Influenza | 76% | 76% | 71% | 86% | 86% | 52% | 57% | 14% | 14% | 43% | 57% | 33% | 76% | 33% | 5% | 5% | 5% | 10% | 95% |
| Paratuberculosis | 58% | 169 | 129 | 112 | 15 | 15 | 0 | 76 | 0 | 29 | 0 | 0 | 6 | 3 | 6 | 0 | 0 | 0 | 1 |
| E. coli | 63% | 22 | 49 | 2 | 111 | 101 | 0 | 3 | 0 | 0 | 0 | 8 | 1 | 4 | 2 | 0 | 0 | 0 | 13 |
| Hepatitis E | 58% | 18 | 53 | 3 | 99 | 90 | 0 | 3 | 0 | 0 | 1 | 0 | 9 | 1 | 3 | 0 | 0 | 0 | 25 |
| Bovine Tuberculosis | 63% | 25 | 32 | 36 | 2 | 2 | 94 | 34 | 1 | 0 | 7 | 17 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| Swine Influenza | 58% | 12 | 15 | 0 | 65 | 39 | 7 | 6 | 0 | 0 | 6 | 9 | 0 | 2 | 0 | 0 | 0 | 1 | 16 |
| African Swine Fever | 58% | 2 | 43 | 16 | 7 | 3 | 8 | 10 | 0 | 0 | 16 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| Salmonella | 58% | 32 | 36 | 26 | 15 | 8 | 0 | 7 | 32 | 0 | 0 | 0 | 7 | 6 | 2 | 0 | 0 | 0 | 24 |
| PRRS | 53% | 30 | 7 | 2 | 11 | 8 | 27 | 2 | 0 | 0 | 0 | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 7 |
| Foot and Mouth Disease | 74% | 20 | 27 | 2 | 11 | 8 | 10 | 3 | 0 | 0 | 13 | 2 | 2 | 1 | 2 | 4 | 0 | 0 | 16 |
| Campylobacter | 47% | 6 | 8 | 13 | 13 | 11 | 0 | 3 | 0 | 0 | 19 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 |
| Bluetongue | 47% | 0 | 12 | 3 | 18 | 17 | 5 | 2 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 8 |
| Coxiella burnetii | 26% | 15 | 0 | 0 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Classical Swine Fever | 47% | 0 | 15 | 5 | 4 | 3 | 12 | 0 | 0 | 0 | 1 | 11 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| Bovine Respiratory Syncytial Virus | 53% | 10 | 13 | 2 | 2 | 2 | 0 | 1 | 2 | 0 | 5 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 |
| Peste des Petits RumiOntS | 47% | 11 | 9 | 0 | 3 | 2 | 1 | 0 | 0 | 2 | 0 | 9 | 0 | 3 | 0 | 0 | 0 | 0 | 3 |
| Bovine Viral Diarrhoea Virus | 47% | 4 | 3 | 1 | 10 | 3 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Contagious agalactia | 53% | 3 | 7 | 3 | 7 | 7 | 7 | 0 | 0 | 0 | 0 | 8 | 1 | 0 | 0 | 0 | 3 | 0 | 2 |
| Multiple | 16% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Infectious Bovine Rhinotracheitis | 5% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| S. aureus | 53% | 1 | 0 | 1 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 4 | 1 | 0 | 0 | 0 | 2 |
| | 5% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Percentage of parameters available for each pathogen

Images source: Natalia Ciria Artiga, Autonomous University of Barcelona



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3. NEW TOOLS FOR BIOSECURITY

BIOSECURE has developed a range of new tools to aid in the implementation and understand the effectiveness of biosecurity measures for decision makers.

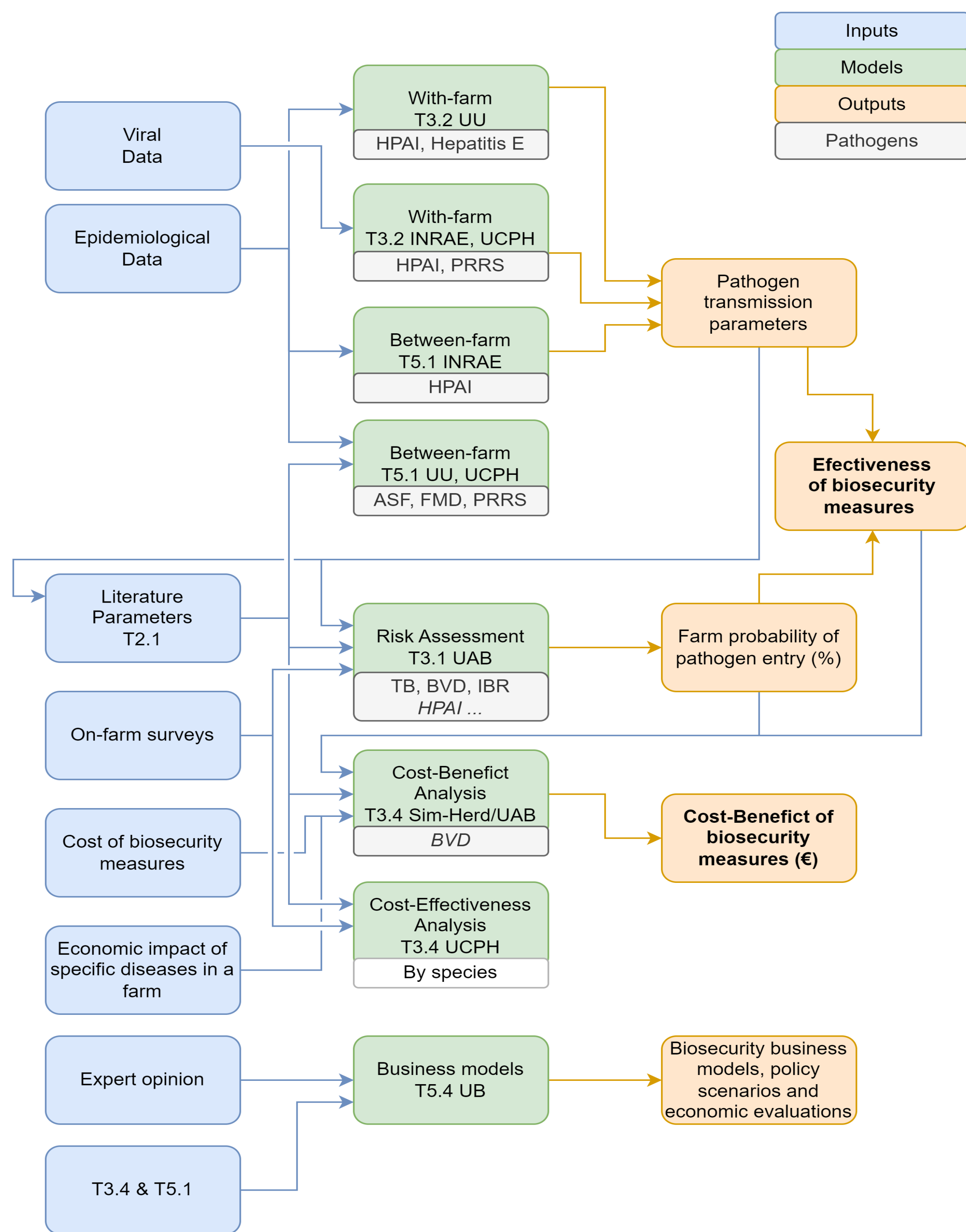
Interactive Biosecurity Dashboards

BIOSECURE now offers interactive dashboards on the project website (<https://biosecure.eu/>)

These cover biosecurity applications and supporting measures to aid decision makers in improving biosecurity.

On Farm Biosecurity Evaluation

Biocheck.UGent is an independent risk-based scoring system to evaluate on-farm biosecurity. As part of BIOSECURE, new surveys have been developed, expanding their scope to small ruminants and outdoor pig production, providing more tools for European biosecurity.



Images source: Natalia Ciria Artiga, Autonomous University of Barcelona

Risk Based Modelling

Improved epidemiological intelligence is invaluable for developing new decision tools for stakeholders.

- A **risk-based model** was developed to assess and **improve biosecurity** on farms.
- This involved creating a **model** to calculate the **probability** of pathogen **introduction** on farms.
- This model is a **unique** approach which will serve as an invaluable tool for providing **tailored recommendations** on farms to improve biosecurity.

4. KEY MESSAGES MOVING FORWARD

- Good **biosecurity** practices are **essential** to preventing the incursion or **spread** of **disease**
- Although there are still **data gaps** for diseases, particularly transboundary diseases, which makes modelling control measures more difficult, good **external biosecurity** can still prevent their spread into Europe
- To date, **research has been reactive**, with data clustering **after historic outbreaks** particularly for transboundary diseases, with little data on sheep and goat pox, and peste des petits ruminants which have now spread to Europe
- To best combat disease spread, **research in the future should focus on a proactive approach**, with a focus on diseases at risk of spread to and within Europe
- BIOSECURE is committed to improve biosecurity implementation and in the **second stage** of the project will now focus on **how to improve biosecurity on a range of different production systems**
- Previous focus was often on **intensive** farming, BIOSECURE is **breaking new ground** by also focusing on **small scale, backyard, and extensive** farming systems
- Stakeholder surveys show **high levels of interest** and engagement from **Eastern European countries** which are **key** players in maintaining biosecurity from **transboundary diseases** in near neighbour countries
- **Biosecurity** impacts **farm management and costs**, BIOSECURE has collected diverse **economic data** which will soon be elaborated to **assess supply chain and sector effect**



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