H2020-SFS-2018-2020

**DECIDE**

**Data-driven control and prioritisation of non-EU-regulated contagious animal diseases**

# Deliverable 6.4

# First set of practice abstracts

WP6 – Communication activities and dissemination and exploitation of results

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## Revision History

| Author Name (Partner short name) | Description | Date |
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| Jamuna Siehler (accelCH) | Draft deliverable | 26.01.2024 |
| Carla Gomes (AHI), Marloes Boeters (UU), Yara Slegers (UU), Sjaak de Wit (GD), Jade Bokma (UGent), Gema Vidal (SVA), Annette Boerlage (SRUC), Cecilie S. Walde (NVI) | Main content input for the practice abstracts | 02.02.2024 |
| Gerdien van Schaik (UU) | Revision 1 | 28.02.2024 |
| Johannes Ripperger (accelCH) | Formal quality checks | 29.02.2024 |
| Jamuna Siehler (accelCH) | Final version and submission | 29.02.2024 |

# Content

## Abbreviations

| Abbreviation | Description |
|---|---|
| BRD | Bovine Respiratory Disease |
| CRA | Central registration of antibiotics |
| D | Deliverable |
| DoA | Description of Action |
| EU | European Union |
| IB | Infectious Bronchitis |
| PD | Pancreas Disease |
| PMP | Poultry monitoring program |
| WP | Work Package |

## Partner short names

| Short name | Organisation |
|---|---|
| UU | Universiteit Utrecht |
| UCPH | Københavns Universitet |
| UGent | Universiteit Gent |
| SVA | Statens Veterinärmedicinska Anstalt |
| NVI | Veterinærinstituttet – Norwegian Veterinary Institute |
| SRUC | Scotland's Rural College |
| AHI | Animal Health Ireland Initiative |
| GD | Gezondheidsdienst voor Dieren B.V. |
| accelCH | accelopment Schweiz AG |

# Executive Summary

This deliverable presents a report on the first set of practice abstracts developed by the DECIDE project. It includes eight short summaries for practitioners, covering the main results and findings of the DECIDE project as well as practical recommendations for end-users from all four DECIDE species: cattle, poultry, pigs and salmon.

**Objectives of the Deliverable**

With the help of this deliverable, we aim to contribute to the effective dissemination of DECIDE results and pave the way for the successful uptake of DECIDE tools and innovations. In detail, this includes:

- The deliverable aims to effectively disseminate the main results and findings of the DECIDE project to practitioners, covering all four DECIDE species: cattle, poultry, pigs, and salmon.
- It seeks to pave the way for the successful uptake of DECIDE tools and innovations by end-users in the livestock and aquaculture sectors.
- The deliverable is designed to bridge the gap between the project's findings and the end-users who can benefit from them.
- The DECIDE project is committed to presenting its results in a user-friendly and accessible manner, in this case, through the production of practice abstracts. These abstracts provide a concise yet comprehensive overview of the project's findings and recommendations, making them a valuable resource for end-users.

**Activities**

The practice abstracts presented in this deliverable have been developed in a collaborative manner by the DECIDE consortium. Each species group has been asked to draft two practice abstracts covering their main findings or practical recommendations of their work so far. As a basis, the DECIDE consortium has made use of the EIP-AGRI common format, as laid out in the project's DoA.

**Outcome**

The outcome of this deliverable is the collection of the first eight practice abstracts of the DECIDE project. The practice abstracts cover the following topics:

The cattle barometer: 1) Navigating Europe's pathogen landscape for livestock health; 2) The cattle purchase assistant: decision support to minimize the risk of introducing diseases; 3) Creation of a pig health tool to improve decision-making at farm level; 4) Overview of the economic impact of common respiratory diseases in pigs and possible interventions; 5) Creating a dashboard for broiler farmers and veterinarians to monitor infectious bronchitis strains; 6) Analysis of risk factors for antibiotic use, mortality and footpad lesions in Dutch broiler flocks; 7) Early Detection of Salmon Disease: An Innovative Approach in Aquaculture; 8) Monitoring monthly mortality of mariculture Atlantic salmon (Salmo salar L.) in Scotland

**Next steps**

The DECIDE consortium aims to feed these practice abstracts into the EIP-AGRI common database for further distribution. The second set of practice abstracts will be delivered as part of D6.9 – second set of practice abstracts.

# 1 Introduction

Farmers, veterinarians and other animal health managers in the livestock and aquaculture sectors are currently missing information on the prevalence and burden of contagious animal diseases that are not regulated by the European Union. The diseases are estimated to cause 10-15% reduction in performance efficiency of livestock farming, resulting in large financial losses and lower sustainability as well as affect animal welfare.

DECIDE, a five-year Horizon 2020 project, is developing data-driven decision support tools that offer robust and early signals of disease emergence and options for diagnostic confirmation. Moreover, options will be provided for controlling the disease along with their implications in terms of disease spread, economic burden and animal welfare.

**To bridge the gap between the project's findings and the end-users who can benefit from them, the DECIDE project is committed to disseminating its results in a user-friendly and accessible manner, in this case in the form of practice abstracts.** A total of 16 practice abstracts are expected to be produced from the DECIDE project, divided into two deliverables, D6.4 and D6.9, each comprising 8 practice abstracts. These abstracts will provide a concise yet comprehensive overview of the project's findings and recommendations, making them a valuable resource for end-users.

## 1.1 EIP-AGRI common format

The DECIDE project is utilising the EIP-AGRI common format to create a set of best practice guidelines. In the following, these guidelines are presented in the form of "practice abstracts," which are short summaries that encapsulate the main information, recommendations, or practices that can assist end-users in their daily work.

The EIP-AGRI common format is a standardised template designed to facilitate knowledge transfer from innovative and practice-oriented projects. It is used by Horizon 2020 multi-actor projects, thematic networks, and EIP-AGRI Operational Groups. The EIP-AGRI common format contributes to building up a unique repository of practical knowledge across the EU via the EIP-AGRI, which supports the dissemination of results of all interactive innovation projects. It not only facilitates the exchange of knowledge but also the contact between potential partners in innovation projects.

By adhering to the EIP-AGRI common format, the DECIDE project ensures that its findings are presented in a standardised, accessible manner, making it easier for end-users to apply the project's insights in their daily practice. This approach also contributes to the EIP-AGRI's goal of building a unique repository of practical knowledge across the EU.

Where applicable (e.g. when a tool is available for a specific region), the practice abstracts are also provided in a second/native language to ensure wider accessibility and inclusivity, and ultimately uptake of the DECIDE innovations.

The following chapters will cover the DECIDE practice abstracts 1-8.

# 2 First set of practice abstracts

## Cattle

- **The cattle barometer:** Navigating Europe's pathogen landscape for livestock health.
- **The cattle purchase assistant:** Decision support to minimize the risk of introducing diseases.

## 2.1 Practice abstract 1: The cattle barometer: Navigating Europe's pathogen landscape for livestock health.

**The cattle barometer** (link: https://decide-project-eu.github.io/case-studies-website/case-studies/cattle-barometer.html) **is an innovative tool conducted within the framework of the DECIDE project which visualizes pathogen-specific lab results of respiratory tract samples obtained from cattle in several European countries.** The historical trend, dynamics and current presence of specific pathogens per area is depicted in a dashboard (Figure 1). It holds the potential for early warning and to support decision-making by the farmer and veterinarian to control infectious diseases on farm. For example, when an increase in the positive sample rate for a specific pathogen is observed, the farmer could decide to vaccinate the herd to prevent severe disease. Another possibility is when they purchase an animal from a specific region, and observe a high number of positive samples in this area, they may want to perform extra testing for this specific pathogen or a prolonged quarantine period before adding your newly purchased animal to the herd. Thus, preventing introduction of disease in a herd.

At the moment, the cattle barometer allows to explore the data visually. **It's like a map for navigating the world of BRD pathogens**. One can simply click, filter and explore to gain insights. So far, data from Belgium, the Netherlands, and Ireland are included. In the near future, one could expect the cattle barometer to be updated more frequently, because the plan is to include data automatically from more European countries. Next to this, the early warning component to help farmers and their veterinarians to stay ahead of potential outbreaks will be developed. However, for the cattle barometer to be successful, it is important that farmers and veterinarians keep submitting respiratory tract samples in case of outbreaks to their laboratories, so the barometer can become continuous instead of static, and targeted biosecurity measures can be implemented on time.

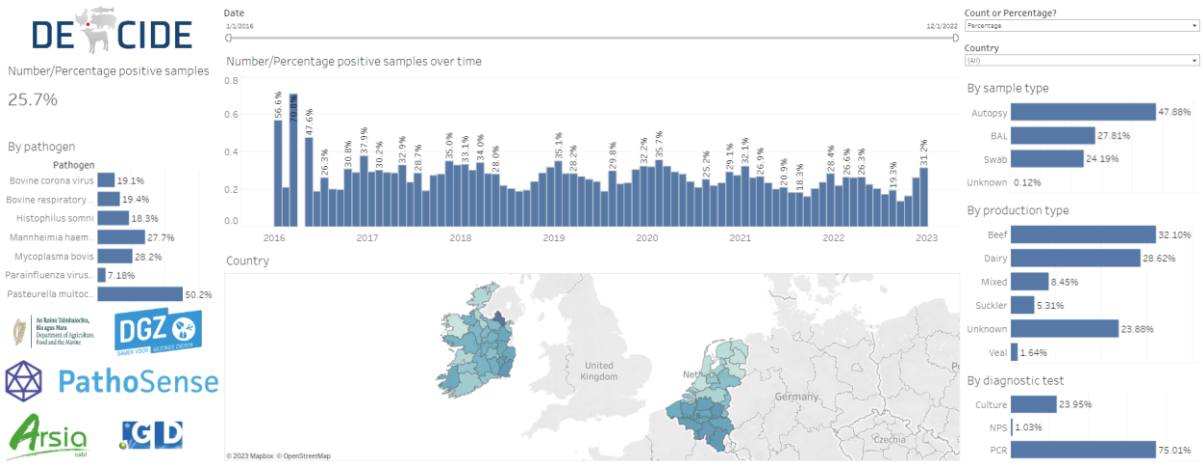


Figure 1. The cattle barometer, an interactive dashboard for exploring the circulating pathogens in the dimension of time, space and diagnostic tests.

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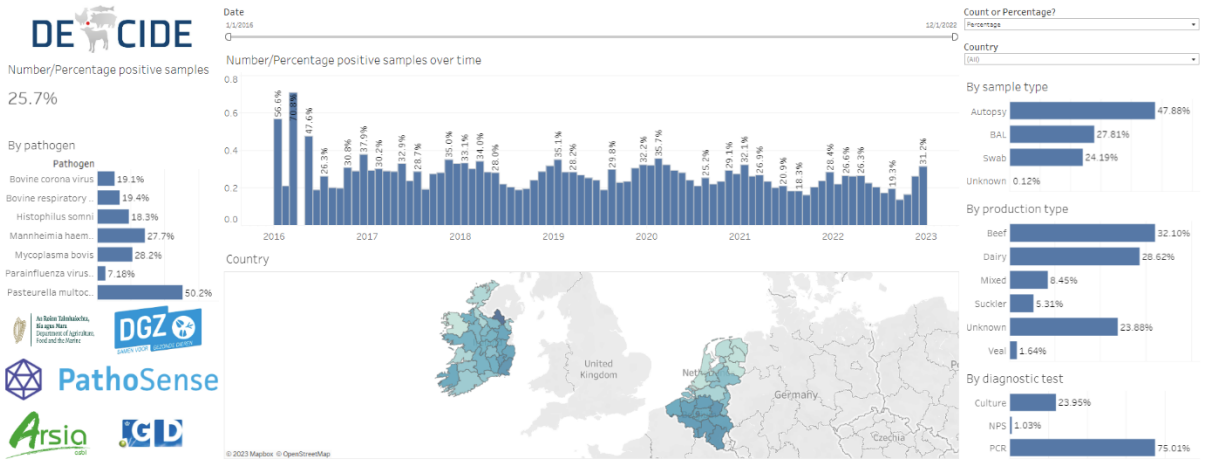
***Dutch version***

## De Europese griepbarometer: een kaart om door de wereld van luchtwegpathogenen te navigeren

**De Europese griepbarometer** (link: https://decide-project-eu.github.io/case-studies-website/case-studies/cattle-barometer.html) **is een innovatieve tool die binnen het DECIDE-project wordt ontwikkeld.** Het dashboard visualiseert labresultaten van luchtwegmonsters van rundvee uit een aantal Europese landen en de historische trends, dynamiek en aanwezigheid van specifieke pathogenen per gebied (figuur 1). Daarnaast biedt het de mogelijkheid om vroegtijdig te waarschuwen en de besluitvorming door de veehouder en dierenarts te ondersteunen om infectieziekten op het bedrijf onder controle te houden. Als er bijvoorbeeld een toename is in het aantal positieve monsters voor een specifieke ziekteverwekker, kan de veehouder besluiten om zijn veestapel te vaccineren om ernstige ziekte in de veestapel te voorkomen. Daarnaast kan er bij aankoop van een rund uit een bepaalde regio gekeken worden of er een hoog aantal positieve monsters in dit gebied zijn, waarna ze extra testen voor deze specifieke ziekteverwekker kunnen doen of bijvoorbeeld een verlengde quarantaineperiode instellen voordat ze het nieuw aangekochte rund aan de kudde toevoegen. Zo zal dit dier niet de hele veestapel besmetten.

Op dit moment maakt de Europese griepbarometer het mogelijk om de gegevens visueel te verkennen. **Het is als een kaart om door de wereld van BRD-pathogenen te navigeren.** Je kunt gewoon klikken, filteren en verkennen om inzichten te krijgen. Tot nu toe zijn gegevens van België, Nederland en Ierland opgenomen. In de nabije toekomst zal de Europese griepbarometer vaker worden bijgewerkt, gegevens van meer Europese landen geautomatiseerd op te nemen. Daarnaast zal een vroegdetectie component worden ontwikkeld om veehouders en hun dierenartsen te helpen potentiële uitbraken voor te blijven. Voor het succes van de Europese barometer is het echter belangrijk dat veehouders en dierenartsen in het geval van luchtwegaandoeningen in de koppel monsters van de luchtwegen naar hun laboratoria blijven sturen, zodat de barometer continu kan worden geupdate en gerichte bioveiligheidsmaatregelen op tijd kunnen worden geïmplementeerd.




*De Europese griepbarometer is een interactief dashboard voor het verkennen van de circulerende ziekteverwekkers in tijd, ruimte en diagnostische tests*

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## 2.2 Practice abstract 2: The cattle purchase assistant: decision support to minimize the risk of introducing diseases.

*"Most diseases are bought and paid for".* This catchphrase highlights the risks farmers face when purchasing animals from various herds. It's like rolling the dice, and farmers might end up bringing in diseases that could impact the health of the herd and their livelihoods. This risk is particularly high in the veal calf or feedlot industry, where animals are often bought from multiple herds. These systems are prone to intensive antimicrobial use, especially for respiratory tract infections, to protect production results and animal welfare. Even smaller scale dairy and beef farms can also face long-term issues, with the potential introduction of infections like Salmonella or *Mycoplasmopsis bovis*, which can persist for years. The European Union's new animal health law encourages the exchange of animals and products between farms of similar health status. This is supported by official and voluntary programs tackling different infections, although their implementation varies across EU countries. Additionally, there's a growing amount of data from veterinary laboratories for non-regulated diseases, such as respiratory viruses and *M. bovis*.

Within the framework of the DECIDE project the **Purchase Assistant** is an innovative tool that was developed by the Swedish Veterinary Agency (SVA). In collaboration with the Swedish Board of Agriculture and cattle stakeholders, a co-creative and iterative process was used. **This tool doesn't just provide a risk estimate for introducing a certain pathogen when buying cattle from other herds, but also offers a list of matching herds according to a certain health state**. This facilitates safe trade, supports the new EU animal health requirements, and encourages frequent testing among cattle farmers. As result, the Purchase Assistant benefits individual farms and the sector as a whole, turning the dice roll into a calculated risk.

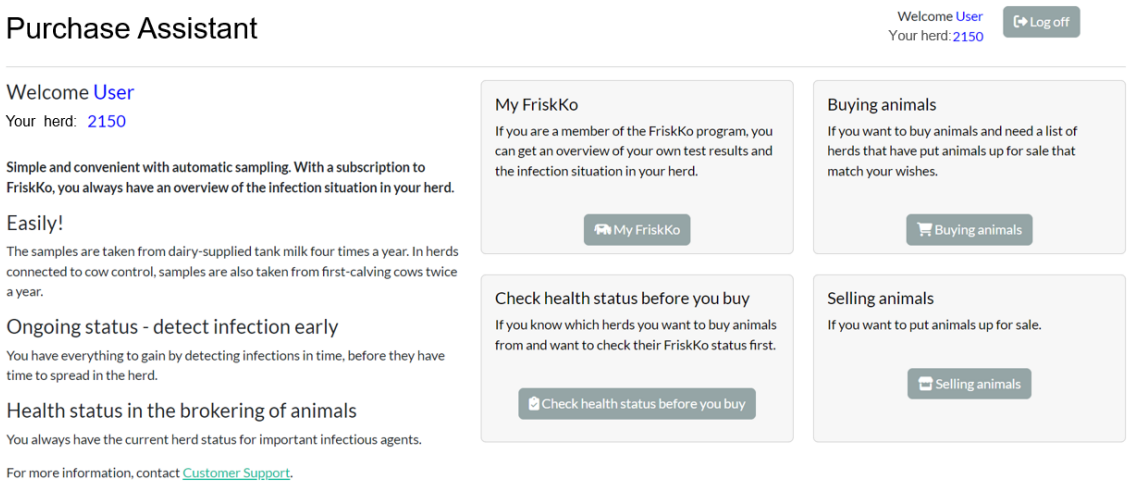


Figure 2. Home page of the Purchase Assistant app. Users can choose to look at their own laboratory results ("My FriskKo"), get a list of herds selling animals based on selected criteria ("Buying animals"), check the health status of other herds ("Check health status before you buy"), and enter animals for sale in the database ("Selling animals").

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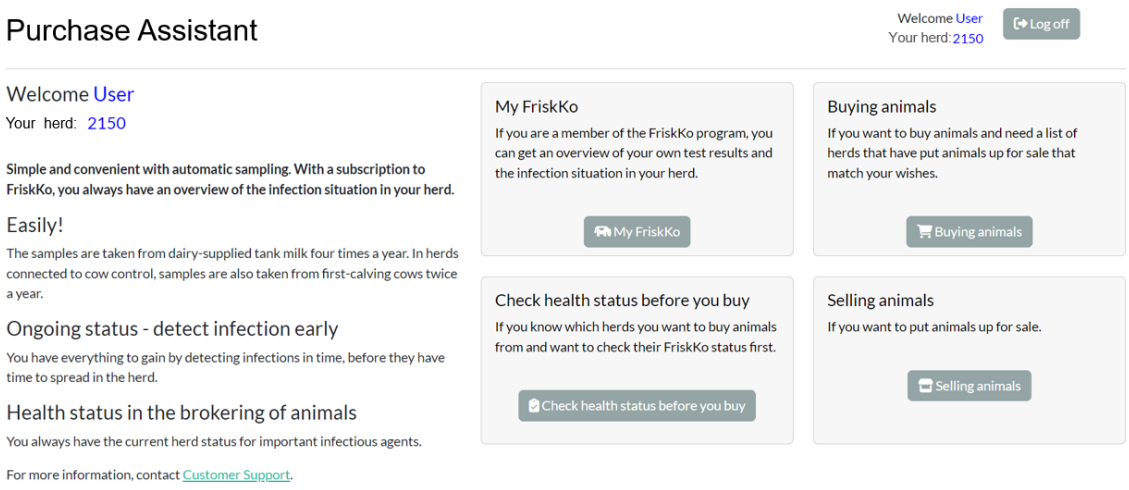
***Swedish version***

## Inköpsassistenten för nötkreatur: beslutsstöd för att minimera risken för att införa sjukdomar

"De flesta sjukdomar är köpta och betalda". Denna fras belyser riskerna för jordbrukare när de köper djur från olika besättningar. Det är som att kasta en tärning, och bönder kan hamna i att få in sjukdomar som kan påverka besättningens hälsa och deras försörjning. Denna risk är särskilt hög inom kalv- eller foderindustrin, där djur ofta köps från flera besättningar. Dessa system är benägna att ha en intensiv antibiotikaanvändning, särskilt för luftvägsinfektioner, för att skydda produktionsresultat och djurens välbefinnande. Även småskaliga mjölk- och nötköttsgårdar kan också få långsiktiga problem, med potentiell introduktion av infektioner som salmonella eller Mycoplasmopsis bovis, som kan kvarstå i flera år. Europeiska unionens nya djurhälsolag uppmuntrar utbyte av djur och produkter mellan gårdar med liknande hälsostatus. Detta stöds av officiella och frivilliga program som tar itu med olika infektioner, även om genomförandet varierar mellan EU-länderna. Dessutom finns det en växande mängd data från veterinärlaboratorier för icke-reglerade sjukdomar, såsom luftvägsvirus och M. bovis.

Inom ramen för DECIDE-projektet är Inköpsassistenten ett innovativt verktyg som tagits fram av Statens veterinärmedicinska anstalt (SVA). I samarbete med Jordbruksverket och nötkreatursintressenter användes en samskapande och iterativ process. Det här verktyget ger inte bara en riskuppskattning för att introducera en viss patogen vid köp av nötkreatur från andra besättningar, utan erbjuder också en lista över matchande besättningar enligt ett visst hälsotillstånd. Detta underlättar säker handel, stödjer EU:s nya djurhälsokrav och uppmuntrar frekventa provtagningar bland nötkreatursuppfödare. I och med det gynnar Inköpsassistenten enskilda gårdar och sektorn som helhet, och gör tärningskastet till en kalkylerad risk.




*Hemsidan för Inköpsassistenten. Användaren kan välja att se sina egna laboratorieresultat ("My FriskKo"), få en lista över besättningar som säljer djur baserat på utvalda kriterier ("Buying animals"), kontrollera hälsostatus för andra besättningar ("Check health status before you buy"), och skriva in djur till salu i databasen ("Selling animals").*

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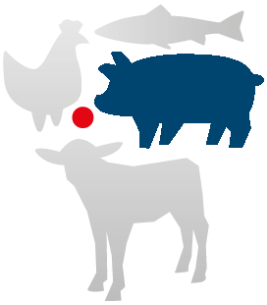

## Pigs

- **Creation of a pig health tool to improve decision-making at farm level** – the Irish example.
- **Overview of the economic impact of common respiratory disease in pigs and possible interventions.**

## 2.3 Practice abstract 3: Creation of a pig health tool to improve decision-making at farm level – the Irish example.

To meet the needs of Irish pig farmers and their health advisors (e.g. veterinarians) for better decision-making at farm level and to coordinate activities at national level, the **Animal Health Ireland Pig HealthCheck** Programme was set up (https://animalhealthireland.ie/programmes/pig-healthcheck/).

The programme gathers information from several sources into a central database (https://animalhealthireland.ie/programmes/pig-healthcheck/pig-healthcheck-database/). Currently, this consists of biosecurity and animal welfare data, data captured at the slaughterhouse, antimicrobial usage data and data from other national programmes. A mobile-friendly web system displays the data through a series of dashboards (graphs and tables), **allowing a farmer to access their data, benchmark it against national averages and monitor progress over time**. Each farmer has their unique username and confidentiality of data is maintained all times. Farmers can consent to share their data and dashboards with their health advisors. This way health advisors can use this tool to review farm health status, detect health issues and suggest recommendations for improvements.

Benchmarking is a powerful tool as allows comparison with others, increasing awareness of problems and driving improvement.

The database has the capacity to expand to include other data types (e.g. production data) or to link to existing tools that already collect such data. Linking several additional data sources in this way also allows for more detailed analysis to be undertaken and presented, thus further improve farm specific decision-making. Users' feedback on this tool is being sought so that we can improve it and help other countries and sectors develop similar tools.

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## 2.4 Practice abstract 4: Overview of the economic impact of common respiratory diseases in pigs and possible interventions.

**Understanding the financial impact of diseases is crucial for making well-informed decisions about disease prevention and control on pig farms.** In a scientific literature review, we summarized economic studies on infectious respiratory diseases in pigs, shedding light on the costs of disease and the associated costs and benefits of various interventions. The review includes 58 relevant scientific studies that use data from various regions, including Europe, the US, Canada, Asia, Oceania, Mexico, and Brazil. Most studies focused on commercial fattening farms, and the porcine reproductive and respiratory syndrome virus and *Mycoplasma hyopneumoniae* were the most studied pathogens. The reported economic impact per pig varied based on the respiratory pathogen, but overall ranged from €1.70 to €8.90 per nursery pig, €2.30 to €15.35 per fattening pig, and €100 to €323 per sow per year. A variety of interventions was studied, but vaccination was studied in over 60% of them. Most of the studies showed that applying an intervention on the farm resulted in a positive change in profits. Naturally, the economic impact of diseases and the effects of interventions may differ between farms and pathogen genotypes. However, the results from this review provide an indication of the often-unnoticed losses due to respiratory diseases and highlight the options for prevention and control.

***Dutch version***

### Een overzicht van de economische gevolgen van veel voorkomende luchtwegaandoeningen bij varkens en mogelijke bestrijdingsmaatregelen.

**Het begrijpen van de financiële impact van veelvoorkomende ziektes op varkensbedrijven is cruciaal voor het nemen van geïnformeerde beslissingen rond preventie en controle.** In een wetenschappelijke literatuur review vatten we economische studies over besmettelijke luchtwegaandoeningen bij varkens samen, waarbij de kosten van de ziektes en de kosten en baten van verschillende interventies werden belicht. De review identificeerde 58 wetenschappelijke studies die gegevens gebruikten uit verschillende regio's, waaronder Europa, de VS, Canada, Azië, Oceanië, Mexico en Brazilië. De meeste studies richtten zich op commerciële vleesvarkensbedrijven, en het porcine reproductive and respiratory syndrome-virus en *Mycoplasma hyopneumoniae* waren de meest bestudeerde ziekteverwekkers. De gerapporteerde economische impact per varken varieerde tussen de ziekteverwekkers, maar lag tussen €1,70 en €8,90 per big, €2,30 en €15,35 per vleesvarken, en €100 en €323 per zeug per jaar. Diverse interventies werden bestudeerd, maar in meer dan 60% van de gevallen lag de focus op vaccineren. De meeste studies toonden aan dat het toepassen van een interventie op het bedrijf resulteerde in een positief economisch resultaat. Uiteraard kunnen de economische impact van ziektes en de effecten van interventies verschillen tussen bedrijven en pathogeen genotypen. Desalniettemin bieden de resultaten van deze review een indicatie van de vaak onopgemerkte verliezen als gevolg van luchtwegaandoeningen en worden de onderzochte opties voor preventie en controle belicht.

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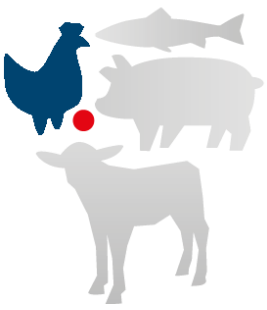

## Poultry

- **Creating a dashboard for broiler farmers and veterinarians to monitor infectious bronchitis strains** – a Dutch pilot.
- **Analysis of risk factors for antibiotic use, mortality and footpad lesions in Dutch broiler flocks.**

## 2.5 Practice abstract 5: Creating a dashboard for broiler farmers and veterinarians to monitor infectious bronchitis virus strains – a Dutch pilot.

Infectious bronchitis (IB) is one of the major respiratory pathogens affecting broiler production systems in Europe. Although vaccinations have the potential to effectively protect against IB infections, a single vaccine doesn't protect against all strains of the virus. Information on the most prevalent strains in the region can therefore aid poultry farmers in optimisation of their vaccination strategy.

In the Netherlands, Royal GD has a monitoring system for IB strains. The results are published on a national level in a pdf-document twice a year. The reporting of the IB monitoring results could be improved by creating an interactive dashboard, which can be accessed from the farm and provides an up-to-date overview of the prevalence of the most important IB strains. The strain prevalence can be visualised per quarter of the year and province, which provides more information to the user than the current reports.

The diagnostic data that is used in this tool is summarised by quarter of the year and province, thus avoiding privacy issues. The tool can be expanded to include data from different labs within the Netherlands and other European countries. A preliminary version of the IB dashboard can be found at: https://decide-project-eu.github.io/case-studies-website/case-studies/poultry-barometer.html

***Dutch version***

### De ontwikkeling van een dashboard voor vleeskuikenhouders en dierenartsen om infectieuze bronchitis-virusstammen te monitoren – een Nederlandse pilot

Het infectieuze bronchitisvirus (IBV) is een van de belangrijkste veroorzakers van luchtwegproblemen bij vleeskuikens in Europa. Hoewel vaccins effectieve bescherming kunnen bieden tegen IBV-infecties, kunnen ze niet tegen alle verschillende virusstammen tegelijk beschermen. Informatie over de meest voorkomende stammen in een regio kan daarom vleeskuikenhouders helpen om hun vaccinatiestrategie te optimaliseren.

In Nederland heeft de Gezondheidsdienst voor Dieren (GD) een monitoringsysteem voor IB. De resultaten worden twee keer per jaar gepubliceerd op nationaal niveau als pdf-document. Het rapporteren van de resultaten van de IB-monitoring zou verbeterd kunnen worden met de ontwikkeling van een interactief dasboard. Dit dashboard is toegankelijk vanuit het vleeskuikenbedrijf en geeft actuele informatie per kwartaal en provincie, wat de gebruiker meer informatie kan bieden dan de huidige rapporten.

De diagnostische data die gebruikt wordt in deze tool wordt samengevat per kwartaal en provincie, waardoor er geen privacygevoelige informatie in staat. De tool kan worden uitgebreid met data van andere laboratoria, uit Nederland of andere Europese landen. Een eerste versie van het IB-dashboard kun je hier vinden: https://decide-project-eu.github.io/case-studies-website/case-studies/poultry-barometer.html

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## 2.6 Practice abstract 6: Analysis of risk factors for antibiotic use, mortality and footpad lesions in Dutch broiler flocks.

An average broiler farm produces vast amounts of data. In the Netherlands, where broiler production is not integrated, a considerable part of this data is captured in national datasets. These data sources are often analysed individually for monitoring purposes. A combined analysis could provide new insights, for example on risk factors for antibiotic use, mortality, and footpad lesions. We combined data from the central registration of antibiotics (CRA), poultry monitoring program (PMP) and slaughter transportations (flock information system poultry, *KIP*), from 2013 to 2021. This resulted in the inclusion of 112,142 flocks from 919 farms. Our results showed that the broiler type was a major determinant of antibiotic use, mortality, and footpad lesion scores, with slower-growing flocks performing better on all three outcomes. An increase in flock size increased the risk of antibiotic use. Thinned flocks had a higher probability of antibiotic treatment after the first week and higher footpad lesion scores. All three outcomes showed a seasonal effect.

These results are a first step towards decision support tools for antibiotic use, mortality, and footpad lesions. The next step is to see if the identified risk factors can be used for prediction models, or if important data is lacking, such as data on farm-specific management decisions and disease diagnostics. This will be discussed with stakeholders.

***Dutch version***

### Analyse van risicofactoren voor antibioticagebruik, sterfte en voetzoollaesies in Nederlandse vleeskuikenkoppels

Een gemiddeld vleeskuikenbedrijf produceert een grote hoeveelheid aan data. In Nederland, waar vleeskuikenbedrijven niet geïntegreerd zijn, wordt veel data verzameld in nationale datasets. Deze gegevensbronnen worden vaak apart van elkaar geanalyseerd voor monitoring, maar zelden samengevoegd. Een gecombineerde analyse zou nieuwe inzichten kunnen bieden, bijvoorbeeld over risicofactoren voor antibioticagebruik, sterfte en voetzoollaesies. In onze studie hebben we de volgende datasets gecombineerd: de Centrale Registratie Antibiotica (CRA), het Pluimvee Monitoring Programma (PMP), en afvoermeldingen uit het Koppel Informatiesysteem Pluimvee (KIP), van 2013 tot 2021. Dit resulteerde in een dataset met 112.142 koppels van 919 bedrijven. De resultaten lieten zien dat het type vleeskuiken het grootste effect had op antibioticagebruik, sterfte en voetzoollaesies, waarbij traaggroeiende kippen beter scoorden op alle drie de uitkomsten. Grotere koppels kregen gemiddeld vaker antibiotica na de eerste week en hadden hogere voetzoollaesiescores. In alle drie de uitkomsten was een seizoenseffect te zien.

Deze resultaten zijn een eerste stap richting beslissingsondersteunende tools om antibioticagebruik, sterfte en voetzoollaesiescores zo laag mogelijk te houden. De volgende stap is om te kijken of de gevonden risicofactoren gebruikt kunnen worden voor voorspellende modellen, of dat er daarvoor extra data nodig is, zoals bedrijfsspecifieke managementbeslissingen en diagnostiek. Dit zal worden besproken met stakeholders.

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## Salmon

- **Early detection of salmon disease: An innovative approach in aquaculture**
- **Monitoring monthly mortality of maricultured Atlantic salmon (Salmo salar L..) in Scotland**

## 2.7 Practice abstract 7: Early detection of salmon disease: An innovative approach in aquaculture

A new monitoring system for early warning of disease in Atlantic salmon farming aims to detect pancreas disease (PD) outbreaks by looking at monthly death rates of salmon. The system triggers monthly alarms when death rates are higher than what is typically expected. It uses a combination of production data and environmental conditions as inputs for statistical models. Developed with data from 2014 onwards, the system has proven its capability in identifying potential outbreaks of PD. In testing the system, involving over 19,000 months of farm operations in Norway, we found that it was quite effective but not perfect. It correctly identified farms with PD outbreaks most of the time, about 80.5% to 87.4% of the time. A notable strength of the system is its high reliability in non-outbreak situations. When the system did not trigger an alarm, there was a high probability (about 81% to 94%) that the farm truly had no PD outbreak. The system alarms align closely with Norway's national PD surveillance, often raising alerts within the same or adjacent months. A potential limitation is that around half of the trigged alarms were false positive for PD, indicating a PD outbreak when there was none. But just because it was a false alarm for PD, it does not mean there were no other health issues at the farm that needed attention.

The proposed system shows promise in detecting diseases in timely manner in salmon farms, possible earlier than non-data-driven traditional methods, contributing significantly to aquaculture health management. Currently, we are in contact with potential stakeholders interested in using the system. Future improvements could include more frequent and detailed data collection, further enhancing system's performance.

***Norwegian version***

### Tidlig varsling av sykdommer hos laks: En innovativ tilnærming for akvakultur

Et nytt system for sykdomsovervåking hos oppdrettslaks har som mål å avdekke utbrudd av pankreassykdom (PD) gjennom overvåking av månedlig dødelighetsrate. Systemet går ut på at en månedlig alarm utløses hvis dødelighetsraten overstiger en gitt normalrate. En kombinasjon av produksjonsdata og miljømessige forhold brukes som input for statistiske modeller. Systemet er utviklet med data datert tilbake til 2014 og frem til i dag, og har vist evne til å identifisere potensielle utbrudd av PD. Under testing av systemet (som involverte over 19 000 måneder med anleggsdrift i Norge) er det avdekket at systemet er effektivt, men ikke perfekt. Systemet detekterte oppdrettslokaliteter med PD-utbrudd ca. 80,5 % - 87,4 % av gangene. En av styrkene til systemet er den høye sikkerheten i situasjoner hvor PD-utbrudd ikke forekommer. Det betyr at i de tilfellene systemet ikke utløste alarm var det høy sannsynligheten (81 % - 94 %) for at oppdrettslokaliteten ikke hadde PD-utbrudd. Systemet er godt samstemt med det nasjonale overvåkingsprogrammet for PD, og alarm ble som oftest utløst samme, eller nærliggende, måned som PD-mistanke oppstod. En potensiell begrensning av systemet er at halvparten av de utløste alarmene var falske positiver for PD, som betyr at systemet kan indikere PD-utbrudd selv om dette ikke er tilfellet. Likevel kunne den utløste alarmen settes i sammenheng med andre helseproblem som trengte tilsyn.

Dette varslingssystemet viser evne til å detektere sykdomsutbrudd ved oppdrettslokaliteter tidlig, muligens tidligere enn tradisjonelle «ikke-data-drevne» metoder. Det betyr at systemet kan være et godt bidrag til sykdomshåndtering innen akvakultur. Foreløpig er vi i kontakt med potensielle interessenter for bruk av systemet. Ytterligere forbedringer kan være hyppigere innsamling av mer detaljerte produksjonsdata.

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## 2.8 Practice abstract 8: Monitoring monthly mortality of maricultured Atlantic salmon (Salmo salar L.) in Scotland.

**Mortality is one of the most important challenges to the sustainability of the salmon farming industry** because it poses a substantial economic burden for producers and is an indicator of suboptimal fish health and welfare.

The Scottish government continuously collects monthly production data from all Scottish salmon producers, which becomes publicly available. This data provides the opportunity for monitoring mortality at a national level without the constraints of additional data collection and developing data sharing agreements. Such a monitoring system can be used to prompt producers and inspectors to further investigate when mortality is higher than expected. Several models have been developed using two different modeling techniques. One approach involves monitoring each production cycle individually, while the other takes the relationships between several sites in diverse regions into account. Open source remotely sensed environmental data from satellites is included to enhance the models. The objective was the creation of an industry-wide monitoring model for salmon mortality in Scotland that does not require additional administrative challenges.

The open-source Scottish salmon data proved to be valuable in monitoring salmon mortality, providing stakeholders with information about mortality being higher than expected. Nevertheless, the mortality predictions have some degree of uncertainty. There is scope to reduce this uncertainty, e.g. by adding information on factors influencing salmon mortality and movement data, or using shorter time periods for mortality data aggregation, such as weekly instead of monthly, however, such data is currently not publicly available.

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# 3 Outlook

This deliverable presented the first set of practice abstracts of the DECIDE project. A second set of practice abstract will be published as part of the deliverable D6.9 – Second set of practice abstracts. In total, this will constitute a number of 16 practice abstracts by the end of the project. As a public deliverable, the practice abstracts will be made available via CORDIS and the DECIDE website (decideproject.eu). As a next step, it will be assessed how the abstracts can be fed into the new EU CAP Network website (former EIP-AGRI database) for further dissemination. Alongside the EU CAP Network, The EU Farmbook is a new digital platform funded by Horizon Europe, aimed at gathering and sharing agricultural and forestry knowledge. The practice abstracts from the DECIDE project could be incorporated into the EU Farmbook by creating a dedicated section for them, categorising them based on relevance, and linking them to related resources for easy access and use. Lastly, all DECIDE consortium partners are committed to distributing the practice abstracts among interested stakeholders and end-users of the described tools.