H2020-SFS-2018-2020

DECIDE

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

Deliverable 6.9

Second set of practice abstracts

WP6 – Communication activities and dissemination and exploitation of results

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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
INRAE	Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement
UGent	Universiteit Gent
IRTA	Institut de Recerca i Tecnologia Agroalimentàries
NVI	Veterinærinstituttet – Norwegian Veterinary Institute
HFP	HF Partners
SRUC	Scotland's Rural College
accelCH	accelopment Schweiz AG

Executive Summary

This deliverable presents the second set of practice abstracts developed within the DECIDE project. It includes eight concise summaries tailored for practitioners, highlighting key results, tools and recommendations across the four DECIDE species: cattle, poultry, pigs and salmon. Together with the first set of practice abstracts presented in Deliverable D6.4, this completes the full collection of 16 abstracts foreseen in the project.

Objectives of the Deliverable
This deliverable contributes to the effective dissemination of DECIDE results and supports the uptake of project outputs by end-users. Specifically, it aims to:

- Disseminate the latest results and insights of the DECIDE project in a format accessible to practitioners across livestock and aquaculture sectors
- Support the adoption of DECIDE tools, models and approaches by farmers, veterinarians and other stakeholders
- Bridge the gap between scientific outputs and practical application through clear, targeted communication
- Complement the first set of abstracts in D6.4 by providing additional results, tools and case-specific findings emerging from the later stages of the project

The practice abstracts follow a user-oriented approach, presenting key findings and recommendations in a concise and actionable format.

Activities
The practice abstracts included in this deliverable were developed collaboratively by the DECIDE consortium. Each species group contributed two abstracts reflecting recent results, methodological advances or practical recommendations derived from their work.

All abstracts were prepared in line with the EIP-AGRI common format, ensuring consistency with EU standards for knowledge exchange.

Outcome
The main outcome of this deliverable is the second collection of eight practice abstracts, which expand the portfolio of DECIDE outputs introduced in D6.4. These abstracts address:

- Advanced tools for early detection and decision support for Bovine respiratory disease (BRD) management, including activity-based monitoring and privacy preserving data sharing approaches (federated learning) and the welfare impact of BRD in dairy calves.
- Comparative assessments of intervention strategies and surveillance tools in pig production, including the Pig Barometer
- A model for early prediction of footpad lesions in broiler chicken. Epi-economic analyses and decision-support approaches in aquaculture, including disease control strategies and dashboard design

Together with the first set of abstracts, these outputs provide a comprehensive overview of DECIDE results, covering disease detection, surveillance, economic assessment, welfare evaluation and decision support across species.

Next steps
The DECIDE consortium will further disseminate all practice abstracts through established European knowledge platforms including:

- The EU CAP Network platform
- CORDIS and the DECIDE project website
- Integration into platforms such as the EU FarmBook

In parallel, consortium partners will continue promoting these materials to relevant stakeholders to maximise their practical use and long-term impact.

1 Introduction

Farmers, veterinarians and other animal health managers in the livestock and aquaculture sectors often lack comprehensive and harmonised information on the prevalence and impact of contagious animal diseases that are endemic in Europe. These diseases are estimated to reduce production efficiency by approximately 10–15%, leading to significant economic losses, reduced sustainability and negative impacts on animal welfare.

DECIDE is a five-year Horizon 2020 project that addresses this gap by developing data-driven decision support tools for the early detection, monitoring and control of such diseases. The project integrates epidemiological modelling, economic assessment and advanced data analytics to provide timely signals of disease emergence, support diagnostic confirmation and evaluate intervention strategies. These tools are designed to inform decision-making by considering disease spread, economic implications and animal welfare outcomes.

To ensure that these results are effectively transferred to practice, **DECIDE places strong emphasis on user-oriented dissemination. Practice abstracts are one of the measures in this approach. They provide short, structured and accessible summaries of project results and recommendations tailored to end-users.**

In total, 16 practice abstracts are produced within the DECIDE project and distributed across two deliverables. The first set of eight abstracts was presented in Deliverable D6.4, focusing on initial tools, datasets and early findings. This deliverable, D6.9, presents the second set of eight practice abstracts, reflecting more advanced results, validated tools and refined methodologies developed during the later stages of the project.

Together, both deliverables provide a comprehensive and practice-oriented overview of DECIDE innovations across all four target species: cattle, poultry, pigs and salmon. The abstracts support knowledge uptake by translating complex research outputs into actionable insights that can be readily applied in livestock and aquaculture management. The first set of practice abstracts is available on the DECIDE website under “Deliverables”: DECIDE_D6.4_First-set-of-practice-abstracts.pdf.

The following chapters will cover the DECIDE practice abstracts 9-16.

1.1 EIP-AGRI common format

The DECIDE project uses the EIP-AGRI common format to develop its practice abstracts. This standardised template is designed to facilitate the transfer of knowledge from research and innovation projects to practitioners in agriculture and aquaculture. Practice abstracts present key results, recommendations and practical solutions in a clear and structured way, supporting their direct application in daily practice. The format is widely used across Horizon 2020 multi-actor projects, thematic networks and Operational Groups, contributing to a shared European repository of practice-oriented knowledge.

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.

2 Second set of practice abstracts

Cattle

- **Connect'BRD: Activity-based early detection and decision support to manage respiratory diseases in cattle**
- **Across laboratory disease prediction without sharing data**
- **The welfare impact of BRD in dairy calves**

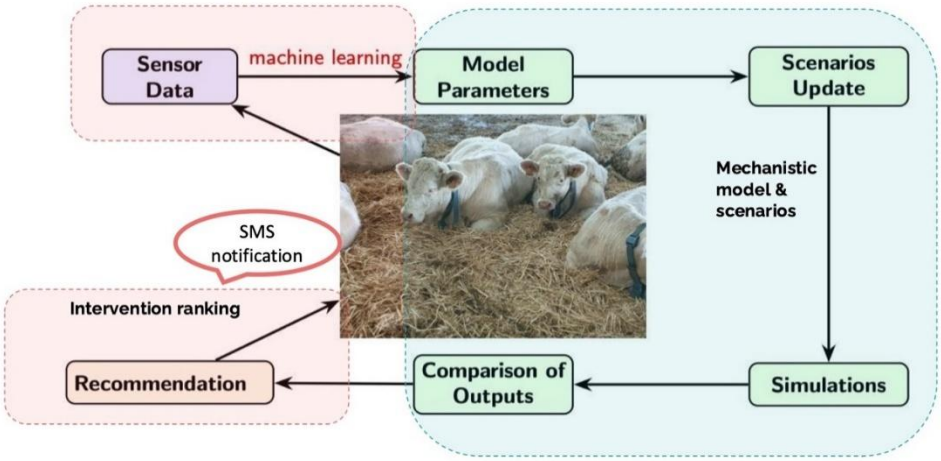
2.1 Practice abstract 9: Connect'BRD: Activity-based early detection and decision support to manage respiratory diseases in young beef cattle

Bovine respiratory disease (BRD) is one of the main health challenges in cattle production, particularly in young animals in fattening systems. It is difficult to detect early, as clinical signs are often subtle and observed only during routine checks. This can lead to delayed treatment, increased disease severity, and frequent use of antibiotics at group level, with impacts on cattle welfare and farm profitability.

Within the DECIDE project, **the Connect'BRD tool has been developed by INRAE to support farmers and veterinarians in the early detection and management of BRD. This innovative tool combines behavioural data from on-farm sensors with artificial intelligence and models that predict the spread of BRD in the herd.** Cattle are equipped with activity sensors (accelerometer-based collars) that continuously record behaviours such as eating, resting, and rumination. These data are analysed using artificial intelligence-based models to detect animals that may be at risk of disease, even before clear clinical signs are visible.

When a change in health status is detected, the tool simulates different intervention scenarios that can limit BRD transmission and progression. These scenarios take into account multiple pathogens, uncertainty in infection status, and possible management actions such as individual or group treatment, isolation, or additional monitoring (e.g. body temperature check). Based on these simulations, **the tool ranks the most effective interventions, prioritising animal health outcomes** (mortality and severity) and then antimicrobial use. Farmers receive SMS notifications indicating animals at risk and suggested actions.

Connect'BRD was tested in commercial fattening farms in France between November 2024 and May 2025, involving nearly 550 beef cattle across multiple farms. Results show that the detection system is able to identify a large proportion of disease cases early (high sensitivity), supporting more proactive surveillance. Farmers reported that the tool helps them react faster and increases their awareness of herd health. However, early detection may also generate false positives, meaning that the tool should be used as a support for decision-making rather than as an automatic trigger for treatment, and that the false positive rate has to be reduced in future versions.



The sensor-model-recommendation loop in Connect'BRD. Activity data received from individual necklaces are used to identify possibly diseased beef cattle, simulate contrasted intervention scenarios, compare their outcomes, and recommend the actions that are predicted most efficient to reduce disease impact and spread.

Beyond BRD, the Connect'BRD approach is designed to be generic and could be adapted to other diseases, livestock species, or production systems. By combining early detection with scenario-based decision support, it offers a promising way to improve animal health management while supporting more targeted and responsible use of antimicrobials.

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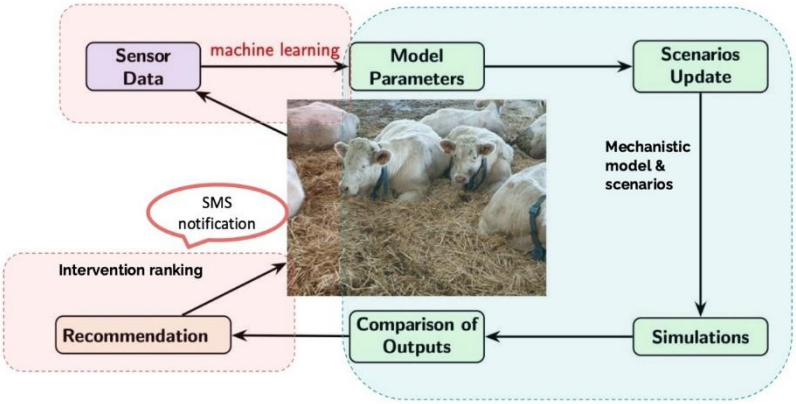
French version

Connect'BRD:Détection précoce basée sur l'activité et outils d'aide à la décision pour la gestion des maladies respiratoires chez les bovins.

Les maladies respiratoires des bovins (BRD) constituent l'un des principaux défis sanitaires en production bovine, en particulier chez les jeunes animaux en engraissement. Elles sont difficiles à détecter précocement, car les signes cliniques sont souvent discrets et observés uniquement lors des contrôles de routine. Cela peut entraîner des retards de traitement, une aggravation de la sévérité des cas et un recours fréquent aux antibiotiques à l'échelle du lot, avec des conséquences sur le bien-être des bovins et la rentabilité des exploitations. Dans le cadre du projet DECIDE, **l'outil Connect'BRD a été développé par INRAE pour accompagner les éleveurs et les vétérinaires dans la détection précoce et la gestion des maladies respiratoires bovines. Cet outil combine des données comportementales issues de capteurs en élevage avec des méthodes d'intelligence artificielle et des modèles épidémiologiques mécanistes.** Les taurillons sont équipés de capteurs d'activité (colliers accéléromètres) qui enregistrent en continu des comportements tels que l'alimentation, le repos et la rumination. Ces données sont ensuite analysées à l'aide d'algorithmes d'apprentissage automatique afin d'identifier les animaux susceptibles d'être à risque, possiblement avant l'apparition de signes cliniques.

Lorsqu'un changement d'état de santé est détecté, l'outil simule différents scénarios d'intervention de réduction de la transmission et de l'évolution des BRD. Ces scénarios prennent en compte plusieurs agents pathogènes, les incertitudes sur l'état infectieux, ainsi que différentes actions de gestion possibles, telles que le traitement individuel ou collectif, l'isolement ou un suivi complémentaire (par exemple la prise de température corporelle). **Sur la base de ces simulations, l'outil classe les interventions les plus efficaces, en priorisant les critères de santé animale** (mortalité et sévérité), puis l'usage des antibiotiques. Les éleveurs reçoivent des notifications par SMS indiquant les animaux à risque et les actions recommandées.



La boucle capteur–modèle–recommandation dans Connect'BRD. Les données d'activité issues de colliers individuels sont utilisées pour identifier les bovins à viande potentiellement malades, simuler différents scénarios d'intervention, comparer leurs résultats et recommander les actions jugées les plus efficaces pour réduire l'impact et la propagation de la maladie.

Connect'BRD a été testé dans des élevages commerciaux d'engraissement en France entre novembre 2024 et mai 2025, impliquant près de 550 jeunes bovins de boucherie répartis sur plusieurs exploitations. Les résultats montrent que le système de détection est capable d'identifier précocement une grande proportion des cas de maladie (forte sensibilité), favorisant une surveillance plus proactive. Les éleveurs ont indiqué que l'outil les aide à réagir plus rapidement et à renforcer leur vigilance vis-à-vis de la santé du troupeau. Toutefois, la détection précoce peut également générer des faux positifs, ce qui implique que l'outil doit être utilisé comme une aide à la décision plutôt que comme un déclencheur automatique de traitement, et que son taux de faux positifs devra être réduit dans les versions futures. Au-delà des BRD, l'approche Connect'BRD a été conçue pour être générique et pourrait être adaptée à d'autres maladies, espèces animales ou systèmes de production. En combinant détection précoce et aide à la décision basée sur des scénarios, elle offre une voie prometteuse pour améliorer la gestion de la santé animale tout en favorisant un usage plus ciblé et raisonné des antibiotiques.

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2.2 Practice abstract 10: Across laboratory disease prediction without sharing sensitive data: Federated Learning for Bovine Respiratory Disease

Bovine Respiratory Disease (BRD) is one of the most costly diseases affecting cattle in Europe. Predicting disease outbreaks helps veterinarians and farmers take preventive action. However, accurate predictions require data from multiple laboratories across different countries. Currently, laboratories cannot easily share their diagnostic data due to privacy regulations, data ownership concerns, and competition between institutions. This creates "data silos" where valuable information remains isolated.

The Cattle Barometer visualizes pathogen trends across European laboratories, helping farmers and veterinarians make informed decisions about disease control. Building on this, we developed a Federated Learning system for the Cattle Barometer surveillance platform. This system allows veterinary laboratories to collaboratively build disease prediction models without sharing their raw data. Each laboratory trains a prediction model locally on its own data. Only the learned patterns (not the actual animal records) are shared and combined into a global model. Data stays local, knowledge is shared, and privacy is preserved.

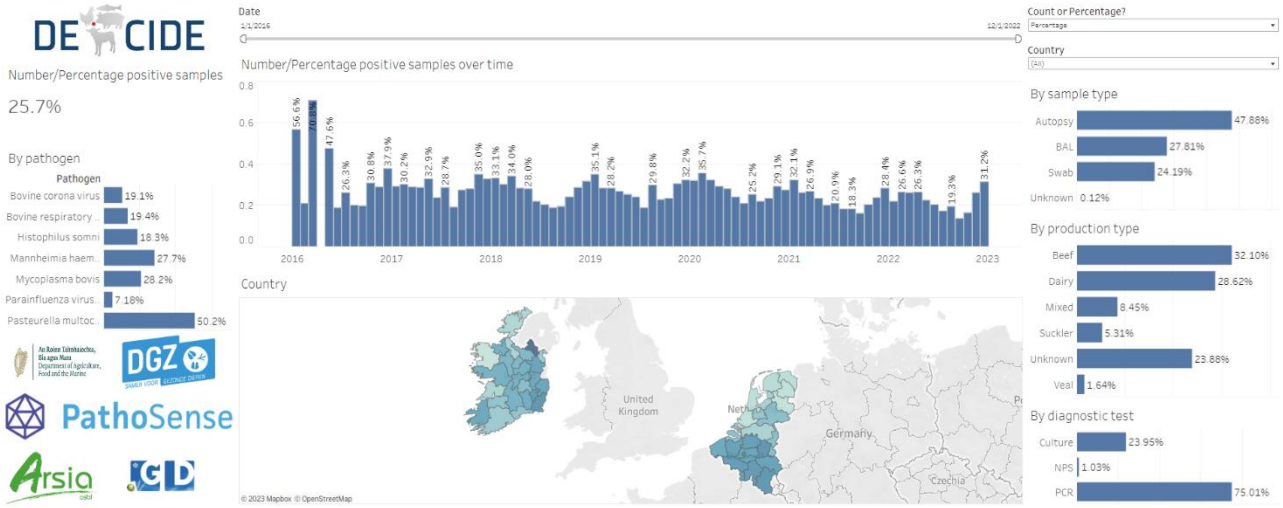

Figure 1 The cattle barometer, an interactive dashboard for exploring the circulating pathogens in the dimension of time, space and diagnostic tests.

The system **has been tested with six laboratories across four European countries** (Belgium, France, Ireland, and The Netherlands). Veterinarians get access to better disease predictions based on European-wide patterns. Laboratories can collaborate without legal or competitive concerns about data sharing. Farmers benefit from earlier disease warnings, leading to reduced animal losses and treatment costs. The approach can be extended to other diseases and species such as the Pig Barometer.

More Information

- **Cattle Barometer:** https://decide-project-eu.github.io/case-studies-website/case-studies/cattle-barometer.html
- **Code and Documentation**: https://github.com/Bovi-analytics/ontology_driven_horizontal_federated_learning_BRD
- **DECIDE Project:** https://decideproject.eu/

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Dutch version

Gezamenlijke ziektevoorspelling zonder gevoelige gegevens te delen: Federated Learning voor Boviene Respiratoire Ziekte

Boviene Respiratoire Ziekte (BRD) is een van de meest kostbare ziekten bij runderen in Europa. Het voorspellen van ziekte-uitbraken helpt dierenartsen en veehouders om preventieve maatregelen te nemen. Accurate voorspellingen vereisen echter gegevens van meerdere laboratoria in verschillende landen. Momenteel kunnen laboratoria hun diagnostische gegevens niet gemakkelijk delen vanwege privacyregelgeving, zorgen over data-eigendom en concurrentie tussen instellingen. Dit creëert "datasilo's" waarin waardevolle informatie geïsoleerd blijft.

De Cattle Barometer visualiseert pathogenentrends van Europese laboratoria en helpt veehouders en dierenartsen bij het nemen van weloverwogen beslissingen over ziektebestrijding. Hierop voortbouwend hebben wij een Federated Learning-systeem ontwikkeld voor het Cattle Barometer-surveillanceplatform. Dit systeem stelt veterinaire laboratoria in staat om gezamenlijk ziektevoorspellingsmodellen te bouwen zonder hun ruwe gegevens te delen. Elk laboratorium traint lokaal een voorspellingsmodel op eigen gegevens. Alleen de geleerde patronen (niet de daadwerkelijke diergegevens) worden gedeeld en gecombineerd tot een globaal model. Gegevens blijven lokaal, kennis wordt gedeeld en privacy blijft gewaarborgd.

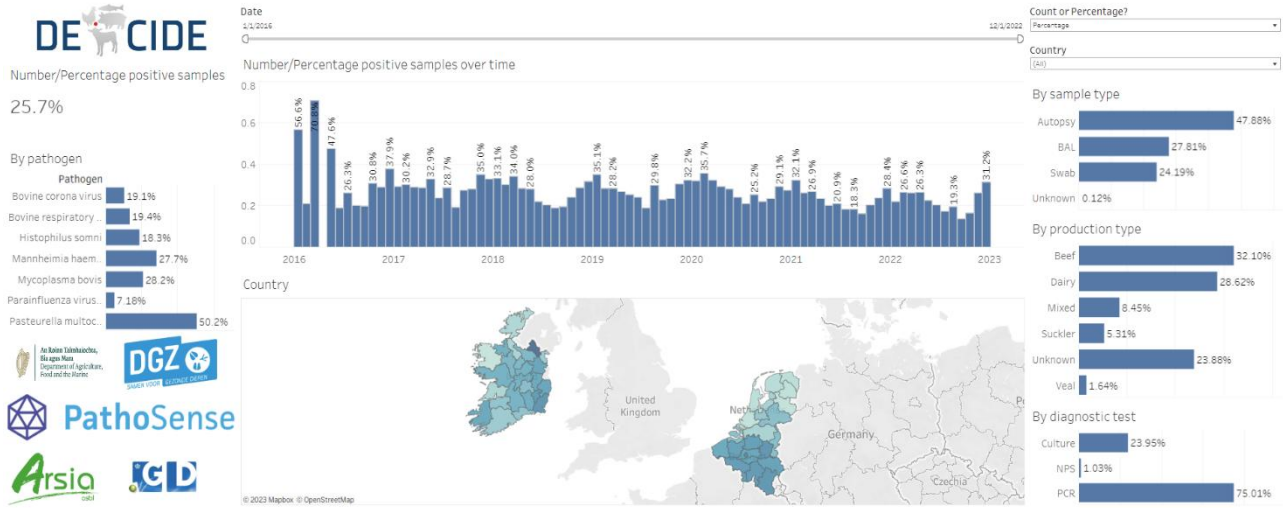

Figure 2 De veebarometer, een interactief dashboard om circulerende ziekteverwekkers te verkennen in de dimensies tijd, ruimte en diagnostische testen.

Het systeem is getest met 6 laboratoria in 4 Europese landen (België, Frankrijk, Ierland en Nederland). Dierenartsen krijgen toegang tot betere ziektevoorspellingen op basis van Europese patronen. Laboratoria kunnen samenwerken zonder juridische of concurrentiële zorgen over het delen van gegevens. Veehouders profiteren van eerdere ziektewaarschuwingen, wat leidt tot minder dierverliezen en lagere behandelkosten. De aanpak kan worden uitgebreid naar andere ziekten en diersoorten, zoals de Pig Barometer.

Meer informatie

- **Cattle Barometer:** https://decide-project-eu.github.io/case-studies-website/case-studies/cattle-barometer.html
- **Code en documentatie:** https://github.com/Bovi-analytics/ontology_driven_horizontal_federated_learning_BRD
- **DECIDE Project:** https://decideprojet.eu/

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2.3 Practice abstract 11: The welfare impact of BRD in dairy calves

The study focused on post-weaned dairy calves aged two to six months kept in group housing. Experts in animal health and welfare evaluated how different BRD-related changes in calves influence their welfare. The assessment included five key indicators: eating time, lying time, coughing, exploratory behaviour, and social behaviour. These indicators were selected using the Five Domains Model, which links physical health and behavioural changes to the animal's overall welfare state. Experts compared different combinations of these indicators to estimate how strongly each one contributes to welfare impairment. The results showed that coughing was perceived as the most important indicator affecting calf welfare, followed by reduced eating time and changes in social behaviour. Using these expert assessments, the study calculated the welfare impact associated with different levels of BRD severity. The results showed that welfare impairment increases rapidly as disease severity increases, indicating that more severe clinical signs correspond to a substantially reduced calf welfare.

For farmers and veterinarians, this approach can **support the prioritisation for control of health problems** on the farm. In practice, several health issues may occur simultaneously, such as BRD, diarrhoea, or lameness. When the welfare impact of different diseases can be quantified, it becomes easier to identify which conditions impose the greatest welfare burden and therefore require greater attention in prevention and herd health management strategies. In addition, quantitative welfare insights can support monitoring and benchmarking. When welfare impacts are expressed in numerical terms, improvements in herd health management can be tracked over time and compared across farms or production systems.

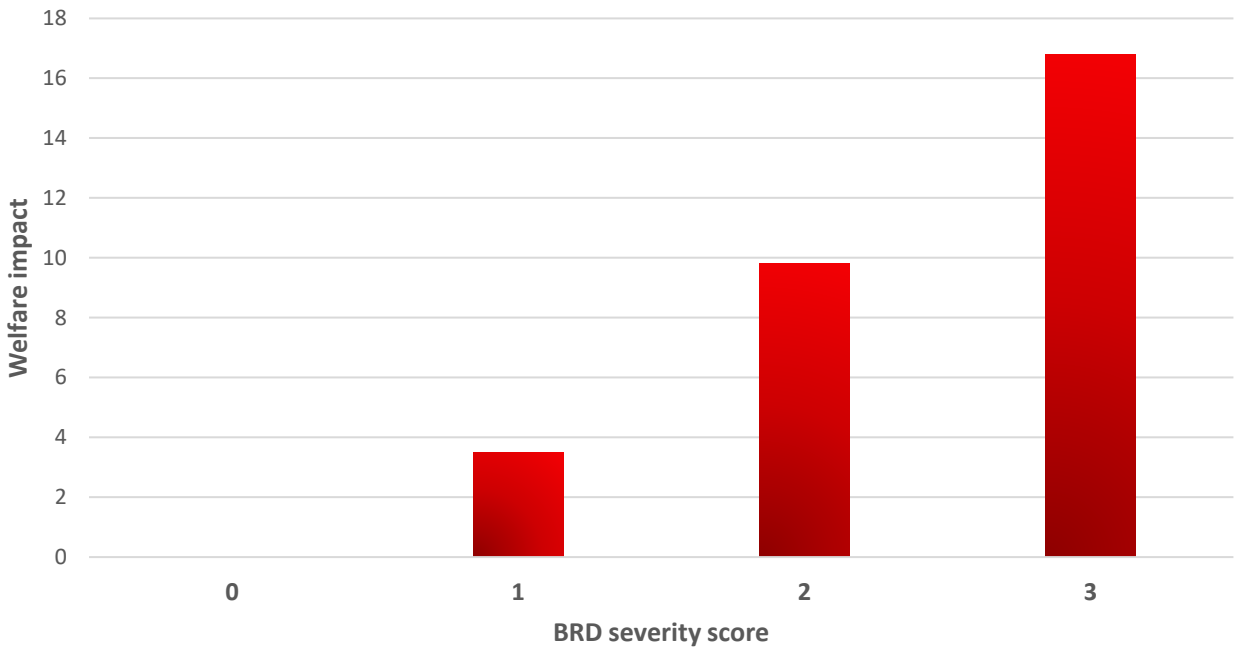

Figure 3 The welfare impact for different BRD severity scores (0=a calf with no clinical signs, 1=slightly ill calf with mild depression or gauntness, 2= a moderately ill calf demonstrating severe depression/laboured breathing/nasal or ocular discharge, 3= a severely ill calf and near death showing minimal response to human approach).

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Dutch version

Kwantificeren van het de welzijnsimpact van Bovine Respiratory Disease (BRD) bij kalveren

Bovine Respiratory Disease (BRD) is een belangrijke ziekte bij kalveren, en kan het dierenwelzijn aantasten. In de praktijk is het echter moeilijk om precies te kwantificeren hoe sterk een ziekte het welzijn beïnvloedt, vooral wanneer meerdere klinische symptomen en gedragsveranderingen tegelijkertijd optreden. Binnen het DECIDE-project is een studie uitgevoerd om **de impact van BRD op het welzijn van kalveren** te kwantificeren.

De studie richtte zich op gespeende melkveekalveren van twee tot zes maanden oud, gehuisvest in groepshuisvesting. Experts op het gebied van diergezondheid en dierenwelzijn hebben beoordeeld hoe verschillende BRD-gerelateerde veranderingen bij kalveren het welzijn beïnvloeden. De beoordeling omvatte vijf belangrijke indicatoren: eetgedrag, liggedrag, hoesten, exploratief gedrag en sociaal gedrag. Deze indicatoren werden geselecteerd op basis van het “Five Domains Model”, dat fysieke gezondheid en gedragsveranderingen koppelt aan de algemene welzijnstoestand van het dier. Experts vergeleken verschillende combinaties van deze indicatoren om in te schatten hoe sterk elk van hen bijdraagt aan de vermindering van het welzijn van kalveren. De resultaten lieten zien dat hoesten werd gezien als de belangrijkste indicator van verminderde welzijnsstatus, gevolgd door verminderd eetgedrag en veranderingen in sociaal gedrag. Op basis van deze expertbeoordelingen berekende de studie de impact op het welzijn bij verschillende mate waarin de kalveren ziek werden van BRD. De resultaten toonden aan dat de vermindering van het welzijn sterk toeneemt naarmate de ernst van de ziekte toeneemt.

Voor melkveehouders en dierenartsen kan deze aanpak helpen bij het **prioriteren van de aanpak van gezondheidsproblemen op het bedrijf**. In de praktijk kunnen meerdere gezondheidsproblemen tegelijkertijd voorkomen, zoals BRD, diarree of kreupelheid. Wanneer de impact van verschillende ziekten op het welzijn kwantitatief kan worden uitgedrukt, wordt het eenvoudiger om te bepalen welke aandoeningen de grootste belasting voor het welzijn vormen en dus extra aandacht vereisen bij preventie en bestrijding. Bovendien kunnen kwantitatieve welzijnsgegevens ook monitoring en vergelijking tussen bedrijven ondersteunen. Wanneer de effecten op het welzijn in numerieke termen worden weergegeven, kunnen verbeteringen door preventie of bestrijding in de tijd worden gevolgd en vergeleken tussen bedrijven of productiesystemen.

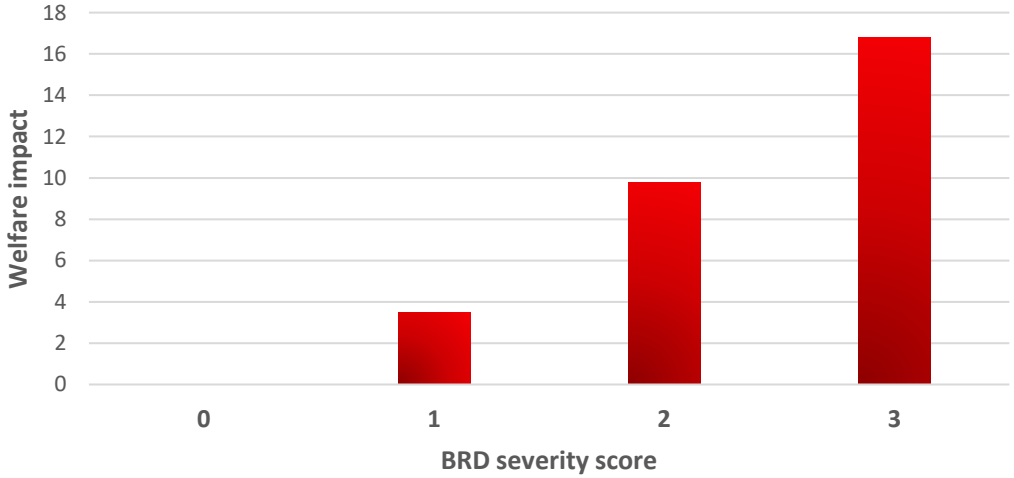

Figure 4 Het welzijnsimpact voor verschillende ernstniveaus mate waarin de kalveren ziek werden van BRD (0 = een kalf zonder klinische symptomen, 1 = een licht ziek kalf met milde depressie of vermagering, 2 = een matig ziek kalf met ernstige depressie, moeite met ademhalen of neus- of ooguitvloeiing, 3 = een ernstig ziek kalf, bijna stervende, met minimale reactie op menselijke benadering).

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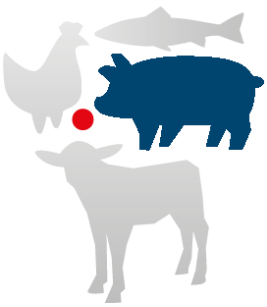

Pigs

- **Trade-offs in *Mycoplasma hyopneumoniae* control in pigs**
- **The Pig Barometer: Monitoring pathogen dynamics for improved swine health management**

2.4 Practice abstract 12: Trade-offs in *Mycoplasma hyopneumoniae* control in pigs: comparing vaccination and antimicrobial treatment strategies on health, antimicrobial use, economic performance, labour, and environmental impact

Mycoplasma hyopneumoniae is a common respiratory disease in pigs that can cause coughing, reduced growth, higher antimicrobial use, increased labour for the farmer, and greater environmental impact due to increased feed use. In practice, this makes it difficult to compare control strategies, because they often influence several of these outcomes at the same time. In this study, we compared three commonly used intervention strategies: vaccinating piglets at three weeks of age, treating entire groups of pigs with antimicrobials, and treating individual pigs when they show clinical signs.

A computer simulation model representing infection spread and production performance in a batch of pigs was used to estimate the effects of each strategy. We compared their impact on pig health, antimicrobial use, financial results, labour requirements, and environmental impact.

Figure 5 Impacts of *Mycoplasma hyopneumoniae* control. Illustration generated using AI (ChatGPT, OpenAI).

The results showed clear trade-offs between strategies. Vaccination gave the best overall improvement in pig health, reduced labour requirements, and lowered environmental impact, but was least favourable in terms of financial performance (loss of €1.10 per pig sold). Treating all pigs in a batch with antimicrobials resulted in the highest financial return (gain of €0.90 per pig sold) and the lowest labour demand, but also led to the highest antimicrobial use and had a relatively small effect on reducing the duration of clinical signs. Individual antimicrobial treatment of coughing pigs fell in between: it reduced antimicrobial use compared to group treatment and improved health outcomes, but required more labour and delivered smaller financial and environmental benefits.

For farmers and veterinarians, these results highlight that there is no single "best" strategy for all goals. The choice of control strategy depends on what is important for the decision maker: economic performance, antimicrobial reduction, labour efficiency, animal health, or sustainability. This framework can support more informed decision-making when balancing these competing priorities in pig health management, and future evaluations may also include combinations of interventions and additional measures.

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Dutch version

Afwegingen in de bestrijding van *Mycoplasma hyopneumoniae* bij varkens: vergelijking van vaccinatie- en antibioticastrategieën op gezondheid, antibioticagebruik, economie, arbeid en milieu

Mycoplasma hyopneumoniae is een veelvoorkomende luchtwegaandoening bij varkens die kan leiden tot hoesten, verminderde groei, hoger antibioticagebruik, meer arbeid voor de veehouder en een grotere milieu-impact door een toename in voergebruik. In de praktijk is het lastig om verschillende bestrijdingsstrategieën met elkaar te vergelijken, omdat ze vaak meerdere van deze uitkomsten tegelijk beïnvloeden. In deze studie vergeleken we drie veelgebruikte interventies: vaccinatie van biggen op drie weken leeftijd, behandeling van hele koppels met antibiotica, en individuele behandeling van varkens met klinische verschijnselen.

Figuur3. Impacts van *Mycoplasma hyopneumoniae* controle. Illustratie gegenereerd met behulp van AI (ChatGPT, OpenAI).

Met een computersimulatiemodel dat infectieverloop en productie in een varkenskoppel nabootst, hebben we de effecten van deze strategieën geschat. Daarbij keken we naar diergezondheid, antibioticagebruik, financieel resultaat, arbeidsinzet en milieu-impact.

De resultaten laten duidelijke afwegingen tussen strategieën zien. Vaccinatie gaf de beste algehele verbetering van de diergezondheid, zorgde voor minder arbeidsinzet en een lagere milieu-impact, maar was financieel het minst gunstig (verlies van €1,10 per verkocht varken). Het behandelen van hele koppels met antibiotica leverde het hoogste financiële resultaat op (winst van €0,90 per verkocht varken) en vroeg de minste arbeid, maar ging gepaard met het hoogste antibioticagebruik en had slechts een beperkt effect op de duur van klinische verschijnselen. Individuele behandeling van hoestende varkens zat daar tussenin: minder antibioticagebruik dan groepsbehandeling en betere gezondheidsresultaten, maar wel meer arbeid en kleinere financiële en milieuvoordelen.

Voor varkenshouders en dierenartsen laten deze resultaten zien dat er niet één beste strategie is die voor alles optimaal is. De keuze hangt af van wat prioriteit heeft voor de besluitvoerder: economisch resultaat, vermindering van antibioticagebruik, arbeidsbesparing, diergezondheid of duurzaamheid. Dit raamwerk kan helpen bij het maken van beter onderbouwde keuzes wanneer deze doelen tegen elkaar moeten worden afgewogen in de varkensgezondheidszorg. Toekomstige analyses kunnen daarnaast worden uitgebreid met combinaties van interventies en aanvullende maatregelen zoals verhogen van de bioveiligheid en investeringsstrategieën.

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2.5 Practice abstract 13: The Pig Barometer: Monitoring pathogen dynamics for improved swine health management

The **Pig Barometer** (link: https://decide-project-eu.github.io/case-studies-website/case-studies/pig-barometer.html) is an interactive surveillance tool developed within the framework of the DECIDE project to visualize pathogen-specific laboratory results from samples collected in pigs across Spain. The Pig Barometer presents data on the occurrence, temporal trends, and geographical distribution of key endemic pathogens affecting swine, including swine influenza virus, porcine reproductive and respiratory syndrome virus, porcine epidemic diarrhea virus, *Mycoplasma hyopneumoniae*, *Lawsonia intracellularis*, *Brachyspira* spp., and *Actinobacillus pleuropneumoniae*.

Through an **accessible dashboard** with filtering options and comparative visualizations, the Pig Barometer allows users to explore temporal and spatial dynamics of pathogen circulation, providing valuable epidemiological insights. For instance, the identification of seasonal patterns can support timely implementation of preventive measures such as vaccination strategies or reinforced biosecurity. To reach its full potential, however, the Pig Barometer relies on the **continuous and systematic sharing of diagnostic data** by veterinary laboratories, which enhances its representativeness, update frequency, and analytical power.

The long-term vision is to develop the Pig Barometer into a **pan-European tool**, integrating data from multiple countries to support disease monitoring across Europe. This will enable more accurate monitoring and strengthen the implementation of targeted disease control strategies, especially at regional level. The ambition of the Pig Barometer is to evolve into a robust, real-time surveillance system comparable to the Swine Disease Reporting System (SDRS) in the United States (link: https://fieldepi.org/sdrs/dashboards/), which provides continuous updates on pathogen circulation to support decision-making.

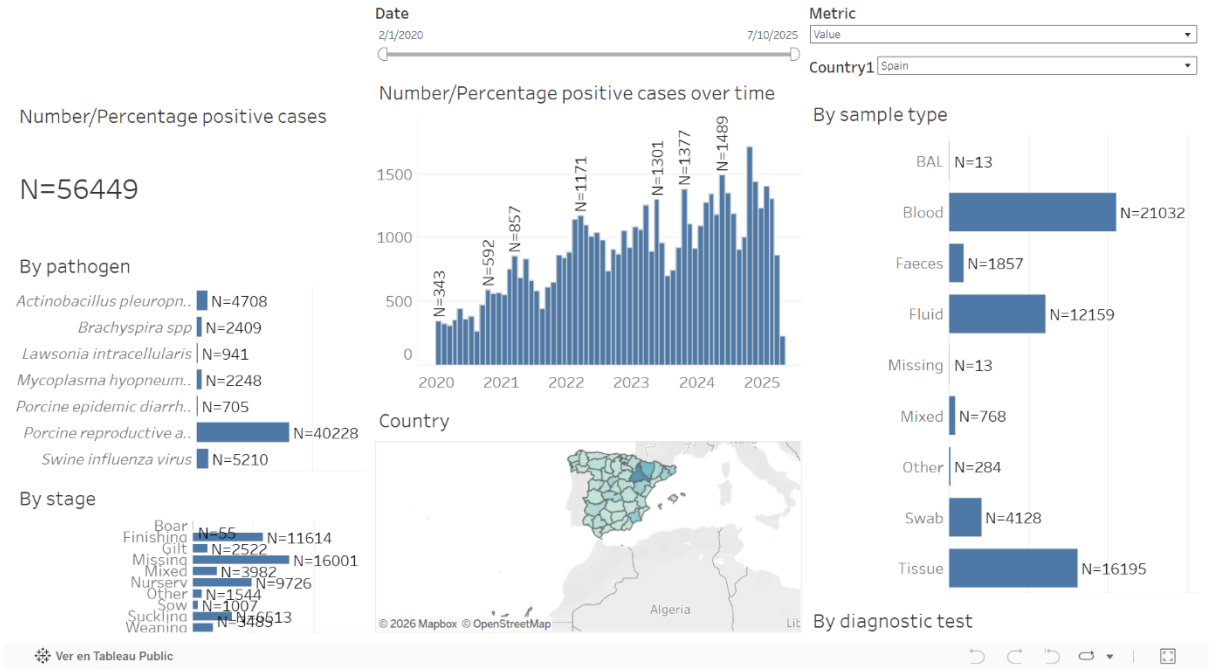

Figure 6 The Pig Barometer, an interactive dashboard for exploring circulating pathogens in time and space by diagnostic tests, sample, and production stage.

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Spanish version

El Barómetro Porcino: seguimiento de la dinámica de patógenos para una mejor gestión de la sanidad porcina

El **Barómetro Porcino** (enlace: https://decide-project-eu.github.io/case-studies-website/case-studies/pig-barometer.html) es una herramienta interactiva de vigilancia desarrollada en el marco del proyecto DECIDE para visualizar resultados de laboratorio específicos de patógenos a partir de muestras recogidas en cerdos en toda España. El Barómetro Porcino presenta datos sobre la aparición, las tendencias temporales y la distribución geográfica de los principales patógenos endémicos que afectan al ganado porcino, incluidos el virus de la gripe porcina, el virus del síndrome reproductivo y respiratorio porcino, el virus de la diarrea epidémica porcina, *Mycoplasma hyopneumoniae*, *Lawsonia intracellularis*, *Brachyspira* spp. y *Actinobacillus pleuropneumoniae*.

A través de un **panel web accesible** con opciones de filtrado y visualizaciones comparativas, el Barómetro Porcino permite a los usuarios explorar la dinámica temporal y espacial de la circulación de patógenos, proporcionando información epidemiológica de gran valor. Por ejemplo, la identificación de patrones estacionales puede facilitar la implementación de medidas preventivas en el momento adecuado, como estrategias de vacunación o el refuerzo de la bioseguridad. No obstante, para alcanzar todo su potencial, el Barómetro Porcino depende de la compartición continua y sistemática de datos diagnósticos por parte de los laboratorios veterinarios, lo que incrementa su representatividad, la frecuencia de actualización y su capacidad analítica.

La visión a largo plazo es desarrollar el Barómetro Porcino como una **herramienta paneuropea**, integrando datos de múltiples países para apoyar la vigilancia de enfermedades en toda Europa. Esto permitirá un seguimiento más preciso y reforzará la implementación de estrategias de control de enfermedades, especialmente a nivel regional. La ambición del Barómetro Porcino es evolucionar hacia un sistema de vigilancia robusto y en tiempo real, comparable al *Swine Disease Reporting System* (SDRS) de Estados Unidos (enlace: https://fieldepi.org/sdrs/dashboards/), que proporciona actualizaciones continuas sobre la circulación de patógenos para respaldar la toma de decisiones.

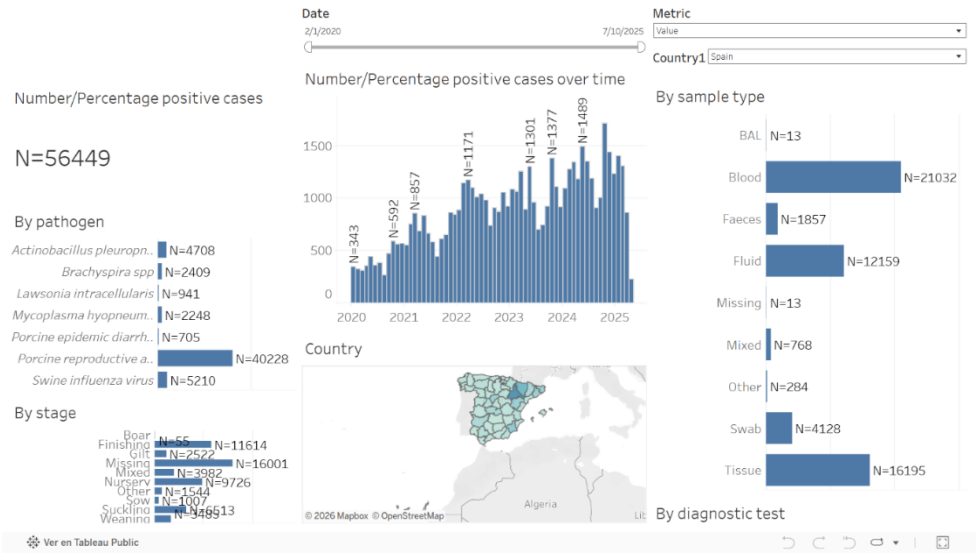

Figure 7 El Barómetro Porcino, un panel web interactivo para explorar los patógenos que circulan en España, en tiempo y espacio, por pruebas diagnósticas, tipo de muestra y etapa productiva.

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Poultry

- **Developing a model for early prediction of footpad lesions**

2.6 Practice abstract 14: Developing a model for early prediction of footpad lesions

Footpad lesions (FPL) are a common welfare problem in broiler chickens. These lesions are related to wet litter and are seen more often during colder months. In the Netherlands, as well as other EU countries, footpads are scored at the slaughter line. A flock receives a score between 0 (best) and 200 (worst), and farmers receive a penalty if their annual scores are too high. If these FPL scores could be predicted early in the production round, the farmer would still be able to intervene, for example by renewing the litter or adapting ventilation, to prevent high scores at slaughter.

For this reason, we developed a model to predict whether flocks would receive an FPL score above 80 (high score). We used data from 19,988 flocks from 592 broiler houses across 190 farms in the Netherlands. We included information on previous flocks in the same house, weather data from the first week of the production cycle, and flock and farm characteristics. All these variables are widely available for European broiler farms. The best-performing model correctly identified flocks with high scores in 74% of cases, while it correctly identified flocks with low scores in 60.2% of cases.

The most important predictor of a flock's score was how previous flocks had scored. Still, there was a lot of variation in scores between flocks from the same broiler house that was not explained by changes in weather conditions. More research is necessary to find additional factors that explain this variation, such as indoor climate and feed changes. If model predictions can be improved using these variables, the model could be suitable as an early warning system for high FPL scores.

Figure 8 Footpad lesions on chicken feet. AI generated based on pubs.ext.vt.edu/APSC/apsc-191

Dutch version

Ontwikkeling van een model voor het vroeg voorspellen van voetzoollaesies

Voetzoollaesies (VZL) zijn een veelvoorkomend probleem bij vleeskuikens. Deze aandoening is gelinkt aan nat strooisel en komt meer voor in koudere maanden. In Nederland worden voetzolen gescoord aan de slachtlijn, net als in meerdere EU landen. Een koppel krijgt een score tussen 0 (beste) en 200 (slechtste) en er volgen maatregelen als de gemiddelde jaarlijkse score van een stal te hoog is. Als we VZL-scores vroeg in de productieronde kunnen voorspellen, dan kan de veehouder nog ingrijpen, bijvoorbeeld door strooisel te vernieuwen of de ventilatie aan te passen, om hoge scores bij slacht te voorkomen.

Om deze reden hebben we een model ontwikkeld dat voorspelt of koppels een VZL-score van meer dan 80 (hoge score) zouden krijgen bij slacht. Daarvoor gebruikten we data van 19,988 vleeskuikenkoppels uit 592 stallen van 190 bedrijven in Nederland. Het model gebruikt informatie over de vorige koppels uit dezelfde stal, weerdata van de eerste week van de ronde en verschillende kenmerken van het koppel en bedrijf. Alle gebruikte informatie is algemeen beschikbaar in Europese vleeskuikenhouderijen. Het beste model wees koppels met hoge scores terecht toe aan deze groep in 74% van de gevallen, terwijl koppels met lage scores in 60.2% van de gevallen goed werden toegewezen.

De belangrijkste voorspeller van de VZL-score van een koppel was de score van vorige koppels. Desondanks waren er nog veel schommelingen in koppelscores binnen dezelfde stal die niet konden worden verklaard door veranderingen in weersomstandigheden. Meer onderzoek is nodig om aanvullende factoren te vinden die deze schommelingen kunnen verklaren, zoals stalklimaat en voerwisselingen. Als deze variabelen het model kunnen verbeteren, zou het model in de toekomst kunnen worden gebruikt om hoge VZL-scores vroeg op te sporen.

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Salmon

- **The costs and benefits of culling to control pancreas disease (PD) of farmed Atlantic salmon in Norway**
- **The use of colour coding in data tools in aquaculture**

2.7 Practice abstract 15: The costs and benefits of culling to control pancreas disease (PD) of farmed Atlantic salmon in Norway

Negative impacts from pancreas disease (PD) are a major concern for the sustainable production of farmed salmonids in Norway. In 2015, the farm-level cost of a PD outbreak was estimated at 7.8 million EUR. To prevent spread into non-endemic production areas, disease incursions in Norway are managed by culling all salmonids at farms with a confirmed diagnosis, resulting in substantial costs for affected farmers.

This study assesses the short-term costs and benefits of culling as a control strategy for PD in a specific non-endemic production area, using an epi-economic model. The model estimates farm- and area-level profits under different management strategies: immediate culling (<30 days after detection), delayed culling (2–6 months), or no culling, over time horizons of 12 and 48 months.

Preliminary results indicate a short-term benefit at the area level, on average 44.57 million EUR, when immediate culling is implemented, compared with a strategy of no culling (Figure 9). Delaying or omitting culling leads to a marked increase in the number of infected farms, causing this benefit to decline rapidly as the time from disease detection to culling increases (Figure 9). The costliest strategy is delaying culling by six months rather than implementing immediate culling, with estimated area-level losses exceeding 100 million EUR (Figure 9). This is driven by an increase in the number of farms requiring culling and by greater negative impacts of the disease on biomass production.

Delaying culling beyond six months allows more farms to harvest as planned, thereby reducing some of the direct culling costs (Figure 9). Nevertheless, omitting culling remains more costly at the area level than immediate culling in the short term, although less costly than a six-month delay. Immediate culling leads to a rapid burnout of the epizootic, whereas delayed culling results in persistent infection even after 48 months. In the longer term, the costs of omitting culling are likely to exceed short-term estimates, as PD will become endemic in the production area and increase the risk of spread throughout the wider non-endemic region.

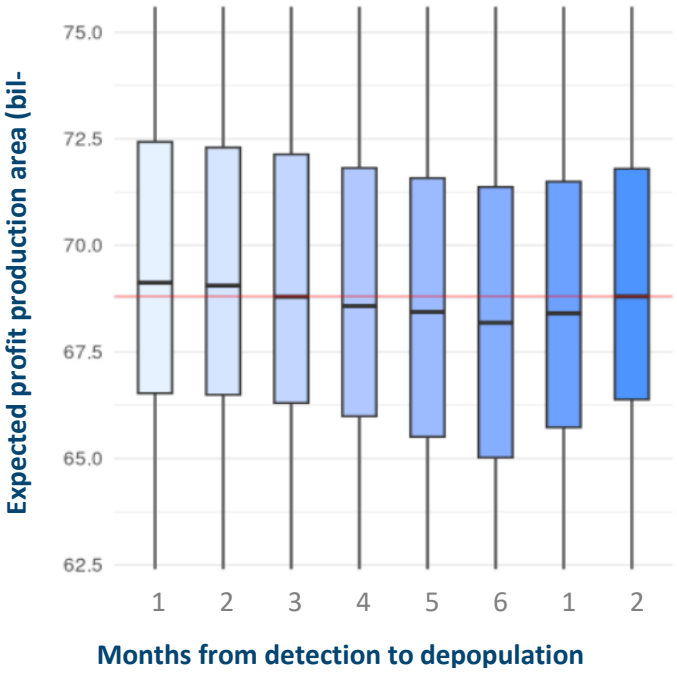

Figure 9 Box plot showing the expected area-level profit in billion NOK with increasing months from detection to stamping out. The red line indicates baseline profit with omitted culling.

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Norwegian version

Kostnader og nytter ved utslakting som tiltak for å kontrollere pankreassykdom (PD) i lakseoppdrett i Norge

Negative konsekvenser av pankreassykdom (PD) er en betydelig utfordring for bærekraftig produksjon av oppdrettede laksefisk i Norge. I 2015 ble kostnadene ved et sykdomsutbrudd på anleggsnivå estimert til 55,4 millioner kroner. For å hindre spredning av sykdom i den ikke-endemiske sonen vil bekreftet PD-diagnose på et anlegg i denne sonen kontrolleres ved utslakting av all fisken på anlegget. Dette medfører betydelige kostnader for de berørte produsentene.

Denne studien vurderer kortsiktige kostnader og gevinster ved utslakting som kontrolltiltak for PD i ett spesifikt ikke-endemisk produksjonsområde, ved bruk av en epi-økonomisk modell. Modellen estimerer profitt på både lokalitets- og områdenivå under ulike kontrollstrategier: umiddelbar utslakting (<30 dager etter påvisning), forsinket utslakting (2–6 måneder), eller ingen utslakting, over tidshorisonter på henholdsvis 12 og 48 måneder.

Foreløpige resultater viser en kortsiktig gevinst på områdenivå – i gjennomsnitt 521 millioner kroner – dersom utslakting gjennomføres umiddelbart, sammenlignet med en strategi uten utslakting (Figur 9). Forsinkelse eller utelatelse av utslakting fører til en markant økning i antall infiserte anlegg, noe som gjør at denne gevinsten raskt reduseres jo lengre tiden fra sykdomspåvisning til utslakting er (Figur 9). Den mest kostbare strategien er å utsette utslakting med seks måneder sammenlignet med umiddelbar utslakting, med estimerte tap på områdenivå på over 1270 millioner kroner (Figur 9). Dette skyldes både økt antall anlegg som må slakte ut og større negative effekter av sykdommen på produsert biomasse.

En utsettelse av utslakting utover seks måneder gir flere anlegg mulighet til å slakte som planlagt, noe som reduserer deler av de direkte kostnadene knyttet til utslakting (Figur 9). Likevel er den kortsiktige kostnaden på områdenivå ved å unnlate utslakting fortsatt høyere enn ved umiddelbar utslakting, selv om den er lavere enn ved seks måneders forsinkelse. Umiddelbar utslakting fører til at epizootien raskt dør ut, mens forsinket utslakting resulterer i vedvarende smitte selv etter 48 måneder. På lengre sikt vil kostnadene ved å unnlate utslakting sannsynligvis overstige de kortsiktige estimatene, ettersom PD vil bli endemisk i produksjonsområdet og øke risikoen for spredning til resten av den ikke-endemiske regionen.

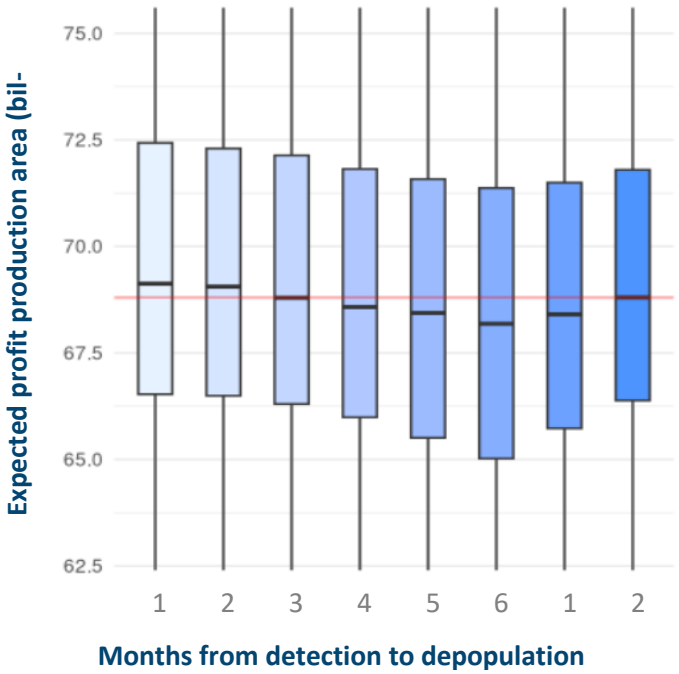

Figure 10 Boksplott som viser forventet områdenivåfortjeneste i milliarder NOK med økende måneder fra påvisning til utslakting. Den røde linjen indikerer basisfortjeneste uten avliving.

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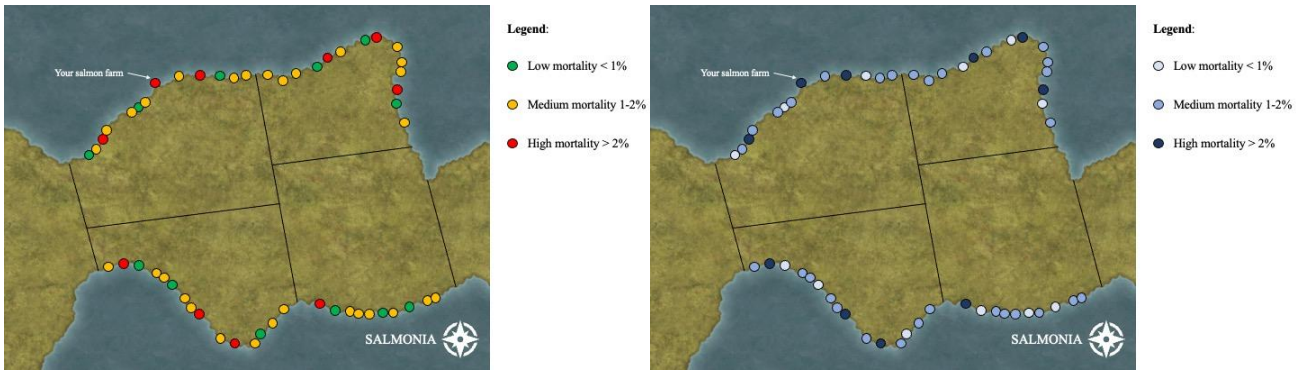
2.8 Practice abstract 16: The use of colour coding in data tools in aquaculture

Data tools used in aquaculture and agriculture display important information, such as salmon mortality or environmental risks, frequently using colour-coded signals. However, the way information is visually presented may influence how people interpret risks and decide what actions to take. To better understand these potentially biasing influences, we examined whether different colour schemes used in dashboards affect how users understand and respond to information about salmon health and mortality. In particular, it compared a familiar "traffic light" system (green-yellow-red) with a sequential colour scale (light, medium and dark blue) that gradually changes colour as risk increases.

More than 1,400 members of the public in the United Kingdom and nearly 100 European students studying veterinary medicine, animal science, or fish biology took part in online experiments. The experiment used simulated dashboards that displayed information about salmon mortality and harmful plankton levels in the environment. The results showed that the risk level shown for a participants' own farm, not necessarily the surrounding farms, strongly influenced how risky they perceived the situation to be and what actions they chose. The choice of colour scheme had a small impact as well. The traffic light colours helped participants remember the information slightly better and made them somewhat more confident in their decisions in high-risk situations.

While the results suggest that traffic light colours might be more intuitive, it should be considered that traffic light colours might challenge people with colour vision deficiencies and they may introduce other types of bias. This is the case when a fairly substantial salmon mortality is rated as fine due to the green colour assigned to it. Overall, the findings highlight the importance of designing dashboards together with the people who will use them. Involving future users throughout the development process can help ensure that dashboards remain easy to understand while still communicating risks accurately and supporting better decisions.



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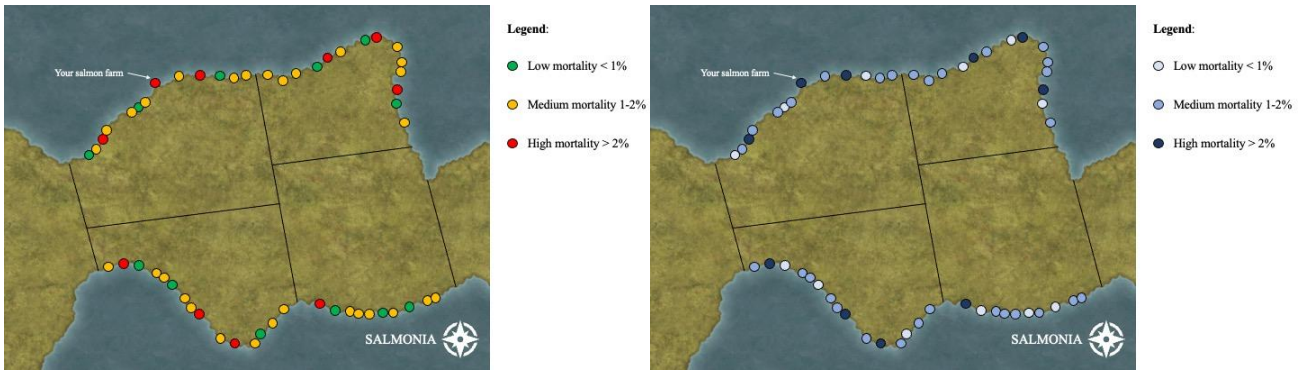
Bruk av fargekoding i dataverktøy i akvakultur

Måten informasjonen presenteres visuelt kan påvirke hvordan mennesker tolker risiko og dermed deres beslutninger, og være gjenstand for feiltolking eller menneskelig biasI dataverktøy som brukes i akvakultur og landbruk, blir ofte viktig informasjon, som for eksempel dødelighet hos laks eller miljømessige risikoer, fremstilt ved hjelp av fargekodede signaler. For å forstå om slike signaler kan være gjenstand for feiltolking undersøkte vi om ulike fargeskjemaer i dashbord påvirker hvordan brukere forstår og reagerer på informasjon om laksehelse og dødelighet. Studien sammenlignet et velkjent «trafikklys»-system (grønn–gul–rød) med en gradert fargeskala (lys, medium og mørk blå) som gradvis endrer farge i takt med økt risiko for dødelighet.

Over 1 400 personer fra Storbritannia og nesten 100 europeiske studenter innen veterinærmedisin, husdyrvitenskap eller fiskehelsebiologi deltok i nettbaserte forsøk. Eksperimentet brukte simulerte dashbord som viste informasjon om dødelighet hos laks og nivåer av skadelige plankton i miljøet. Resultatene viste at risikonivået for deltakernes eget oppdrettsanlegg – og ikke nødvendigvis naboanleggene – hadde sterk innvirkning på hvordan de oppfattet risiko og hvilke tiltak de valgte. Valg av fargeskjema hadde en mindre effekt. Trafikklys-farger gjorde det litt lettere for deltakerne å huske informasjonen og gjorde dem noe mer selvsikre i beslutninger i høyrisikosituasjoner.

Selv om funnene antyder at trafikklys-farger kan oppleves som mer intuitive, bør det tas i betraktning at de også kan være utfordrende for personer med fargesynsdefekter og kan introdusere andre typer feilkilder eller rom for feiltolkning. Dette gjelder for eksempel når en relativt høy dødelighet vurderes som uproblematisk fordi den vises med en grønn farge. Samlet sett understreker funnene viktigheten av å utvikle dashbord i samarbeid med dem som skal bruke dem. Ved å involvere fremtidige brukere gjennom hele utviklingsprosessen kan man sikre at dashbordene forblir lette å forstå, samtidig som de kommuniserer risiko på en presis måte og støtter bedre beslutninger.



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3 Outlook

This deliverable presented the second set of practice abstracts of the DECIDE project adding to the first set of practice abstracts delivered within D6.4. In total, this will constitute a number of 16 practice abstracts. As a public deliverable, the practice abstracts will be made available via CORDIS and the DECIDE website (decideproject.eu). By the end of the project partners will assess 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 digital platform funded by Horizon Europe, aimed at gathering and sharing agricultural and forestry knowledge. The second set of practice abstracts from the DECIDE project will be incorporated into the EU Farmbook following the first set already available on the platform: eufarmbook.eu/en/contributions/66f5c439a49df370f40da733.