

BOOK OF ABSTRACTS

Towards multiple societal burden animal
health decision-making



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ORAL PRESENTATIONS

A decade of fight against avian influenza: reengineering public action networks

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Over the past decade, the recurrence of highly pathogenic avian influenza (HPAI) waves have challenged the governance of animal health in France, as well as the organization of all stakeholders, from the local to the national level.

Based on a retrospective analysis of the HPAI epizootics from 2015 to 2024, our study examines how prior prevention and control strategies collided with the reality of the crisis and how managers overcame this dead-end by reinventing their organization.

We used the theoretical framework of organization studies and the concepts of “management situation” and “public action networks” to analyse semi-structured interviews performed in 2025 involving various stakeholders: local and national veterinary officers, policymakers, HPAI experts, as well as professionals from the poultry sector.

Our results show that, although remaining the same, instruments available (animal testing, movement control, stamping-out) have been used in very different manners over the course of HPAI crisis. This evolution was driven by a reshaping of animal health governance networks at different scales, thanks to flexible management. We observed that, while the original national strategies had to face many operational issues, such as a lack of human resources and facilities, middle managers operating at a local scale developed adaptive approaches to navigate between regulatory and logistic constraints, thus optimizing HPAI control. We also found that the roles of specific stakeholders, such as farmers’ associations, have been clarified, and their place in the system has ultimately been recognized for a better efficiency of disease management.

Our results show that by reinventing the whole collective organization, stakeholders were able to contain the crisis and better prepare for future ones. Vaccination can therefore be seen as a promising tool for disease control, but also as an evolution of the management situation, which inevitably implies new changes in the organization of animal health programs.

More meat, less waste, and improved pig welfare- can we have it all?

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Condemns of pork due to injuries detected at post-mortem inspections is a multi-dimensional problem, associated with impaired animal welfare, increased labour for handling carcasses, and potential negative impact on the slaughterhouses' economic outcomes due to reduced revenue at retail. Condemns also constitute an environmental burden, as the pig has consumed resources without yielding an edible product, at a time when food supply and preparedness are more critical than ever. The primary aim of this study was to quantify condemns in finishing pigs related to chronic traumatic injuries (CTI) sustained on-farm and acute traumatic injuries (ATI) sustained during transport or at the slaughterhouse, recorded post-mortem by official veterinarians at Swedish slaughterhouses. The secondary aim was to analyse costs and benefits related to a reduction in condemns. Between 2019 and 2021, approximately 14,000 kg of meat was trimmed from pig carcasses annually due to CTI and ATI (based on data from 95% of all slaughtered Swedish pigs during this period). The annual estimated meat loss is equivalent to the recommended weekly consumption of red meat for 28,000 persons, based on the Nordic Nutrition Recommendations. Furthermore, CTI corresponds to an annual gross loss of 14,800 EUR in reduced revenue for farmers. Assuming that the condemned meat could be sold as either minced meat or shoulder steak, the annual gross loss from CTI and ATI ranges from 106,275 to 158,784 EUR. To reduce traumatic injuries, financial incentives encouraging better management, handling, and facility design are needed. However, investing in practices improving animal welfare may be more costly than accepting condemns. This study serves as a starting point for discussions on how pig producers and slaughterhouses can invest in practices that reduce injuries, while highlighting the costs and benefits of reducing meat loss and improving economic efficiency, assessing if this can all be accomplished without compromise.

Rethinking heifer rearing strategies in response to environmental policies

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Introduction:

Agricultural policies in high milk-producing countries like the Netherlands increasingly target emission reduction. The 2018 Phosphate Rights system limits phosphate production from manure, forcing Dutch dairy farmers to reduce either their producing herd or youngstock to comply.

This study examines the tradeoffs between herd economic performance and phosphate production by altering replacement heifer rearing strategies, using a modeling approach.

Materials and method:

The applied modeling framework integrates a single-cow place optimization model with a dairy herd simulation module to capture interdependencies among 100 cows. Monthly decisions—whether to keep or replace a cow—are optimized, assuming full heifer availability. If heifer supply is limited, only cows with the lowest values are replaced. The herd simulation module tracks cow state dynamics based on the adjusted decision policy, feeding results into the next month's evaluation, while assessing economic performance and phosphate production.

A base scenario representing an average Dutch dairy farm is defined, assuming an age at first calving of 26 months, a 3.4% youngstock mortality rate, and a 30% replacement rate. Given these herd characteristics, 5,175 kg of phosphate rights are required annually, serving as a benchmark for evaluating rearing scenarios with varying heifer availability and age at first calving.

Results:

The average annual gross margin in the base scenario was €250,639 (SD €4,656). Reducing heifer availability from 30 to 22 per year decreased annual phosphate production to 4,632 kg (SD 136 kg) and the gross margin to €244,199 (SD €7,900). Lowering the age at first calving from 26 to 24 months resulted in a phosphate production of 5,102 kg (SD 54 kg) and an increased gross margin to €256,106 (SD €8,193).

Conclusion:

Reducing the replacement heifer supply or lowering the age at first calving can decrease phosphate production on a farm without considerably reducing the gross margin.

The economic impact of West Nile Virus infections in Germany

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West Nile Virus (WNV) is a virus transmitted between mosquitoes and birds, but can infect humans and horses as well. It was introduced in Germany in 2018 and since then it established in the eastern part of the country. In 2024, WNV spread to many new regions, causing more cases in humans than in previous years. In many cases, infection in humans is asymptomatic, but it can sometimes cause neuroinvasive symptoms and fatal outcomes. Long lasting disabilities occur in up to 60% of neuroinvasive cases.

Because of possible blood-borne infections blood donations in Germany are regularly tested for WNV in the transmission season.

To evaluate future control and prevention programs, it is first necessary to ascertain the extent of the damage caused by WNV. This study will facilitate a more profound comprehension of the consequences of West Nile disease (WND) and thereby support the development of effective preventive programs.

The aim of this study was to estimate the impact of the WND in humans in Germany in terms of losses, resources, treatment, preventive measures and surveillance.

The study is based on case numbers from past years since its introduction in Germany in 2018, data from literature and, where data was missing, complemented with expert interviews.

A stochastic cost model was developed in R Statistical Software. The model estimates the costs of an infection including incurred losses, additional resources needed, treatment of patients (ambulatory or stationary) as well as costs for preventive measures and surveillance costs. Losses included productivity loss and lost years of life. Resources consisted of medications and consumables, care, transportation and accommodation. Treatment included cost of stationary, even intensive care unit treatment with medical fees and care costs, ambulatory treatment and rehabilitation. Surveillance consisted of testing of blood donations.

Results will be shown at the conference.

Effects of grazing on disease incidence and associated health costs in Dutch dairy herds

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Introduction:

Grazing is recognized for improving dairy cow welfare and aligning with societal expectations. Improved cow health is also considered an advantage of grazing. However, the impact of grazing on animal health and consequently disease-related costs remains unexplored. Understanding these effects is relevant from a farm management perspective, as diseased animals can lead to significant losses in farm income. This study examines the impact of grazing on disease economics.

Materials and methods:

A partial budgeting approach is used to determine disease-related costs in grazing and non-grazing systems through a model study. The partial differences, e.g. disease incidences and system effects like milk production, are simulated for a standard Dutch farm with 100 dairy cows. Mastitis, lameness, parasitic diseases, and ketosis are analysed, by modelling the economic effect of the most common causative agents. Which is assessed through e.g. treatment costs and production losses. Interactions between diseases are also considered. Parameterisation of input values (e.g. milk and slaughter price) is based on Dutch data between January 2022 to December 2024. Literature and expert knowledge on disease incidences and disease-related costs are used.

Results:

The modelling results highlight the economic impact of different production diseases on a standard Dutch farm, both with and without grazing, providing insight in the effect of grazing on disease economics. For instance, the costs of lameness are estimated at €66 and €45 per cow per year on a standard non-grazing farm and grazing farms, respectively. The differences in disease costs when comparing grazing to non-grazing was not positive across all evaluated health conditions. This underscores the importance of considering grazing as a strategic factor in disease management, with decisions adapted to the specific health and economic conditions of each farm.

Conclusion:

Preliminary results show that grazing slightly reduces production disease costs on a standard Dutch dairy farm.

Effectiveness and Cost-Benefit Analysis of Potential Paratuberculosis Control Strategies in Swiss Dairy Herds

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Paratuberculosis (PTB) is a globally prevalent disease caused by *Mycobacterium avium* subsp. paratuberculosis, leading to significant economic losses in the dairy industry. This study aims to estimate the costs and benefits of potential PTB control strategies in Switzerland.

Two control strategies were developed based on literature reviews, stakeholder feedback, and expert opinions. Both strategies were modelled under three scenarios, each varying in participation rates using stochastic simulation in @Risk. The effectiveness and cost-benefit analyses were assessed over a ten-year period.

In control program 1, herds are screened using a sock swab PCR followed by individual fecal PCR testing for positive sock swab results. Control program 2 follows a risk-based approach: in high-risk herds, all cows over 24 months of age are tested using a serum ELISA, with positive cases confirmed via fecal PCR. In other herds, only high-risk cows undergo serum ELISA testing to determine herd status.

Simulations have shown, that both control programs effectively reduce the between-herd prevalence to below 1% when participation rates are high, whereas low participation rates have only minor impact on prevalence reduction. However, none of the epidemiologically efficient scenarios are economically beneficial due to the relatively low within- and between-herd prevalence of below 5% in Switzerland. For a control program to be economically viable, the following conditions would need to be met: higher between- or within-herd prevalence, improved test sensitivity and specificity, or more efficient identification and participation of positive herds relative to negative herds.

Overall, while the proposed control programs are epidemiologically effective, they are not economically justifiable under current PTB-prevalence levels in Switzerland. This study highlights key parameters that would need to be optimized or conditions that would need to change for these programs to be viable for implementation.

Effects of hormone-based reproduction management programs on greenhouse gas emissions in a dairy herd

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Background and research question:

Greenhouse gas (GHG) emissions is a major environmental concern in dairy farming. Improving reproductive performance is one of the mitigation for GHG emissions. Many studies have shown that using reproductive hormone programs improves the reproductive performance of dairy herds, but no studies have directly linked GHG mitigation with hormone programs. In this study, we estimated the effect of hormone-based reproduction managements on GHG emissions in dairy herds.

Materials and methods:

We integrated a stochastic simulation model with a life cycle assessment (LCA) approach to estimate GHG emissions. Four hormone-based reproductive management programs were included in the model. The default program reflected the normal situation in European dairy farms where hormone protocols were used after veterinary diagnosis. The second to fourth scenarios involved systematic hormone uses, where hormones were administered to individual cows under specific reproductive conditions, including: 1) Double Ovsynch protocols followed by fixed-time AI (FTAI), 2) Double Ovsynch protocols followed by fixed-time AI and estrus detection, with a resynchronization protocol for non-pregnant cows (FTAI+ED), and 3) Estrus detection with AI for detected cows and a PRID-Synch protocol for cows with undetected estrus (ED+TAI).

Results and conclusions:

The results showed that hormone-based reproductive management programs resulted in higher milk yields, fewer culled cows, more calves, and shorter calving intervals compared to the default program. Median total GHG emissions for the default, FTAI, FTAI+ED and ED+TAI programs were 969.3, 958.1, 958.5 and 956.2 kg CO₂e / tFPCM, respectively. Therefore, the systematic hormone-based reproductive management programs reduced GHG emissions compared to the default program. The systematic hormone-based reproductive management programs had a potential to be GHG mitigation options in dairy farms, and would provide benefits to the farm production and environment.

The cost and benefit of controlling pancreas disease of farmed Atlantic salmon in Norway

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Negative impacts from pancreas disease (PD) are of major concern for sustainable production of farmed salmonids in Norway. In 2015, the farm-level cost of a disease outbreak was estimated at 55.4 million NOK. To prevent spread in non-endemic areas of Norway, disease incursions are controlled by stamping-out farms with a confirmed diagnosis, which implies large costs for the affected farmers.

The costs and benefits of stamping-out to control PD in a non-endemic production area are assessed using a bio-economic model. The probability of farms getting infected given either no control, immediate (within the first month) or delayed (more than one month) stamping out are simulated. Farm-level expected change in profit is depended on level of control thus the probability of infection. For each control intervention, scenarios are compared for production with and without disease. Estimated effects of PD and economic input parameters are based on literature. The area level gain of controlling PD is calculated as the sum of farm-level expected change in profit for all farms in the production area over 12 and 48 months.

Preliminary results indicate that delaying or omitting stamping out leads to a marked increase in the number of infected farms. When simulating outbreak in one single farm, 0.01 %, 1.2% and 4.0% of the susceptible production cycles in the neighbouring farms became infected in case of immediate, 6 or 48 months delayed stamping out, respectively. The epizootic quickly burns out with immediate stamping out, but is still persistent after 48 months if stamping out is delayed. The farm-level cost of stamping out is influenced by the standing biomass when infected. In some cases it can be beneficial for a single farm to stamp out rather than having an outbreak, increasing the benefit for the area.

Economic estimation the human health burden from Escherichia coli resistant infections related to antimicrobial use in animal farming in Europe

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The EU restricted antimicrobial use (AMU) in agriculture due to its potential role in spreading antimicrobial-resistant (AMR) diseases in human populations and set a 50% reduction target from 2018 to 2030. However, the cause-and-effect relationship between AMU in farming and such pathologies remains undefined, limiting accurate economic evaluations of AMR policies. This study aims to quantify the health and economic burden of AMR E.coli infections in humans linked to farm AMU, focusing on the countries participating in the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC).

We used 2019 country-level data on AMR E.coli deaths and DALYs from the IHME database, the ESVAC surveys on veterinary antimicrobial sales (as a proxy for farm AMU), and the ECDC human AMU statistics. We estimated the health burden in 2019 with a Generalized Linear Regression model, considering deaths and DALYs from resistant E.coli as response variables and veterinary antimicrobial sales and human AMU as predictors. The economic evaluation applied the Human Capital Approach. We projected the 2019 burden to 2030 and 2050 based on changes in veterinary antibiotic sales and farm animal biomass under two scenarios implying: (1) continued reduction in farm AMU up until 2050, following the 2019-2022 veterinary antimicrobial sales decline, and (2) farm AMU reduction capped once the EU 2030 target for sales is met.

The ESVAC countries' human burden from AMR E.coli infections associated with farm AMU was estimated at 170,402.91 DALYs in 2019, the economic losses at USD 6.36 billion, the 2050 burden at 42,025.66 DALYs (USD 0.95 billion) under Scenario 1, and 103,231.17 DALYs (USD 2.34 billion) under Scenario 2.

This is the first study that quantifies correlation between agricultural AMU and DALYs associated with AMR E.coli infections for economic assessments. Historical series on the disease burden, now available, may improve our evaluation model.

Developing an animal cost-of-illness (a-COI) framework for zoonotic diseases

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Foodborne zoonotic diseases impact both human health and animal health. While economic models in human health are well established, economic assessments in food-producing animals remain fragmented and inconsistent, making cross-sector comparisons challenging. Zoonotic diseases can significantly impact animal production, causing productivity losses, increased veterinary costs, and market disruptions. However, no standardized framework exists to systematically quantify their full financial burden, especially when considering direct, indirect, and intangible costs. This study aimed to develop an animal cost-of-illness (a-COI) framework to address these gaps and create a structured methodology for evaluating the economic impact of zoonotic diseases in livestock. Additionally, the framework is designed to align with human health economic metrics, enabling integration into One Health burden assessments.

A systematic literature review is conducted to identify existing cost components, methodological approaches, and data gaps in zoonotic disease economic evaluations in poultry. Drawing from human health economic models (e.g. cost-of-illness, DALYs), key cost categories are adapted for animal health and classified as: direct tangible costs (e.g. production losses, veterinary treatment, disease control expenses), indirect tangible costs (e.g. culling, replacement, trade restrictions), other tangible costs (e.g. supply chain disruptions, export bans), and intangible costs (e.g. loss of consumer confidence).

A comparative analysis explored how human health economic frameworks can be translated to animal health, ensuring the a-COI framework is applicable independently but can also be combined with human burden estimates. This framework will be illustrated with two zoonotic diseases in poultry: campylobacteriosis and salmonellosis.

The a-COI framework provides a structured and standardized method for estimating economic losses in animal production, improving disease impact assessments, resource allocation, and policy decisions. By bridging human and animal health economic metrics, this framework supports a holistic One Health economic approach.

Behavioural-economic factors and epidemiological models for improved livestock disease interventions

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This study reviews the behavioural-economic factors influencing farmers' adoption of livestock disease prevention and control measures. The motivation stems from the significant socio-economic and public health impacts of livestock disease epidemics and the need for effective interventions that consider both mandatory and voluntary approaches.

The research is structured around three gaps in the animal health economics literature: (1) predominant focus on motivational factors, but a broader categorisation of behavioural factors exist; (2) no attempt to link interventions to behavioural factors in livestock disease contexts, and (3) current epidemiological models underrepresent the interplay between disease dynamics and human action in terms of behavioural factors and interventions.

A scoping review methodology was employed to address these gaps, first summarising findings according to four groups of behavioural factors. Relevant studies published after 2013 were reviewed, focusing on diverse livestock diseases across various regions. The review also evaluated which behavioural factors and interventions bio-economic and epidemiological models so far have integrated and focussed on.

The findings highlight the importance of understanding risk both as appraisal and as feeling. It is also key to understand the temporal dynamics of behavioural factors during disease events. The review reveals gaps in the literature, particularly in the empirical assessment of risk and time preferences, and the need for more experimental and longitudinal research designs. Depending on the cultural context, social capital and networks can either support or hinder disease prevention and control policies. Our findings also emphasize the potential of nudging and other innovative tools and interventions to enhance voluntary approaches.

Integrating behavioural-economic insights into bio-economic and epidemiological models can improve the design of livestock disease interventions. The study calls for a comprehensive perspective on behavioural factors and related interventions to inform policy and enhance farmers' willingness to adopt disease prevention and control measures.

Motivational factors and financial incentives to mitigate tail biting in nurseries in Finland

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Tail biting affects the health and welfare of pigs, the quality of pig carcasses, and the profitability of production in both fattening and nursery rearing. There are specific quality criteria for weaned piglets, and tail damage can lead to a tail deduction in the purchase price of the piglet. As research has paid little attention on tail biting in nurseries, the aim of this study was to investigate the impact of various motivational factors and economic incentives on the prevention of tail biting in Finnish pig farms and to assess the costs of tail biting occurring in nurseries.

The data were collected by interviewing representatives from 15 fattening farms and 10 intermediate rearing farms during 2021-2022. The interviews covered risk factors for tail biting and the factors that most motivated producers to reduce tail biting. Additionally, a calculation model to assess the economic significance of tail biting in nurseries was developed.

The interviewed farmers were very or fairly motivated to address tail biting when they observed it in their own farms. Half of the representatives from nurseries found the preventive measures laborious to implement. The economic incentives that most motivated nurseries to address tail biting were the better price obtained for intact-tailed piglets and financial support for preventive measures. Fattening farms were most motivated by the reduction in carcass condemnations and the increase in the price of meat. The results suggest that the desire to produce healthy, well-being pigs also motivated farmers.

According to the calculation model, tail biting in nurseries can cause a loss of up to approximately 32 euros per bitten pig, taking into account possible effects in the fattening phase, reduced growth, treatment of the tail-damaged pig, and various income losses and additional costs.

This project has received funding from the Ministry of Agriculture and Forestry (MMM/MAKERA).

Understanding risk management for fasciola hepatica on Welsh sheep farms: A qualitative study

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Research Objectives:

This study explores how Welsh sheep farmers understand and manage the risks of Fasciola hepatica infection in their flocks.

Introduction:

Fasciolosis is an endemic parasitic disease affecting sheep globally, accounting for significant morbidity and mortality, serious economic costs, with increasing resistance to anthelmintic treatment seen. The life cycle of Fasciola hepatica is complex, relying on the presence of the intermediate host Galba truncatula, suitable snail habitats in grazed land, and favourable weather conditions. With Wales' large sheep population and temperate climate, this zoonotic disease has serious implications for sheep health and welfare, farm productivity and public health.

Materials and Methods:

Sixteen sheep farmers who believed they had liver fluke in their flocks were recruited using purposeful sampling, representing a range of different farm types and locations throughout Wales. Semi-structured in-depth interviews were conducted (n=16), with several farmers also taking part in a farm walk and participatory mapping exercise (n=8). Interviews were recorded, transcribed, and underwent thematic analysis. Farm walks were documented using photography, ethnographic field notes and paper-based mapping exercises. Aberystwyth University ethical approval #23489.

Results & Discussion

Participants perceive the risk of F. hepatica to be high, complex and difficult to mitigate. Farmers expressed significant uncertainty in the diagnosis, management and prevention of disease, leading to a risk-averse approach of over-treatment. The complexity of the parasite's life cycle, combined with a perceived lack of effective and consistent veterinary advice means participants are utilising chemical control in ways that drive the development of drug resistance.

Understanding Consumer Preferences for Layer Hen Welfare: a Cluster-Based Analysis of Egg Purchasing Behavior

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As global demand for ethically produced food grows, consumer attitudes toward animal welfare play a critical role in shaping agricultural practices and policy decisions. Many Western countries have implemented strict regulations to phase out battery cages and promote higher welfare standards in egg production. In Taiwan, while the government introduced the Animal-Friendly Egg Production System Definition and Guidelines in 2014, these standards remain voluntary, leading to a gradual but market driven shift toward cage-free egg production. Currently, approximately 10% of eggs in Taiwan originate from farms that adhere to higher welfare standards, reflecting a rising but still underdeveloped market for welfare-friendly products.

This study investigates Taiwanese consumers' attitudes toward animal welfare, animal health, and their egg purchasing behaviors through cluster analysis. Based on a nationwide online survey of 1,176 egg consumers in 2024, we identified three distinct consumer segments: ethically competent consumers (40.2%), active consumers (50.7%), and inactive consumers (9.1%). Ethically competent consumers prioritize eggs with animal welfare certification and demonstrate strong ethical considerations in their purchasing choices. Active consumers also exhibit a preference for cage-free eggs but lack a clear motivation for their behavior. Inactive consumers, while a minority, show minimal concern for animal welfare in their purchasing decisions. Our findings reveal that consumer demand for animal welfare-certified eggs in Taiwan exceeds current supply, highlighting the potential for further expansion of ethical farming practices.

These insights contribute to the broader global discourse on animal welfare and consumer-driven market transformations. As Asian markets increasingly engage with welfare-centered food production, the case of Taiwan provides valuable lessons for policymakers, businesses, and researchers worldwide—particularly in regions where consumer attitudes, regulatory frameworks, and market structures differ from those in Western economies.

The role of data-based tool design in decision-making about an infectious disease in pigs

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The control and prevention of infectious respiratory and gastrointestinal diseases in pigs remain challenging, as its prevalence is often associated with multiple risk factors such as virus, environmental factors, the pig host, and production management. To support pig health management, data visualizations can be useful tools to inform about disease risks and support pig farmers and veterinarians' decision-making. For instance, infection surveillance maps could monitor the prevalence of infectious respiratory disease on specific farms and neighboring farms through the cooperation between farmers and veterinarians. Additionally, visualizing pig health data in time series could be used for benchmarking within and between farms. Previous research has demonstrated that the design of dashboard elements, such as color and the type of information shown, affected individual risk perception and behaviors of disaster risks. However, it remains unknown if individual decision-making will be affected by the pig infection information displayed on an infection surveillance map and a benchmarking tool when different design elements are considered. Here, we conducted an online experiment to investigate UK individuals' responses to pig infection information displayed on two mock dashboards: a map-based dashboard visualizing the infection rate on a specific farm and neighboring farms; and a benchmarking dashboard visualizing the weekly mortality in pigs over time regarding an individual farm and the regional average. The effect of message framing (i.e., information type and marking) regarding the two dashboards on individual risk perception and decision-making were identified in varied disease infection contexts. Based on this, we provide recommendations and implications for tool developers and policymakers by highlighting the focus area of dashboard element design, which would benefit future studies of developing data tools to facilitate risk communication of infectious diseases in pigs and support actual professionals' decision-making in pig farming. Funding: This project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000494

French farmers' decision-making and High Pathogenicity Avian Influenza transmission: insights from an agent-based model

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Since 2015, France has experienced recurring High Pathogenicity Avian Influenza (HPAI) outbreaks causing considerable challenges to the poultry industry. Biosecurity measures implemented by farmers have long been considered the main solution to reduce the risk of infection. The effect of these practices on HPAI transmission dynamics still needs to be assessed. We therefore propose an epidemiological model integrating farmer decision processes regarding the implementation of biosecurity measures based on their socio-economic context.

An agent-based model was developed with two interacting agent sets. The farm buildings were considered as the epidemiological unit, with specific characteristics (species, flock size and biosecurity level). The second set of agents consisted of farmers, whose decisions were based on the expected utility theory. Based on the epidemiological situation, the economic assessment of interventions and personal risk perception, the farmer can decide whether to adjust the building's biosecurity level. This would modulate the risk of infection introduction and spread according to the farmers' perception of environmental information.

The model integrates a spatial dimension through the representation of farms' locations, between-farm animal movements and distance to at-risk areas. The epidemiological model accounts for susceptible, infectious, detected and removed statuses. Upon detection, surveillance and protection zones are designed with movement restriction and active surveillance protocols. A sensitivity analysis was performed to assess the impact of the economic components. Social aspects were mainly represented based on agents' physical proximity, animal movements and shared associations with the same production operator. Socio-economic and epidemiological data were obtained from the literature and a sociological field study.

Our results are expected to enhance the understanding of HPAI dynamics and assess the role of farmers' practices in it. This research more broadly contributes to the paradigm shift in infectious animal disease modelling, moving from separate modelling frameworks to integrative systems that better reflect field realities.

What motivates and hinders dairy farmers to implement measures to improve calves' health?

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Although best practice approaches for successful rearing dairy calves are well-known, dairy calves' health is still a reason for concern in Germany. These observations raise the question what motivates or hinders farmers to implement measures to improve the health of their calves.

Initiated by the Saxon State Office for Environment, Agriculture and Geology, a mixed-methods study was conducted on nine large dairy farms. Veterinarians conducted interviews and assessed calves' health during two visits. Based on these findings, a strength-weakness analysis was performed and discussed with herd managers and their staff. Transcripts of these consultations were analysed using Qualitative Content Analysis to identify barriers and motivators. After the consultation and during the following year, the stage of change based on the Transtheoretical Model was assessed concerning these measures.

On all farms, high prevalences of diarrhea and respiratory disorders were observed. Prevalences of omphalitis were lower. Most herd managers rated the situation as okay or good for all three diseases. During the consultations, more barriers than motivators were mentioned. Barriers referred mostly to management, workforce and staff. Moreover, outdated buildings were seen as problematic. Costs, however, were mentioned less frequently. Veterinarians and herd managers agreed on 3 to 5 measures on each farm. Preliminary results indicate that after six months, herd managers stated to have implemented about half of these measures (stage of action/maintenance). Notes on the questionnaires and observations by the study team, however, indicated that the implementation rate was lower, and some measures were implemented partly or given up.

The results give an insight into reasons why measures are not implemented. As herd managers talked more frequently about barriers than motivators, motivational interviewing might be useful for veterinary consultations. Moreover, the awareness of herd managers towards common diseases might be improved by regular feedback.

Illness perception in dairy farming: Impacts on treatment decisions and farmer well-being

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In human medicine, illness perception plays a key role in how individuals interpret and respond to health conditions. According to Leventhal's Self-Regulation Model of Illness, a person's perception and experience of symptoms, along with their emotional response to a health threat or diagnosis, shape their understanding of the illness, including its causes, treatment, and controllability.

In livestock farming, production diseases such as mastitis and lameness in dairy cows cause significant pain and suffering in the animals constituting a major animal welfare problem. In terms of farming, animal health depends on farmers' perception and understanding of production diseases, as this influences whether—and when—they decide an illness requires treatment. Farmers' perception of production diseases is likely to influence disease management, treatment decisions, and overall animal welfare. Based on Leventhal's Self-Regulation Model of Illness, we investigated how farmers' illness perception mediates the relationship between i) animal health and farmer well-being, and ii) between animal health and farmers treatment decisions.

Using data from two questionnaire-based studies targeting Swedish dairy farmers, we examined how their perception of production diseases affects their well-being and treatment decisions. Data were analyzed using the PROCESS macro for serial multiple mediator analysis, allowing for the estimation of mediators in a causal chain.

The results show that farmers' well-being is indirectly related to animal health through their illness perception and perceived control over the situation on the farm. Additionally, the timing of treatment initiation is indirectly related to animal health via illness perception, perceived control, and motivation to work with animal welfare.

Understanding farmers' illness perception is crucial for improving animal health outcomes and farmer well-being. Strengthening awareness and perceived control over production diseases may enhance decision-making, leading to improved animal welfare and reduced stress among farmers.

Strategic behaviours and therapeutic decisions against Bovine Respiratory Diseases: a farmer's dilemma

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The nature of bovine respiratory diseases (BRDs) provides an interesting backdrop to explore decision-making across all actors of the French young beef market. Sellers have limited disease risks; yet vaccination efficiency is best when done at the breeding stage, potentially imposing its cost on breeders. Conversely, buyers face a high risk of disease ex-post; vaccination has limited efficiency at this stage, but treatment options centred on antimicrobials are abundant and relatively inexpensive. Externalities, in the form of antimicrobial resistance, are compounded by the lack of vaccination throughout the system and constitute an acute public health emergency.

In the absence of a transparent flow of information, vaccination records of newly bought calves are rarely known to fatteners. This information asymmetry leads to market failure, with calves of unknown health status negatively perceived by buyers. Equally, it fuels BRDs spread as breeders have little incentive to vaccinate their herd ex-ante.

We develop a model of information acquisition and disclosure to propose the creation of a vaccination certification programme, subject to third-party monitoring. Vaccination is both akin to a credence good and imperfect: disease occurrence ex-post cannot be held as proof of its absence ex-ante. Thus, we argue that an ex-ante traceability system is best suited to resolve the targeted information asymmetry. We demonstrate that by certifying true product quality ex-ante, vaccinated calves become eligible to a market premium, encouraging breeders' participation. Fatteners' profits are revealed to be dependent on vaccine efficiency, disease prevalence and the price premium. Interestingly, the nature of vaccination imposes a limit on the number of vaccinated calves needed for herd protection – and thus a limit on the demand for vaccinated calves. Lastly, we show that the strength of the third-party monitoring is essential to limit the risk of free-riding and ensure that no producers are tempted to cheat.

Impact of long-term supplier relationships on animal health and productivity in pig fattening

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Research Question:

How does the duration of supplier relationships between piglet producers and pig fattening farms influence feed efficiency, animal losses, therapeutic index, and daily weight gain?

Motivation:

Animal health and productivity are critical factors in pig production, with direct impacts on economic profitability. Effective collaboration and communication between piglet producers and fatteners can improve biological performance and reduce medication use. This study investigates the influence of long-term supplier relationships on key performance indicators, contributing to sustainable and socially responsible animal health management.

Data and Methods:

The study surveyed 50 pig fattening farms in Germany, analyzing the effects of supplier relationship duration on feed conversion efficiency, animal losses, therapeutic index, and daily weight gain. Data were collected through structured interviews. Statistical analysis assessed association between relationship duration and performance indicators, considering additional factors such as communication frequency and veterinary care.

Results:

Findings indicate that longer supplier relationships are positively associated with feed efficiency and daily weight gain while reducing animal losses and therapeutic interventions. Farms with extended partnerships reported more stable health conditions and fewer performance fluctuations, attributed to consistent piglet quality, improved biosecurity, and tailored feeding strategies. The therapeutic index, reflecting medication use, decreased as relationship duration increased, suggesting enhanced preventive health management. Communication between farms and veterinarians was more frequent in long-term partnerships, supporting proactive health measures.

Conclusions:

Long-term supplier relationships contribute to better animal health and productivity, reducing economic and societal burdens associated with disease outbreaks and antimicrobial use. Strengthening long-term supplier relationships between piglet producers and pig fattening farms through transparent communication, standardized production criteria, and joint health management improves animal health and productivity. Collaborative approaches that align economic interests and promote data sharing can reduce therapeutic interventions and enhance overall system efficiency.

Socioeconomic and geographical predictors of vaccination of small ruminant herds in West Africa

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Objectives

The livelihood of rural households of Sub-Saharan Africa is still undermined by vaccine-preventable infectious diseases of small ruminants, including Peste des Petits Ruminants and Sheep and Goat Pox. Diverse socioeconomic factors hindering small ruminant vaccination were identified in surveys conducted in specific locations and using different methodological approaches. Our objective was to weigh the relative importance of these different factors using a regional survey dataset.

Method

We used secondary data produced by the Living Standard Measurement Surveys conducted in seven West African countries in 2018-2019. A total of 16910 households owning goats or sheep answered the survey and were included in our analysis. We pre-selected a set of socioeconomic and geographical variables categorized into five thematic groups based on their hypothesized association with different dimensions of access to vaccination (availability, accessibility, affordability, acceptability and awareness). We fitted a mixed-effects Principal-Component regression model using Multiple Factor Analysis as a dimension-reduction technique. Both frequentist and Bayesian approaches were used for fitting the model.

Results

Of the households surveyed, 38.9% reported the use of vaccination in their small ruminant herds in the past 12 months. The frequentist and Bayesian techniques produced very similar results but the Bayesian approach returned comparatively narrower uncertainty intervals. Access dimensions identified to have the strongest associations with the likelihood of vaccination were, by decreasing order of importance, vaccine availability (geographical region), acceptability (herd management and size, previous experience with animal diseases), affordability (sources of income, household capital, perceived livelihood), awareness (media technologies) and accessibility (remoteness, household belonging to socially disadvantaged groups, including single women).

Conclusion

The likelihood of vaccinating small ruminant is primarily associated with the geographical location of households, showing the existence of important spatial disparities in the allocation of vaccines or vaccination programs.

Assessing the cost-effectiveness of Cystic echinococcosis control measures targeting sheep farming in selected regions of Italy

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Background. Cystic echinococcosis (CE) is a neglected zoonotic disease caused by *Echinococcus granulosus sensu lato* (s.l.). The parasite is prevalent globally, impacting pastoral communities in the Mediterranean, Asia, the Middle East, and South America. The lifecycle of *E. granulosus* requires a carnivore definitive host and a herbivore intermediate host (usually sheep or cattle), however humans can become accidental intermediate hosts. Despite being notifiable in most countries, surveillance systems are often passive, insensitive or inconsistently implemented, leading to the under detection of cases and an underestimated socioeconomic burden. Sustainable policy recommendations require integrated epidemiological and economic evaluations to inform investment decisions. **Methods.** Here, the Cystic echinococcosis stochastic transmission (CEST) model, originally developed to reproduce parasite dynamics in dogs and sheep in Argentina was adapted to four administrative regions in Italy. These regions include hypoendemic (Veneto) and hyperendemic (Lazio, Toscana and Campania) areas, with a history of livestock burden and hundreds of human cases annually, constituting an ongoing public health concern.

Real disease prevalence in sheep and dogs was estimated through an active sampling survey, and the effectiveness of control interventions, including variable frequencies of dog deworming and sheep vaccination, were assessed. Costs were calculated for resources, programme delivery, and recurrent overheads to enable a cost-effectiveness analysis. A sensitivity analysis will also assess the cost-effectiveness economic model's sensitivity to changes in baseline prevalence and the costs of control measures.

Projected results. We expect interventions implemented in Italy to be cost effective, as has been seen in other CE endemic regions. We anticipate that in the hyperendemic regions (Lazio, Toscana and Campania), a more aggressive deworming schedule and vaccination will be most cost-effective based on an incremental cost effectiveness ratio. Conversely, in the hypoendemic region (Veneto), we expect a less frequent deworming schedule to be more cost-effective.

Towards transparency in dairy cattle farm-level emission modelling

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Livestock contributes to anthropogenic greenhouse gases (GHGs) worldwide. However, while it generates significant methane (CH₄), nitrous oxide (N₂O), and carbon dioxide (CO₂) emissions and occupies most agricultural land, it also plays an important socioeconomical role, particularly in rural economies, and is crucial to global food security. As Denmark and other countries advance GHG mitigation strategies, accurately quantifying livestock-borne emissions is essential for identifying model discrepancies and informing policy development. Precise emissions assessment will enable the creation of effective, economically viable strategies that reduce greenhouse gas emissions while ensuring the sustainability of critical dairy sectors.

The objective of this study is to compare GHG emission models used for the dairy sector to evaluate their variability. A literature review identified 26 models. These models differed in their consideration of emission sources, inclusion of pre- and post-farm emissions, land-use changes, carbon sequestration, non-GHG impacts, functional units, calculations, and their inclusion of sensitivity analyses.

While most models included CH₄ and N₂O from enteric fermentation and manure management and CO₂ from energy use, only one considered downstream emissions (e.g., slaughterhouses) and three excluded upstream emissions (e.g., feed production). Reporting of functional units varied, with emissions expressed per farm, per hectare, per animal, and per kilogram of product. Of the 26 considered, 16 failed to include CO₂ emissions from carbon sequestration, only eight considered land-use change emissions, and 10 included a measure of uncertainty.

Future analyses will utilize Danish farm accountancy data from the Farm Accountancy Data Network to compare representative Danish dairy farms across soil type, animal density, feed composition, productivity, and land use. These data will be integrated into emission models identified in the literature review, with their outputs used to assess model suitability and quantify uncertainty.

Estimating effects of metabolic diseases on enteric methane and economy in four European dairy herds.

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Global dairy production is facing challenges with a growing human population and subsequent increase in demand, climate and environmental burdens and increased awareness of animal welfare. Therefore, dairy production needs to become more efficient and animal welfare friendly, while the economy on-farm remains profitable. Diseases in dairy cows can affect various herd production parameters such as the milk yield, feed intake, feed efficiency, reproduction, longevity and thereby also the farm economy and methane emission. These effects of diseases vary significantly between studies. This can be due to differences between herds regarding farming system, management and prices. However, it may also be because of differences in the applied models. This study investigated how metabolic diseases (milk fever and ketosis) affected the economy and enteric methane emissions in herds from Denmark, Italy, Norway and Sweden using input data (local key performance indicators and prices) obtained from the respective countries, which showcases variation between countries by using the same bioeconomic herd simulation model (SimHerd).

Key findings indicate that metabolic diseases contribute significantly to economic losses and methane emissions, and the magnitude varies by country. Milk fever was identified as the most costly and prevalent metabolic disease, with failure costs per case estimated at €645 in Denmark, €855 in Italy, €907 in Norway, and €1,257 in Sweden. The study also found that disease prevention reduces methane intensity while generally increasing methane yield due to higher milk production, however that the magnitude of the effect on enteric methane yield and intensity differed between countries, both when calculated per case and in total. Further analysis is needed, and will be conducted, to obtain more insights into these between-country differences.

A multicriteria bio-burden simulation model for suboptimal mobility in dairy cattle.

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The economic burden of animal diseases is evident and has been quantified for many diseases. Other burdens are also associated with diseases, including the burden on animal welfare, the environment and public health. The relevance of these non-monetary burdens is increasing but their impact is rarely quantified. As a result, the information on which decisions regarding animal diseases are made is incomplete. Our aim was to develop a bioburden simulation model to simulate animal disease and quantify its effect on the economic, animal welfare, environment and public health burden. As animal health disorder case, we used suboptimal mobility in dairy cattle. Suboptimal mobility is a common concern in dairy cattle with substantial economic and animal welfare implications. An existing dynamic, stochastic, and mechanistic discrete-time step bio-economic model was extended into a multicriteria bio-burden model. In the model, disease dynamics of eight hoof disorders are simulated in a herd of 125 dairy cows. The economic burden is quantified as the difference between milk yield returns and the costs of milk yield losses, feed, insemination, culling, hoof trimming, veterinary services, labor and treatments. The animal welfare burden is quantified as the amount of time a cow lived with impaired welfare and the welfare impairment weights elicited by experts for various levels of disease severity. The environmental burden is quantified as greenhouse gas emission (in CO₂-equivalents) from, amongst others, growth, milk production, feed production, enteric fermentation, and manure management. The public health burden consists of antimicrobial resistance which can occur through antimicrobial usage and is expressed as the number of defined daily dosages. Combining all burdens in one model is currently being finalized. Results, including the trade-offs between burdens of subsequent simulations will be presented during the meeting.

Cost-benefit trade-off of business structures in the Danish cattle industry: Managing Salmonella Dublin

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The Danish cattle industry has shifted towards fewer but larger and more complex farms. Cattle operations are structured into businesses, where a single business can encompass multiple properties (farms), each with its own herds. If any farm within a business test positive for Salmonella Dublin (S. Dublin), all associated farms within a 4 km radius are automatically classified as test positive. This classification increases the risk of false positives in Denmark's official S. Dublin surveillance program. Regaining test-negative status requires substantial investments in decontaminating including cleaning, testing (milk, blood, and manure samples), veterinary and farmer labor, animal separation, and purchasing protective equipment.

This study analyzed cattle businesses in Denmark from 2010 to 2020, assessing the control costs and benefits of business structures within and beyond a 4 km radius.

The share of dairy farms in businesses grew from 3.6% in 2010 to 5.6% in 2020, while heifer farms increased from 8.7% to 13.9%. Over the study period, 27.2% of all cattle businesses within 4 km tested positive for S. Dublin, each involving an average of 10 farms. This resulted in an estimated control cost of €9 million per infection across all businesses. Including businesses outside the 4 km radius would increase costs 14-fold, as 89.3% fall beyond this boundary.

Businesses provide advantages such as easier acquisition of farm infrastructure, lower per-stall costs, improved pasture access, and reduced administrative burdens, including taxation and movement tracking. However, they also pose risks, as an S. Dublin infection in a business result in high control costs for farms part of a business. While this study does not account for production losses and reduced turnover of exported cattle, it highlights the tradeoff between operational efficiency and the financial burden of disease control, where infection-related classifications may be purely administrative.

Quantifying the welfare burden of Bovine Respiratory Disease on dairy calves: Insights from expert elicitation

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To move beyond traditional economic considerations, it is essential to integrate animal welfare (AW) into animal health decisions. However, assessing the AW burden of diseases is challenging, as current welfare assessment systems, such as Welfare Quality[®], primarily use disease presence as a proxy for AW, without directly measuring its impact. Edwardes et al. (2024) introduced a novel method to quantify disease impact on AW, applying it to suboptimal mobility in dairy cows, linking AW impact to disease severity.

This study aimed to determine whether the methodology developed by Edwardes et al. (2024) could be applied to another disease: Bovine Respiratory Disease (BRD) in weaned dairy calves. Additionally, we assessed the association between experts' educational, professional, and experiential backgrounds on their assessments of BRD's AW impact.

Expert elicitation was applied via Adaptive Conjoint Analysis (ACA) and the Five Domain Model to identify key animal welfare indicators (AWIs) and their levels, as effected by BRD. The ACA was conducted using an interactive online questionnaire, and gathered responses from 33 experts in animal health and welfare. The responses were analysed to determine the average importance of each WI and WI level. Welfare disutility, the sum of welfare impacts, was then calculated for different BRD severity grades.

Results showed that WIs related to the health and nutrition were the most impaired by BRD, according to the respondents. A linear relationship between BRD severity and welfare disutility was observed, aligning with clinical disease progression. The backgrounds of the respondents were not significantly associated with their assessment of the AW impact of BRD.

This study demonstrates the applicability of Edwardes' method to BRD and suggests it could be extended to other diseases, using a similar approach. Such indirect AW assessment methods offer valuable insights for health management strategies, promoting improved AW outcomes.

Using a one-health-one welfare-one wellbeing approach to assess disease burdens in UK livestock farming

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Livestock farming faces increasing challenges due to climate change, soil degradation, water scarcity, and evolving food production demands. These pressures, alongside growing concerns regarding sustainability and both animal and human welfare, highlight the need for a more holistic approach to determine disease burden. This study aimed to assess methodologies for quantifying the economic, welfare, and productivity costs associated with key diseases in UK beef and sheep farming, while identifying points for improved disease prevention, management, and control.

Using data from a UK beef and sheep farm management survey, two methodologies were used: the Global Burden of Animal Diseases (GBADs), which accounts for economic, environmental, and human health externalities, and a proposed One-Wellbeing approach. The latter builds on the GBADs method by more fully incorporating One Health and One Welfare approaches, emphasising the interconnected health and welfare of humans, animals, and ecosystems.

Findings suggest that while the GBADs method provides valuable insights, it does not seem to capture the full complexity of disease burden, particularly non-monetary aspects. Using a One Health-One Welfare approach broadens this method by integrating elements beyond the absence of disease, encompassing behavioural, ecological, and ethical dimensions. And would accommodate the discrepancy we found between the prevalence impact of different diseases compared to how farmers perceive the importance of these diseases, suggesting ego-centric approaches are limited. This aligns with the emerging discourse that eco-centric worldviews (which prioritises the intrinsic value of all living organisms and ecosystems rather than just humans) need to become dominant for systemic, positive change. Furthermore, using a more holistic method such as a One Health-One Welfare-One Wellbeing approach could better aid identifying sustainable leverage points for change, including behavioural and management interventions. Improving not only animal health burden outcomes but also fostering resilience and supporting a sustainable and just livestock sector.

A metric to estimate livestock disease outbreak preparedness

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Veterinary public health authorities face a range of logistical, economic, and societal challenges in responding to livestock disease outbreaks. To enhance the ability of authorities to anticipate resource bottlenecks and assess their preparedness, a novel metric is proposed.

Primary preparedness indicators, such as testing and laboratory capacities, which are explicitly related to outbreak preparedness, were captured through the circulation of a data collection template to livestock researchers in 37 countries in and around Europe. Secondary indicators, such as trade flows and other economic characteristics, while indirectly related to preparedness, provide valuable context for primary variables, and were obtained from open-access databases and reports. These two sets of indicators were combined to estimate country-level outbreak preparedness for five diseases: African Horse Sickness, African Swine Fever, Avian influenza, Chronic Wasting Disease, and West Nile Fever.

Using multidimensional Item Response Theory (mIRT), primary indicators were mapped as items to a set of latent capacity traits (laboratory, educational, culling, monitoring and surveillance, and collaborative capacities). Secondary indicators were included as covariates to provide additional explanatory power within a series of latent regressions.

France, Spain, and Austria were among the highest scoring countries in overall preparedness across all diseases considered. Culling capacity, laboratory capacity, and educational capacities were generally the most impactful in terms of their estimated relationships to overall preparedness, while collaborative capacity was generally among the least.

The results demonstrate the use of mIRT to combine indicators of preparedness into a comprehensive metric and emphasize the importance of investment into culling, laboratory, and educational capacities. By incorporating secondary variables as covariates, this metric also captures the dynamic nature of resource holdings by considering the ability of countries to not only implement a response given their current capacities, but also to build up capacities in emergency situations.

Challenges in modelling the economic impact of multiple interrelated reproductive diseases

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Reproductive diseases in dairy cows are interrelated, which complicates economic impact estimation. Therefore, identifying the interrelations between the various reproductive diseases is crucial to model their overall economic impact. This study aimed to quantify the economic impact of multiple interrelated reproductive diseases in dairy cows and to develop a structured approach for parameterizing a simulation model estimating this effect. Seven reproductive diseases (dystocia, retained placenta, acute metritis, chronic endometritis, anovulation, cystic ovarian disease-COD, sub-oestrus) were modelled. An existing individual cow-based, dynamic, and stochastic bio-economic simulation model of a 200-cow-herd in daily time steps was extended to include the interrelated reproductive diseases. The structured modelling approach started with developing a causal diagram to determine the possible interrelations between the diseases. Next, the overall incidences of diseases were determined based on scientific literature and expert opinion. Then, the risk of developing each disease given the previous event was estimated based on expert opinion. Finally, each conditional probability input, determined by a calibration process, was assigned to obtain the overall incidence of each disease. When taking all diseases into account, the mean annual cost of reproductive diseases was €100/cow/year. The highest mean annual cost was observed for acute metritis (€30/cow/year), while the lowest mean annual cost was observed for dystocia (€4/cow/year). Several modelling challenges were faced during our modelling process. There were no existing studies quantifying the conditional probabilities of the reproductive diseases in relation to each other. Additionally, available data on the incidence of reproductive diseases in Dutch dairy farms was scarce and outdated. Our structured approach, in combination with the use of expert opinion, provided a deeper understanding of the complex interrelations among reproductive diseases and allowed for a comprehensive estimation of their combined economic impact on dairy farms, in situations where insufficient epidemiological data prohibit an empirical estimation approach.

Assessing the economic burden of animal diseases in French dairy cattle: a dynamic population modelling approach

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The dairy cattle sector is a very important industry in France, worth several billion euros. This study followed the approach developed by the Global Burden of Animal Diseases (GBADs) programme, to estimate the Animal Health Loss Envelope (AHLE), a metric developed to link health and production parameters to farm economics. It is a tool with no a priori assumptions about disease prevalences, based solely on demographic and economic data. We used a dynamic and stochastic modelling approach to estimate the burden of animal diseases on the French dairy cattle sector. We considered France as a single farm to calculate its dairy cattle biomass and evaluate its economic performance. The AHLE was estimated by comparing three scenarios: a hypothetical ideal scenario (IDS) in which mortality and production losses associated with morbidity did not exist, a scenario that accurately reproduced the current state of the sector (CUS), and an intermediate scenario in which mortality and health expenditures are set to zero but everything else is congruent with the current scenario (ZMS). The model was calibrated with data from the scientific literature, government and professional sources and databases. As a preliminary result, we found an AHLE value per cow-year of €1,694±85, of which 23% is directly attributable to mortality and the rest to production losses. Pending a more precise calibration of the model, this result seems to be overestimated compared to the average estimated annual losses per cow-year found in comorbidity-adjusted economic analyses. However, this could also be explained by the inclusion of minor diseases that are usually neglected. This estimation is a first step towards a better understanding of the burden of animal diseases on livestock farmers: this metric could be used to calculate the cost-benefit ratio of health interventions and allow comparisons between sectors.

Linking the economic burden of animal disease to ex-ante intervention assessments

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Cost-benefit analysis (CBA) has long been used by veterinary services to assess the likely profitability of animal health interventions and support decision-making. However, there is no standard approach to ensure analyses are comparable across countries, production systems and diseases. The Global Burden of Animal Diseases has developed an analytical framework to assess the burden of disease across animal species. This framework may be used to assess the current impact of specified diseases, and therefore to provide a baseline for assessing the likely impact of interventions to control or eliminate animal diseases. In this work, we explored how the two approaches (disease burden and intervention assessment) can be jointly implemented. The case study presented here relates to the hypothetical implementation of foot-and-mouth disease (FMD) free compartments producing beef in Zambia. FMD is endemic in some areas of Zambia and is the main disease affecting the trade of chilled beef products in the Southern African region. The analysis relied on a bioeconomic herd model of the compartment population, including both breeding and fattening units, for a total of around 180,000 head. Biological, management and epidemiological parameters were assessed based on a structured literature review. The model outputs were used to calculate the enterprise gross margin under different scenarios, which serves to estimate both the current burden of FMD and as input into the CBA. The activities and costs related to implementing an FMD-free compartment were assessed during a stakeholder workshop in Zambia. The results showed that an increase in farm-gate prices, which appeared to be realistic given retail prices in potential export markets, would be required for the intervention to break even. While the intervention is likely to be economically profitable, stakeholders raised practical questions regarding its implementation and the associated risks.

Modeling the multifaceted burden of *Mycoplasma hyopneumoniae* infection on a dutch pig fattening farm

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Mycoplasma (*M.*) *hyopneumoniae* poses a significant challenge for pig producers globally, yet its multifaceted impact remains poorly understood. This study aimed to gain insight into the economic and health burdens caused by the disease by developing a stochastic individual-based model using the EMULSION modeling framework, simulating infection dynamics, clinical signs, pneumonia progression, and production performance.

The model represents a compartment on a Dutch pig fattening farm, consisting of 12 pens, each housing 12 pigs, enabling the distinction between within-pen, between-pen, and indirect transmission. Additionally, antibiotic treatment was modeled based on coughing detection at the compartment level. Model outputs were used to calculate the gross margin, accounting for revenues per carcass and costs related to labor, transportation, feed, and treatment. Parameters were sourced from scientific literature, representative surveys, or expert elicitation, with sensitivity analyses conducted where appropriate. Model validation was performed using field studies, expert review, and slaughterhouse data on macroscopic lesions.

Various infection scenarios were simulated, with the progression of the infection and development of clinical signs and pneumonia visualized at both pen and compartment levels. In a severe *M. hyopneumoniae* infection scenario, antibiotic treatment occurred in 93% of simulations, with a mean total dosage of 655 grams. Compared to a non-infected cycle, this outbreak resulted in an average gross margin decrease of €5.31 per fattening pig.

The findings highlight trade-offs between financial costs, animal health, and antibiotic use. This model provides a robust tool for evaluating the impact of preventive and control measures on multiple burdens, as well as assessing co-infections with other respiratory pathogens. These insights are essential for developing more effective management strategies for *M. hyopneumoniae* infections.

Understanding the economic burden of AMR and AMU in livestock through the GBADs approach

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Antimicrobial resistance (AMR) in livestock can have far-reaching socio-economic consequences, generating significant negative externalities in human health and the environment and affecting animal health and production. Given diverse data needs and the absence of standardised methodologies, the socio-economic burden of AMR and antimicrobial use (AMU) in livestock is complex to gauge. Yet, quantifying this impact is crucial in policy development, public awareness, resource allocation and research prioritisation. We describe the progress made to assess this burden within the Global Burden of Animal Diseases (GBADs) programme.

Guided by a conceptual framework developed in the first phases of our project, we have estimated the contribution of AMR resistance to the overall envelope of losses in two case-studies. In Denmark, in the pig sector, in post-weaning diarrhoea, and Ethiopia, in cattle, in clinical mastitis. Diverse data describing the production systems and the price system they operate was used to estimate the Animal Health Loss Envelope for these two case-studies. In addition, AMR epidemiological and AMU-related data were used to attribute that envelope to resistance within the scope of our studies.

Our results show a relatively small contribution of resistance in the two selected examples to the overall disease burden – 2.7% in Denmark and 1.2% in Ethiopia. The results also highlighted key critical gaps in the data landscape of AMR in livestock and the need to improve health and production data collection in livestock for production.

To our knowledge, this work generates the first estimates of the economic burden of AMR in the two selected countries. Continued work in this field and enhanced data can allow for the design of data-driven AMU stewardship and AMR mitigation programs in livestock, understanding complex trade-offs, and prioritising animal health investments. We discuss lessons learned, opportunities, and challenges for future work.

POSTER PRESENTATIONS

A socio-ecological approach of applicability of animal diseases' control measures - scoping review

Presenting author: L. Vors, (lisa.vors@envt.fr)

Analysing challenges faced by Salmonella insurance in Finland and policy options for enhanced economic viability

Presenting author: J. Niemi, (jarkko.niemi@luke.fi)

Biosecurity "à la française": Paperwork and its role in shaping field actors' experiences of biosecurity

Presenting author: P. Brauneisen, (rebecca.hibbard@envt.fr)

Bluetongue: to vaccinate or not? Field data to inform policy decisions

Presenting author: I. Valente, (isotta.valente-esterno@izslt.it)

Companion animal veterinarians' knowledge of antibiotic stewardship in Austria: an online survey

Presenting author: C. Firth, (clair.firth@vetmeduni.ac.at)

Counting the hidden costs: Unveiling food system hazards across sectors

Presenting author: K. Simpkins, (kierans@liverpool.ac.uk)

Economic implications of technology-driven animal welfare data exchange in the livestock value chain

Presenting author: N. Schlereth, (natascha.schlereth@tum.de)

Economics of vaccination against diarrhoea and respiratory diseases in French cow calves' systems: a bioeconomic modelling approach

Presenting author: A. Ferchiou, (ahmed.ferchiou@envt.fr)

Enhancing antibiotic stewardship in livestock: AMR risk assessment and governance framework

Presenting author: B. Huntington, (ben@pengwernanimalhealth.com)

Epidemiology and risk factors of Foot and Mouth Disease outbreaks in Java, Indonesia (2022–2023)

Presenting author: C. Inchaisri, (chaidate.i@chula.ac.th)

Equine veterinarians' perspectives on care priorities in four common veterinary scenarios

Presenting author: Y. Elte, (y.elte@uu.nl)

Estimating disease burden in Polish broiler flocks using production data

Presenting author: C. Delavenne, (camille.delavenne@epimundi.com)

Estimating the animal disease burden for the Dutch dairy farms

Presenting author: R. Bergevoet, (ron.bergevoet@wur.nl)

Exploring antibiotic stewardship interventions within a One Health context: A scoping review.

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Factors influencing the use of biosecurity on poultry farms in the UK: a qualitative study assessing the perspectives of different stakeholders

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Farm extension services to implement effective biosecurity on cattle farms in the state of North Rhine-Westphalia (NRW) in Germany to reduce medication and improve performance.

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Harmonizing the use of epidemiological parameters in economic assessments: a Scoping review on Cystic echinococcosis

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Horse owners' decision-making and expectations in equine veterinary care: a survey-based study

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Improving data sharing for zoonosis surveillance in Senegal: challenges and opportunities

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Investigating the non-monetary impacts of High Pathogenic Avian Influenza globally.

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Is prevention truly better than cure? Evaluation of the willingness to vaccinate preventively and reactively against Peste des Petits Ruminants in Senegal

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Mapping the Risk: Spatial Links Between Poultry Farming, Wild Birds, and Avian Influenza Outbreaks in Taiwan

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One Health governance of antibiotic resistance in Senegal

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Reduction of antibiotic use in fattening calves with high-quality care in the rearing phase

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Reevaluating the economic and public health burden of West Nile Fever in Armenia: Implications for equine and avian surveillance

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Review of economic feasibility of using sensors for health monitoring in dairy farming

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The economic impact of technological advancements in livestock production: A systematic review

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The One Health legal framework of antibiotic stewardship in Senegal

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Upper and underworld of antimicrobial trade and usage in farmed animals in Lomé (Togo)

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Veterinary public health & zoonoses in Austria: an interactive seminar for veterinary students

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