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CONFERENCE ABSTRACTS

Inaugural Meeting of ISESSAH

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edited by:
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Preface

On behalf of the committee of the International Society for the Economics and Social Sciences in Animal Health, and everyone else who has played a part in the organisation of this inaugural conference, we welcome you warmly to Aviemore. Thank you for making this gathering possible through your commitment to coming together.

ISESSAH was established to improve animal health and welfare policies, programmes and projects through the application of tools and methodologies available in economics and social science disciplines, and though this it is our objective that opportunities will emerge for animal health professionals globally to deliver improvements in health and welfare for animals and the societies of which they are a part. That ambition has shaped our programme, and we hope it will deliver the objectives of the society, looking to the needs of individuals, animals and society more generally.

We hope you will all discover useful and worthwhile knowledge during your time together, as well as establishing new contacts and renewing old friendships. Furthermore, we hope you will enjoy taking part in every aspect of our programme – the formal sessions, meeting and debating with colleagues, the social night we have planned for you, and not least seeing some of the beautiful landscape of the Scottish Highlands.

Jonathan Rushton – Chair of ISESSAH
George Gunn – Conference Chair

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Presentations

What does 'cost of a disease' really mean? A reflection on the framing of research questions related to animal health from an economic point of view

E. Wauters

This paper provides a critical examination of the concept 'cost of disease', which is currently one of the dominant endeavours in economics of animal health (EAH). Since the 1960s, many scholars have contributed a lot to the further evolution and development of EAH, leading to substantial theoretical and methodological improvement, Still, it is our view that many studies suffer from a vague formulation of the research question and a too narrow conceptual view on the societal problem. The dominant economic endeavor in veterinary economics is calculating the cost of disease. However, several issues can be formulated regarding this concept, such as the lack of consistency with which it is used and applied, which impedes meaningful comparisons and hampers useful reflections. More critically, calculating the cost of a disease somehow departs from the core questions with which economics is concerned, which is decision making when decisions force people to consume finite resources such as time and money. In its prescriptive form, it tries to inform decision makers on the best possible decision; in its descriptive form it aims to predict how decision makers will react to changes and uses that information to propose changes. When assessing the cost of a disease, it is often unclear and unspoken which decisions are investigated, amongst others since the cost of disease already partly includes costs associated with decisions related to prevention and monitoring. As such, research in the veterinary economics profession risks wasting enormous resources without actually contributing to better decision making. This paper reviews past approaches to the estimation of the cost of a disease and the limited settings in which this concept can aid decision making. We further advocate to move from a disease-centric approach to a decision-centric approach and propose a conceptual framework in which such veterinary economics analysis may be performed.

Modelling the costs of locomotory disorders and postpartum dysgalactia in sows

J.K. Niemi, S. Ovaska, P. Bergman, M. Heinonen

During the first parities, post partum dysgalactia syndrome and locomotory disorders are common health problems occurring in sows. Previous research suggests that they can cause substantial losses and result in premature removal of the sow from the herd. For instance, studies show that 9-45% of sows are culled due to the lameness. However, economic costs of post partum dysgalactia syndrome and locomotory disorders have not been investigated properly.

The goal of this paper is to examine economic losses caused by locomotory disorders and udder-related dysfunctions during the postpartum period in sows and their impacts on the longevity of sows. A stochastic dynamic programming model, which maximizes return on sow space and optimizes the replacement of sows under speciec scenarios was developed. The state variables were litter size and parity number. Their evolution was modelled as a stochastic process. The model characterized changes in the production parameters such as the number of piglets born and piglet mortality as a function of current state of nature and other relevant factors, as well as sow health data. Data from databases of Faba breeding and Natural Resources Institute Finland were used to parametrize the model.

The results suggest that lameness and fertility disorders can cause on average about €35 losses per pig space unit per year. This corresponds to about €1-2 per piglet. Due to premature replacement associated with studied disorders, the number of litters that the sow would be able to deliver during her lifetime is decreased by about 0.5 litters. The results suggest that the losses can be partially reduced by management measures, and that it is particularly important to put effort on maintaining the health of sows in their three first parities.

Economic eradication model for LA-MRSA in Danish pig herds

F.F. Calvo-Artavia, M.G. Christiansen, N. Toft

In 2014, the prevalence of methicillin-resistant Staphylococcus aureus (MRSA) serotype CC398 (livestock associated LA-MRSA) in Danish pig herds was estimated at 63% in breeding herds and 68% in slaughter pig herds, which is a marked increase compared to the 16% herd prevalence estimate in previous years (i.e. 2010 and 2011). There is a need for a strategy to control LA-MRSA, particularly in pig production, and limit its spread to humans. The aim of this study was to estimate the cost of eradication of LA-MRSA in pigs, as a strategy to control LA-MRSA and prevent further spread to humans in Denmark. The estimation of total eradication cost was divided into the following components: 1) planning, 2) monitoring and 3) management on a national scale; 4) depopulation costs of positive farms; 5) loss of genetic progress in breeding farms. The estimated costs (in million (M) Danish Kroner (DKK)) for each component was estimated at 193M DKK for the first year of establishment of the LA-MRSA status of all Danish pig farms, mapping and planning of the LA-MRSA eradication strategy plan, 396M DKK for the following three years (i.e. pig depopulation period) for management and monitoring, 49M DKK for the monitoring during the fifth year of the eradication strategy plan, 3385M DKK for the depopulation of positive farms, including operational and production losses, and 1500M DKK as the loss of genetic progress, due to depopulation of breeding farms. The total cost of a 5-year eradication program for LA-MRSA in the Danish pig production system was estimated at 5.5B DKK. Furthermore, the cost of LA-MRSA surveillance, after the 5-year eradication program, was estimated at 49M DKK per year, consisting of one veterinary visit to each Danish pig farm, sampling and analysis of samples.

Equine influenza control in New Zealand: an integrated epidemiologic and economic (epinomic) approach

S.M. Rosanowski, N. Cogger, T.E. Carpenter, C.W. Rogers, D. Adamson

Equine influenza (EI) is a highly infectious respiratory disease of horses that has never been detected in New Zealand (NZ). The 2007 EI outbreak in Australia spurred the NZ government and stakeholders into evaluating alternative EI control strategies in an attempt to maximise the return to society from expenditure. To build on the policy debate, this paper presents an integrated epinomic (epidemiologic and economic) modelling approach to evaluate how alternative EI control and eradication strategies influence the distribution of EI through the NZ equine industry. These result parameters are then utilised within a cost-benefit analysis (CBA) framework, to identify the efficiency and feasibility of EI control/eradication in NZ.

The presentation explores nine alternative control/eradication scenarios; three vaccination strategies (suppressive, protective or targeted) with breeding-cycle adjusted outbreaks starting in August, November or February, compared to two adjusted baselines: movement restriction in the breeding season (August to January) or non-breeding season (February to July). The economic loss parameters were incursion response, impact to the commercial racing industry (breeding, sales and racing), horse morbidity and mortality and compensation to industry participants.

The results suggest that the economic justification of the EI program is dependent on when in the breeding cycle the EI outbreak occurs and the type of vaccination strategy implemented. A targeted vaccination strategy, where only horses from the racing industry were vaccinated, was economically inefficient as well as an epidemiologically ineffective. As multiple industry stakeholders benefit from these strategies, the study will enable policy development to prioritise strategies and focus the debate regarding user-pays eradication programmes.

Economic evaluation of BVD eradication in Switzerland

B. Thomann, G. Schuepbach-Regula, I. Magouras, A. Tschopp, B. Häsler

The mandatory eradication programme for Bovine Virus Diarrhoea (BVD) has been ongoing since 2008, and is focused on detection and elimination of persistently infected (PI) animals. Detection was initially based on antigen testing of the entire cattle population, followed by antigen testing of all new born calves until 2012. Since then, bulk milk testing (dairy herds) and blood sample serology (beef herds) have been used for the surveillance of disease-free herds. From 2008-2012, the proportion of new born PI calves decreased from 1.4% to less than 0.02%. However, this success is associated with substantial expenditures.

The aim of this study was to conduct an economic evaluation of the Swiss BVD eradication programme. Production models for three dairy farm types were used to estimate gross margins and net production losses and expenditures caused by BVD. The total economic benefit of a BVD eradicated population was assessed by extrapolating the farm level benefits, which comprised avoided production losses and expenditures, and comparing them to the total eradication costs in a benefit-cost analysis. Data on the disease impact of BVD on animal health, fertility and production parameters were obtained empirically in a retrospective epidemiological case-control study in Swiss dairy herds. Other production and economic parameters were based on benchmarking data and published agricultural statistics. In terms of eradication costs, cumulative expenses for sampling and diagnostics were estimated. The economic evaluation consisted of a stochastic simulation in @Risk for Excel with 20,000 iterations and was conducted for a time period of 14 years (2008-2021).

The median net present value (NPV) obtained was 13.4m CHF (90% CR: -18.9m to 38.2m CHF). The median benefit-cost ratio (BCR) was 1.15 (90% CR: 0.79 - 1.42) and the break-even point was estimated to be reached in 2019. Overall, these outcomes indicate that the Swiss BVD eradication campaign results in a net benefit.

Integrating contagion and human behavior into animal health economics

D.A. Hennessy

Many economic tools have been adeptly integrated into the analysis and management of animal disease. Neoclassical theory of the firm are now standard fare in animal health economics, including decision making under risk, uncertainty and limited public information; demand-side and market equilibrium responses; indirect cost subtleties; and human health dimensions. Less developed are two conspicuous components of many animal health management problems; namely that many of the most costly diseases generate contagion-related externalities, and that those managing these diseases are of species H. sapiens and not H. economicus.

When infection occurs across commercial herds as well as between wildlife and commercial herds then incidence of prevention costs incurred is separated from losses borne. As such, private commercial incentives diverge from socially optimal choices. Although seldom stated in this way, the public animal health sector was created in large part to bridge the divide. Many tools in the space of information economics and game theory have been adapted to address related problems in the areas of resource conservation, defense economics and human health economics. It has also been well-established that managers display systematic biases and make inconsistent choices when assessing low-probability events, using test data to update event probabilities, viewing the same data in different ways, and comparing alternative investments with deferred rewards.

This presentation will argue that the time is right for our discipline to more comprehensively account for the incentives implications of contagion-related externalities and for human cognitive biases when acting in the presence of risk and uncertainty. In short, we can reinforce and expand our understanding of actual decisions made and of policy effectiveness through the use of approaches and insights from strategic analysis and behavioral economics.

Current and potential methods for valuing nonmarket animals

A. Hagerman, K. Johnson, J. Thompson

Animal disease events can be costly to the affected country. Animal health economists are often tasked with estimating the benefits or costs associated with surveillance, reporting, trade embargos, disease prevention, estimating fair market value to support indemnification and disease reporting, or disease event impacts. However, lack of available data or absence of consistent reporting can reduce the efficacy of these valuations. Animals that are not sold on the market or the sales of which are not publicly reported may be omitted or undervalued in analyses. At times the closest values available are for other animal types, which may not encompass the true value of an animal, or values estimated for a different region or country. Each of these has drawbacks, especially when using these values to determine best disease management practices for a given livestock sector. This work looks at current methodology used for determining the value for nonmarket animals followed by a discussion of potential estimation techniques. Improvements in estimation of values for nonmarket animals and animal products begin with the importance of reporting and gathering prices for fuller analyses and continue in the practice of estimating animal values. An empirical example of valuation of nonmarket animals is explored to show potential estimation techniques and to show the shortcoming of these methods. Exploring nontraditional valuation methods may provide a way to value animals that would not otherwise be valued, in a way that is accessible and consistent with theory.

Beliefs, intentions, and beyond: A qualitative study for the adoption of sustainable parasite control in Flanders' cattle industry

F. Vande Velde, J. Charlier, V. Cauberghe, L. Hudders, E. Claerebout

Anthelmintic drugs are a cornerstone of worm control in cattle. To slow down the emerging anthelmintic resistance, sustainable worm control strategies should be adopted by the industry, including the use of diagnostic methods to support informed treatment decisions. To predict the uptake of sustainable parasite control strategies, we need to understand farmers' beliefs, motivations, intentions and gaps in the adoption process. For this purpose, semi-structured in-depth interviews with 20 Flemish dairy and beef cattle farmers are performed. The objectives of this study are twofold. Firstly, the study will identify intrinsic beliefs to further enrich a previously developed adoption framework for sustainable parasite control (Vande Velde et al., 2015). The results will include motivations and barriers for using diagnostics, as well as important influencers, perception of control, and perception of the risk for anthelminthic resistance. Although this method is now commonly used in the field of preventive veterinary medicine and has provided meaningful insights, a gap is emerging that should be addressed. Nearly all theories model farmers' behavior in the cognitive perspective and are set up to predict behavior intention. However, intention is not the sole predictor of behavior. The study of Vande Velde et al. (2015) presented a strong intention to adopt diagnostic methods on dairy farms, but in practice diagnostics are seldom being applied. Accordingly, the second aim of this study focuses on the intention gap, providing insights in the black box between intention and behavior. This will not only help herd health professionals with advising and communicating on sustainable parasite control, it offers an opportunity for social and economic science in animal health to evolve from strictly cognitive models to new frameworks with more integrated approaches, providing an answer for the final question ‘where should we go’.

Using psychological models of behaviour change to identify barriers to and motivators for biosecurity implementation on dairy cattle farms

I.F. Richens, J. Houdmont, W. Wapenaar, P. Hobson-West, O. Shortall, J. Huxley, M.L. Brennan

Identification of motivators encouraging farmer uptake of biosecurity practices has been attempted by a number of researchers utilising a range of methods. Approaches which take into consideration an individuals' preparedness for change (Transtheoretical model of behaviour change), alongside beliefs thought to motivate an individual to enact certain behaviours, may provide a framework for actuating change.

The aim of this study was to use a combination of health psychology models to link beliefs with behaviour to identify possible key interventions to improve the uptake of biosecurity measures by dairy cattle farmers in Great Britain (GB).

A postal questionnaire was sent to a selection of 2505 dairy cattle farmers in 2015. Questions were asked about the extent to which a host of biosecurity measures were used and the influence of various stakeholders (e.g. veterinarians, industry bodies) in informing biosecurity choices. A variety of analysis methods were used to interrogate the data, including reliability analyses, factor analysis, and logistic regression.

Around one third (757/2505; 30%) of the individuals contacted were eligible for inclusion in the study. Farmers appeared to either not carry out measures and have no intention of doing so, or had carried out measures for some time. Farmers felt that biosecurity improved cattle health and welfare, but that disease was inevitable. Preliminary analyses suggested a difference between the influencing beliefs of farmers and whether specific types of measure (e.g. direct versus indirect biosecurity) were more likely to be undertaken. For example, farmers' beliefs about other stakeholders appeared to play a role in influencing behaviour relating to direct, rather than indirect, biosecurity measures.

The use of a combination of health psychology models has identified some key variables that could be utilised for interventional approaches to improve the uptake of biosecurity on dairy cattle farms in GB.

Precise, smart and integrated - high impact essentials for new animal disease control tools

C.E. Milne, A.W. Stott

Innovations that could make current animal health problems rarities in the future are being inspired by Precision and Smart farming thinking. New disease diagnostics, prevention methods and veterinary treatments all have the potential to transform livestock production and the possible benefits are compelling. However, in the drive for progress there is a risk that factors influencing industry adoption are not given sufficient attention and consequently new developments do not achieve their potential. A challenge for animal health researchers is therefore to integrate social scientists to develop tools that address animal health problems in ways that enable rapid and effective uptake.

Recognising this challenge, the BUG consortium (Building Upon the Genome, BBSRC ref BB/M003949/1) has brought together experts from a wide variety of backgrounds. Their aim is to identify novel ways to reduce the rate at which resistance to anthelmintics develops. Social scientists are providing theoretical and empirically tested guidance on the likely industry acceptance of any tools developed. Fully integrating the economic and behavioural insights requires consortium members from diverse disciplinary backgrounds as well as industry to develop a shared understanding and recognition of critical science and commercial variables.

This paper reports on the social science frameworks being applied in the BUG project, including innovation adoption, behaviour change models and cost-benefit analysis. Findings will be presented from farmer interviews about current control policies and practices for gastroenteric parasites. These show the diversity and complexity of farming systems into which new tools must fit if for widespread adoption. They also highlight the potential value of fully integrated social and natural science research, which though requiring additional staff input can yield innovations with greater potential impact.

Participatory evaluation of vaccination services for Newcastle disease control in village poultry in Democratic Republic of Congo

F. Lwapa, J. Masumu, F. Matala, F. Mukoko, N. Moula, N. Antoine-Moussiaux

Rural areas of Democratic Republic of Congo (DRC) suffer recurrent food crises. Poultry keeping thus plays a crucial role in households' nutritional and financial security. This study mobilises participatory approaches and stated preference methods to evaluate recent vaccination campaigns against Newcastle disease (ND), led on a cost-recovery basis, and assess the demand for self-sustaining ND vaccination services in Kongo Central province. The survey covered 4 districts (Kasangulu, Madimba, Kolo, Kwilu Ngongo). It included 12 focus groups with farmers and veterinary services and 160 individual semi-structured interviews (snowball-sampled). To value the demand for distinct modalities of vaccination services, a stated preference survey was conducted with 320 poultry keepers. Through proportional piling, field actors estimated that about 80% of households keep chickens. Inside our sample, the mean flock amounted to 9.6 ± 9.1 chickens, an adult being sold at 3.5 to 5 USD. ND-compatible syndromes are described as annual and reaching mortality rates around 84% ± 18%. All interviewees recognized this disease as a main concern and 96% stated an overall willingness to pay for vaccination. Past vaccination campaigns had included 24% of the sampled farmers; 87% of those declared being convinced of vaccine's efficacy. Public veterinary services considered that the various campaigns had been an opportunity to acquire a new working tool, to generate income and constitute for them a positive object of collaboration with smallholders. According to all stakeholders, ND vaccination campaigns are the sole having shown regularity in the zone in the last 5 years. The maximal price evoked in open survey being of 20 US cents, conjoint analysis considered prices per dose of 5, 10 and 15 US cents. The modalities deemed important in vaccination services valuation were the mode of organisation (coordinated vs. individual recourse), the route of administration, and vaccinator's qualification.

Dog owners' intention to participate in rabies control in Flores Island, Indonesia

E. Wera, M. Mourits, H. Hogeveen

Since its introduction in 1997, rabies has been endemic in Flores Island Indonesia. The success of the applied control strategy depends on the commitment of the dog owners. By applying 'house-to-house' vaccination free-of-charge serious efforts have already been made to increase the mass dog vaccination coverage. However, realised coverage remains lower than the recommended 70%.

In this study the Theory of Planned Behaviour was used to identify the psychological factors associated with the intention of dog owners in Flores Island to participate in rabies control. For this purpose, 450 dog owners were questioned. Ninety-six percent of these owners indicated to participate in a free-of-charge vaccination campaign. Nearly 81% intended to keep their dogs inside their house or to leash them day and night for at least 3 months in case of a dog rabies incidence in their village, while only 40% intended to cull their dogs.

The influence of the psychological factors attitude, subjective norm and perceived behavioural control on the intention to participate in rabies control was analysed by multivariable logistic regressions. The attitude item 'vaccinating dogs reduces rabies in humans', and the perceived behavioural control items 'availability of time' and 'ability to confine dogs' were shown to be significantly associated with the intention to participate in a free-of-charge vaccination campaign.

As several attitude items were significantly associated with the intention to participate in rabies control, an educational campaign on the benefits of rabies control is expected to increase the intention of dog owners to participate. The significant association between perceived behavioural controls and vaccination intention points to other relevant policy interventions to increase intention, like the provision of a method to confine dogs and an appropriate campaign planning to relax the constraints on time availability.

Drivers of cattle market price formation in Cameroon

M. Motta, T. Porphyre, G. Rydevik, S. Hamman, V. Tanya, I.G. Handel, B.M. Bronsvoort

Livestock production and trade are critical for the food availability and welfare of rural households in Sub-Saharan Africa. In Cameroon, animal trade consists mainly of live cattle commercialized through livestock markets. The trade-off between the economic value of cattle and cost of mitigating infectious diseases in the livestock production system is essential to improve animal health and the livelihood of rural households. Better understanding of key aspects contributing to cattle price formation is therefore critical for designing effective policies for sustainable industry and food availability. In this study, we evaluate a range of factors for their effect on the price of traded cattle across markets in Cameroon. Based on details of all transactions (n=118,017) recorded from 31 livestock markets in the main area of cattle production, we developed a generalized additive mixed-effect model that explained 51.2% of the observed variation in traded cattle price. We further verified the robustness of the identified drivers by bootstrapping. The age and gender of the cattle traded as well as the week of the trade were consistently found to be important drivers of the price ($P<0.01$). The model also highlighted a positive association between the number of incoming trading connections of a livestock market and the price of the traded live cattle ($P<0.01$). In addition to these results, both human and bovine densities at the market vicinity were found to have strong, non-linear relationships with the price of traded cattle. These results show that the value of marketed cattle in Cameroon depends on a limited number of key drivers and highlight the potential link with the number of incoming market connections, a factor that may also impact disease spread.

Trading partner and product switching during an animal health event

J. Thompson, A. Hagerman, K. Johnson

From December 2014 to June 2015, U.S. poultry was affected by highly pathogenic avian influenza (HPAI) which led to the destruction of 48 million birds and losses in international trade. During the HPAI event, 45 countries placed trade restrictions on U.S. poultry exports, varying from regionalized, product-specific restrictions to total U.S. poultry embargos. In the face of food safety and biosecurity concerns, importing partners can choose to restrict products from a country or region. The restriction on one or several product categories can lead to a change in the composition of products demanded by the importer, causing importers to demand more of an unaffected product to compensate for the loss of restricted products. If the composition of trade changes cannot compensate for losses in traded quantity for the importer, switching of export sources will occur. For the affected exporter, there can be an increase in opportunistic importers that benefit from reduced prices and available markets. By analyzing changes in product composition and trade partners during a disease outbreak, a better understanding of trade responses can be estimated. For this analysis, trade composition and partner switching is evaluated for the 2014-2015 HPAI outbreak in U.S. poultry to quantify the changes in poultry trade and its effects on the United States, trading partners, and composition of trade. This empirical analysis can be used as an approach for how to model and estimate impacts of a future disease event.

Participatory methods in social science to identify barriers to implementing risk mitigation measures: Closures of live bird markets in Vietnam

T.T.T. Nguyen, X.T. Dinh, T.T.A. Tran, F. Lyle, D, TagoPacheco, N. Scott, A. Tripodi

Extensive research in Viet Nam and elsewhere has shown that live bird markets (LBMs) play a significant role in the ecology and zoonotic transmission of avian influenzas (AI) including H5N1 and H7N9. Viet Nam has a large number of LBMs reflecting the consumer preferences for live poultry. Under pressure to mitigate risks for H7N9 and other zoonotic avian influenzas, Viet Nam is considering, among other mitigation measures, temporary closures of LBMs as a policy to reduce risk of AI outbreaks. However, the efficacy of market closure is debated, particularly because little is known about how poultry traders may react, and whether trading may emerge outside formal marketplaces. Combining efforts of anthropologists, economists, and sociologists can be useful to elucidate the drivers behind poultry traders' reactions and better understanding the barriers to implementing risk mitigation measures. In this paper, we present results from a participatory stakeholder survey of LBM poultry traders in Viet Nam. Our qualitative data shows that trading outside formal markets is very likely to occur in the event of a temporary LBM market closure. Our data shows that the poultry value chain in Viet Nam remains highly flexible, with traders willing and able to trade poultry in many possible locations. Our results indicate that simplification of the poultry value chain along with strict enforcement, engagement of stakeholders and adequate communication would be a necessary prerequisite before market closure could be an effective policy.

Flashtalks

Structural change and animal disease risks in the Finnish livestock sector

J.K. Niemi, T. Lyytikäinen, L. Sahlström, A. Sinisalo, H. Lehtonen

The average size of livestock farms in Finland has increased while the number of farms has decreased over the past decades. This has raised concerns about the rise of animal disease risks, because larger farms tend to have a more intensive contact network than smaller farms.
The goal of this study was to analyse the trade-offs between structural change in pig and cattle sectors and risks related to contagious animal disease risks in Finland. Stochastic simulation and partial-equilibrium modelling were employed. Potential changes in location, size and contact structure of farms until year 2033 were simulated. Decreasing number of farms eliminates current contacts whereas increasing farm size initiates new contacts. Hence, a proportion of farms were re-linked with new contacts. Changes in farms' production costs per unit of output (due to economies of scale) were estimated. Finally, disease losses for the current and future farm structure were simulated by using foot and mouth disease (FMD) as an example.
The economic losses caused by an FMD outbreak in Finland in 2009 were estimated at €27.7 million (95% range €11.6 -€74.4 million). The proportion of re-linked contacts impacted future economic losses. In the best-case scenario (no re-linking) the total losses were simulated at €23.7 (11.7-50.6) million and in the worst-case scenario (full re-linking) at €34.4 (11.7-109.7) million. These correspond to -14% and +24% change in losses when compared to year 2009. Due to economies of scale, production costs per unit of output were estimated to decrease average by 22% in dairy, 8% in finishing pigs and 6% in piglet production when compared to 2009.
The results suggest that an increase in losses caused by a highly contagious disease may be proportionally smaller than simultaneous reduction in production costs per unit due to economies of scale. However, the conclusion is sensitive to changes in the contact structure between farms.

The Value of Cost Collection During an Animal Health Event

A. Hagerman, K. Johnson, T. Marsh, R. Seeger, D. Pendell

During a disease outbreak event costs are incurred publicly through government expenditures and privately by producers for disease mitigation efforts, ensuring the flow of commerce in impacted product, and signaling disease free status. A recent survey done in collaboration with the World Animal Health Organization showed that, while most of the countries surveyed had an animal health event in the last 20 years, limited cost data had been collected in those outbreaks (Rushton, 2016). The 2014-2015 highly pathogenic avian influenza outbreak in the United States included a concerted effort to collect detailed, farm-level cost information across an array of categories for the purpose of analyses to further aid the response effort. This detailed cost information was analyzed to examine costs across farm type and size, economies of size and scope, and regional differences in costs of response across the 15 affected states. It also informed policy and program responses during the course of the outbreak, and highlighted the value and challenges of cost data collection during an outbreak. Preliminary results indicate costs increased as resources such as labor and equipment became scarcer and costs varied widely across farms and regions.

Estimating the economic contribution of bovine viral diarrhea virus biosecurity strategies in the United States using whole farm planning

T. Cozzens, M. Sanderson, R. Smith

2007 USDA's National Animal Health Monitoring System survey reports that 96.9% of all cattle producers identify that the removal of calves persistently infected with bovine viral diarrhea virus (PI-BVDV) from the herd may reduce sickness and/or treatment costs. 89.7% of those same producers indicate the removal of PI's will improve reproductive efficiency and 95.7% say the removal will reduce death loss. Interestingly, only 41% of all operations vaccinated any cattle or calves against BVDV and only 4.2% of operations tested for persistent infection of BVDV in their herd over the last three years. The high rate of vaccination among operations, relative to testing, may indicate that producers believe vaccination may be a viable risk mitigation strategy to maintain animal health and control the spread of BVDV. This analysis evaluates the relative contribution of BVDV prevention strategies to minimize risk related to farm income and the uncertain financial impacts of a BVDV outbreak. The analysis estimated the impact of BVDV introduction to representative U.S. cow-calf operations using an epidemiological disease spread model to determine the annual costs of BVDV in cow-calf herds. BVDV model results were then incorporated into a linear programming framework to evaluate the tradeoffs between returns and risk of the alternative control strategies at the whole farm level. Results show that a North Central U.S region representative cow-calf producer, depending on the risk level and biosecurity strategy implemented, may seek to operate at a risk level between $0 and $2,000 with risk-return ratios ranging from $18.23 to $1.79 on the high and low end, respectively. Depending on the individual producer's risk preference and management objectives, the results from this analysis should provide guidance to better improve management and control of BVDV spread and incursions and simultaneously allow producers to manage risk.

Economics of vaccinating extensively managed sheep flocks against bluetongue disease

D. Peck, T. Munsick, J. Ritten, M. Miller, R. Jones

Introduction & Objectives: Bluetongue is a serious and recurring threat to sheep producers throughout the world. In the western United States, bluetongue virus (BTV) is transmitted by biting midges in late summer and early autumn, just before lambs are sent to market. No vaccine is currently sold for the most common serotype in the state of Wyoming and neighboring states, BTV-17. It is possible, however, for companies to manufacture custom-made vaccines for susceptible premises, upon special approval by the State Veterinarian. Before granting such approval, the State Vet needs information about potential benefits and costs of a BTV-17 vaccine for rangeland sheep flocks. Thus we estimate: (1) the cost to a representative sheep producer of a BTV-17 outbreak; (2) the cost of administering a custom-ordered BTV-17 vaccine to a susceptible sheep flock; and (3) the expected net benefit of using a BTV-17 vaccine to prevent outbreaks for a range of outbreak intervals.
Methods & Results: We construct a stochastic economic simulation model of a representative rangeland sheep operation, accounting for variability in lamb prices, morbidity rates and mortality rates. Expected net benefit is calculated for both a killed virus (KV) vaccine and modified live virus (MLV) vaccine. Our results show that expected net benefit is positive for many production scenarios, up to a 20-year outbreak interval. The MLV vaccine is less costly than a KV vaccine, but Wyoming regulations prohibit MLV vaccines for BTV due to concerns about vaccine ""escape"" - i.e., reverting to virulent type and transmitting from vaccinated to susceptible animals. An important policy question is whether the social cost of potential vaccine escape outweighs the private benefit to sheep producers of a more affordable vaccine. These results provide actionable economic information for both veterinarians and sheep producers, who face increasingly challenging production (e.g., climatic and market) conditions.

A cost-benefit analysis of the bovine viral diarrhoea control and eradication programme in Styria, Austria

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The objective of this study is to carry out an economic evaluation of the bovine viral diarrhoea (BVD) control and eradication programme in place in the Austrian state of Styria from 1998 to 2016. During the eradication phase of the programme, a strict testing scheme and removal measures were implemented according to the Scandinavian control model, followed by surveillance activities to ensure disease-free status. All cattle herds in Styria (n=15,385) were tested and all PI (persistently infected) animals were removed. Currently, approximately 99.59% of the cattle herds in Styria are BVD-free.
In order to provide information about optimal resource allocation, we have calculated the cost-benefit-ratio, the least-cost and the break-even point of the programme. We used a government database to assess the economic losses of rearing, milk production and fertility (e.g. calving intervals). A regression model was applied to calculate production losses. Furthermore, we determined expenditures related to the implementation of the programme, such as diagnostic and treatment expenditures, as well as the in-kind contributions of both the private and public sector in carrying out the mitigation activities.
The results of the economic evaluation show that the costs of milk yield reduction and the costs of extended calving intervals were marginal. In contrast, a significant economic impact with respect to the rearing of cattle was determined. The results indicate that a risk-based sampling scheme might be more economic under Austrian conditions compared to the testing of all cattle.

The value chain approach in animal and public health, focus on present applications and challenges

N. Antoine-Moussiaux, M. Peyre, P. Bonnet, C. Bebay, M. Bengoumi, A. Tripodi

The value chain (VC) is a major operational concept of socio-economic analysis at meso level. It is widely mobilised in development practice but is still undergoing conceptual and practical refining, mainly to take account of sustainability in all its dimensions. In a few words, VC refers to the full set of actors, activities (technical or economic functions), and flows (material or immaterial) involved in the provision of a good or service on a market. In the last decade, this concept has been promoted as a thread guiding the analysis and improvement of animal health systems. In particular, the emergence of highly pathogenic avian influenza (HPAI), which acted as a triggering event in the building and promotion of the One Health approach, has also been the occasion of an interdisciplinary application of VC to animal health. These efforts brought at the forefront participatory investigation methods in the socio-economic analysis of health systems. Participatory methods, using qualitative and quantitative data, fully valorise field actors' knowledge and involvement, hence facilitating the transdisciplinary work needed for analysis and more effective action. They fit into an adaptive and action-oriented strategy, fostering stakeholders' participation. Recent research on surveillance systems in South-East Asia merged VC and participatory approaches to develop innovative tools for analysing constraints to animal health surveillance. On-going interventions for HPAI control as well as the prevention of other emerging zoonotic risks in Africa are presently building on this VC framework to develop strategies for its application at national and regional scales. Based on the latter experiences, this communication aims at taking stock of VC applications to animal health systems, reviewing the lessons learnt, opportunities and limits of the approach, as well as the practical challenges of its application on a wider scale and its full insertion in the OH approach.

Identification of optimal time for change of surveillance strategy - based on assessment of cost of error

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To maximize effectiveness and efficiency of animal health surveillance, regular evaluation taking into account technical and economic considerations is required enabling adjustments in design of surveillance programmes. Importantly, evaluations need to take into account multiple dimensions, in particular factors that influence decision-making (e.g. zoonotic potential, impact on trade).

Currently, Danish outdoor-reared pigs are subjected to traditional meat inspection (TMI) including incisions or palpations into selected lymph nodes because of requirements from important trade partners. One of the main differences between TMI and visual-only inspection (VOI) is the ability to detect bovine tuberculosis (bovTB); this will be more difficult in case of VOI. Denmark is officially free from bovTB, but infection prevails in several EU Member States.

The aim of the present project is to conduct a cost-effectiveness analysis of two different surveillance systems for bovTB in pigs; namely TMI or VOI for outdoor-reared pigs, subjected to different biosecurity measures (roof and net in front of open pig stables, or serologic monitoring for bovTB). Scenario tree modelling will be applied. A comparison of cost-effectiveness between different scenarios will be made. Moreover, economic consequences associated with a bovTB outbreak will be estimated: 1) export losses of pigs, cattle, pork and beef, and 2) outbreak control costs, 3) production losses in livestock populations.

The results will help policy makers identifying the most cost-effective surveillance option - in this case, the decision about the future of meat inspection in Danish outdoor-reared pig. Importantly, it will show the consequences of false-negative or false-positive reactions. Costly externalities such as loss of confidence or brand value among stakeholders and trade partners will be identified and estimated.

Work is in progress and results will be presented at the conference.

Market Impact of FMD Control Strategies: the Case of UK

S. Feng, M. Patton, J. Davis

Foot and Mouth Disease (FMD) poses a serious threat to the agricultural sector due to its highly contagious nature. Outbreaks of FMD can lead to substantial disruptions to livestock markets due to loss of production and access to international markets. In a previously FMD-free country, the use of vaccination to augment control of an FMD outbreak is increasingly being recognised as a potentially important component in eradicating the disease (Roche et al. 2014). Furthermore, the use of vaccination gives rise to the decision of the way of dealing with the vaccinated livestock (i.e. vaccinate to die or to live), which in turn has implications on production, trade and hence prices of the sector. Specific choice of eradication strategies depends on their costs and benefits. Economic impact assessments are often based on Benefit-Cost frameworks, which provide detailed information on the changes in profit for a farm or budget implications for a government (Rich, Miller and Winter-Nelson, 2005). However, this framework cannot capture price effects caused by changes in: production due to culling of animals; access to international markets; and consumers' reaction. These three impacts combine to affect equilibrium within commodity markets (Paarlberg, Lee and Seitzinger, 2002).

This paper provides assessment of sectoral level impacts of the eradication choices of FMD outbreaks, which are typically not available from Benefit-Cost frameworks, in the context of the UK. The FAPRI-UK model, a partial equilibrium model of the agricultural sector, is utilised to investigate market outcomes of different control strategies (namely, stamping-out, vaccinate-to-die and vaccinate-to-live) in the case of FMD outbreaks. The outputs from the simulations of the EXODIS epidemiological model (number of animals culled/vaccinated and duration of outbreak) are used as inputs within the economic model to capture the overall price impact of the animal destruction, export ban and consumers' response.

Linking disease epidemiology and livestock production efficiency: the case of Bovine respiratory pathogens in the French cattle sector

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Animal husbandry systems are increasingly confronted to the societal demand of reducing their antimicrobial usage, improving animal welfare and limiting their environmental impact. In line with this issue, reliable methods are needed to evaluate the impact of interventions aimed at reducing the incidence of endemic livestock pathogens on farm production efficiency (i.e. level of output produced with a given quantity of inputs), which, in turn, determines the impact of livestock farming in term of water and land use and its economic sustainability.

The present study attempts to address this question using the example of Bovine Respiratory Disease (BRD), a syndrome caused by a large variety of viral and bacterial pathogens infecting the respiratory tract of cattle, in France. Using a modelling approach, we aimed at estimating the impact of BRD on the production efficiency of the cattle sector at the national level.

A literature review was performed in order to list all previously identified effects of BRD on cattle production performances and quantitative estimates of these effects. We then used these estimates to infer the likely changes in levels of production parameters of the cattle sector (i.e. mortality rate, average daily weight gain, age at first calving, carcass quality) in response to changes in BRD incidence rates. Production efficiency was defined as the net income generated by the cattle sector from a given quantity of feed (quantified in metabolizable energy) over one year. It was calculated using the Livestock Production Efficiency Calculator (LPEC) program.

Our results show that changes in BRD incidence affect the structure of cattle population (relative proportion of breeding cows and other age categories) with potentially huge effects on their production efficiency. These findings emphasize the interest of such modelling approach to estimate the economic and environmental outcomes of defined interventions to control endemic livestock diseases.

Reducing antimicrobial use without jeopardizing performance: Key outcomes of a multi-country intervention study

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Because of the rising threat from antimicrobial resistance, pig farmers are strongly encouraged to reduce antimicrobial usage. Alternative measures have to be implemented, but little is known about their effectiveness and return on investment. The objective of this study was to assess, across four countries, the technical and economic impact of interventions to reduce antimicrobial usage while implementing alternative measures.

An intervention study was conducted between February 2014 and August 2015 in 70 farrow-to-finish pig farms located in Belgium, France, Germany and Sweden. Herd-specific interventions were defined together with the farmer and the herd veterinarian. Farms were followed for one year and their antimicrobial use, as well as technical performance, was compared with values from the year before the intervention. Change in net farm profit was estimated in a subset of 33 farms from France and Belgium with sufficient data, using a production economic model. A sensitivity analysis was conducted to explore parameters mostly influencing the change in net farm profit.

After intervention, a substantial reduction in antimicrobial use was achieved without negative impact on average performance. A median reduction of 47.0% of antimicrobial treatment incidence from birth to slaughter was obtained, corresponding to a 30.5% reduction of antimicrobial expenditures. Mortality, daily weight gain (DWG) and feed conversion ratio (FCR) did not significantly change, whereas the number of weaned piglets per sow slightly increased. The median change in net farm profit was estimated to be EUR4.46/sow/year (Q25-Q75:-32.54; 80.50). This was more influenced by a change in DWG and FCR than by the intervention cost or the change in antimicrobial expenditures. Therefore, costs of alternative measures to reduce antimicrobial usage should not be perceived as a barrier, but rather as an opportunity to optimise production practices for sustained productivity and improved animal health.

Special feature of the French young bulls' value chain and associated sanitary issue to control bovine respiratory disease

A. Poizat, F. Beaugrand, A. Rault, C. Fourichon, N. Bareille

In France, the young bulls sector has a very complex organization where beef calves are raised by a cow-calf producer and then sold to a fattener through numerous middle men. This organization is in favour of an increased incidence of respiratory diseases in fattening units, and thus increased use of antibiotics.
No study allows a holistic understanding of the young bulls' value chain, in France or in other countries. This would lead to a better apprehension of the influence of stakeholders to control bovine respiratory diseases (BRD) and of the possible lever to improve the existing situation.
In this research, we aimed at (i) describing the functioning of the French young bulls value chain and the different roles of stakeholders and institutions, (ii) understanding how the present organization influences the risk to develop BRD in fattening units, (iii) observing the existing strategies of stakeholders to control the risk of BRD and discussing some possible alternative methods.
We collected information from cow-calf producers, middle men, and fatteners relying on qualitative semi-structured interviews and on observations on field conducted in major beef cattle regions in France.
The main findings first confirmed the expected complexity of different existing commercial paths in the value chain and the role of this vertical organization in increasing risks factors for BRD. Second, there was a preventive and quasi systematic use of antibiotics which sharply reduced (i) the potential effects of technical and sanitary interdependency between the cow-calf producer and the fattener, (ii) the risk to develop BRD, when there were an increased number of middle men before fattening. Finally, main opportunities to improve sanitary health status of animals would be to (i) reduce the number of intermediaries and (ii) the number of farms of origin in weanling batches, (iii) increase the use of vaccination by cow-calf producers.

Interdisciplinary approach to teaching: how Economics can benefit? Report about an experiment at the Veterinary School of the Bologna University

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Economics at the Veterinary School of the University of Bologna is taught during the first year for a total of 7 credits shared in two modules: Economics and management of cattle breeding farms and Veterinary economics (focused on pet sector economy). Teaching approach is usually monodisciplinary for all disciplines. Yearly surveys conducted to assess teaching quality show that students appreciate most the disciplines they perceive as more directly involved in the medical and clinical practice, to the detriment of the others, economics and statistics among them. This sometime result in negative student performance over time. In June 2016 an experiment of interdisciplinary teaching was developed to provide students with a wider understanding of each discipline role in the complexity of veterinary profession. Experiment methodology passed through the following steps: (a) teachers identified a specific topic for the exercise (breast and milk production in bovines) and briefly recalled the basic concepts linked to the topic in a disciplinary perspective; (b) students gathered themselves in small discussion workgroups to elaborate their own vision of the functional links among the above-mentioned disciplines in relation to the topic; (c) workgroups reported in a plenary discussion session with teachers. System thinking and participative techniques completed the interdisciplinary approach. An interdisciplinary matrix was drawn by first year teachers to stress interdisciplinary links and address the discussion session. Exercise's impact on students was assessed through an anonymous evaluation questionnaire which resulted in positive and promising feedback. The exercise added value to traditional teaching, and rose students' interest in all disciplines. Teaching economics can greatly benefit from this approach which shows the practical advantages of an economic background in the veterinary profession. A follow up of the initiative through the second year is foreseen.

Motivation of farmers to get their cattle vaccinated against BVD - applications of the 'theory of planned behaviour

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Bovine Viral Diarrhoea (BVD) is a viral disease of cattle, which can lead to massive economic losses. BVD control in Germany is based on three pillars: in addition to the monitoring the BVD-status of the stock and the eradication of persistently infected animals, BVD vaccination is an additional measure by reducing the pressure of infection and thus reducing the transmission risk. Nevertheless, in recent years, vaccinations are less favoured amongst farmers.

In order to get more information about the reduced willingness of farmers of vaccinating their animals, a questionnaire was developed based on the theory of planned behaviour (TPB) by Icek Ajzen. This theory is about the prediction of actions, the execution or omission of such, and the motivation a person has in relation to these actions. It is based on the concept that the attitude towards an activity, the social norm and the perceived behavioural control all influence the intention to perform the action.

In a first phase, open interviews were conducted with different farmers. The statements of these interviews were converted into a questionnaire according to the TPB. Additionally, questions about general farm management, different vaccinations, interventions and measures were included. In total 600 questionnaires were distributed to dairy farmers within Bavaria and 223 answers received. Reliability between the different items of each theme block (attitude, social norm and behavioural control) were resulted in values between 0.82 and 0.97. In regression analyses the influence of the three theme blocks onto the intention and the actual performance of vaccination were evaluated. Interestingly the behavioural control did not play an important role in predicting the intention to vaccinate against BVD.

The results of this study will help to understand the motivation of farmers to get their animals vaccinated and thus will provide the basis for future interventions.

The Development of a Producer-Driven Bovine Leukemia Virus Control Program for Alberta, Canada

A. *Kuczewski, H.W. Barkema, K. Orsel, R.J. Erskine, S. Mason, F. van der Meer*

Controlling diseases and their spread has always been an important task of the veterinary profession, but not all established control programs are equally successful. Bovine Leukemia Virus (BLV) has been eradicated in numerous European countries, but not in North America. A 90% herd prevalence in Alberta makes the control of BLV a priority. To guarantee the successful implementation of a BLV control program, the program has to be holistic, practical and feasible. To highlight the necessity of the control of BLV, an economic evaluation of the economic impact of BLV in Alberta is undertaken. This will identify losses due to the disease, explore necessary investments for prevalence reduction and demonstrate the benefits of controlling the disease. Economic losses are the result of reduced milk production and cow longevity, export restrictions and carcass condemnation. As producers are key figures in controlling the disease, the development of the control program is based on the involvement of motivated producers. Their knowledge and experience will be integrated in the process by producers' participation in focus groups, workshops and a trial implementation of the control program. The resulting control program will consist of an on-farm risk assessment that is followed by an action plan. This can be tailored to individual farm needs. At the same time, important motivators and barriers in a producers' decision process will be identified. Answers to the following questions will be sought: What motivates producers to consider a BLV control program? Why would producers implement a BLV control program? Which incentives do farmers need to continuously adhere to the proposed measures of the farm specific control program? Knowledge, science and practical experience will be combined to establish a producer-driven, coherent and evaluated BLV control program which can be implemented on a larger scale.

Implementing a One Health/Ecohealth approach in Southeast Asia: Integration of health and agriculture issues in the socio-ecosystem's dynamics

A. Binot, P. Promburom, W. Primpapai, K. Suksabai, R. Duboz

Global changes in Southeast Asia (such as increasing urbanization and population densities, intensification of trade and farming systems, drastic land use changes and biodiversity erosion) are affecting the drivers of health risks emergence. Therefore, building bridges among Health, Environment and Agriculture sectors is one of the main challenges that Southeast Asian countries have to face, in the framework of a ""One health/Ecohealth"" approach. It calls for a better integration between animal health and public health, social and environmental sciences, and agriculture (including livestock production) to address complex and emerging health issues. Managing these risks at the human/animal/environment interface aims at increasing resilience of the socioecosystems. Such an integrative approach implies methodological guidelines for cross-sectorial and interdisciplinary collaborations involving stakeholders from different horizons. Innovative strategies are needed to link policies and collective actions an enable knowledge sharing approaches at animal/human/environment interface.

We have iteratively developed such an integrative approach to address health impacts of waste (notably from pig farms) and water management at provincial and municipality levels in Thailand. Our case study, implemented in the framework of ComAcross EU project, was involving communities, local and provincial authorities as well as academics (from animal health, agronomy, ecology, modeling and social sciences). We will show how the use of participatory approaches (participatory epidemiology and companion modeling) for diseases prioritization and problems identification allowed us to address health issues in link with livelihoods (agriculture and livestock farming), involving local and national institutions. Our approach and methodology contributed to improve coordination between actors and sectors and could be suitable to address other health issues occurring at animal/human/environment interface.

Factors affecting sow removal in commercial farms - an observational, multilevel, on-going study

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Pig farmers within the European Union have been experiencing dramatic changes during the past two decades shifting to larger, more intensively managed units for which maximizing sow productivity has become essential. The future of swine producers is depending on their abilities to enhance the economic performance in the competitive pork production networks, however, not at the expenses of animal fitness and welfare. Proper culling would provide an excellent opportunity to remove marginal females and replace them with more productive ones. Yet, the factors operating both at the sow and the herd levels to influence sow performance and longevity are still unsatisfactorily understood.

In the present study, firstly, the removal of sows is described based on the electronic records of commercial Finnish herds (n=90). Secondly, generalized linear mixed models with Poisson distribution are used to study the effects of sow production indicators on the risk of removal. Thirdly, the heterogeneity between the units of the higher hierarchical level, thus, the farm, is assessed as the approach allows the simultaneous estimation of the random effect.

The risk of culling dependent on the sow's characteristics will be straightforwardly calculated using the generated models and parameter estimates to gain more insight into the removal of sows, which affect the herd output in many different ways. The results can be used as benchmarks for further development and update of economic models.

Future directions for this on-going research project include expansion of the models with on-farm observational data gathered in 2014 during herd visits (n=45) on individual sow (n=2241) health indicators and herd related factors by interviews, a questionnaire of farmers' perceptions and investigation of the housing conditions to further improve understanding of the links between sow performance, health, removal and socioeconomic decision making across piglet producing systems.

True cowmen and commercial farmers: Exploring vets' and dairy farmers' contrasting views of "good farming" in relation to biosecurity

L. Sutherland, A. Ruston, J. Kaler

Biosecurity - stopping the spread of disease onto or out of areas where farm animals are present - is an important area where the social sciences can contribute to animal health decision making. The dominant approach to exploring decision making within social veterinary epidemiology has been the use of socio-psychological models such as the theory of planned behaviour and theory of reasoned action. There is a need for more research on the cultural meanings that participants bring to decision making on biosecurity. To this end this research uses the concept of the ""good farmer"" to explore how veterinarians (vets) and farmers understand good biosecurity in the dairy sector. The research is based on interviews with 28 farm animal vets and 14 dairy farmers in England.

The results showed that the vets and farmers had different understandings of what a good farmer is in relation to biosecurity. According to the majority of vets interviewed a good farmer is a large, commercial farmer who has the economic and cultural capital to invest in biosecurity and see the vet regularly. In contrast, farmers saw a good farmer as one who knows his or her animals well, is an excellent stock keeper and is self-sufficient - they do not need to rely on the vet for all their animal health needs. Some of the practices normally seen by farmers as good farming were viewed by the vets as the opposite: doing a favour for a neighbour or judging an animal by eye were seen by the vet as characteristics of the traditional farmer habitus which undermined good biosecurity.

This research demonstrates the utility of approaches which explore the cultural and symbolic meanings different groups bring to decision making on animal health. It raises the issue of reconciling differences between how vets and many farmers see good biosecurity, and highlights the relatively uncritical stance of most vets towards the field of large, intensive dairy farms in relation to biosecurity.

Sociological aspects influencing the effectiveness of the bovine tuberculosis eradication program in Spain

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The effectiveness of control activities against bovine tuberculosis (bTB) are influenced by a range of biological and non-biological factors. The commitment of farmers and vets is critical for the eradication program's success; however, the influence of social factors is often ignored. In this study we aim to investigate their perceptions and attitudes in relation to the Spanish bTB eradication program. The study was carried out in Andalucia (high prevalence) and Catalonia (low prevalence). In the first phase (exploratory interviews), representative key farmers and vets were interviewed through semi-structured interviews in order to identify relevant themes. Interviews focused on strong and weak points of the program; reasons for failure to achieve eradication; benefits of being free; future perspectives and proposed changes to the program. More detailed information were gained through in-depth qualitative interviews (second phase) performed by a team of sociologist. The third phase was a quantitative telephone survey (simple random sample of 705 farmers and 300 vets) conducted with a structured questionnaire in order to quantify how many people shared the same arguments. Main results from exploratory and qualitative interviews highlighted a lack of confidence in the diagnostic tests. The complexity of the disease combined with gaps in knowledge generated disbelief in the control measures in place. The lack of training for farmers and pressure faced by veterinarians due to personal relations with farmers also emerged. Few benefits of being bTB free were perceived and the weak communication between farmers and official vets contributed to a general feeling of distrust. The lack of coordination among institutions gave rise to comparative grievances and demotivation among farmers. Results of quantitative interviews (ongoing, sampling completeness 87%) will enable to quantify the importance of different factors that could influence the effectiveness of the program.

Motivation for disease control on Scottish beef farms

K. E. Adam, G.J. Gunn

Qualitative methods are becoming more widely used in animal health research as the importance of human behaviour in effective disease control is recognised. This study aims to explore Scottish beef farmers' motivation to implement disease control measures and to understand the role of the private veterinary surgeon in motivating farmers to control disease. Much of the previous research on farmer behaviour and cattle health has focussed on the barriers to farmers putting recommendations into practice. The study will approach the issue from a different perspective, with data collected through interviews based on narratives of successful disease control implementation. Self-determination theory, which identifies basic psychological needs which motivate people to take action, is the underpinning theoretical framework. Data will be analysed thematically to investigate whether farmers and vets are intrinsically motivated to engage with disease control or whether they act to gain external rewards or avoid penalties. As data collection is currently in progress, the methodology and preliminary results will be presented and discussed. Ultimately, the study findings will be used to inform future government policy on cattle health in Scottish beef production and may have broader applications to other livestock systems.

An innovative approach to evaluating farmers' perceptions of foot and mouth disease vaccination in Vietnam

D.B. Truong, A. Binot, M. Peyre, N.H. Nguyen, S. Bertagnoli, F.L. Goutard

This study aims to explore the farmers' perceptions of FMD vaccination using a reflexive research method called Q methodology. A structured sample was composed including 46 farmers selected according to gender, farming experience, level of education and production type. Statements relevant to the farmers' perceptions of and attitudes towards FMD vaccination, related to confidence, logistics, costs and impacts of vaccination, were developed. Results were analysed by principal component analysis, using R version 3.1.2.
Three distinct discourses ""Believe"", ""Confidence"", ""Challenge"", representing common perceptions among farmers and accounting for 57.3 % of the variance, were identified. Consensus points were found such as: the feeling of being more secure after FMD vaccination campaigns; the fact that farmers take vaccination decisions themselves without being influenced by other stakeholders; the opinion that FMD vaccination is cheaper than the costs of treating a sick animal; and that vaccines provided by governmental authorities are of good quality. Part of the studied population did not consider vaccination to be the first choice strategy in prevention. This raises the question of how to improve the active participation of famers in the FMD vaccine strategy. Regular awareness raising is an important tool to foster active participation and to maintain the farmers' motivation to vaccinate.

Perceptions and attitudes to Salmonella control programme among Swedish poultry farmers and veterinarians

E. Lahti, J. Wirdby

Background: Salmonella is a leading cause of bacteriological gastroenteritis. In Sweden a control program in the food production chain has been in place since more than 50 years. The prevalence of Salmonella in the Swedish animal production is very low (<0.5%). In case of Salmonella, irrespective of serovar, the affected poultry farms are put under restrictive measures, birds are euthanized and the premises sanitized. An evaluation of the programme was initiated to assess the function and effectiveness of the programme.
Aim: To determine compliance and attitudes among poultry farmers and veterinarians to the Salmonella control programme.
Methods: Three facilitated focus group interviews of producers in the chicken meat and egg line (n=17) and veterinarians working with poultry (=17) were done to determine the attitudes to sampling routines, biosecurity, sanitization as well as communication between producers, industry and authorities.
Results: Thematic analysis of the focus group transcriptions revealed convergent themes, both within and across, the farmer and veterinary focus groups. All the interviewed farmers and veterinarians considered the Salmonella control programme and stringent biosecurity routines as extremely important. No willingness to decrease sampling intensity was identified. However, more flexibility and clearer instructions on sampling were requested. The use of alternative methods, such as PCR was desired. In addition, both farmers and veterinarians emphasized the need for veterinary training on poultry production and poultry diseases. Farmers with specialized poultry veterinarians as their own veterinarian were more satisfied. Farmers with experience of detection of Salmonella felt frustrated, depressed and loneliness. Veterinarians were unhappy with the current Swedish poultry registries and with the sanitation plans.
Conclusion: The in-depth insight into the perceptions will aid the development of the control programme.

Understanding donkey branding in the Maasai communities of Narok and Kajiado, Kenya

G. Madara, L. Kavata, E. Mithigi, P. Compston

Brooke East Africa works with communities in Kenya to identify solutions to their donkeys' welfare problems. A common welfare concern is mutilations, including ear notching and clipping, hot iron branding, and nostril and muzzle piercing. These mutilations often originate in Maasai communities, who have a prominent role in donkey trade. Understanding specific reasons for mutilations within each Maasai community is important.

When Brooke teams worked with female groups in Maasai communities they were reluctant to discuss the topic. This was assumed to be because men are decision-makers with respect to mutilation and branding. To address this, six focus groups were held in Narok and Kajiado regions, each with 10-12 male members. Reasons why each type of mutilation was practiced were investigated, along with methods used. Data were coded and key themes identified.

Two classes of mutilation were identified. The first was cultural, which was further subdivided. Clan and family marks refer to a complex system of hot iron brands and ear notches that represent levels of relationship (i.e. nuclear to increasingly extended family). These marks have a role in status, food security and deterring intermarriage. Mutilations related to belief systems are associated with perceived aesthetic enhancement, ceremonial rituals and traditional treatments.

The second class was associated with husbandry and management. Identification to mitigate loss, theft or conflict was a key motivator, and overlapped with clan and family marks. Nostril and muzzle piercings were used to control and discipline donkeys.

Clan and family marks are community-specific and have an important role in culture. Interventions to address how the experience can be made better for the donkey may be more successful than those aiming to discontinue the practice. Building community capacity on welfare-friendly handling and restraint will aim to make the use of nostril and muzzle mutilations for control redundant.

Added value of social sciences in setting up a control program against hydatidosis in Morocco

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Hydatidosis is highly endemic in some areas in Morocco, where its life cycle basically involves sheep, dogs and human. Despite the national program implemented since 2005, it still represents a major problem of public health due its high prevalence, morbidity as well as the economic losses that are yet to be fully evaluated. This failure calls for a full recognition of the complexity of this public health problem in the design of an improved control strategy. Complexity, in its scientific meaning, refers to a set of frameworks for analysis and action, taking account of systems properties, internal diversity and intrinsic uncertainty. As part of a project exploring the applicability of sheep-vaccine-based solutions, a set of studies aims at contributing to their insertion in the wider perspective of a national control strategy. In this context, social sciences are mobilized, i.e. sociology, anthropology and socio-economics, to build up a common framework for action in a transdisciplinary perspective. The first steps of this approach involves an in-depth analysis of stakeholders, their place in the disease socio-ecological system, their degree of involvement in the past and present control strategies, their perceptions of the disease and of the past control actions. This communication presents the main results of a stakeholder analysis, exploring the disease system along the various interconnected socio-economic organisations, mainly connecting to the sheep value chain, the rural household and the health care system. The analysis focused on the main gaps and trade-offs in communication strategies in the Moroccan context of cultural diversity, the discussion of incentives along the sheep value chain, the place of dogs in households, as well as the link between rural households and health care systems. It proposes some tracks for further dialogue between social and health scientists in the co-construction of a response in the analysed context.

Economics of mastitis in dairy farms in Colombia, South America

J. Romero, E. Benavides, C. Meza, L.C. Villamil

Based on cross sectional and longitudinal epidemiological studies on dairy production systems in Colombia, mastitis economic impact assessment models were built, following the direct and indirect losses framework. Relevance of subclinical mastitis as invisible source of direct losses as well as control practices effectiveness were found. Participatory epidemiology survey about mastitis control practices provides insights about main decisions and decision making process. Understanding economic rationality of decision making following stakeholders roles along value chain was found useful in order to raise lessons and recommendations.

Animal welfare and economic impacts of using nurse sows in Swedish pig production

K. Alvåsen, H. Hansson, U. Emanuelson, R. Westin

The number of born piglets per litter has increased in Swedish pig industry and farmers are struggling to improve piglet survival. A common practice is to make litters more equally sized by moving piglets from large litters to smaller, when piglets have had colostrum, to make sure that all piglets get an own teat to suckle. Litter equalization is not always enough, as many sows have large litters and/or damaged teats, which results in an insufficient number of available teats. One way to solve this problem is to use nurse sows. A nurse sow raises her own piglets before receiving a foster litter to suckle.

The aims of this study were to investigate how the use of nurse sows affects the welfare of sows and piglets and to explore how it impacts the gross-margin of pig production in Sweden. A literature review was made to investigate welfare aspects of sows and piglets. In order to explore the impact on the gross-margin of pig production, a partial budgeting approach with stochastic elements was used for a fictive pig farm. Standard templates for calculating costs and benefits were supplemented with figures from existing literature and expert opinions.

In Sweden, the suckling period is one week longer compared to EU legislation, 28 versus 21 days. This might reduce the welfare of nurse sows as a prolonged suckling period could increase the risk of poor body condition, damaged teats and shoulder ulcers. This may lead to impaired fertility and increased culling risk. On the other hand, the piglet mortality could be reduced but the separation and mixing of piglets could be stressful. The partial budgeting suggested that the nurse sow system is slightly more profitable, but the result is highly dependent on the input values and welfare aspects were not considered in the calculation.

Posters

"There will be winners and there will be losers": changing business models in farm animal veterinary practice

K.E., Adam, S. Baillie, J. Rushton

The challenges facing farm animal veterinary practice have been the subject of much discussion in recent years, but little empirical research has been carried out to identify practical solutions to overcome these challenges. Many of the issues facing the veterinary profession relate to broader socioeconomic and political changes and are beyond the control of the average rural veterinary practice. Instead, these businesses must adapt in order to survive. In order to investigate further, a study was carried out based on a series of case studies of rural veterinary practices in Great Britain. The aim was to capture the knowledge, experience and attitudes of practice partners and directors on the front line of service delivery to livestock farmers and explore how they are adapting to a changing business landscape. The 莆ndings demonstrate how business consolidation and increasing species specialisation are delivering a number of advantages for owners, employees and clients of rural practices. However, local livestock density determines the viability of these changes, leaving practices located in areas of low livestock density with more limited options. As further changes occur in the veterinary and agricultural sectors, the ability of rural veterinary practices to adapt successfully will determine the future delivery of private and public livestock health services.

Understanding the way French traditional free-range broiler farmers use antimicrobials: a transdisciplinary study

N. Fortane, C. Ducrot, M. Paul

It has now been well recognized - though still challenged - that massive use of antimicrobials in farming animals is partly responsible for the raise of antimicrobial resistance (AMR). In order to decrease antimicrobials use (AMU), it is necessary to understand the way farmers perceive antimicrobials in their daily work, and how and why they are using it. A transdisciplinary sociology and epidemiology study was conducted in 2015 on antimicrobial practices in French traditional free-range broilers farms. This production is already engaged in a voluntary reduction of AMU. The study aimed at understanding the perception and practices of the farmers regarding AMU and in relation with their technical and sanitary advisors. Twenty semi-structured interviews were conducted with farmers, veterinarian practitioners and technical advisors from 3 different farmer organizations (FO). Analysis of fully transcribed interviews was completed following the principles of content analysis methods. First, although farmers do not master knowledge on the AMR issue, drug reduction is in accordance with their farming identity, which is essential to implement AMU reduction strategy. Despite being part of integrated FO, farmers are quite autonomous in their daily work, and are testing new practices like acidifying water drink or using new herbal drug. They also get involved in the decision making process leading to antimicrobial prescription. Thus they can both directly and indirectly influence AMU. Second, the FO for whom the farmers are producing can impulse a virtuous dynamic circle of AMU reduction. To help the farmers decreasing AMU, FOs have economic incentives like bonus for antimicrobial-free broilers, and technological incentives like technicians supporting the farmers.
In conclusion, the decrease in AMU on farms does not only rely on technical or economical levers. Change should be based on the characteristics of the organization of the production and of the farming identity.

Role of poultry trade movements in the dissemination of high mortality poultry diseases in Niger

S. Ahmadou Elhadji, A. Mani, S. Chitou, C. Mahamadou, N. Antoine-Moussiaux

In the rural areas of Niger, poultry keeping is a widely practiced livelihood-oriented activity, mainly in the hands of women. High-mortality poultry diseases (HMPD), mainly gathering Newcastle disease and Highly Pathogenic Avian Influenza (HPAI), thus represent in these zones a gender-biased threat on livelihoods, to which the zoonotic potential of HPAI has to be added. The role of poultry trade in the dissemination of these HMPD have been documented elsewhere, e.g. in the case of HPAI in Vietnam. This study provides a preliminary assessment of the role of poultry trading in HMPD in the area supplying the cities of Tahoua and Konni. The study mobilised participatory approaches, building on the knowledge of stakeholders about trade movements and HMPD. Semi-structured interviews were conducted with a total of 60 participants in 12 markets (on-site snowball sampling), among which only one woman could be met. GPS coordinates of selling points were gathered as well as the main links between markets. The markets supplying chicken products to the city of Tahoua are Taza, Tabalak, Takanamat, Telemcès, and Barmou. Konni is supplied through markets of Malbaza, Dossey, Bazaga, and Dabnou. The markets of Guidan Ider and Badaguichiri are common to Tahoua and Konni. Day-old chicks are traded from Kano, Nigeria, through Sokoto and Illela. Stated constraints are mortalities due to heat during transport, diseases and slump in sales. The main disease cited is called chekou, described as diarrhoea, comb discoloration, prostration, with a mortality of about 20% in 3 days. Transporters try to prevent mortality during transport by driving early in the morning and particular placing of birds in cars. Upon symptoms, actors have recourse to traditional remedies or emergency culling. Children are employed for birds transfer and plucking, thus exposed to zoonotic risk. Chekou is widely reported in all surveyed markets, suggesting a well-established pathogen circulation.

Swedish dairy farmers' definition and perception of preventive herd health management

K. Alvåsen, H. Lomander, J. Frössling, C. Svensson

A preventive herd health approach will most likely reduce incidence of clinical and subclinical disease. Since a few years back, Swedish veterinary organisations offer specific programs for improved herd health management. However, these are not used to a large extent.

The aim of the study was to explore dairy farmers' perceived barriers to use herd health management programs and how they see the role of veterinarians in the work to prevent disease.

Six focus group interviews were conducted in March 2015 in the south-west of Sweden. In total, 33 dairy farmers participated in the 1.5-2h sessions. Interview recordings were transcribed and coded using thematic analysis.

The participants stated preventive animal health to be important, but had difficulty defining the actions included in that concept. The majority of their daily work duties on the farm were considered to be preventive. When discussing the veterinarians' role in herd health management the participants' mentioned e.g. milk sampling and fertility checks. Farmers' list of potential contribution by the veterinarians in herd health management was strikingly short, compared to the considerable number of preventive measures they performed themselves. The farmers wanted their veterinarian to have high competence and communication skills, to be empathic but also frank and sharp when needed. Lack of time was stated as one factor that hindered a deeper collaboration with the veterinarian. Furthermore, the participants viewed financial costs as being very important and admitted that costs are often more evident than saved expenses.

Our findings suggest that Swedish dairy farmers acknowledge the implementation of herd health management, but do not see which role the veterinarian can play, as veterinarians were mainly associated with treating unhealthy cows. In order to increase the use of herd health management programs, the services and potential benefits of such programs needs to be communicated more proactively.

Dairy farmers' attitudes and perceptions towards on-farm cow mortality: a qualitative study

K. Alvåsen, M. Brennan, U. Emanuelson, H. Ljunggren-Bergeå

On-farm cow mortality (i.e. unassisted death and euthanasia) is a potential iceberg indicator for animal welfare and the relatively high levels in many countries with intensive milk production is worrying. Our hypothesis was that farmers' attitudes and decision-making influence their cow management and effects on-farm cow mortality.
Focus groups were carried out with Swedish dairy farmers in 2013. Farmers were contacted randomly among engaged farmers participating in annual farmers' meetings. A facilitator guided the semi-structured group interview and an observer took notes. Four focus groups with 6-11 farmers per group were performed. The interview recordings were transcribed and uploaded into Nvivo for thematic analysis. The analysis highlighted two broad themes: current situation and explanations for on-farm cow mortality. The current economic situation of dairy production was seen as problematic and made farmers more reluctant to act on a problem. This 'wait and see' approach usually resulted in severe problems which were more difficult to solve. The farmers seemed, however, quite convinced that it was possible to reduce on-farm mortality, even if a mortality rate of zero was not seen as realistic. The lack of emergency slaughter was identified as a major reason for high mortality. The farmers experienced the ante mortem inspection as unpredictable and this affected their decision making in sending a cow to slaughter. The farmers clearly stated that an on-farm death was a big failure and the backside of being a dairy farmer. Further, the farmers viewed their own part in reducing on-farm mortality as limited and the identified barriers were mainly external.
Performed in an ideal way, focus groups can be used for exploring sensitive issues, which on-farm mortality could be for some farmers, as the interaction between participants can encourage them to tell things that they might otherwise keep for themselves.

Dairy farmers' attitudes to antibiotic use

A. Stiernström, K. Fischer, N. Fall, S. Stermberg Lewerin, U. Emanuelson

Farmers' perspectives and practices towards the use of antibiotics are factors that have been shown to have large effects on the possibilities to achieve changes in practice. The drivers behind farmers' choices to use antibiotics within dairy production are however not well investigated. Knowing more about these drivers would be of particular importance for the organic sector, where strategies to reduce the need of antibiotics are important to safeguard consumer trust in organic production.

In this exploratory research project we collaborate across disciplines (epidemiology, veterinary medicine and social sciences) to learn more about farmers' perspectives and practices on antibiotic use and resistance. Semi-structured in-depth interviews, covering different areas related to antibiotic use such as routines and animal health management, has so far been conducted with six Swedish dairy farmers. Additional interviews will be conducted until we reach saturation. Preliminary results indicate that although there might be a discrepancy between discourse and practice, the farmers share a narrative of antibiotic treatment being last resort in their animal health management. What in practice this 'last resort' is might however differ slightly between farmers. All farmers expressed a concern in general, about what they perceived as a frequent use of antibiotics in livestock farming systems.

The project is an example of the value of collaboration between veterinary research and social sciences, as many of the practical problems of animal disease prevention and treatment hinges on how farmers' perceive and act on the disease. Drawing lessons from social sciences theories and methodology helps us in this venture to interpret and understand how and why farmers act like they do.

Encouraging behavioural change to improve smallholder pig production in San Simon, Pampanga, Philippines

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Smallholders are important contributors to pork production in the Philippines. A project aiming to improve the competitiveness of the smallholder pig system using an EcoHealth approach is underway in Pampanga, Philippines. Initial knowledge about the system was gathered using qualitative and quantitative methods.

Several management issues were identified. These were underpinned by farmers' beliefs based on their interpretations of experiences. Water provision to sows was often restricted; some farmers believed that free access to water could drown piglets in utero/cause diarrhoea in piglets. The diet of sows during gestation was often inadequate because of the high cost of feeds, power of traders in dictating purchase price and farmers prioritising cost reduction.

The project team delivered seminars focussing on the importance of water and sufficient nutrition. The aim was to extend beyond transformative learning, whereby the farmers would have a greater understanding of water and nutritional needs, to behavioural change whereby farmers would actually adopt the recommended practices. When possible, ""trusted sources"" (farmers who were already using these practices) were encouraged to speak about their experiences. Trainers also kept a reflective diary of their experiences so they were better able to identify areas for improvement for future activities.

Follow-up interviews are currently being conducted with some participants to identify what they felt were the most important messages from the seminars, actions they had taken, challenges faced actioning learning and sharing of learnings. Findings are validated with direct observation of husbandry practices. Analysis of these data will help guide future project activities with the overall aim of long-term behavioural change. The strong participatory component and use of social science methods in this research gives ownership to farmers and should help to improve their pig production and thereby their livelihoods.

Where should we go? Guiding development of research in response to liver fluke challenges

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Liver fluke is an endemic parasite, causing disease (fascioliasis) which affects the health and welfare of ruminants in the UK. The incidence and the geographic range of fascioliasis has increased over the last decade, which, when combined with increasing reports of reduced efficacy of treatment and the development of drug resistance, presents challenges for effective control. Estimates of total costs of liver fluke at farm level have been published but the problem lacks proper economic analysis to guide scientific solutions. For example, indirect costs have so far been ignored. The aim of our work was therefore to evaluate the change in economic welfare to dairy producers (i.e. infested and uninfested herds) and milk consumers in the UK induced by the presence of liver fluke in the UK dairy herd. First, a herd-level model simulated disease dynamics and farm management systems. Then results were fed into a national-level economic welfare model with a constant level of disease prevalence in the UK dairy herd. At the national-level we conclude that the economic burden falls mainly on producers of infested herds and, to a lesser extent, milk consumers, while producers of uninfested herds benefit from the presence of liver fluke. The suite of models can also act as a decision-support tool to prioritise alternative control strategies in relation to cost effectiveness but balanced against strategies that are practical on the farm, to improve liver fluke management for producers and policy-makers. The suite of models highlights challenges in estimating the economic welfare of liver fluke including disease dynamics, climate change, complex farm management systems, data limitations, alternative diagnosis and treatment options, and a need to better inform decision-making. This project was developed by an interdisciplinary research team of epidemiologists and economists working with industry partners to help guide future research.

Social appraisal of cattle helminth control: exploring farmers' knowledges, practices and values

C. Bellet, M. Green, J. Kaler

Raising concerns over anthelmintic resistance in the UK have contributed to the development of guidelines for 'best practice' in helminth control in livestock by the industry. Recent reports, however, suggest that the adoption of these guidelines by farmers is poor and that the levels of farmers' engagement with this issue is highly variable among farms. Research in veterinary sciences has recently increased its focus on the social aspects of disease control, i.e. the social factors shaping farming practices. However, experts' approaches often rely on instrumental theoretical frameworks and methods that do not leave room for reassessment of research variables and assumptions, despite engagement with farmers. This study explored farmers' knowledges and practices in relation to cattle helminth control and their intersection with farmers' values and concerns. The empirical work is based on qualitative thematic analysis of 42 in-depth semi-structured interviews with cattle farmers in England. One main theme that emerged from the analysis is that farmers' knowledges on cattle helminth infections are substantial and that their related control practices are rational and sensible to farming context. Despite their intentions to do so, farmers often face challenges and resource constraints (e.g. time, money) to implement recommended 'best practice' on cattle helminth control. However, they are interested in improving their practices as long as evidence of the benefits of such control are provided. Farmers highly value their expertise and trust their own judgment when making decisions on farm. Policy makers need to take into account farmers' perspectives and their contextual challenges, when designing guidelines, if they are expected to be accepted and adopted on-farm. This requires more constructive dialogues with farmers and opportunities for farmers to have a real input in the governance of cattle helminth control in the UK.

The relationships between the technological equipment of dairy farms including the welfare parameters and the farm's efficiency

J. Pokorny, P. Fronek

European dairy farmers face a high milk price volatility in recent years which makes their incomes unstable. The low price periods squeeze their budgets and press them to pump their financial reserves. On the other hand, there is a permanent need of farm investments as the rapid developments of knowledge and technologies result in dynamic changes in the branch so that the farm modernization is a necessary precondition to maintain the farm competitive.
To utilize the production ability of dairy cows, it is to conform the on-farm conditions to dairy cows' natural needs. The assessment of the economic effects of the welfare investments is a topic for most of dairy farmers. The aim of our research was to examine the process of technical and technological modernization of Czech dairy farms, to find a grading system to evaluate the dairy barns from the welfare viewpoint and to measure the relationships between the technical parameters including the welfare conditions, the on-farm practices and selected farm efficiency indicators.
The managers of 44 dairy farms, representing 8 % of the country milk collection, were interviewed concerning the current technical stage of barns, milking rooms and feed storages, the on-farm practices, the schemes of further investments and the barriers of their realization. The own grading system for the dairy barns assessment from the welfare viewpoint was developed. We deployed the descriptive statistics and the correlation analysis to evaluate the data collected. As the dairy farming comprises a series of operations affecting the final results, the expectations of the strong relationships between the partial production characteristics and the complex efficiency indicators were rather pessimistic. Despite, some moderate and strong relationships were detected. It is to mention that part of the indicators was constructed for reduced sample only and some of the results are to be validated in the next research covering more farms.

Prospects for the use of mobile and video ethnography in animal health research

K. Brown, O. Shortall

Mobile and video methods have increasingly been innovated and developed to better understand human-animal relations in many different areas of social science, including the study of recreational, conservation, cattle-breeding and technological-agricultural practices. The main strengths of such approaches over those using discursive and still photography approaches include: allowing access to the fleeting and transitory; reflection and discussion around taken-for-granted everyday practices and tacit knowledges; understanding how practices are situated in particular spaces and times; linking human to nonhuman (co)agency, and; appreciating better the role of sensory experience and emotion in animal-human conjoint practices. Although video methods have been used for many years in animal behaviour studies, they have much less frequently been used to understand the cultural, social and sensory practices surrounding animal health. Yet there appears potential to apply these approaches to deepen understandings of how animal health and welfare is framed, assessed and produced by key human actors (e.g. farmers, handlers, vets, administrators). This paper reviews work done to date on animal-human relations using mobile and video ethnography, explores the potential strengths and weaknesses such approaches may have for animal health research in particular, and suggested some possible fruitful avenues to exploit this potential.

The marketing of veterinary preparedness is an overlooked asset in Danish export strategies

T. Christensen, L. Alban, A. Boklund, H.O. Hansen, H. Houe, S. Mortensen, S. Denver

The Danish food sector had an export value of EUR14.5 billion in 2015. The pig and cattle export accounted for 50% with large parts being exported to markets outside the EU. Access to export markets for animals and animal products depends crucially on the exporting country being able to stay free from serious contagious diseases such as foot and mouth disease (FMD). Officially, export markets can reopen after an outbreak when OIE grants a country status as FMD free. However, importing countries might demand further risk assessments, which will delay the reopening of trade between countries. Hence, trust in a system's ability to prevent disease introduction and spread, as well as in the system's effectiveness during an outbreak could be of outmost importance.
The purpose of this study was to analyse the importance and branding value of animal health standards and control systems in Denmark in relation to access to export markets and re-opening of markets after an outbreak of FMD.
A qualitative study of the main stakeholders in relation to export (people from the main abattoir company; a dairy company; companies specializing in exporting live animals and semen; and agricultural counsellors on Danish embassies representing the Danish authorities) was conducted. A questionnaire survey (18 respondents, response rate 53%) was supplemented with 5 individual interviews and a focus group interview.
Results indicated that there was little economic incentive for improving the veterinary preparedness, if the purpose was to improve market access in peace time or to prepare quick recovery to export markets after an FMD outbreak. Results indicated that marketing of the Danish activities in relation to veterinary preparedness as well as the transparency and open communication of any suspicions of outbreak had economic potential. Also, a ""Danish model"" with close corporation between veterinary authorities, the agricultural sector and research seems to be a good sales parameter.

When does monitoring and evaluation stop and research start?

P. Compston, M. Upjohn

Numerous data are collected during monitoring and evaluation (M&E) to inform activities and improve the performance of NGOs working in animal health. For example Brooke, an equine welfare organisation, collects animal-based measures and clinical records, focus group discussion and interview data, survey and questionnaire data, from animals, animal owners and animal health service providers. These are routine data collection activities, accepted in the NGO community as valid methodology to show accountability and progress but often not sufficiently robust to fulfil academic research requirements.

Analogy between clinical research and audit can be made. Like audit, M&E is usually not subject to ethical review. When working with communities this can mean that apparently similar data collection exercises, for example a focus group discussion, may formally request consent for research but not for routine programmatic work. This may introduce bias, as participants' answers may be skewed by the perceived importance of a formally-introduced meeting, as opposed to one that is not.

Research capacity of NGO staff can be a barrier to moving M&E techniques towards robust research norms. Records of qualitative information are often insufficient for full analysis. Programme teams' understanding of appropriate sampling and study methodology can be hindered by conflicting information resources disseminated for M&E versus research studies. Donor-dependent organisations recognise that data collection costs money and may take staff away from implementing the programmes they are employed to run. Therefore thorough cost/benefit prioritisation of data gathering exercises is required.

Ultimately, currently, NGOs can be a repository of information that is difficult to disseminate via peer-reviewed mechanisms. Mutual understanding of data collection techniques, requirements and cultures is required by NGOs and academia in order to facilitate effective collaboration between the two sectors.

Moving from participatory community engagement to participatory epidemiology

P. Compston, C. Sheikh, D. Mohite

The qalander in North India breed mules for sale. In April 2011 high abortion rates were reported in horse mares, assumed to be due to endemic trypanosomiasis. However, serology results collected July to August 2012 indicated presence of multiple abortive agents and interventions targeted at trypanosomiasis failed to show reduced abortion rates.

Brooke's work with communities often includes focus group discussion and use of participatory tools during community engagement exercises. However both structure and purpose of these exercises differ from those used in participatory epidemiology (PE). Therefore pilot PE data were collected to inform development of a research proposal and build staff PE capacity.

Two PE exercises were performed in two communities, who were asked to describe clinical signs seen in their animals. These were simultaneously transcribed into pictorial form and checked with community members for accuracy. Communities were facilitated to reach consensus where differences in opinion existed.

Reported abortion rates were high, with losses of 14% to 75%. It was rated as most common clinical sign seen during pairwise ranking in community one. During seasonal calendar mapping in community two it was rated second overall and first during winter.

Both communities and facilitators had to adjust to increased rigor during PE exercises, as community engagement is inherently fluid. PE exercises should be fully reasoned beforehand and facilitators clear on each stage. PE exercises require time and must be completed; preparation is needed. When creating cards describing clinical symptoms, or other category required, a community member should be responsible for image depiction and validation. Diagnostic terms (i.e. thrush, strangles) should be avoided when discussing clinical signs. Words describing what owners see in their animals should be used. These results will inform design of a proposed epidemiological study into causes of abortion in these communities.

Strengthening animal healthcare systems: two examples from Asia

P. Compston, K. Saville

Brooke, an international animal welfare organisation, develops operational plans to strengthen animal healthcare (AHC) systems towards 3 objectives: improving technical capacity, improving demand and ensuring sustainability. Objective data collection is needed during strategy development. This abstract compares and contrasts plans developed in Afghanistan and India.

Plans were developed through consultation between UK-based technical support teams and national programmatic staff. In both a detailed stakeholder analysis and AHC infrastructure map were produced. Strengths and weakness were identified and assumptions tested using a priori data. Challenges to AHC system integrity were identified, ranked and interventions proposed and tested for feasibility.

Both contexts have complex layers of informal local healers and formal primary AHC paraprofessionals. Accessing suitable pharmaceuticals and equipment is difficult. Farriery is informal and unregulated.

India's AHC system is primarily public with a network of government vets. It is more mature, as is the NGO landscape. Legislation is state-dependent. Owners have diverse socioeconomic statuses. AHC providers exist in most places. The plan focused on linking AHC providers with each other and owners.

Afghanistan's AHC system is private, with less regulation and indistinct tiers. A few NGOs have trained most AHC providers in all species, seeming to create a collaborative setting. Higher education standards are particularly low, and curricula difficult to influence due to restrictive legislation. Donkeys occupy a very low status in the national rhetoric. The plan focused on reducing harmful practices and improving technical capacity, and increasing resource availability.

In both, sustained AHC provider engagement in equine welfare following training was a challenge. Research has been initiated into factors affecting motivation of AHC providers in Afghanistan, and identifying constraints faced by farriers in India.

Are there economic benefits of improving biosecurity in cattle herds in relation to foot and mouth disease in Denmark?

S. Denver, L. Alban, A. Boklund, T. Halasa, H. Houe, S. Mortensen, Christensen, T

It has been estimated that a middle-sized outbreak of foot and mouth disease (FMD) in Denmark would cost around EUR1 billion (Halasa et al., 2015). As the expected costs are so high, the livestock industry and the veterinary authorities have implemented a number of preventive activities. The purpose of the present study was 1) to estimate how improvements in cattle biosecurity would affect the total costs of an FMD outbreak and 2) to assess the costs of preventive activities that could cause this improvement. Three scenarios were formulated by a group of experts from the livestock industry, the universities and the veterinary authorities. Costs of outbreaks were simulated by the simulation model DTU-DADS - an updated and modified version of the Davis Animal Disease Simulation model. Estimation of costs of specific preventive activities was based on a study by Denver et al. (2016) of all FMD and swine fewer preventive activities carried out in Denmark in 2013.
The simulations indicated that initiatives to increase biosecurity in only dairy herds had very little effect on the costs of an outbreak while initiatives including all cattle herds could reduce costs of an outbreak. In addition, the costs of several activities to improve the biosecurity were estimated. Future research into which extent the risk of introduction of FMD is affected by these preventive activities will act as valuable additions to the present work to make firmer recommendations on priorities of how to improve the veterinary contingency plans.

Benefit-cost analysis of FMD vaccination at local level

D.B Truong, S. Bertagnoli, F. Goutard, M. Peyre

This study aimed to analyse the financial impacts of foot-and-mouth disease (FMD) outbreaks at household level and to perform a benefit-cost analysis of FMD vaccination in Long An and Tay Ninh, province located in the South of Vietnam. Production data was collected from 53 small dairy farms, 15 large dairy farms and 116 meat cattle farms using questionnaire survey. Financial data was collected using participatory tools in 37 villages of these provinces. Cost saved and net profit of dairy cow production in large scale were 3 times higher than those of dairy cow production in small scale and 30 times higher than those of meat cattle production. Vaccination was extremely important in dairy cow production in large scale while contributing to save financial losses in case of FMD. The benefit-cost ratio of dairy cow production in large scale, dairy cow production in small scale and meat cattle production was 37.19, 30.04 and 7.34, respectively. The sensitivity analysis showed that dairy cow production in small scale was mostly affected by an increase in vaccination cost of which the benefit decreased from 3.08 to 5.13. The vaccination cost was more important than market value in affecting the benefit-cost ratio. The benefit-cost analysis of biannual vaccination strategy showed that an investment in FMD prevention could be economically effective. Further study focused on benefit-cost analysis of vaccination strategy at national level is necessary to evaluate and modify strategy to achieve final objective of national vaccination program.

Are we systematically underestimating the cost of food animal disease? The implications for public investment and farm level prevention optimization

D.D. DiPietre, L.S. Mulberry

Introduction: Food animal disease results in the waste of billions of dollars of scarce global resources and excess carbon emissions each year through multiple inefficiencies, death loss, and impaired output quality. In addition, food animal disease often significantly degrades animal welfare and negatively affects farm morale. A survey of the literature reveals the most common method of assessing these losses, both for a farm and for regions is the partial budget. Our work demonstrates that partial budgets systematically underestimate the cost of disease. This is likely leading to underfunding of regional or national mitigation or eradication efforts by policy makers and under investment in the profit optimal level of bio-security and prevention strategies by producers.

Materials and Methods: Epidemiological models of food animal diseases reveal they often emerge over a time period and create sub-populations of differently affected individuals. This creates multi-modal and typically left-skewed distributions of production values and metrics. In combination with asymmetric harvest payment schemes, this results in serious estimation errors when production process and payment means are used to gauge economic impact in their stead.

Results: We demonstrate through stochastic simulation modeling that partial budgeting systematically underestimates the cost of a disease. We illustrate the case modeling a Porcine Respiratory and Reproductive Syndrome Virus (PRRSv) infection utilizing data from a controlled experiment where different groups of piglets were challenged post-weaning with log-level escalations of PRRSv virus particles and assessed in multiple ways over time through grow out.

Conclusion: We report the measured difference in partial budgeting estimates and estimates derived from the more realistic simulation of the non-normal distributions and asymmetric harvest payment schemes. We make the case the results can be generalized to other diseases.

The use of antibiotics in cattle farming in the north Benin, a real factor of the development of bacterial resistance in the cattle and the food chain

S.R. Dognon, N. Antoine-Moussiaux, C. Douny, P. Gustin, N. Moula, M. Scippo, A.K.I. Youssao

This study aim is to inventory antibiotics used in cattle livestock in north Benin and assess risk practices that could be the cause of both food chain contamination by antibiotic residues and selection of antibiotic-resistant bacteria in animals and humans.
Survey was conducted in the Commons of Banikoara, Kandi, Bembereke and Kalale in north Benin, where 98 cattle farmers were chosen by the "snowball sampling" process. Semi-structured interviews were conducted following farmer status, breeding system, antibiotics and use practices. Descriptive statistics were performed with Excel software while multiple correspondence analysis and hierarchical classification analysis of breeder typology were performed with the software "R".
Seventy-one percent of farmers were "Fulani" and 97 % of them were uneducated. Cattle herds were composed by the breeds "Borgou" (76.4 %) and "Fulani Zebu" (16 %); some herds were mixed. Antibiotics groups used in cattle breeding were tetracyclines, beta-lactams, sulfonamides, aminoglycosides and macrolides by respectively 100, 88, 56, 44 and 35 % of farmers. These drugs were purchased in local market (58 %) and veterinary pharmacy (39 %). They were used against bacterial diseases (respiratory, podal, mastitis, omphalitis and neonatal enteritis diseases) and skin diseases. Only 49 % of farmers seek veterinary services to treat animals and 93 % of them did not respect antibiotic withdrawal times. Farmers were classified in three groups: high-risk (23.5 % of breeders), medium (50 % of farmers) and low risk (26.5 % of breeders) group.
These practices suggest high risk of on one hand, contamination of bovine meat with antibiotic residues, and on anther hand, selection of resistant bacteria, both resulting in adverse health effects on consumers.

The biosecurity of on-farm logistic management as broiler disease control in Western Java

E.R. Cahadi, A. Daryanto, D. Indrawan, H. Hogeveen

Poultry farms in West Java are vulnerable to diseases risks transmitted through in bound and out bound logistics. Biosecurity is considered as an effective control measure to reduce diseases transmission by controlling potential contact in farm operation. However, biosecurity practices differ across types of producers and scales of production. This paper aims: (1) to compare biosecurity practices across different types of broiler farms from logistic management point of view and (2) to examine the effect of types of producers and production scales to biosecurity level and investment. Applying multistage sampling procedure, the study carried out a survey to 400 broiler producers selected in four districts, namely Ciamis, Tasikmalaya, Subang and Sukabumi. Various types of farm consisting of independent farmers, contract farmers and companies are assessed and interviewed. Biosecurity control score (BCS) is assessed by applying 16 biosecurity control indicators to farm logistics management, such as control of inbound and out bound, control of workers, control of visitors, control of vehicles, control of traders, source of water, source of feed, and disposal of dead birds. Investments on biosecurity infrastructure also are investigated. Those analyses are used to map weaknesses and strengths on biosecurity level practices across districts to carry out relevant improvements by policy makers and farmers. The further analysis shows the need to review policies on poultry business practices that influence the biosecurity level.

Dairy farmer knowledge about antimicrobials and antimicrobial resistance

U. Emanuelson, K. Sjöström, S. Sternberg Lewerin, N. Fall

Increasing antimicrobial resistance is one of the major societal challenges. A high awareness concerning the use of antimicrobials and risks of antimicrobial resistance form a necessary basis for efforts to achieve changes in usage patterns. This applies to both veterinarians and farmers, where the latter may lack the necessary education but their level of knowledge is generally not known. To get a better understanding of dairy farmers' knowledge, a survey was conducted in Sweden, where data were collected using a questionnaire. A draft questionnaire was developed based on discussions with researchers and veterinarians, pre-tested on three animal science students and pilot-tested on ten dairy farmers. The questionnaires were posted in the beginning of June 2014 to a stratified random sample of 800 farmers, with a reminder in September, and data was entered manually in Netigate in October. The questionnaire had several parts, where the part on knowledge of antimicrobials and antimicrobial resistance had 14 statements that could be answered by true, false or don't know. In the analysis, the "don't know" answers were treated as wrong answers. A total of 194 usable questionnaires were received, giving a response rate of 24.2%. Median herd size for the respondents was 80 (inter-quarter range (IQR) 60-130), 47% were organic (a sampling criteria), 38% had automatic milking systems, 43% were females, median age was 51 (IQR 43-58) and 53% had post-secondary school education. The level of knowledge was generally high, with a median number of correct answers of 12 (IQR 10-13). The statement with highest percent correct answers (97%) was "Antimicrobials are effective against virus", while the statements with the lowest percent correct answers were related to transmission of MRSA from cattle to humans (52%) and transmission of antimicrobial resistance from humans to humans (56%). We found no differences in knowledge between organic and conventional farmers.

Health management in organic and conventional Swedish dairy herds

N. Fall, K. Sjöström, U. Emanuelson

A common view within veterinary medicine is that prevention is better than cure. Hence, animal health management is utterly important. This is particularly true in organic production, since the production conditions on organic farms aim to promote animal health. However, little is actually known about how health is managed in organic herds and if it differs from conventional. The aim of this study was therefore to investigate aspects related to animal health management in organic and conventional dairy herds in Sweden. A questionnaire was developed to acquire information on management routines. The questionnaire was 8 pages long and most questions were closed, either multiple-choice or scored on visual analogue scale (VAS). A random sample of 300 organic and 500 conventional farmers was targeted. The questionnaires were posted in the beginning of June 2014, with a reminder in September, and data was entered manually in Netigate in October. Comparisons of answers between organic and conventional farmers was done with Kruskal-Wallis tests for replies on continuous- or VAS-scale and with Chi2-tests for categorical answers. A total of 192 usable questionnaires were received, with a response rate of 30.3% among the organic and 20.2% among the conventional farmers. Herd characteristics of organic and conventional were similar, except that organic farms had pipe-line/tie-stall systems to a much lower degree and that a higher proportion had post-secondary school education than conventional responders. The two types of herds were also similar with respect to general management and preventive actions, but there were significant differences in the respondents' intents related to prevention of disease. Management of a calf with signs of diarrhoea or a cow with signs of subclinical mastitis was also very similar, with the only exception being that conventional herds may tend to contact a veterinarian earlier than organic herds would do.

Social sciences for animal health: From farmer's perceptions to collective action

M. Figuié, N. Fortané, M. Paule

Epidemiologists recently have worked more closely with social scientists. Their objective was to better understand human behavior as a risk factor for disease spread, and to analyze barriers to the effective implementation of control measures. A number of socio-psychology and behavior sciences studies undoubtedly have provided new insights on farmer's behavior.
These studies tend to focus on farmers as individuals, and on cognitive or psychologic factors that may bias their perceptions of risks. However, the next research challenge is to give more attention to the collective dimension of health risks. This encompasses professional, institutional, political and market issues that also structure the way risks are managed by different stakeholders.
From a sociological point of view, animal diseases can be considered as collective risks, and their management can be analyzed through the concept of collective action: action taken together by groups of people, based on common rules and mutual trust, to achieve shared objectives or to defend shared values.
This shift, from individual perceptions to collective action, raises new questions that sociologists can contribute to answer. These questions include the structuration and relationships within and between groups of stakeholders (farmers, veterinarians...) as well the strategies of organizations -sometimes with competing interests- involved in risk management (public authorities, industry...).
Our communication exposes this perspective shift. Based on researches conducted by the authors (especially on avian flu management and antibiotic use in livestock) and a large literature review, it points out the role of factors such as social bonds, market chain organization, shared values, trust in vet services...in framing farmer's risk management strategies.
It concludes on the potential of this shift to renew the collaboration between epidemiologists and social scientists and to explore new paths of health intervention.

Where is the participation in participatory epidemiology?

K. Fischer, E. Chenais, E. Torsson, J.J. Wensman

Peste des Petits ruminants (PPR) is a potentially lethal, highly contagious viral disease of sheep and goats. Domestic sheep and goats are important species for the livelihoods of poor people in many developing countries. Within societies where PPR is now spreading, poverty is widespread and the disease is expected to have significant negative impacts on livelihoods. In resource-constrained marginalised societies, it is often difficult to collect disease data in conventional ways. Participatory epidemiology (PE) has been suggested as a particularly suitable research method to study epidemiology and social impacts of diseases in these contexts. However, for PE to achieve its full potential, stronger efforts to achieve true participation and to incorporate lessons about participation and power from the social sciences may be required. This review shows that social science engagement in PE to date is virtually non-existent, but that increased efforts to draw lessons from the social sciences and to increase the degree of participation in PE could increase its potential as an important tool in disease impact assessment and control. Particular attention is paid here to the potential role of PE in future research on the epidemiology and control of PPR.

Cost benefit analysis for the BVD control program in Germany

J. Gethmann, C. Probst, H. Lentz, P. Blunk, J. Bassett, P. Hoevel, F.J. Conraths

Bovine Viral Diarrhoea (BVD) is one of the most important cattle diseases causing high economic losses (1-3). A compulsory nationwide eradication program was therefore implemented in Germany, which started in January 2011 (4). The key points are to detect persistently infected animals (PI animals) by testing all newborn calves and animals before trading them (Figure 1). All detected PI animals must be swiftly removed from the population.

Until September 2016, more than 32 million animals have been tested. The proportion of PI animals was thereby reduced from 0.5 % in 2011 to 0.02 % in 2016. However, the risk of getting re-infected increases as the number of free farms and naive animals rises. To prepare a scientific basis for the decision on the future control strategy, a cost benefit analysis has been carried out. An agent-based disease-spread model on animal basis was developed, which includes trade between farms and different control strategies. The results of the model are used to estimate costs and benefit of various control strategies, e.g. stop the current program, continue without changes or include compulsory vaccination.

The economic analysis included both a gross margin analysis (GMA) on the animal level and a cost-benefit analysis (CBA) on the national level. The GMA was carried out for different production types, e.g. rearing of calves or young animals and heifer or milk production. In a second step, the effect of both transient and persistent BVD infection was included in the GMA. The outcome of the simulation model and the results of the CBA will be presented.

Economics and human behavioural science: essential elements for infectious disease control

G. Gunn, K. Adam, C. Heffernan, K. Rich

As members of research teams with a clear focus on animal and human infectious disease controls the authors will describe to the audience why the inclusion of social science in any control programme is essential for success. However, the behavioural "struggle" begins with understanding of entrenched human beliefs on both sides of the division between natural and social sciences and the wide grey zone between! Deficiencies in already crowded training environments result in conflicts because natural and social scientists equally never know what they do not know. Examples will be used to highlight this and the real and additional issues associated with adapting the behaviours of the animal keepers and human populations at risk using diseases such as bovine viral diarrhoea, paratuberculosis, Lyme disease and verocytoxigenic E. coli (VTEC). Historically, natural scientists worked hard to discover the pathway to disease for a specific pathogen in a particular species. Having elucidated this, intervention strategies are developed, for example: tests for control or eradication; novel treatments; management strategies for exclusion or prevention strategies using vaccines. That eureka moment where the target population "en masse" adopts the wonderful new, hard won, intervention does not happen. Elation becomes disappointment. The authors will try to describe why. For the enlightened, who belatedly invite social scientist reinforcements, progress remains patchy. For farmers with businesses, sound economic arguments for adoption of control do not always win through (BVD, paratuberculosis) and adoption is limited. Behavioural scientists are engaged and, too late, the barriers are identified. Carrots and sticks are discussed. The referents are consulted. The public are confused by the mass of non-valid information available on the internet. Often laws are introduced to try to complete the job using legislation and enforcement. Potential avenues for improvement will be discussed.

Culling perspectives from dairy producers, veterinarians, DHI and feed mill advisors: a Q-methodology study

D. Haine, R. Cue, A. Sewalem, K. Wade, R. Lacroix, D. Lefebvre, J. Rushton, J. Arsenault, É. Bouchard, J. Dubuc

If minimizing total losses is most profitable, producers can still decide the timing of the cull and take individual choices, or have to face certain constraints. Motivational and behavioural aspects of culling expectations and its decision process were not explored yet. Our goal was to describe shared criteria on culling decision among dairy producers and farm advisors, using a Q-methodological study, which allows for the systematic exploration of subjectivity and the understanding of human behaviour.

Forty-one dairy producers and 42 advisors (veterinarians, feed mill and DHI advisors) undertook a Q sort with 40 statements that represented a range of viewpoints about cow and herd health, production performances, management issues, and material factors that might impact their culling decision-making process. Sorts were analyzed by-person using factor analysis.

Dairy producers shared a single view on culling, where udder health, milk production performances, milk quota management and producing a healthy, secure milk were key criteria. Farm management parameters like debts, milking parlour capacity, herd size were not considered at all. Two profiles were identified among farm advisors. They all used the same key parameters as producers. The first profile - 81% similar to producers - stressed withdrawal period and animal welfare. The second - 56% similar to producers - differed more clearly by considering reproduction status, followed by post-partum diseases and production financial incentives.

Our findings suggest that dairy producers and their advisors generally hold a common viewpoint. A subgroup of advisors is using recommendations from economic models where reproduction status is central to farm profitability. Despite outreach programs promoting this approach, it did not reach most of the advisors nor the majority of producers. Understanding and managing these differences is important to assist change management processes required to increase farm profitability.

Farmer decision-making around livestock trading practices: the multifactorial roles of stock agents

A. Hidano, G. Enticott, T. Carpenter, C. Gates

Livestock movements play a pivotal role in spreading many economically important diseases. Numerous studies have shown that the spatial and temporal patterns in these movements as well as the biosecurity measures implemented by farmers have a substantial impact on disease risk. Understanding how farmers make these trading decisions is important for developing more effective disease control strategies, however, there is currently limited knowledge on how, why, and when farmers engage in livestock trade. Drawing on 20 qualitative interviews with farmers and livestock agents in different geographical areas in New Zealand, this study describes how various socio-psychological, economic, environmental and epidemiological factors shape farmers' livestock trading decisions.

Behavioural theory recognises that farmers' decisions are influenced by a range of other people. Stock agents are one of these actors, however, there is limited knowledge on their interactions with farmers. We found that farmers who require regular purchases of "better" cows for increasing their milk production tend to use one agent because they believe that a trusted and consistent relationship with an agent would lead to better trade opportunities. These farmers stated that buying from farms with reliable disease status is important and they trust that agents would find suitable animals based on their more extensive knowledge of the disease epidemiology and trustworthiness of potential source farms. On the other hand, farmers who deal with agents mainly when they are selling animals tend to work with multiple agents, which allows them to choose "better" deals with the highest market value. The strength of farmers' reliance on agents for decision making, however, varied across regions and farm characteristics. We discuss the implications of these findings on livestock movement and disease spread patterns in New Zealand livestock systems.

A value chain analysis as a tool to evaluate highly pathogenic avian influenza (HPAI) intervention strategies

D. Indrawan, H. Hogeveen, K Rich, P. van Horne

A value chain analysis of poultry chain through the market channels is developed and combined with the information of highly pathogenic avian influenza (HPAI) intervention strategies. The purpose is to propose changes in production and marketing system to reduce the risk of HPAI infection. The changes are proposed as a policy that regulate the way the poultry sector operates and control the HPAI endemic, the structure of the industry needs to be fully understood, along with the motivations and views of the poultry sector stakeholders. The first step in development is a description of the main characteristics of the Western Java poultry value chain. It includes a mapping of the poultry chain, a description of relevant stakeholders, the number and value of poultry transferred between stakeholders in different governance structure. This study explained the relationship between the governance structure, its economic performance and consequences to HPAI eradication. Furthermore, the developed value chain analysis provides a rational and systematic framework for describing the possibility to upgrade the chain for different governance structure of possible intervention methods. The conceptual model will be parameterized for two important value chain scenarios for the Western Java situation: the traditional and the modern channel for poultry supply. Each scenario is illustrated with case examples. This study shows that the developed value chain analysis is a robust model that can be used to evaluate intervention strategies.

The true cost of missing dogs - A case study using Harvey's Law

M. James, C. Sampson

Losing a loved dog accidentally or through theft is traumatic. Roads are busier and pet theft increasing in the UK. Owners feel loss akin to human bereavement. Searching for a pet is costly in financial and emotional terms. This work uses the exemplar of Harvey's Law to illustrate the cost. In 2014 the Highways Agency withdrew routine scanning and identification of domestic pets retrieved from the highways. The decision was reversed in January 2015, following evidence submitted to a Westminster Hall Debate- Harvey's Law - a movement inspired by a dog killed on the highways and his owner's search. Scanning was reintroduced.
The Department of Transport's cost of implementing Harvey's Law was £2.24 per dog killed, comprising capital (refrigeration, scanners, operating costs) and staff time. The potential cost to the owner of search is greater. There are no published figures on this cost. This work presents estimates from Harvey's Law report. The physical cost of a lost pet can be split into consumable costs such as posters, advertising and equipment and time cost of search, by the owners', friends, family and the public. The cost of search represents an opportunity cost of time; time diverted away from other activities, whether leisure activities or paid employment. Missing dog groups on social media such as Facebook can have in excess of 2000 members. Assuming only 20% of those members actively help to search\ post for the missing dog, at least 200 people are engaged on a weekly basis per dog. Using conservative figures calculated for Harvey's Law, the total social costs of searching for a missing dog can be in excess of £10,000. These costs are without the devastating effects on quality of life from pet loss. With up to 300 dogs killed on major roads and around 2000 reported stolen p.a. the costs of missing pets are a large burden on individuals. With a quarter of UK homes owning dogs, there are potential policy implications around addressing the issue of lost pets.

The challenges of making resource allocation decisions across several hazards within a surveillance portfolio

K. Johnson, L. Gustafson, S. Belle, C. Giray, M. Branan, A.D. Hagerman, J. Thompson

The increasing use of surveillance as a tool to support risk mitigation and market access decisions means that surveillance data will be in demand for a variety of pathogens and contexts. With this demand, questions about how and where to allocate limited resources will require evidence-based comparisons of the costs, benefits, and feasibility of specific surveillance activities. Selecting the optimal level of activities designed to meet the surveillance needs can be challenging. The complex set of factors considered when deciding on the optimal level of surveillance that meets a pre-determined standard of effectiveness includes: characteristics of the industry, disease, environment, infrastructure, veterinary services, current regulatory requirements, and stakeholders. Decision-makers should attempt to minimize cost subject to meeting effectiveness requirements (i.e., disease detection capability, timeliness, etc.) of a surveillance system. This presentation will focus on the challenges of work aimed at estimating the effectiveness and efficiency of surveillance portfolios. Challenges include evaluating new surveillance testing methods as science provides new approaches for sample collection and diagnostic testing, funding availability and associated constraints on funding uses, competing priorities for resources, and changes expected from known and emerging hazards. This presentation should foster discussion by outlining topics that are current challenges and encourage participants to brainstorm ways to overcome those hurdles using partnerships, acquiring new data, or developing methods to estimate missing parameters necessary for estimating the cost and benefit of surveillance portfolios. One specific topic would be to discuss sources of information that can assist with estimating the cost of labor used for surveillance activities, since this is usually a fixed cost and not paid through a user fee or pay-for-service style revenue.

Cost-benefit analysis of commercial aquaculture health program standards (CAHPS) shellfish pilot project

K. Johnson, C. Antognoli, L. Gustafson, M. Branan, M. Remmenga, R. Jones, K. Orloski, D. Hsi, A.D. Hagerman, J. Thompson

Regulations governing aquaculture farms are complex and create a significant financial burden for producers in the United States. Hundreds of local, State, and Federal regulations govern the production, health, and transport of hundreds of aquatic species currently produced in the U.S. The Commercial Aquaculture Health Program Standards (CAHPS) are voluntary and provide a framework for verifying and improving farmed aquatic animal health. With the implementation of a new program comes a lot of concerns about costs and benefits, which are essential for marketing the program and encouraging participation.

This presentation will share the results from a pilot project conducted in Maine, USA. The project looked at using a more comprehensive surveillance approach that provides shellfish health status information for a zone, as opposed to only for a given site. The CAHPS framework promotes zonation as an important approach to aquatic health management in open systems. The U.S. is positioning to implement this framework, in conjunction with industry and State authorities, to assist in disease prevention and response and support trade decisions. Annual cost analyses will be compared for the different levels of testing required using both the site-specific and zone approaches to show the difference in resource investments required to make disease freedom claims.

Veterinary services: cost or investment? Exploring providers' and users' opinions

T. Knific, M. Ocepek, A. Kirbiš, I.M. Černič

The focus of veterinary services has shifted from curative to preventive measures due to potential economic and social consequences of animal diseases. Even so, the predominant way of providing veterinary services for livestock in Slovenia is by contacting a veterinarian when impaired health in a herd is noticed and costs of services are generally directly funded by the farmers. The aim of this study was to gain insight in field veterinarians' and livestock owners' perception of veterinary services in general and in particular, what economic meaning are they attributing to these services and how they think they should be improved. In April and May 2014, we conducted in-depth, semistructured interviews with three field veterinarians and three dairy farmers from different regions of Slovenia. Each individual interview was recorded and later transcribed to enable thematic analysis. The results show that farmers were overall more satisfied with veterinary services and had fewer suggestions how they could be improved. Both farmers and veterinarians felt the pressure of the financial aspects of veterinary services. Veterinarians wished that their work would not be dependent on farmers' limited financial resources as it is currently the case. Although they had difficulties with defining their services as cost or investment, they skewed toward investment, whereas two farmers thought they are strictly costs, however none of them ever performed any calculations. Veterinarians wished their services would be more accessible, thus farmers might be more in favour of quick and regular treatment. Veterinarians proposed that part of the solution would be by changing farmers' views of veterinary services merely as costs and by giving more emphasis on preventive measures. This research suggests that veterinarians should accept a more proactive role in bringing about changes. In order to be able to do that, better education on economics and communication seems crucial.

Automated lameness detection in dairy farming in search for an attractive business model

T. Van De Gucht, W. Saeys, L. Lauwers, A. Van Nuffel

Although lameness is a major health problem in dairy farming, and promising automated lameness detection systems (ALDS) are emerging, adoption of these systems is still not widespread. Ongoing PhD research analyses the interlinks between various system characteristics of ALDS and socio-economic features of farm and farmer. The poster pictures the results from published and submitted papers and almost finished research. First, based on literature and expert information, a system analysis is performed to map the factors and their interlinks that conceptually matter for satisfactory performance and farmers' acceptance. Next, for four ALDS -accelerometers, pressure mats, pressure plates and camera systems- the economic value is simulated. Expected reductions in lameness prevalence and costs in time are discounted into a net present value. Current lameness prevalence, system price, detection performance and herd size have large influence on farm profitability. A choice experiment on a sample of Flemish dairy farmers with choice options on the same ADLS groups shows that farmers still attach a negative utility to automated lames detection. This attitude becomes less negative after receiving more information on farm economic impact of lameness. Farmers who are familiar with automated oestrus detection, show a positive preference for leg-mounted ALDS. ALDS attributes that negatively effected preferences are, in decreasing order of importance: sensitivity (% missed lame cows), specificity (% false alarms) and system costs. Preference is positively effected by the ALDS attribute 'indication of the lame leg'• . In order to arrive at an attractive business model for both ALDS providers and farmers, more technical research focusses on decreasing system costs while keeping the detection performance at a reasonable level. Attention is paid to downscaling pressure mats and to deriving new variables from gait measurements that allow for better lameness detection.

Is animal health management of cattle herds consistent with environmental concerns?

E. Letort, A. Rault

The preservation of a good animal health and the preservation of the environment are both considered as public goods, and they are at the core of livestock farming. Hence, the sustainability and the competitiveness of the livestock production sector do not only rely on economic performances, but also on its ability to reach high levels of environmental and health performances. While farm production decisions may affect at once the income, the herd health and the environmental externalities, the potential spillover effects (positive or negative) of farmers' decisions between these three pillars of sustainability are rarely addressed in the literature.

The focus of this paper is to shed light on the possible complementarity or technical competition between environmental and sanitary objectives set by cattle producers. We aim at highlighting the determinants of environmental and health performances at the farm level. This permits to link farm types (e.g. among the degree of intensification of livestock farming) and their environmental and animal health externalities. Our research approach relies on the elaboration of (i) a theoretical model with externalities. While environmental externalities are often theoretically modeled, to our knowledge, externalities associated to the animal health management are rarely considered, especially when considered jointly with environmental externalities, (ii) a spatial econometric model of simultaneous equations revealing the farm performances, using farm level French data for cattle producers, and concerning common bovine diseases (mastitis, lameness). Results of the estimations are expected to show how the environmental and health policies in livestock production are inclined to generate obstacles to the farm performances and competitiveness, or whether animal health benefits (resp. environmental) can be expected from environmental policies or practices (resp. health).

Fighting antimicrobial resistance in veterinary medicine: assessment of European public policies in food-animal production and measures to address

G. Lhermie, Y. Gröhn, D. Raboisson

Antimicrobial resistance created by the veterinary usage of antimicrobials represents a potential hazard for human health. Several European governments implement measures to decrease antimicrobial use (AMU), targeting particularly Critically Important Antimicrobials. In food producing animals, antimicrobials are used to control diseases that cause economic losses. This major difference with human medicine may explain the failure of the public policies implemented to control AMU. Here, we review the specific factors influencing AMU in the farm animal sector and highlighting the farmers' decision-making process of AMU. We then identify alternative measures to be considered.

To understand the decision making process of AMU, a conceptual framework including sanitary, behavioral, economic, and institutional variables influencing AMU, is proposed. A critical analysis of the measures implemented in the previous years in several European countries is performed.

The first set of measures targets farmers, and focuses on their technical skills improvement, to avoid unnecessary AMU. The second set targets veterinarians, enhancing their major role as prudent prescribers of antimicrobials. The third set targets both veterinarians and pharmaceutical industries, supervising the prescription of certain antimicrobial classes and limiting the financial interests surrounding drug delivery. Substitution between antimicrobials and other measures for infectious disease control, development of taxes and insurance systems, and supervising antimicrobials prices appear as interesting alternatives to be addressed. Finally, we emphasize the value of optimizing antimicrobial regimens, and developing veterinary precision medicine to achieve clinical efficacy in animals while limiting negative externalities on public health. In conclusion, the set of actions implemented up to now does not seem to address the economic interests of farmers' use of antimicrobials, suggesting improvement in this way.

Farmer action groups - A participatory approach to policy making

L. Morgans, H. Buller, K. Reyher, D. Main

Despite increasing pressure to reduce antibiotic usage, many dairy farms still use critically important antibiotics. This research assesses the potential of peer-to-peer support through farmer action groups (FAGs) to achieve practical, farmer-led changes to reduce antibiotic usage and improve herd health and welfare.

FAGs, based on 'Stable Schools', seek to harness local-level experience and expertise. To date, this project has established 4 FAGs in the South West of England, each made up of 5-12 dairy farmers that meet approximately every 6 weeks to discuss medicine usage. Meetings last 3 hours and involve a farm walk and facilitated discussion, all of which is audio recorded. Medicine audits are carried out on each farm at the start and end of the project. The outcome of each meeting is for the farmers to produce an action list for the host farm of practical measures to achieve the goal of antibiotic reduction without adverse impacts.

To date, 45 farmers have been directly contacted, 25 (55.6%) have been in attendance, 15 (33.3%) have shown an interest but have not yet participated, and 5 (11.1%) have declined or are uncontactable. Many more farmers have been initially asked to participate by veterinary practices, via agricultural show contacts, through advertisements in the farming literature and through recruitment meetings in collaboration with the levy board, AHDB Dairy.

Thus far, farmers involved have implemented measures such as; re-designing sheds to reduce the incidence of bovine respiratory disease, increasing the frequency of preventative visits by the foot trimmer and designating a farm worker to ensure medicine records are being kept up-to-date.

Outputs are being used to inform policy decisions on how to proceed with regulation on antimicrobial resistance (AMR). Results will demonstrate whether a participatory approach to AMR and farmer led change can be successful in the UK.

Estimating the costs of Porcine Reproductive & Respiratory Syndrome (PRRS) and return on investment of interventions with a PRRS economic simulator

C. Nathues, J. Rushton, G. Schüpbach-Regula, R. Jolie, M. Jimenez, V. Geurts, H. Nathues

PRRS is among the diseases with the highest economic impact in pig production. Yet, its economic impact at farm level is not well understood as losses caused are often not obvious. Furthermore, the vast number of control options makes it difficult to decide on the most cost-efficient strategy. Aim of this study was to develop a simulator to estimate the costs of PRRS and cost-efficiency of control strategies for an individual farm. In a production model, the impact of PRRS infection on health and productivity parameters depending on PRRS severity was integrated. Financial losses were calculated in gross margin and partial budget analysis. The model was extended by different intervention strategies: a) depopulation/repopulation (D/R), b) close & roll-over (C&R), c) test & removal (T&R), d) mass vaccination of sows (MS), e) MS & vaccination of piglets (MSP), f) 6-60 vaccination of sows (6-60), g) 6-60 & vaccination of piglets (6-60P), h) improvement of biosecurity & management (BSM), and combinations of h) with d) - g). Data were obtained through literature review and expert poll. The expected value (EV) of each control strategy over 5 years was assessed through investment appraisal. In a moderately affected herd (moderate deviations in all health and productivity parameters from what could be expected in an average healthy herd), total median losses per year were €-442,973. The control strategies with the highest median EV were 1) C&R €1,126,807), 2) MSP (€1,114,649) and 3) 6-60P (€1,096,314). In a slightly affected herd, median annual losses were €-223,298, and the highest median EV had 1) MSP (€721,745), 2) 6-60P (€712,511) and 3) MS (€ 664,111). Results indicate that losses in affected herds can be considerable and that expected benefits of interventions depend on the farm situation. The simulator provides a better understanding of the economic impact of PRRS in a farm is a valuable tool for farmers and veterinarians to decide on the need for interventions.

Economic losses due to lameness in dairy cattle herds

L. Ózsvári

The long-term competitive, profitable milk-production can only be achieved by the reduction of production costs and the animal diseases implying costs have become very important risk factors of herd profitability. Therefore, one of the basic aims of dairy managers today is to minimize the incidence, consequently the losses caused by herd diseases. In studies carried out in intensive dairy units showed that lameness was responsible for the third largest economic losses after mastitis and reproductive disorders, and the largest part of losses was resulted from the returns foregone, that is, the diminished income due to reduced production. The aim of this study is to gain a broader knowledge about the causes of lameness, their occurrence, and how these factors have an economic impact on dairy cattle herds by influencing the production parameters. There is a wide source of literature dealing with the occurrence and the clinical and aetiological origin of the major types of lameness. The most significant incidence value of lameness is between 20% and 35%. In order to calculate the economic cost of lameness in intensive dairy herds the most authors recognized the following components as the sources of losses: reduced milk receipts, decreased revenues due to longer calving interval, treatment costs, extra labour costs, cost of early culling and cost of live weight loss. The largest part of the loss due to lameness mostly came from the decreased milk receipts and the premature disposal, at the same time the drug cost could usually be blamed for the smallest cost component. The magnitude of loss resulting from lameness in dairy units is very similar in the different countries, mostly varying between €40-50 per cow and €100-300 per case.

Climate change & livestock health on the U.S. Northern Plains: Actionable economic insights & needs

D. Peck

Climate change will impact livestock health through numerous direct mechanisms and indirect drivers. Examples of direct mechanisms include climate-driven changes in the biology of pathogens, and the distribution of vectors. Indirect drivers may include changes in environmental factors, land-use, and agricultural practices. Relatively little attention has been paid to the potential implications of climate change for livestock pests and diseases in the temperate U.S. Northern Plains. The proposed poster will summarize the current state of knowledge for this region, focusing on the role and contributions of economics thus far. The production path of cattle and sheep, from extensive rangelands to feedlots, will be the primary emphasis. It will identify gaps in our knowledge and opportunities to generate actionable insights about climate-driven impacts and adaptations to livestock pests and diseases.
As the new Director of the U.S. Department of Agriculture's Northern Plains Climate Hub, this poster will provide a venue to combine my expertise in livestock health economics with our Hub's expertise in climate-change science. The Northern Plains Climate Hub's mission is to translate climate-change research into usable information and tools for agricultural producers and knowledge-transfer partners. The proposed poster will therefore identify practical adaptations that livestock managers in the U.S. Northern Plains might consider implementing, in response to climate change, to re-optimize animal health. Current understanding of the economic costs and benefits of such adaptations, and remaining needs for actionable economic and climatic information will be illustrated.

Farmers motivation for the usage of sensor technology and information

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Over the last few decades, the average herd size of dairy farms has grown substantially. To account for the accompanied increase in labour, a trend towards technical innovations exist, e.g. the adoption of Precision Livestock Farming (PLF) technologies to improve the on-farm efficiency. There has also been a shift in dairy health management, from treatment of clinical illnesses to disease prevention. Sensor technology can aid in disease prevention, by the detection of behavioural changes that might indicate health problems in individual dairy cows. 'Sense of sensors in transition management' is a project that focusses on early detection of health problems in the transition period with the use of Smarttag technology. Reliable sensor alerts contribute to the farmers motivation to use sensor technology in health management. Disease registration is an important part of disease prevention and in this project an aspect of the development of reliable sensor technology. An accurate and complete registration is important to validate sensor information and can be used by farmers to identify farm specific health problems. However, standardized, valid and systematically recorded health data at herd level is often partially kept or at worst non-existent. The first aim of this research is to study farmer's motivation to register diseases. The second aim is to study the farmers trust in sensor alerts and the reliability of the sensor alerts. Consequently, behavioural influence techniques will be applied to develop strategies to improve on-farm disease registration. A questionnaire, based on socio-psychological explanatory models , has been developed to explain disease registration behaviour and a questionnaire is developed to determine the behaviour of farmers after receiving sensor alerts. Factors of influence on the motivation of farmers to register diseases and use of sensor alerts will be presented.

Impact of local socio-economic constraints on the value of animal health information

M. Peyre, H.T.T. Pham, A. Delabouglise, N.M. Hoang, Calba, F. Goutard, F. Roger, D.T. Vu, N. Antoine Moussiaux

Early detection and control of animal diseases through efficient surveillance system is critical to sustain livelihoods of farmers and prevent emergence and re-emergence of human pathogens adapted from animals. Most animal health programs relies on data generated by national surveillance systems. The effectiveness of most surveillance system remains limited especially in low-income countries. Many socio-cultural, economical and political factors can affect the performance and costs of surveillance systems and therefore the value or at least the « perceived value » of animal health information. Studies have been implemented in South East Asia and in Europe to better understand local socio-economic constraints impairing animal health surveillance performances.. All the studies used common evaluation tools based on participatory approaches and contingent valuation method to assess the non-monetary benefits, i.e., the value of sanitary information. Farmers are facing several options besides reporting: treatment, sale or destruction of animals. Reporting is often associated with lots of uncertainty regarding outcomes and transaction costs as the release of health information induces market price drops. Low acceptability of the surveillance system linked to social costs such as stigmatization and stress is a major issue for disease reporting. The ability to sell or trade sick animals reduces dramatically surveillance benefits, especially under high uncertainty of compensation and treatment. All the studies provided evidence that local constraints not only linked to technical and epidemiological issues but also to socio, cultural and economical aspects have a strong impact on the value of animal health information. Such data are critical to better inform decision-making and ensure efficacy of new surveillance or improved surveillance designed. This work also demonstrates the added value of participatory approaches in the evaluation process.

Financial and economic assessment of bovine viral diarrhoea virus prevention and mitigation activities worldwide: A systematic review

B. Pinior, C.L. Firth, V. Richter, K. Lebl, M. Dzieciol, S. Hutter, M. Trauffler, J. Burgstaller, W. Obritzhauser, A. Käsbohrer

A literature search covering studies published between 1970 and 2015 was carried out to identify studies, which financially and economically assessed bovine viral diarrhoea virus (BVDV) prevention and mitigation activities. All studies that assessed prevention and mitigation activities, such as control and eradication measures, vaccination or surveillance programmes, with respect to financial matters, were included in this review. The studies were reviewed systematically according to the monetary outcomes and location of prevention and mitigation activities, methodology, production systems, calculation level (national, regional, or farm level), and the payers of these activities.

The systematic review considers 35 studies, covering 12 countries. The majority of the studies assessed national control and eradication programmes and biosecurity measures at farm level. Approximately one third of the studies described the costs and/or benefits in a tabular overview, without using specific economic methods. The majority of the costs were borne by the farmer. Dairy production systems were three times more likely to be economically assessed than beef production systems. Our review indicated issues within the studies such as neglecting to define a timeframe or varying population sizes. We can confirm the need for more well-designed studies in the area of animal health economics in order to ensure robust results on whether prevention and mitigation activities of BVDV infection are justified or not.

A global survey of the prevalence of bovine viral diarrhoea and implemented control and eradication programmes

B. Pinior, C. Funke, C.L. Firth, S. Hutter, M. Dangelmaier, V. Richter, T. Marschik, M. Trauffler, A. Käsbohrer

The global distribution of BVD was evaluated using a questionnaire sent to 170 countries. In particular, information was sought on the prevalence of the disease and any intervention measures implemented to control BVD. The survey participants were the Chief Veterinary Officers of the countries, as well as research institutions focusing on BVD. In addition, we performed a systematic literature review regarding the implemented intervention measures in the countries that responded to the questionnaire. The latter approach was essential in order to interpret the recorded prevalence values of the countries accurately.
In total, 53 (31%) countries responded to the questionnaire, of which only 42 provided usable data. On a world map, we have illustrated either the earliest and the most recently available recorded prevalence data or the prevalence values before and after the implementation of intervention measures of the countries. Our results demonstrate a substantial benefit of implemented intervention measures as shown by the decrease in BVD prevalence values in most countries. These results could be used to perform a cost-effectiveness analysis of the implemented intervention measures of the countries and to advise veterinary public health authorities and national governments on established BVD control strategies.

Special feature of the French young bulls' value chain and associated sanitary issue to control bovine respiratory diseases

A. Poizat, F. Beaugrand, A. Rault, C. Fourichon, N. Bareille

In France, the young bulls sector has a very complex organization where beef calves are raised by a cow-calf producer and then sold to a fattener through numerous middle men. This organization is in favour of an increased incidence of respiratory diseases in fattening units, and thus increased use of antibiotics.
No study allows a holistic understanding of the young bulls' value chain, in France or in other countries. This would lead to a better apprehension of the influence of stakeholders to control bovine respiratory diseases (BRD) and of the possible lever to improve the existing situation.
In this research, we aimed at (i) describing the functioning of the French young bulls value chain and the different roles of stakeholders and institutions, (ii) understanding how the present organization influences the risk to develop BRD in fattening units, (iii) observing the existing strategies of stakeholders to control the risk of BRD and discussing some possible alternative methods.
We collected information from cow-calf producers, middle men, and fatteners relying on qualitative semi-structured interviews and on observations on field conducted in major beef cattle regions in France.
The main findings first confirmed the expected complexity of different existing commercial paths in the value chain and the role of this vertical organization in increasing risks factors for BRD. Second, there was a preventive and quasi systematic use of antibiotics which sharply reduced (i) the potential effects of technical and sanitary interdependency between the cow-calf producer and the fattener, (ii) the risk to develop BRD, when there were an increased number of middle men before fattening. Finally, main opportunities to improve sanitary health status of animals would be to (i) reduce the number of intermediaries and (ii) the number of farms of origin in weanling batches, (iii) increase the use of vaccination by cow-calf producers.

A questionnaire study on veterinarians' attitudes towards antimicrobial usage for mastitis treatment

V. Pucken, A. Schwendner, M. Bodmer, G. Schüpbach-Regula, B. H.P. van den Borne

The increase in antimicrobial resistance is a global concern in human and animal health and necessitates the reduction of antimicrobials in both fields.
In dairy herds most antimicrobials are used for mastitis treatment. A sustainable reduction of antimicrobials in this field can be achieved by establishing a mastitis control program, focusing on prevention to reduce the need for therapeutic interventions. In such programs the interaction of veterinarians and farmers plays a pivotal role, especially as many farmers see their veterinarian as their most important contact for udder health and mastitis problems. Therefore it is important to understand veterinarians' attitudes towards the use of antimicrobials to treat mastitis. Although several investigations on the quantification of antimicrobials used on dairy farms were conducted, information on attitudes of Swiss veterinarians towards antimicrobial usage is currently lacking.
For this purpose 438 Swiss veterinary practitioners with at least 15% of dairy clients were invited to fill out an online survey with 45 questions regarding veterinarians' attitudes and behaviours towards antimicrobial resistance, antimicrobial prescription, critically-important-antimicrobials and treatment of chronic and subclinical mastitis. With a total of 145 (33.8%) participating veterinarians and 98 (22.4%) completed surveys a detailed insight into Swiss veterinarians' attitudes towards antimicrobial usage for mastitis treatment and antimicrobial resistance could be gained. In general a prudent usage of antimicrobials dominates. However in some fields, especially in antimicrobial resistance and in critically-important-antimicrobials, the attitudes of veterinarians vary. This information will be useful to create more targeted intervention strategies geared towards veterinarians in the field, who are the main actors in executing any intervention program.

Service Quality: Client Compliance. An integrated approach to animal health provision

G. Wright, K. Walley, E. Bleach

Domesticated animals form an important part of modern life fulfilling roles as companion, working or food producing animals. Regardless of the position realised, the daily health care of animals is complex and involves a range of healthcare practitioners. Benefits of a holistic approach to human patient care are established with marketing models of Service Quality (SQ) and concepts of value co-creation fully incorporated. Despite recognition of the advantages conferred by effective integrated working through use of the multidisciplinary team, and the active role played by clients in service provision, neither is broadly adopted within the animal health sector. The discerning nature of the veterinary client in combination with the developing roles of professionals and changing demographics, has transformed market dynamics and highlighted the need for reflection on SQ. Notions of value cocreation in human health care such as empathy and communication are known to influence patient to medic loyalty, trust and so treatment compliance. Presented is a conceptualisation of value co-creation within the animal health sector based on an analysis of stakeholders' service experiences using a mixed methods approach. Depth interviews (n=13) with vets, paraprofessionals and clients provided data for thematic analysis (NVivo) and subsequent survey data (n=271) was analysed using Exploratory Factor Analysis (SPSS). Results confirmed important dimensions of SQ and value co-creation. Study findings and the extant literature suggest factors affecting client active engagement in the service encounter to be multi-faceted and complex, but propose the usefulness of value cocreation to the sector. An original contribution to knowledge is made through theoretical application of marketing theory to the animal health sector; proposed to be developed into workable solutions for both rapidly changing veterinary businesses and factors affecting client loyalty and treatment compliance.

The new standards of economics applied to animal health - first results of a French research network

D. Raboisson, A. Rault, C. Mosnier, J. Niemi, E. Wauters, P. Dupraz, P. Sans

Economics of animal health (EAH) is of high interest for stakeholders and decision makers in agriculture (see NEAT project). Up to now, efforts in this growing scientific domain emerged form scattered initiatives, with a weak coordination between the society questions and the research developments, and also between the various research sciences involved. To improve this, an interdisciplinary research network entitled Economic reasoning for improved animal health was created in 2016 by INRA to help co-build a shared and interdisciplinary vision of EAH. This ongoing network is organized around regular workshops, open to researchers and representatives of the sectors. First findings and outcomes are reported here.

First discussions revealed a high heterogeneity of stakeholders demand, including disease cost approaches and better understanding of actor behaviors. They also highlighted the need for promoting mutual understanding between scientific domains on the basis of existing advances in economics. This point serves as red line for the following sessions.

The first workshop dealt with concepts in economics of production. This field was considered to be founder for EAH and to provide huge improvements for the understanding of the dynamics in the production decisions, including the determinants and consequences of health disorders and decisions. The economics of production is seen as of interest for questions around animal health ranging from farm level to chain level, providing answers for disease costs, best strategies to be retained and assessment of financial incentives for animal health management.

Environmental economics is at the core of the 2nd workshop. This domain can be applied to externalities such as (i) antimicrobial use in animal production and (ii) strategic behaviors in the case of infectious diseases when private actions are dependent on neighborhood decisions. The 3rd topic is planned to focus on parallels with the economics of human health.

The economics of antimicrobial resistance in veterinary medicine: externality, futurity and globality

D. Raboisson, M. Dervillé, G. Lhermie

The economics of antimicrobial resistance (AMR) in human is based on 3 key concepts. Externality arises from the AMR increase in case of antimicrobial use (AMU) and the cost of increased AMR not accounted for in the AM price. Futurity corresponds to the underestimated future cost of AMR after discounting applied (time preference over a long period), and from uncertainty. Globality refers to the worldwide impact, AMR containment being a global public good. We apply here these concepts to the economics of AMR in veterinary medicine.

Two items support the proposed approach. Due to lack of data, quantification of the negative externality due to AMU in food animals remains hard. The globality of AMR suggests that local measures to tackle it should not reduce competitiveness at the local level. Otherwise, the global benefits might be overcome by the higher importations from countries with poor AMU standards.

The proposed framework defines -thanks to microeconomic optimization models or general or partial equilibrium models- the net benefits for each stakeholder when AM is used. It includes (i) the negative externalities in human medicine (community utility), veterinary medicine (decreased future efficacy), and in the food industry (technologic or reputation hazard), and (ii) the positive externality on other diseases of the farm. The framework is able to consider (i) the main stakeholders (farmer, veterinarians, pharmaceutical and food industries and consumers), (ii) the curative, preventive, metaphylactic and growth promotion -if authorized- AMU, and (iii) the supply-chain value sharing through premium, penalties and product standards.

The proposed framework allows to define farm management or regulation tools -pigovian taxes or change of industry standards- that decrease the negative externality without any impact on neither the industrial sector competitiveness neither the dynamism of global private research on antibiotic alternative or animal disease prevention.

Household willingness to pay for Foot-and-Mouth Disease vaccines in Northern Tanzania

T.L. Marsh, P.G. Allen

Our study examined agropastoralist and pastoralist' willingness to pay (WTP) for routine and emergency vaccines for Foot-and-Mouth Disease (FMD) in northern Tanzania. Using data from 432 households, the study used a double-bounded dichotomous choice contingent valuation method to elicit responses to two separate hypothetical scenarios regarding FMD control in cattle. Of the 432 complete surveys, 87.72 and 76.85 percent of respondents would pay positive amounts for routine vaccinations and emergency vaccinations respectively. The average routine vaccine price amounts to approximately 3700 Tsh, while the emergency vaccine average stands higher near 5100 Tsh. In comparison, households reported spending around 2000 Tsh per head of cattle for treatment costs for FMD during an outbreak.
The information from this study will further enable us to evaluate the potential for vaccines as a control measure for lower income households in Tanzania. By exploring the role of socio-demographics, disease risk, and vaccine attributes as predictors of WTP, we better understand the household decision-making process regarding disease control in livestock. The mean WTP numbers and amount of positive responses suggest people's openness to control options. This is an initial step in eliciting smallholder preferences for FMD control measures and the implications of these controls on managing the risk of infection.

Dynamic decision-making and vaccination strategies in animal health

A. Rault, S. Krebs

The control of animal health on a territory is influenced by individual behaviors, such as self-protection. The eradication of communicable diseases is highly dependent on the success of coordination between animal producers. Failure in collective disease management has been proved to be caused by the strategic behaviors of agents, where farmers' sanitary efforts are low due to individual's expectations of others' efforts. Nonetheless, these advances in economics mainly deal with biosecurity investment levels, and they do not consider the issue of individual discrete choices (e.g. vaccination). Indeed, vaccination of a herd is widely considered as a discrete choice as it results in a binary trade-off, unlike investment expenditures which are continuous.

We investigate this issue by applying to discrete choices the recent economic findings on the relative endogeneity of disease risks (RER). Our objective is to highlight the specificities of individual discrete choices applied to animal disease management, and their dynamic impacts on the overall prevalence of a communicable disease. This theoretical analysis permits to reveal that the success of a voluntary vaccination program is highly dependent on the heterogeneity of risk exposure of the cattle producers. With an application to a SIRS epidemiological framework, we show that the individual RER is primarily dependent on the intra-farm dynamics and on the risk portfolio derived from the status of individual herds for each farm, which leads to a first regional equilibrium. It leads to the definition of two sub-populations of farmers: the vaccinating and the non-vaccinating ones. Then, as the vaccination strategy is diversely chosen by farmers, the RER and the strategic behaviors (private efforts as a function of others' efforts) of the two populations reinforce the overall heterogeneity of vaccination choices when herd immunity is not reached. Targeted incentives are designed for the regional eradication.

Understanding veterinary medicine use on dairy farms: An ethnographic approach

G.W. Rees, K.K. Reyher, D.C. Barrett

The use of veterinary medicines on dairy farms has recently come under increased scrutiny, driven by the rising awareness of the risks of antimicrobial resistance to human health. Despite the speed with which policies are changing, a knowledge gap has been identified: It is not clear how medicines are actually used and recorded on farms. Without this baseline data, it is difficult to create evidence-based policy in a way that is most likely to be effective, and even more difficult to measure any change or improvement in the future. This study explores the relationships that exist between the farmer, farm workers, veterinarian and dairy cattle within the context of current legislative and economic conditions, and how these relationships influence the use of medicines on farms. By using ethnographic techniques - powerful tools commonly used in the fields of anthropology and geography - to explore cultural phenomena, this work will provide rich, detailed data with which to begin answering pressing questions. Three UK dairy farms have been enrolled in a 12-month participant observation study commencing in late 2016. Farms have been purposively heterogeneously sampled to provide a range of different herd sizes, management structures and production goals. A semi-targeted approach to participant observation will be used to maximise time spent on farm during periods of medicine use or decision making. An initial period of observation where the researcher spends time each week participating in routine tasks including milking, feeding, handling and veterinary visits on each farm will inform a further period of targeted study, where the researcher will visit farms during periods of mutually-agreed interest such as herd health review meetings, TB testing, worming treatments, dry cow therapy and vaccination. Preliminary data from the 蒲rst four months of the study will be presented, alongside discussion of the value of this research methodology in this context.

Monetary impact of bovine viral diarrhoea infection worldwide: A systematic review

V. Richter, K. Lebl, W. Baumgartner, W. Obritzhauser, A. Käsbohrer, B. Pinior

Bovine viral diarrhoea (BVD) infection is an important animal disease of cattle herds worldwide. The primary aim of this study was to analyse studies with specific emphasis on the monetary direct losses of BVD. We collected data with respect to monetary level and types of direct losses, initial infection status of the herds, assessed production systems, genotypes, time periods of economic calculations, study types, and if country specific calculations were provided. A linear mixed model was applied to analyse the factors that influenced the monetary level of direct losses due to BVD infection. The second aim was to test the hypothesis that those countries that recorded estimates of direct losses were more likely to operate BVD intervention measures.
Overall, 44 studies from approximately 800 identified studies, using three databases PubMed, ISI Web of Science and Scopus, were included in this systematic review. The analysed studies covered twelve European countries and three non-European countries, which calculated the monetary direct losses of BVDV at farm, regional and national level in the last 30 years. The majority of the studies used country specific calculations of the BVD direct losses. Direct losses per naive beef cow were lower than per dairy cow. Highly significant influences on the monetary level of direct losses were identified due to the factors ""reinfection"" or ""mortality"" of cattle. The model can explain 69% of the variance of the collected data, whereby the majority of the variation in the model could be explained due to variations between the countries.

Determinants of (dairy) producers' decision making regarding voluntary disease prevention and control

C. Ritter, J. Jansen, C.L. Adams, K. Orsel, S. Roche, D.F. Kelton, R. J. Erskine, G. Benedictus, T.J.G.M. Lam, H.W. Barkema

Farmers often do not enrol in voluntary disease control programs or do not adopt recommended management practices to reduce transmission of animal pathogens on and between farms. This indicates that a better understanding of factors influencing farmers' management decisions is necessary. The purpose of the study was to review and synthesize relevant literature about influences affecting farmers' decisions to adopt or change management practices, and to provide recommendations on how to more effectively motivate farmers' uptake of advised practices.

To implement on-farm changes, a first step is farmers' acknowledgement that a specific issue poses a (present and/or future) problem and that it is their responsibility to take action. Confidence in their ability to successfully implement the recommendation, belief in the recommendation's effectiveness and feasibility/practicality are factors that can further influence whether or not farmers decide to make a management change. Although financial considerations are often an essential factor when farmers weigh perceived advantages of an on-farm change against perceived disadvantages, non-economic influences such as social norms or pride in good animal husbandry can also play an important role. Additionally to farmers' beliefs and perceptions, individual demographics (e.g. age, culture), and agricultural contexts (e.g. milk prices, consumer demand) can influence their on-farm decision making.

In conclusion, various socio-psychological influences affect farmer behavior that go beyond economic considerations. Design and implementation of disease prevention and control interventions need to account for these factors, and a collaboration of stakeholders as well as an interdisciplinary approach that includes social scientists, communication specialists and marketing experts is recommended.

Assessing interactions between dairy farmers and veterinarians using action cameras and the Roter Interaction Analysis System

C. Ritter, J. Jansen, C.L. Adams, H.W. Barkema

Veterinary practitioners have a crucial role in farmers' decision making; they are often regarded as the most trustworthy source of advice on farm management and disease control. Consequently, competent communication is an essential clinical skill for practitioners, and veterinary educators increasingly incorporate communication teaching in the veterinary curriculum. However, very limited information is available regarding communication patterns used by dairy veterinarians, and findings from human and small animal contexts are often extrapolated to teach communication in the farm animal environment.

Therefore, the study objective was to assess on-farm dairy veterinarians' communication patterns to identify priorities and gaps in preventive dairy advisory, which will enable the optimization of current veterinary education.

Veterinary-farmer interactions were recorded during regular herd health visits using action cameras (i.e. GoPro cameras) worn by the veterinarians and a voice recorder worn by the farmer. Currently, over 30 visits by 9 veterinarians have been completed but a total of 70 visits by 13 different dairy practitioners is targeted. Initially, preliminary assessments of two pilot recordings demonstrated that action cameras are a suitable technique to capture on-farm interactions, which can be analyzed using the Roter Interaction Analysis System (complete study results using this tool will be available February 2017). The Roter Interaction Analysis System provides comprehensive information on veterinary communication patterns, which can then be contrasted against generally accepted standards for clinical communication (e.g. Calgary-Cambridge Guide). Furthermore, obtained video recordings hold promise to provide information on a broad range of current research deficits such as the assessment of visit structure, topics discussed, or time spent with specific tasks.

Quo vadis pig veterinarian? Barriers and incentives for the evolution towards an advisory role

C. Rojo-Gimeno, J. Dewulf, D. Loncke, E. Wauters

Pig veterinarians and other actors in the pig health advisory system play a key role in the production of high quality, safe, nutritious and affordable pork for consumers, in the improvement of farms' performance and in the protection of pigs' health and welfare. Experts agree that the role of veterinarian in the overall herd health management should evolve from a 'fire brigade' role towards an advising service, which could lead to improvements in animal health. Yet, evidence about how veterinarians and farmers interact with respect to health management shows that this change is still far from being met.

The aim of our study is to propose improvements to the overall pig health advisory system. Our integrative approach consists of three parts. First, qualitative open interviews were conducted with key informants of the Flemish pig sector (n=10), to set the scene and to identify the actors involved. Second, we did qualitative interviews with members of all identified actor groups to investigate practices, attitudes and barriers that impede changes to the health advisory system. Third, we performed focus groups to identify incentives for the desired changes to the health advisory system. The preliminary results confirm the problem statement. Pig veterinarians' main activities in order of time spent and importance for their income, are (i) sale and distribution of medicines, (ii) governmental official work, (iii) attend to emergencies after farmer's request, (iv) give health advice. Veterinarians employed by feed mills or pharmaceutical companies, give 'free' advice which is indirectly paid for by selling feed and drugs. Some of the main identified barriers were (i) current business models relying heavily on the sale of medicines; (ii) the level of competition in both the independent and tied veterinary sector; (iii) reluctance of farmers to pay health professionals for advice; and (iv) lack of a Flemish representative union of the veterinary profession's interests.

Capacity building from training to action in Veterinary Services in South America

J. Romero, L. Fonalleras, A. Betancur, E. Soto

The Inter-American Institute for Cooperation on Agriculture (IICA) is carrying out a capacity building process in economics of animal health to veterinary services in Southamerica. It includes two stages process of training workshops and following up usage of learnings at chosen current animal health programs at national levels. During 2015, training workshops on economic evaluation of animal health programs involving national veterinary services, private service providers and some academic participants of all south American countries. Workshops included economic impact assessment, cost and benefit of veterinary interventions and Cost-benefit Analysis of animal health programs. Seven countries were selected to perform economic studies of chosen animal health programs. Studies are performed by trained employees of the veterinary services and technical cooperation and guidance is provided by IICA. Interest in the topic and usage of tools has encouraged collaboration of veterinary services, private sectors, regional and some other international organizations.

Complexity as an opportunity to connect Animal Health and Social Science

S. Rüegg, M. Santa, P. Denicolo

It is recognised that the connections between biology, society and economic factors in the frame of animal health are complex. Yet, these multidimensional ramifications are often regarded as an obstacle to effective integration of more information in health management.
We propose to combine the concept of leverage points in complex systems used in business management with the components of One Health, namely human, animal and environmental health, to develop a real time monitoring tool for health interventions. The aim is to provide an overview on elements of the system to identify alignments and antagonisms in order to drive the system towards multiscale health. Because in animal health, personal aspects of the owner are essential, it is included in the health dimension. The system levels are ordered according to their leverage. The framework is co-produced top-down starting with the guardians' personal constructs on his/her personal health, human health, animal health and environmental health. Determinants of health associated with these values are then added, and finally health parameters that are deemed appropriate to measure the state of health in relation to the determinants are identified.
An intervention in the system will have two simultaneous goals 1) to align personal constructs about health and 2) to drive health parameters towards alignment with the corresponding determinants of health and constructs. In this manner, the need for health integration and health improvement are recognised, and the evolution of the system can be observed over time by repeated recording.
In contrast to conventional approaches that focus on health parameters, this approach focuses on the personal constructs which have more leverage in the system. Secondly, it allows to integrate quantitative and qualitative aspects of health in one framework.

Putting the 'extra' in animal welfare: health maximisation for non-human animals

C. Sampson, M. James

Economic evaluation in human health care tends to adopt an 'extra-welfarist' approach. The key manifestation of extra-welfarism is the maximisation of health within a given budget. We outline the extra-welfarist framework and evaluate its applicability to various contexts of animal welfare. Many of the reasons for the adoption of an alternative to classical welfarist approaches in humans are pertinent to animals. With a focus on the tools used for health state valuation in humans, we explore potential approaches to health state valuation in animals. Common preference elicitation techniques including time trade-off, standard gamble and choice experiments are outlined. The nature of trade-offs between health-related quality of life and longevity, and the potential role for a quality-adjusted life year (QALY) approach in animals, is explored. We consider the feasibility and validity of alternative perspectives for animal health state valuation including self (i.e. animal's own health preferences), human companion, livestock manager and society. Furthermore, we explore the potential for novel methods of valuation, including a person/animal trade-off. To illustrate the potential for extra-welfarism in animal health, we compare and contrast its application to end of life decisions in humans and in animals. In this context, difficult decisions are necessary in trading off quality and length of life, which might be traumatic for animals and their owners. A key advantage of the extra-welfarist approach is its flexibility, which could accommodate the varying contexts and perspectives for animal health state valuation. Determination of the most suitable approach to animal health state valuation depends on the ethical principles assumed by the analyst, and necessarily differs according to the perspective being evaluated. We outline the importance of defining perspectives in the context of animal welfare and specify key ethical principles associated with alternative approaches.

Cost assessment of integrated surveillance plans for West Nile Disease (WND) in north-eastern Italy

S. Sartore, P. Mulatti, M. Mazzucato, S. Ravagnan, F. Montarsi, L. Gagliazzo, L. Bonfanti

Since 2008 the West Nile Virus (WNV) has been repeatedly found in north-eastern Italy, suggesting the disease has become endemic. Therefore, monitoring activities in equines, mosquitoes, and wild birds were defined. In 2009-2010, monitoring was based on sentinel horses in farms located within 20 km from the area with active circulation of WNV, to assess whether the disease was circulating in previously unaffected areas. In 2013 a new risk-based surveillance plan was proposed: areas at higher risk of WNV reactivation were defined on the basis of previous epidemiological evidence, and only equines that were not moved for at least three months were tested, to determine recent virus circulation. In this study we assess and compare the costs incurred for the two approaches, potentially indicating which plan was more cost-effective. We considered two periods: A (2009-2010) and B (2013-2014). The study covered costs for surveillance on equines and mosquitoes. Costs for equines included: veterinarian work-hours for travelling and sampling; consumables; laboratory tests; delivery to the National Reference Laboratory (NRL). Entomological costs consisted of: work-hours for mosquito collection and identification; laboratory tests for virus detection; data entry. A total of 1,847 and 3,359 equines were tested in period A and B respectively, with total costs of €126,986 and €184,393. The average cost per sampled animal was higher in period A (€68.75) than in B (€54.90), the reason for this was that the new approach likely allowed to optimise resources focussing on the at-risk areas, using tests aimed at detecting only recent infections, and samples shipped to the NRL were limited. The average cost per mosquito pool analysed for searching WNV were almost comparable for the two periods (€29.84 in A; €28.36 in B). Overall, the costs were lower for the new plan, as it was enhanced accordingly to risk and epidemiological evidence.

BVD/MD control programme in Bavaria, Germany - comparison of the voluntary versus compulsory programme

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Since 2005 a voluntary control programme for BVD/MD was conducted in Bavaria, Germany. Within this programme the participating cattle-holders had the possibility of getting the BVD-status of their herd assessed, as well as identifying persistently infected animals (PI-animals) through testing of individual animals with the subsequent possibility of removing these animals from the herd. In 2011 the voluntary control programme was changed into one which was compulsory nationwide.

The proportion of cattle-holders participating in the voluntary control programme over the time period 2005 to 2010 was 24% across Bavaria. Of these the proportion of farms being classified as 'PI-farms' (farms with at least one identified PI-animal) was 18%. At the beginning of the compulsory control programme the prevalence of PI-farms was around 6% and decreased by the third year to 3%. In total 8,339 PI-animals were identified during the 5.5 years of the voluntary programme. However, no change was seen in the PI-animal-prevalence from 2005 to 2009 (1.8%); only in 2010 a decrease of the PI-animal-prevalence across all of Bavaria to 0.7% was observed (due to a pilot-project 'BVD 2010'). In the compulsory control programme, in total 14,625 PI-animals were identified until mid 2013. The PI-animal-prevalence decreased from 0.7% in the beginning to 0.4% in mid 2013. The most PI-animals, in the voluntary as well as in the compulsory programme, were identified in the region of Swabia. The regions of lower and upper Franconia were the ones with the fewest PI-animals. A significant reduction of the BVDV-occurrence on population level was therefore not achieved during the voluntary control programme. The overall greater success of the compulsory control programme in comparison to the voluntary programme is therefore clearly evident.

The comparison give indications that the compulsory BVD control programme in Bavaria was more beneficial than the voluntary programme.

Comunication - Important factor to the succesfuly management of veterinary practice

B. Sekovska, N. Danilovska, S. Risteska-Jovanovska, B. Shikoski

Veterinary medicine is a field that requires the most updated information and scientific technology for success in treating patients. However, it is also an art in which communication and effective listening are vital components necessary for effective care, especially because vets do not communicate with patients directly, but with their owners. Veterinarians treat a variety of animals, ranging from dogs and horses to cattle and iguanas. However, with every animal that practitioners treat, they must also communicate with the animal's owner and caregiver.

With the purpose to explore the role of communication in the veterinary profession, we performed structured surveys to the clients of university veterinary clinics during several months. In total, we collected more than 50 questionnaires during this time. The aim of this study was to investigate clients' perceptions of communication behaviors between the client and the veterinarian during the veterinary medical interview. The surveys,, in which small animal owners and veterinary clients participated, identified common communication behaviors used during the medical encounter and rated clients' level of satisfaction with various aspects of the medical interview.

Pets are increasingly being considered a part of the Macedonian family. People are willing to devote substantial financial resources to the care of their pets, which is why small animal private practice is the fastest growing sector of veterinary medicine. As client expectations rise, veterinarians are facing increased pressure to understand and enrich the client veterinarian relationship. This is especially important for the growing awareness that the major cause of client dissatisfaction is inadequate communication. Results showed various communication behaviors used during the encounters as well as various behaviors that clients prefer their veterinarian to employ.

Economics and social sciences in animal health education in republic of Macedonia - Yesterday, today, tomorrow

B. Sekovska, L. Pendovski

The faculty of veterinary medicine in Skopje exists from 1991. Social and economic sciences are an obligatory part of the curricula since the beginning. From its establishment till now, the educational program of the faculty has changed several times, including different types of curricula and all of them have had economic and social subjects.
In this paper we present the historical development of economics and social sciences in the curricula of the faculty of veterinary medicine in Skopje, Macedonia. We present the acceptance and reaction of the students, but also of the veterinary practitioners' and professors to this economics and social science in the curricula during these 25 years. In the paper we further present the faculty's plans and vision for the future with the purpose to disseminate and exchange positive experience with other lecturers. In the paper will be presented results from student's survey about their opinion regard different subjects and professor, interview with several members of veterinarian chamber and also the historical development of the curricula.

Are dairy farmer attitudes to animal welfare and their work tasks associated with the level of welfare experienced by their calves?

U. Emanuelson

There is no question that our attitudes and beliefs steer our choices and actions. However, when it comes to animal welfare there are different interpretations of the definition and what is believed to be promoting good welfare may not always be associated with increased welfare experienced by the animals. In this study the attitudes of 15 dairy farmers to animal welfare as well as their work-tasks will be identified through structured interviews. The results will be compared with welfare assessments of calves to study how perceived importance of animal welfare as well as preferred work tasks are reflected within the herd.

The structured interview, performed on the same day as the welfare assessment, includes questions about how the farmers define and rank the importance of animal welfare on farm productivity and their own wellbeing. It also covers preferred daily work-tasks and management related questions. The welfare assessment is performed according to a protocol based on the Welfare Quality project and includes resource based measures (like available space, type of pens, access to water and other resources) as well as animal-based observations. The animal-based observations include individual observations of behavior, health and parameters related to feed intake and pen hygiene from 20 to 30 calves from each farm. In addition to the welfare measures, hair cortisol from the individually assessed animals will be included to give a retrospective picture of the circulating cortisol and serve as a measure of differences in chronic stress between farms.

So far 11 farm visits with interviews and welfare assessments have been carried out and the remaining visits are planned before January 2017. The results will be analysed using multivariate methods, like Partial Least Squares Regression, taking the large number of explanatory variables as well as the multi-collinearity of the variables into account.

Modeling the impact of animal disease events on quantity exported

J. Thompson, D. Pendell, A. Hagerman, K. Johnson

Animal disease events can lead to disruptions in international trade. Importing countries may respond to a disease event by implementing trade restrictions for multiple reasons, including animal health and food safety concerns. These trade restrictions, if imposed, can vary in duration, products included in the restrictions, and level of restriction. It is possible to have a complete ban on a subset of commodity categories allowing for a change in composition of imported goods by the restricting country. For example, an importer may restrict fresh whole chicken but allow cooked chicken products. An analysis of trade at the commodity level may miss the nuances of importer trade decisions. Additionally, many of these restrictions are not immediately observable for every bilateral trading partnership nor is the trade restriction known by product category, a disaggregated commodity product level. While there can be changes during a disease event due to reductions in exporter supply, the total impact of a disease event by product category on quantity traded has not been estimated previously. Accounting for multilateral resistance between trading partners, an estimate of the impacts of highly pathogenic avian diseases on quantity traded will be estimated using a general gravity trade model on panel data of bilateral trade from 2004 to 2015 for 24 exporting countries and 12 product categories. This analysis will provide a deeper understanding of the effects of animal disease events on trading quantities, the differences in disease responses by product category, and the differences in response to various avian health events. Understanding these impacts can better prepare exporters for potential changes in trade quantity given a disease event.

Incorporating business continuity into future disease management plans: A case of U.S. HPAI event

J. Thompson, A. Hagerman, K. Johnson

Business continuity can lessen the economic burden of an animal health event by reducing business disruptions, provided that predefined biosecurity and risk-reducing practices are exercised. This allows continued flows of animal products throughout the supply chain, potentially reducing negative impacts to producers and eliminating potential product waste. While business continuity adoption may help reduce potential negative impacts, it may also affect the market for those products domestically and internationally. As long as markets are willing to accept the product moved from a Control Area or product restrictions are applied to specific regions, then business continuity can provide protection to the supply chain from some of the negative implications of a disease event. From December 2014 to June 2015 the United States experienced a highly pathogenic avian influenza (HPAI) disease event. The U.S. poultry industry and the U.S. Department of Agriculture applied proactive risk assessments to immediately provide business continuity throughout the supply chain for turkeys, egg layer birds, and bird products. Over the course of the outbreak, there were nearly 20,000 approved movements and 7,800 permits. A case study of the 2014-15 outbreak of HPAI in the United States will provide an in-depth look at how business continuity has be applied, improvement areas, and questions for future application. Exploring this case can provide context to understand the potential successes and opportunities of business continuity globally.

“Times they are a changing”: integration of epidemiological expertise into social science research for the evaluation of changes to EU legislation

S.C. Tongue, C. Corriea-Gomes, G. Bukowski

In June 2014, changes occurred to the legislation governing official controls in British pig slaughterhouses. These were instigated by EU Regulation that aims to reduce the risks to public health. Three areas of official controls were affected: traditional inspection was replaced by a more risk-based, visual assessment; the threshold for Salmonella testing and subsequent corrective action changed, as did the requirement for Trichinella testing. Ipsos MORI was commissioned to undertake an evaluation of the implementation of the legislative changes (Food Standards Agency: FS10112), part of which was to develop a framework to monitor the effects of the new policy.

A Theory of Change approach was used to define the pathways through which the new legislation would lead to a number of outcomes and impacts and whether these would occur in the immediate, medium or longer term.

Potential measures that could act as indicators to monitor outcomes and impacts associated with the new legislation were identified through desk research and SRUC epidemiological expertise. Knowledge of the industry and current systems was used to critically analyse the pros and cons of each one, in terms of data collection, management, analysis and interpretation. This was supplemented by semi-structured interviews with data managers and industry representatives.

Of the 31 measures identified, eight were shortlisted for recommendation based on two key criteria. First, whether they map to the TOC model, which highlights their relevance to the new legislation. Second, an overall assessment of suitability, derived from issues such as data availability, collection, quality and interpretation. Finally, a Red/Amber/Green rating was applied to assess the pros and cons of using each measure in a final Monitoring Framework.

This study demonstrates that integrating complementary topic and methodological expertise can provide the evidence which funders need to inform their increasingly complex decisions.

‘While shepherds watch their flocks’…: What do both they and their vets perceive ‘surveillance’ to be? An empirical study

E. Marier, S. Tongue, T. Floyd, A. Cook, J. Rushton, G. Gunn

The term ‘surveillance,’ when used in the context of the livestock industry, means different things to different people; differences that can lead to misunderstandings and potential conflict, especially when it comes to policy development and allocation of limited resources. The aim of this pilot study was to provide insights into sheep farmers and their veterinarians’ (vets) interpretation of this term, their perceived role and attitude towards surveillance.

In early 2012, 10 sheep farmers and 5 vets in 2 areas of England and 21 sheep farmers and 5 vets across Scotland were recruited into an exploratory, qualitative study. Face-to-face semi-structured interviews were conducted using a questionnaire that had minor modifications to make it appropriate to the interviewee (e.g. farmer, vet, Scottish terminology). The vets were purposively selected to be those who were involved with a significant sheep-farming clientele. The sheep farmers were identified as potential participants via their vets.

Farmers mostly defined ‘surveillance’ as a concept that revolved around awareness of the health and disease status of their own flock, while their vets had a wider view. However, both focussed on the monitoring aspect, rather than consequent action. The farmers’ view of their role and that of their vets was broadly consistent with the vets’ view of their own role and that of their farmers’. Farmers have a critical front line role in identification of problems and subsequent reporting, while vets should combine a wider awareness of what is going on elsewhere with investigation, as well as acting as a ‘go-between’ on the surveillance pathway. Responses from vets and farmers were more divergent when it came to their perspectives on how current monitoring is conducted and disease prioritisation. There were also differences between the two countries. Additional insights were obtained into the contributions that each strata might be prepared to make in future surveillance systems.

Influencing policy by defining the economic and social importance of working equids

T. Desalegn, M. Upjohn

Equids play an important role in the economy of Ethiopia at national and household levels. Limited information is available on their specific economic and social contributions. Lack of data contributes to under-recognition of their value by the government translating to lack of resources and adequate policy. For example, health care needs are not addressed, with equine welfare and medicine rarely included in veterinary education and equine-appropriate drugs rarely available. Animal welfare NGOs used to work in isolation, some had unskilled personnel while others' activities were ill-defined, inhibiting a coordinated approach.

Two studies used Focus group discussion, semi-structured interview and proportional piling techniques to generate household and community level information.

The first, in 2011, used the sustainable livelihoods framework. In the SNNPR study area households generated 14% of their income from equids. Economic benefits of owning an equid were much greater than associated costs. Equids had recreational and social values.

The second, ""Voices from Women"", in 2014 identified 3 areas where working equids support women: 1) income-generating activities; 2) a social role, raising their status and enabling contribution to their community; 3) significant reduction of women's household chores.

These reports were used in a coordinated approach with other animal welfare NGOs, which was influential in the following changes:

1. Establishment of a separate livestock ministry
2. Increased allocation of resource and budget for equine welfare and health
3. Draft animal welfare proclamation and legislation formulated
4. Draft regional animal welfare policy drafted by IGAD

Review of these studies informs future work. Sampling must be representative to ensure results are relevant. Collaboration between NGOs, research centres and especially government stakeholders is essential during research. The current priority is to quantify national-level economic contribution.

Ensuring that national level studies to quantify equine economic contributions achieve traction with policy makers and the development sector

M. Upjohn, P. Compston, D. Valette

Working equids (horses, donkeys and mules) operate in urban and rural settings as domestic and commercial traction animals, supporting the livelihoods of millions and facilitating food, industrial and commercial value chains. Brooke is an international animal welfare organisation operating in low-income countries in Asia, Africa and Central America. We work with national and international policy makers and influencers to improve awareness and understanding of working equids' roles in human development in order to increase their recognition in policy and programming. We use qualitative and quantitative evidence to support our advocacy. Sustainable Livelihoods Framework-based work has quantified household costs and benefits of equine ownership to inform discussion about equids' value to families' livelihood strategies. Qualitative studies of individual women describing working equids' role in their lives have facilitated gender-based agenda engagement. Household Economy Approach-based work has quantified absolute monetary and proportional contributions of equids at household level and enabled comparison of equids' household contributions with those of other livestock. Policy makers are demonstrating an increased interest in engaging on the issue nationally and globally. Quantification of livestock contribution is based on market value of meat, milk and hide. Whilst working equids' fee generation is clear, quantifying draught power outputs, indirect food production by other species, facilitation of unpaid domestic chores and social benefits at national level is more challenging. They must be incorporated within national data collection frameworks and compliant with international standards for GDP calculation. Development of a sufficiently robust methodology in collaboration with national and international stakeholders is required to enable integration and comparison of data with other sectors whilst taking account of the specific nature of working equids' roles.

The role of veterinarians in integration processes around zoonotic diseases in Southern Ghana

S. Valeix

Field veterinarians are the first actors on the ground to detect, prevent and control zoonotic diseases, which makes them important actors for making policy integration concepts, like One Health, a reality. However, there is a gap in the literature on public health integration as envisioned through a social-professional lens.

By examining the role of a profession such as veterinarian towards integration processes, this work argues that current theoretical approaches around One Health application in developing countries have significant limitations. I here present a novel conceptual framework viewing One Health as a social process, in which professional local contexts are given a significant attention for shaping scientific knowledge, policy and action.

This on-going study is informed by a seven-month ethnography of Ghanaian public vets operating at different levels, from local to international. I carried out participant observations, interviews and a network survey to explore how veterinary perspectives, relationships, and practices shape the role of vets for enhancing integration around zoonosis management.

This work shows how disentangling the complexity associated with professional roles for integration processes raises questions around One Health implementation in resource-limited settings like Ghana.

Estimating the economic value of automatic lameness detection systems in dairy cattle

T.C. Van De Gucht, L. Lauwers, J. Van Meensel, W. Saeys, J. Vangeyte, A. Van Nuffel

Lameness in dairy cattle is an important health problem entailing significant economic losses and a serious deterioration of animal welfare. Current dairy research focusses on the development of automatic lameness detection systems in order to detect and treat lameness in an early stage. This should reduce the economic losses and improve animal welfare. However, little is known about the impact of early detection and treatment on farm profitability. This may impede the adoption of the technology in practice. In this study, the economic value of automatic lameness detection systems is estimated and the factors contributing most to this value are identified. A conceptual framework was constructed to link technical and economic aspects of automatic lameness detection. Several knowledge gaps were identified: the effect of early treatment on the losses caused by lameness, the link between system detection performance and lameness prevalence, the evolution of lameness prevalence in time and the effects of lameness on various factors determining farm profitability. A simplified version of the conceptual framework was used to construct a quantitative framework for estimating the economic value. Assumptions were made to cope with missing links, and data were found in literature. Using a simulation model for estimating economic value, sensitivity analysis was performed to determine which factors were significantly influencing the economic value. The price of the detection system, the on-farm lameness prevalence and the system performance greatly influenced its economic value. Also, the herd size, the level of avoided economic losses and the life span of the system influenced the economic value. To conclude, further research should focus on improving the performance of automatic lameness detection systems, lowering their purchase price and clarifying the effect of early treatment on losses caused by lameness.

Cost efficiency of milk production and animal welfare on dairy farms: trade-offs or win-wins?

J. Bijttebier, S. de Graaf, J. Van Meensel, F.A.M. Tuyttens, W. Verbeke, L. Lauwers

This study investigates the relationship between animal welfare and cost efficiency on dairy farms in Flanders, Belgium. Both animal welfare and cost efficiency were approached as integrated scores before analysing the relationship between its component parts. A sample of 263 farms was used to estimate farm specific cost efficiency with data envelopment analysis (DEA). On 41 of these farms, animal welfare was assessed with the Welfare Quality® (WQ) protocol and an Alternative Welfare Index. Average efficiency scores were 0.66, 0.87, and 0.57 for technical, cost allocative, and cost efficiency, respectively. Correlation analysis revealed a negative correlation between technical and cost allocative efficiency. Technically efficient farms used proportionally more concentrates compared to roughage, whereas cost allocative efficient farms used proportionally less concentrates compared to roughage. Efficiency scores did not differ between farms that were categorized as 'enhanced' (n=10) and those categorized as 'acceptable'(n=31) in terms of animal welfare according to the WQ protocol, and none of the efficiency scores was correlated with the Alternative Welfare Index. However, efficiency scores were correlated with single welfare measures. Farms with higher technical efficiency scores showed a lower prevalence of mastitis (R = -0.344), but higher prevalence of hairless patches (R= 0.318).On cost allocative efficient farms, more cows were lying outside the lying area (R = 0.311), and these farms tended to have a higher prevalence of cows with dirty flanks and upper legs (R= 0.305; P<0.1). Finally, cost efficiency and absence of lesions in the dairy herd were positively correlated. Our results indicate that pursuing both cost efficient milk production and improved levels of animal welfare is feasible, but achieving one goal does not necessarily imply coming forward to the other goal.

Re-reconceptualising the "behavioral approach" in agricultural studies: Beyond a cognitive socio-psychological perspective

F. Vande Velde, J. Charlier, V. Cauberghe, L. Hudders, E. Claerebout

Burton's reconceptualization of farmers' behavior (2004) was revolutionary in a way that our view on farmers grew from a solely rational decision-maker, into a more humane individual with motivations and normative beliefs (Burton, 2004). This came to mind when considering the proposed themes for the upcoming ISESSAH-meeting: where do we come from – where do we stand now – where should we go. Burton (2004) provided us with a solid answer regarding the first two questions. We come from studying farmers as rational individuals, focussed on economic losses and gains, an over-simplistic view of the attitude-behavior relationship. We evolved in studying farmers' behavior and decision-making from a more complex point of view: the socio-psychological perspective guided by intrinsic values, beliefs, norms, motivations, etc. derived from different behavioral models such as the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the Theory of Planned Behavior (Ajzen, 1991), and the Health Belief Model (Rozenstock, 1974). This is where we stand now, but one can ask oneself if there is more to behavior than solely intention. Although the cognitive socio-psychological perspective in farmers' behavioral studies served us with valuable information for more than 10 years, now is the time to re-evaluate and reconceptualise this approach. Behavior is not static and cannot be measured by only a few concepts. Therefore, this study aims to build a framework by integrating concepts beyond behavior intention. The framework will consist of different theories and approaches, such as ecological models putting farmers' behavior in micro and macro perspective, dual-processing models integrating unconscious paths in the behavior, action and stages models which consider the behavior process to be active and in constant change. With this study we hope to provide new insights in farmers' behavior and present a more dynamic and new view of behavior in preventive veterinary medicine.

Capacity of the EU-wide economic policy-support models to incorporate animal health and welfare

B. Vosough Ahmadi

A number of economic models have been developed and used as economic policy assessment tools at national and EU levels. Particularly CAPRI and IFM-CAP modes have been developed and being used by the European Commission for analysing the economic and environmental impacts of policies and in particular CAP reforms. Because various livestock activities such as keeping and rearing adult and youngstock animals, feeding, grazing and trade of animals and their products are major components of these models, one could expect these models, if informed or combined with specific epidemiological models, could be used to assess the impact of policies that are targeted at improving animal health and welfare. In addition they could be utilised to assess the impact of possible outbreaks of contagious animal diseases reflected as price, supply and demand shocks in member states. The aim of this paper is to describe the capacity of these models in providing insights in relation to animal health and welfare policies and regulations at national and EU levels. It also provides a set of recommendations for future collaborative research between agricultural economists and veterinary epidemiologists that will utilise these economic models along with epidemiological models.

The economic value of milk biomarkers: case-study of two biomarkers to detect subacute ruminal acidosis in dairy cows

C. Rojo Gimeno, V. Fievez, E. Wauters

Regardless many claims about their benefits and profitability, the economic value of the information (VOI) provided by precision monitoring systems (PMS) for animal health has been neglected by both developers and analysts. Our study, we propose a method to estimate the value of PMS prior to their implementation and we investigate which characteristics mostly affect the economic value of such systems. We used a case study of two milk biomarkers to monitor subacute ruminal acidosis (SARA) in dairy cows, the fat to protein ratio (FPR) and the fatty acid profile (FAP), which is not yet commercial but has a better accuracy. Economic value is conceptualized as the difference between the economic performance of a production system that uses the PMS and that does not. A stochastic decision tree economic simulation model was applied to a typical Belgian dairy farm. The model uses data on the disease costs, treatment costs, and prevalence of SARA and on the accuracy characteristics of both biomarkers. Disease and treatments costs as well as prevalence, were inserted as a stochastic distribution to reflect uncertainty and variability. Not monitoring was a better decision than monitoring with the FAP with a 69% probability, while monitoring with the FPR always performed worst. Elasticity analyses revealed an inverse U-shaped relationship between prevalence and economic value and that the FAP's economic value increases with increasing disease costs and with decreasing treatment costs. The economic value reacted differently to improvements in specificity or sensitivity. Precision monitoring tools only provide a value in specific situations regarding prevalence, test accuracy and disease and treatment costs. In order to avoid a suboptimal use of resources and to focus the development of PMS for those situations and problems where they can provide value, their economic impact should be analyzed prior to their development and commercialization.

Perception of diseases and biosecurity implementation among Ugandan cattle farmers

S. Sternberg-Lewerin

Uganda has a mainly rural population and about 25% of households keep at least one bovine animal. Infectious diseases are a constraint to animal production, economic development, food security and safety, as well as a zoonotic risk. There is limited access to veterinary services. Focus is on treatment and control of outbreaks rather than disease prevention.

The aim of this study was to assess farmers' perception of diseases in their cattle and their willingness to implement basic biosecurity measures.

The study area was in western Uganda. A purposive sample of 10 focus groups (FG) was made, each of 6-8 cattle farmers with similar herd sizes. FGs were not in the same or adjacent villages.

One of the District Veterinary Officers in the area with previous experience from FGs acted as facilitator of each FG according to a discussion guide. A local veterinary officer/assistant noted participants' non-vocal actions, as well as key points of the discussion. He also filled out a checklist for evaluation of the facilitator. A local government officer performed simultaneous, voice-recorded, interpretation to English during the FGs, without interrupting the discussion. The interpreter focused on conveying the contextual meaning.

Recordings were transcribed and compared to the note-takers' notes. Concepts and sub-categories were identified inductively from 4 transcripts. All transcripts were coded accordingly. Coded data were summarised in matrices for each concept. Next, thematic analysis will be performed to interpret and explain the data.

The results will provide a, currently lacking, understanding of Ugandan farmers' perception of the disease situation and their willingness to implement biosecurity. This will be useful for disease control and prevention, also in other similar settings, as farmer behaviour and the local context are vital.

The study identified some important challenges, mainly related to cultural aspects and language, e.g. the meaning of prevention.

Preliminary results of a pilot study on farmers' opinions about paratuberculosis control programs in Saxony and Thuringia

R. Pützschel, V. Zoche-Golob, K. Donat

In 2003, the German federal states Saxony and Thuringia established voluntary programs to control Paratuberculosis. By participating, the farmers sign on implementing measures to reduce the spread of Mycobacterium avium subsp. paratuberculosis within their herds and on regular tests of their animals. In a pilot study, the use of surveys for the evaluation of animal health programs should be tested. The specific objective of the study was to gain insight into the participants' opinions about Paratuberculosis control programs. From November 2013 to July 2015, questionnaires were distributed among the cattle farmers who attended meetings organized by the agricultural or veterinary authorities and organisations in Saxony and Thuringia.

The questionnaire consisted of four sections: information about the herd and the farmer (1), the farmer's opinion about Paratuberculosis (2), and the farmer's motivation to participate (3) and not to participate (4) in a control program. The participants could only chose from predefined answers to all questions. A hierarchical cluster analysis was conducted to identify groups of farmers with similar positions on Paratuberculosis control programs.

About 30% of the distributed questionnaires were returned. However, the sample of 225 farmers was not representative for cattle farmers in Saxony and Thuringia with large farms being overrepresented. Two groups of participants were identified. Farmers of the first group regarded Paratuberculosis as a thread and generally supported a control program. Farmers of the second group considered Paratuberculosis only a possible image problem of cattle farming and thought of control programs as not important.

The interpretation of the study results is not completed yet. Particularly, further discussion of the usefulness of the survey to evaluate the Paratuberculosis control programs is necessary.