

Animal Health and Greenhouse Gas Emissions Intensity Network Inaugural Workshop

Dublin Castle Conference Centre, Dublin, Ireland

25th March 2014

This workshop was undertaken by participants of the Animal Health & GHG Emissions Intensity Network to support the objectives of the Global Research Alliance on Agricultural Greenhouse Gases. The information contained within should not be taken to represent the views of the Alliance as a whole or its Partners.

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EXECUTIVE SUMMARY

The Animal Health and Greenhouse Gas Emissions Intensity Network (referred to as “the Network” hereafter) is a United Kingdom (UK) led initiative of the Global Research Alliance (GRA) on Agricultural Greenhouse Gases which brings together researchers to investigate links and synergies between efforts to reduce livestock disease and GHG emissions intensity reductions. The first workshop of the Network was held in Dublin, Ireland, prior to the Society for Veterinary Epidemiology and Preventive Medicine (SVEPM) Conference on the 25th March 2014.

The Network workshop brought together researchers in relevant fields to exchange information on current studies via presentations and posters, to discuss the potential for animal health interventions to contribute to GHG emission intensity reductions, and to look at the role of the Network in addressing these issues. The workshop was attended by 21 participants representing six GRA member countries and one non-GRA country.

A background to the development of the Network was presented as well as information on the GRA and relevant global initiatives; the Agriculture, Food Security and Climate Change Joint Programming Initiative (FACCE-JPI) and the Global Strategic Alliances for the Co-ordination of Research on Major Infectious Diseases of Animals and Zoonosis (STAR-IDAZ). Technical presentations were given by delegates from Scotland’s Rural College (SRUC), the International Livestock Research Institute (ILRI), ADAS UK Ltd, and the Food and Agriculture Organisation of the United Nations (FAO).

The discussion sessions identified that increased GHG emissions intensity through animal disease is a global problem but regional differences in livestock systems and mitigation potential need to be considered. The workshop identified that other factors than animal health need to be taken into account when looking at GHG emissions intensity. Key Network objectives were defined and include integrating with FAO and FACCE-JPI, linking up where necessary with other GRA networks, and working towards improving accuracy and availability of data. Participants discussed that the greatest benefit of the Network will be seen in developing countries. The spheres of influence to the Network, potential funding sources and an initial work area were identified.

This report is a summary of key discussions, action points and outcomes from the workshop.

LIST OF ABBREVIATIONS

AHVLA	Animal Health Veterinary Laboratories Agency
ASGGN	Animal Selection Genetics and Genomics Network
CCAFS	The CGIAR research programme on Climate Change, Agriculture and Food Security
CGIAR	Consultative Group on International Agricultural Research
CRP's	CGIAR Research Programmes
Defra	UK Government Department for Environment, Food and Rural Affairs
FACCE-JPI	Joint Programming Initiative on Agriculture, Food Security and Climate Change
FAO	Food and Agriculture Organisation of the United Nations
FONTAGRO	The regional fund for agricultural technology
GA	Global Agenda for Sustainable Livestock
GHG	Greenhouse Gas
GLEAM	Global Livestock Environmental Assessment Model
GRA	Global Research Alliance on Agricultural Greenhouse gases
ICAR	International Committee on Animal Recording
ILRI	International Livestock Research Institute
INIFAP	National Institute of Research in Forestry, Agriculture and Livestock
LCA	Life Cycle Analysis
LRG	Livestock Research Group
MBT	Mapping the benefits
SAI	Sustainable Agriculture Initiative
SRUC	Scotland's Rural College
STAR-IDAZ	Global Strategic Alliances for the Coordination of Research on the Major Infectious Diseases of Animals and Zoonoses
SVEPM	Society for Veterinary Epidemiology and Preventative Medicine
UK	United Kingdom

1 NETWORK BACKGROUND

The Animal Health and Greenhouse Gas (GHG) Emissions Intensity Network (referred to as “the Network” hereafter) is a United Kingdom (UK) led initiative of the Livestock Research Group (LRG) of the Global Research Alliance (GRA) on Agricultural Greenhouse Gases.

The Network was proposed as there is a broad consensus amongst experts and stakeholders that the GHG emissions intensity from livestock farming can be reduced through efficiency and production gains resulting from improved livestock health. The aim of the Network is to bring together scientists and researchers from relevant research disciplines across the world to investigate links and synergies between efforts to reduce livestock disease and GHG emissions intensity reductions. This offers multiple win-win opportunities across a diversity of countries and the GRA provides an excellent platform for researchers to engage with one another. There are significant bodies of current research in work areas relevant to the Network and therefore a real opportunity for interested researchers to collaborate and for research funders to co-ordinate their efforts.

The Network will maintain and enhance capacity in the cross-cutting field of animal health and GHG research, facilitate interaction of practitioners, and encourage sharing of information on current and planned activities, so as to avoid duplication of effort, identify evidence gaps and help focus and prioritise research efforts. The work of the Network has the potential to provide real benefits to farmer livelihoods and food security.

Further information on the background to the Network, its objectives, value and evidence gaps is provided in the Network proposal which can be viewed at <http://www.globalresearchalliance.org/research/livestock/activities/networks-and-databases/#AnimalHealth>.

2 SUMMARY AND OUTCOMES OF THE FIRST NETWORK WORKSHOP

2.1 General overview

The first Network workshop was held on the 25th March 2014 at Dublin Castle, Ireland in the margins of the Society for Veterinary Epidemiology and Preventive Medicine (SVEPM) conference (www.svepm.org.uk). This international workshop brought together researchers in animal health, veterinary science, GHG research and other relevant fields. The workshop was attended by 21 participants from six GRA member countries: the Netherlands, Vietnam, France, Mexico, Ireland and the United Kingdom and from non-GRA country Kenya (see Appendix 1 for the list of participants). The workshop agenda is provided in Appendix 2.

The workshop was chaired by the Lead Network Co-ordinator John Tayleur of the UK Government Department for Environment, Food and Rural Affairs (Defra) with support from Joint Network Co-ordinator, Tim Robinson of the International Livestock Research Institute (ILRI). The discussion sessions were facilitated by Professor Brian Perry (Independent Consultant).

The workshop achieved the following outcomes:

- Introduction to the Network.

- Subject relevant presentations by representatives from ILRI, the Food and Agriculture Organisation of the United Nations (FAO), Scotland's Rural College (SRUC), ADAS UK Ltd and the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI).
- Panel discussion to address the question of whether animal health improvements will have a significant impact on reducing GHG emissions intensities.
- Agreement on Network statements and specific Network objectives.
- Identification of an initial work area.
- Exploration of funding sources, particularly for enabling participation and promotion.

The Network workshop provided an excellent opportunity for delegates to get to know one another and to learn about the variety of research taking place in this field.

2.2 Overview of Presentations

2.2.1 Introduction to the Global Research Alliance on Agricultural Greenhouse Gases

John Tayleur (Defra) presented an introduction to the GRA on behalf of Martin Scholten and Harry Clark (co-chairs of the LRG). The GRA was initiated in 2009 and now has 40 member countries. It aims to increase agricultural production without increasing GHG emissions intensity, to improve global cooperation in research, and to work with farmers and partners to provide knowledge.

This is achieved through stocktakes and inventories, capacity development, and technical information and knowledge sharing in order to ensure common understanding. The GRA encourages and supports concerted actions such as developing networks and databases, research collaboration, policy support, and links to international activities. The GRA consists of three research groups; the LRG, Croplands Research Group and Paddy Rice Research Group and two cross-cutting groups on Inventory and Measurement and Soil Carbon and Nitrogen Cycling. Within the LRG there is a number of Networks, which focus on feed and nutrition, rumen microbial genomics, grassland research, manure management, and animal selection, genetics and genomics (ASGGN), along with the Animal Health and GHG emissions intensity Network.

There are many partner organisations of the GRA including the Global Agenda for Sustainable Livestock (GA), FAO, Sustainable Agriculture Initiative (SAI) Platform, African Development Bank, ILRI, FONTAGRO (an Alliance of Latin American and Caribbean countries that supports research and innovation in Agriculture), World Farmers Organisation, FACCE-JPI and the European Commission.

A number of common challenges are faced across the GRA including 'resourcing the ambition', resourcing the function of the research groups, increasing commitment from existing members, expanding membership, and mobilising partners to support scaling up activities.

Further information on the GRA is available at www.globalresearchalliance.org.

2.2.2 Introduction to the Animal Health and GHG Emissions Intensity Network – John Tayleur (Defra)

Animal health improvements are expected to reduce GHG emissions intensity (emissions per unit of product) and there is significant synergy between improving food security and reducing GHG emissions intensities, particularly in developing countries. Multiple win-wins then derive in terms of poverty alleviation.

John Tayleur (Defra) provided a background to the development of the Network. The activity on animal health status and GHG emissions intensity was first proposed by the GRA in November 2011,

with the UK invited to lead. A scoping workshop was held in June 2012 and the proposal for the formal creation of a Network was approved by the LRG in November 2012. The Network Secretariat was then commissioned in June 2013. Initial invitations for participants to join the Network were sent in September 2013 and participation has been increasing since then. Tim Robinson (ILRI) agreed to become a Joint Network Co-ordinator for the Network in November 2013.

Details of Defra-funded work relevant to the Network were presented. Defra has funded a study to model the impact of controlling endemic diseases of cattle productivity in the UK, estimating their impact on performance and therefore on GHG emissions intensity. This involved a life cycle analysis (LCA) that focused on 10 endemic cattle diseases in the UK to provide estimates of GHG abatement. John Elliott (ADAS UK Ltd) presented the details of the project at the workshop. Building upon the results from this study, Defra also commissioned a review of literature on global GHG abatement potential from health interventions in the livestock sector. The review of academic and grey literature aimed to identify the regions where there is the greatest scope to reduce GHG emissions. The review, which highlights emerging work, has been submitted for journal publication and provides an important step in progressing the Network.

The Defra-funded Network Secretariat acts as the central point of contact for the Network providing the communication and co-ordination hub. The function includes promoting the Network nationally and internationally, organising Network workshops and dealing with Network communications. The UK Agri-Science and Innovation Newsletter, which communicates UK activities supporting international actions to mitigate agricultural GHG emissions, is used to provide updates on the Network and can be accessed at <http://www.globalresearchalliance.org/updates/2013/uk-agri-science-innovation-newsletter/>.

2.2.3 Introduction to the Global Strategic Alliances for the Co-ordination of Research on Major Infectious Diseases of Animals and Zoonosis (STAR-IDAZ) – John Tayleur, Defra (on behalf of Alex Morrow, Defra, UK)

STAR-IDAZ is a global initiative to address the co-ordination of research programmes at international level in the area of animal health, particularly infectious animal diseases including zoonoses. STAR-IDAZ is an important partner to the Network and funded some attendees to participate in this first Network workshop.

STAR-IDAZ aims to “strengthen the linkages between and reduce the duplication of global research effort on high priority infectious diseases of animals (including zoonosis), maximise the efficient use of expertise and resources and accelerate co-ordinated development of control methods”. STAR-IDAZ has 24 partners in 18 countries and work includes sharing information on existing research programmes, facilitating networking and ongoing activities on major issues, and developing strategic transnational animal health research agendas. STAR-IDAZ activities include the analysis of and responding to global, regional and industry sector priorities. It has established regional networks namely the America Regional Network, Asian and Austral-Asia Regional Network, European Regional Network, and African Network.

2.2.4 Animal Health and GHG Research – Tim Robinson, ILRI

Tim Robinson focused on the background and drivers for change in livestock production and the consequences for animal health, to give context for the discussion sessions of the workshop. There are many drivers for change in the livestock sector, mostly associated with increasing demand from the growing economies. Changes in the livestock sector impinge upon global public goods and

therefore an integrated approach to socially desirable livestock sector development is required, based upon reliable data and information to guide sector development.

Tim Robinson drew upon a number of relevant FAO publications which identified that livestock provide livelihoods for 800 million poor small-holders providing valuable calories, protein and micronutrients. A global assessment of emissions and mitigation options has reported tighter emission estimates and discusses mitigation options associated with the global livestock sector. This publication showed huge variation in livestock emissions in different regions. The regional variations are important and should be taken into account when designing mitigation strategies, along with considering that livestock in different parts of the world have multiple roles beyond protein production.

Livestock productivity in much of the developing world is inefficient, and livestock management, breeds, animal health and nutrition all contribute to the yield gap in the developing world. It is important to quantify their relative contributions, and the possible complex interactions among these, in order to identify opportunities for animal health based contributions to closing this gap. The largest knowledge gap is thought to be in relation to the impacts of animal health constraints on productivity measures (and thus on GHG emissions intensities) in developing countries, therefore accurate collection of relevant data is needed in order to understand the animal health contribution to productivity gaps and the levels to which interventions can realistically contribute to reducing these.

Studies that have shown links between animal disease and productivity and emissions intensity were identified. One study has shown that mastitis led to milk yield losses and another showed that there is a strong link between cow fertility and GHG emissions intensity.

Tim Robinson then presented details of two complementary research approaches a) LCA of GHG emissions from livestock; and, b) Mapping the Benefits (MTB) of disease interventions. Tim Robinson described an analytical framework that combines these approaches to achieve outputs of: production amount, value of production, herd growth, and GHG emissions. This analytic framework has been applied to African animal trypanosomosis in East Africa (this was presented in detail by Michael MacLeod during the workshop).

There is a need to understand the drivers for smallholders and whether the market incentives are available to make productivity their primary objective. The ruminant sector is the area with the greatest scope for improvement, however it is important to understand the drivers for change.

Areas for future consideration are:

- Estimating the burden of disease to livestock production;
- Accounting for GHG emissions from animal health interventions;
- Accounting for diverse (livelihoods) objectives and;
- Developing generic tools that will allow comparisons of animal health and other 'interventions' to estimate their environmental impact at multiple scales (farm-level up to global analysis).

A key point raised during the question session was that the GRA aim's is to keep research broad, therefore there is much value in undertaking research into GHG emissions mitigation at a systems level, as opposed to focusing disease by disease, in order to provide international strategic relevance. The systems approach was thought to be particularly relevant for developing countries, where many

factors contribute to yield gaps in livestock production and where livestock have so many diverse functions.

2.2.5 The Global Livestock Environment Assessment Model (GLEAM) – Pierre Gerber, FAO

The FAO work on GHG emissions in the livestock sector was presented by Pierre Gerber (FAO). The goal of this FAO work is to identify low emission pathways for the livestock sector with specific objectives of producing disaggregated assessments of global GHG emissions and related mitigation potential, carrying out economic analysis of mitigation costs and benefits, and engaging in multi-stakeholder initiatives on methods and practice change.

The FAO and partners have developed the Global Livestock Environment Assessment Model (GLEAM) which looks at livestock systems worldwide to compute emissions at a local level. It is an LCA based model that allows for a systems approach looking at the whole production chain allowing users to avoid ‘pollution swapping’ when making recommendations. The model is currently being used to quantify GHG emissions, however it will be further developed to investigate other livestock-environment interactions (such as land use, nutrients and water). The model currently does not have information on livestock feed worldwide and within developing countries estimates are made based upon land availability. It is thought that the model will be used by researchers, organisations providing advice, and non-governmental organisations. The model could be used at country level if appropriate data were available.

Recent FAO publications have estimated global emissions intensities which can then be used within GLEAM to explore mitigation measures. The main strategies for emission intensity reductions were identified in the presentation and included grazing management at the production unit level for ruminants and feed balancing at the animal level for monogastrics.

Further developments for the model will be made through updating the livestock database to 2010, in collaboration with ILRI; improving linkages between feed quality/availability and productivity; improving feed and manure modules; and expanding the range of environmental issues included (nutrients, biodiversity, water).

The FAO will be collaborating with the GRA in order to refine and assess the mitigation measures through an improved understanding of mitigation options and identifying the potential in the livestock sector on a regional to global scale. This will be achieved through combining the resources of FAO (GLEAM) and the GRA (expertise) and focusing the design of packages of mitigation techniques that are appropriate for given conditions (farming system and climatic zones, for example). A dedicated member of staff from the FAO Animal Production and Health Division will be in place to drive the project forward, along with support from a number of countries.

GLEAM is relevant to the Network as (provided the data is available) the model can handle the effects of changes in mortality and fertility on herd structure and related emissions, emissions related to lost productivity (including feed use efficiency losses), and emissions related to lost production. Indeed, this link is currently being exploited in a collaborative piece of work under the auspices of the Network to link the production impacts of controlling trypanosomosis in cattle in East Africa, with the GHG emission intensity impacts taken from GLEAM. The FAO currently has links with AnimalChange (an EU initiative to integrate mitigation and adaptation options for sustainable livestock production under climate change), the Global Agenda for Sustainable Livestock, and the Livestock Environment Assessment and Performance (LEAP) Partnership.

2.2.6 Modelling the Impact of Controlling Endemic Cattle Diseases – John Elliott, ADAS UK Ltd

The aim of this study, Defra project AC0120, was to understand whether GHG emissions can be reduced in the national cattle sector in a cost-effective way, by implementing measures to control endemic diseases or conditions. The project was an interdisciplinary study, which brought together a number of fields (veterinary science, animal production and modellers, for example) to explore possible mitigation measures achievable through disease control interventions, and linking these to economic analysis through marginal abatement cost curves (MACC).

The key findings of the project were that:

- The work provides a ‘proof of concept’ that interventions intended to improve cattle health can be modelled to quantify GHG abatement in terms of scale and cost-effectiveness.
- A large number of treatments are cost-effective for farmers, especially in the dairy sector, but uptake is poor so action is needed to inform and prompt change.
- Efficiency gains are likely to lead to increased production but price effects are small. A key factor is land use change where land is released from livestock production.
- The opportunity for GHG abatement identified in this UK study could potentially be multiplied many times over if applied to cattle and other livestock globally.

Whilst the study focused on an intensive livestock system with good levels of disease control within the UK, the scope for abatement in developing countries is potentially much greater and should be explored further.

This was a complex study with a number of assumptions; including the consideration of diseases individually whereas in practice they exist in combination and interact in complex ways. A further caveat was that land use change impacts were outside the scope of the model. The validity of the assumptions could not be checked within the scope of the project and it was recommended to follow up the project with a more detailed look into one or two diseases to explore a variety of different control approaches.

A discussion topic was raised regarding the importance of understanding the best methods for working with models based upon uncertain estimates of abatement results.

2.2.7 Quantifying the GHG mitigation effect of intervening against bovine trypanosomosis in Eastern Africa – Michael MacLeod, SRUC

This project aims to quantify the GHG mitigation effect of intervening against tsetse and trypanosomosis in Eastern Africa and is a collaboration between SRUC, ILRI, University of Oxford and AP Consultants.

Livestock are estimated to contribute 14.5% of the total anthropogenic GHG emissions and there is expected to be an increase in demand for livestock derived products. Consequently it is important to meet that demand without facing a proportionate increase in emissions. Improving animal health may be one way of achieving that aim. The project is using an Excel version of GLEAM to compare emissions from 12 production systems, with and without trypanosomosis.

The results have shown that the main sources of emissions are enteric methane and nitrous oxide arising from the deposition of organic nitrogen on pasture (either directly via the urine of grazing animals, or via the spreading of the collected manure of housed cattle). Higher yielding, grazed dairy systems had much lower emissions intensity due to their higher productivity. Variation between the other systems was less marked and was largely driven by productivity. The results so far show a link

between improving productivity and decreasing emissions intensity. The greatest changes in emissions intensity in the four key systems that were addressed (pastoral, agro-pastoral low oxen, mixed medium oxen and mixed grade dairy) arise from changes to the productivity of individual animals and herd structure. The removal of trypanosomosis had secondary effects on the proportion of adult males used for work, the number of days oxen work, cow replacement rates, slaughter ages and offtake rates, and the rate of herd growth.

The project also looked at the change in cattle population density and emissions intensity and found that in areas where trypanosomosis was removed (in the model) there were large increases in animal numbers, through growth or animal movements. Emissions intensities resulting from additional draft power associated with healthier animals were also accounted for in the study.

The final tasks in the current project are to look at the total regional effect of removing trypanosomosis on production and emissions, comparing the costs of different interventions, and outlining implications for modelling disease and GHG relationships.

Jos Houdijk (SRUC) was unable to attend the workshop and so Michael MacLeod gave a brief overview of his research into animal health and GHG emissions, specifically the effect of gastrointestinal nematode parasites on methane emissions from ewes and lambs for which parasitism increased methane output by ~14% in ewes. This study provides useful experimental indications of what may be possible.

The question session explored why the benefits on low productivity systems were small. This is where the Network is hoping to see most benefits. One reason may be reduced death rate leading to more meat being produced so emissions per unit of protein don't increase significantly. There are great improvements in commercially oriented dairy systems but the question remains whether large improvement can be made in smaller enterprises.

2.2.8 Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) – Heather McKhann, FACCE-JPI Secretariat

The FACCE-JPI aims to address the interconnected challenges of sustainable agriculture, food security and the impacts of climate change. There are currently 21 participating countries along with European Commission observers.

A strategic research agenda was launched in December 2012. The agenda covers five core themes: sustainable food security under climate change; environmentally friendly growth and sustainable intensification of agriculture; assessing and reducing trade-offs: food production, biodiversity and ecosystem services; climate change adaptation; and GHG mitigation. The 2014-2015 implementation plan was launched in October 2013, with the objectives of aligning existing national research, co-funding research calls and exploring emerging topics such as animal health and GHG mitigation and food safety implications of climate change and climate variability. A workshop to explore this topic will be held in Madrid on the 21st May 2014 (see <https://www.faccejpi.com/Calendar/FACCE-JPI-workshop-on-Animal-Health-and-Disease-and-GHG-Mitigation>).

An important objective of the Animal Health and GHG Emissions Intensity Network is to avoid duplication of effort and to develop links with relevant initiatives and the FACCE-JPI identified that they are keen to work together with the Network and wider LRG in order to ensure best use of resources. Although the FACCE-JPI is focused on European research, it may be possible for the remit to open wider with input from the Network. The FACCE-JPI has appointed a member of the GRA to sit on their stakeholder advisory board.

2.3 Overview of Discussions

2.3.1 Panel discussion: Are animal health improvements going to have a significant impact on reducing GHG's emission intensities?

This session was facilitated by Brian Perry who drew upon the expertise of the panel, detailed below, as well as other workshop participants, to address the above question.

Panel: Johanne Ellis-Iversen (AHVLA, UK) – Epidemiologist within the UK Government.

Eileen Wall (SRUC, UK) – Genetics background, member of ASGGN.

John Goopy (ILRI, Kenya) – Livestock scientist specialising in GHGs in ruminants in Australia.

Pierre Gerber (FAO, Italy) – Key player for GLEAM in FAO.

Sergio Gomez Rosales (INIFAP, Mexico) – Interest in manure and waste to worth.

Brian Perry opened the workshop activity by setting guide topics for the discussion. What are the key issues and where are the real opportunities? How different are these between developed and developing countries? What are the trade-offs between improving productivity and reducing GHG's and who are the key players in research and development? A summary of the discussion is provided below.

The key outcomes were:

- The greatest benefits of the Network will be seen in developing countries, and it was acknowledged that the need to protect the health status of livestock in developed countries was an essential insurance policy.
- Consideration of all factors effecting emissions is required (feed, nutrition, health etc.)
- There are regional differences in livestock systems and GHG mitigation potential.
- The level of available data is low and therefore needs addressing.
- GHGs are a global problem calling for global solutions.

Regional perspectives

Within the UK, there is good collaboration between the cattle industry and the UK Government, with the latter taking more of a back seat but offering support to set up forums to discuss these issues. The UK Government concern is protecting public health, trade and animal welfare whilst responsibility over endemic diseases was largely seen to rest with the industry. The Government do however keep a close eye on exotic disease as this could have a large impact on the UK economy, for example the huge impact of Foot and Mouth disease, of which the overall GHG impact has never been investigated. Johanne Ellis-Iversen (AHVLA) sits on the industry cattle council and works with the climate change mitigation group within government. Johanne has a role in ensuring that the groups think along the same lines so that when research is commissioned it is beneficial to all sides. Livestock industries in the UK take a proactive interest in the reduction of GHG emissions. The initial interest and research was instigated by the Government, with a positive response from industry such as the development of sector specific Roadmaps. Livestock industries in the UK take an active role in reducing GHG emissions in response to market signals from the retail sector and other stakeholders.

In Mexico, although there are no mandatory targets to reduce GHG emissions, the national Government is committed to making reductions and include this as a condition to trade. This would be the main driver for the private sectors in Mexico to reduce GHG emissions. The practices in Australia were discussed with cattle and sheep producers' views being described as financially orientated with no economic penalties existing for high GHG emissions. Instead the country has a good level of product output and a rich supply of inputs, and so the intensification of livestock systems results in a greater quantity of product to export. Within Australia there is generally a good health status and it was discussed that a greater GHG emissions intensity impact would therefore be made by tackling disease levels and poor nutrition in less productive farming systems such as those found in Africa.

In developing regions, there is a difference between independent smallholders and corporations that have export market avenues. The smallholders are harder to reach whilst there is added value associated with access to wider markets and associated quality and standards. In Africa there are few vertically integrated livestock industries, due in part to limited export opportunities, which is related to the high disease burdens in many African livestock systems. Farmers Choice (Kenya) and Zambeef are examples of businesses that might see the added value and translate this to outgrowers to give incentives related to GHG's and animal disease.

The private sector is engaged and responsible in developed countries. The question of how the Network can be of interest to developing countries was discussed including the development of incentives to engage producers and private sector. The broader context for the Network needs to be considered here. Key high level drivers for the GRA, as well as the FACCE-JPI, are global food security and improving livelihoods. If we can improve livelihoods and productivity, the co-benefits will be to reduce negative impact on the environment including reducing GHG's and other diffuse pollutants. The GRA is actively trying to engage underrepresenting countries in the GRA by returning to that agenda. The LRG, a group focussed on research, is starting to bring in industry to wider discussions.

The inclusion of LCA and GHG emissions data on product labels was discussed with the consensus that this was unlikely to happen due to complexity of implementation. However the corporate social responsibility culture within large retailers and retailer policies ensure that measures are taken to reduce GHG emissions and farmers must meet these requirements.

Metrics and targets

Participants questioned whether appropriate metrics are currently being used for measurements and establishing systems improvements and whether the metric choice in relation to desired outputs or targets are being correctly defined. Taking a holistic, broad systems-based approach is important in order to capture the wider implications. It is important to set the right targets and include non-GHG impacts in the metrics as GHG emissions are only one part of the issue and are unlikely to be the only factor in decision making.

Eileen Wall (SRUC) described the International Committee on Animal Recording (ICAR) which aims to agree standards for animal recording.

Holistic approach to livestock disease management and GHG emissions accounting

In the context of the Network, genetics is a potential, longer term, solution. The role of genetics (within a balanced breeding goal) is part of holistic disease management alongside looking at ongoing treatments and cures particularly for endemic diseases such as lameness and mastitis, rather than infectious diseases (building up immunity). The example of work into trypanosomosis resistance in transgenic cows was given.

The full effects of health improvements may not be witnessed if the issue of nutrition is not addressed. Whilst it was concluded that health improvements or nutrition improvements should be seen within the systems approach, they could individually be taken as factors to focus on in the first instance. The importance of avoiding double counting was noted, for example the production gain seen after the removal of disease could be due to increased feed intake.

It was suggested that the Network could take a look at feasibility of interventions. Improving health could be a practical, economic way to make a difference compared to addressing some other productivity gap causes. This may be worth investigating although these factors cannot be treated in isolation. There are multi-faceted reasons for the productivity gap (health, food, feed, genetics, management etc.) among which there will be complex interactions and it was agreed that the contributions made by poor health need to be quantified.

The significance of increased feed intake as a part of addressing the productivity gap was discussed.

Data quality and availability

It is hard to obtain the necessary quality of data. For example, there are few data sets collected in Africa in relation to the enteric emissions from livestock and so mitigation measures are investigated with no baseline data for comparison.

2.3.2 Discussion session on the Network's role in addressing animal health and GHG emissions intensity issues, the Network objectives and the key work areas

The afternoon discussion was facilitated by Brian Perry who asked the group to consider what the Network's role is in addressing the issues raised in the Panel Discussion, the objectives that will address those issues and the potential funding sources.

The key outputs from the session included:

- Agreement on Network statements.
- Definition of spheres of influence for the Network.
- Listed initiatives and organisations relevant to the Network.
- Identification of potential funding sources.
- Identification of an initial work area to produce a scoping study.
- Identification of specific Network objectives.

Some specific Network objectives were:

- Integrate with FACCE-JPI and FAO.
- Be additive and collaborative to the Feed and Nutrition Network.
- Look into the potential for regional subgroups.
- Standardise modelling assumptions.
- Work towards improving the accuracy of data.

A summary of the discussion is provided below.

Network statements

The group agreed on two statements to inform the direction of the Network:

- *“Healthy animals have lower GHG emissions per unit of output”*; and
- *“By improving animal health we are reducing GHG emissions”*

Therefore an aim of the Network could be to work towards answering the question - *“How do we improve and protect animal health?”* and *“How does this differ regionally?”*

The Network is contributing to the role of sustainable animal health improvements in the reduction in GHG emissions.

Discussion on Network objectives and work areas

Globally the topic of animal health and GHGs is an important agenda, and the Network needs to ensure it works alongside other organisations (such as FAO) and other networks (such as STAR-IDAZ and FACCE-JPI) who are addressing similar issues in a complimentary way. Representatives from FAO and FACCE-JPI were present at the workshop.

The Network needs to be pragmatic. As it expands, there will be the possibility to set regional sub-groups as a “one size fits all” approach is not thought to be appropriate. It will be important to consider regional needs and strengths as the Network grows.

The threat of emerging diseases was considered to be an important research area for the Network. Emerging diseases can have a financial impact, cause a reduction in efficiency and have implications on GHG emissions intensity. In this context there are benefits associated with the Network taking a global perspective as the emerging diseases in Western countries are often from other parts of the world.

Modelling was a key theme within the presentations and it was discussed that the Network could become involved in standardising the assumptions underlying models. A definitive objective on this was not drawn, however it was decided that the Network would be useful for sharing ideas and techniques around modelling along with facilitating data collection and consolidation.

The possibility of altering inventory methods in order to improve the sensitivity of data was raised. The difficulty of making protocol changes was emphasised and this is likely to be seen as low priority.

A scoping study will be conducted to identify the research areas that will produce the biggest impact. The study will be taken forward by Tim Robinson (ILRI), using the outcomes from Project AC0120 (presented by John Elliott) and literature review commissioned by Defra as a starting point. It was thought that other LRG research networks, such as ASGGN, may want to feed in ideas.

Hung Pham (Vietnam) suggested that training courses on animal health and GHG emissions should be held to improve technical knowledge of researchers, particularly in developing countries. It was recommended that the experts from the Network visit developing countries to identify real situations and suggest ways to address the problems.

The Network needs to build upon the knowledge that healthier animals have lower emissions.

Member countries are encouraged to start activities, independently or cooperatively, to advance these areas of work before the next Network workshop.

Spheres of influence

The Network is one of many research networks set up under the GRA and LRG. Although the main remit for the Network is research, there is an aim to engage with development aid government departments and agencies to ensure the recommended research can be taken forward and communicated. The Network could engage with numerous organisations suggested by workshop participants (Appendix 3). The organisations fall into the spheres of influence shown in Figure 1.

The discussions identified that the Network needs to raise international awareness of animal health, resource efficiency and GHG's. The GRA Secretariat may be able to advise on and assist in achieving this.



Figure 1 Spheres of Influence

Funding options

In order to meet the objectives of the Network, funding (additional to that already contributed by Defra) will be required. Ideas for funding sources were discussed, with STAR-IDA, the CGIAR research programmes (CRPs) on Climate Change, Agriculture and Food Security (CCAFS) and Livestock and Fish highlighted as possible sources along with potential opportunities through the FACCE-JPI. Funding is required to enable researchers from developing countries to attend Network workshops as well as for research activities.

Tim Robinson will approach the research theme and CRP leaders at ILRI about the possibility of funding for a student or post-doc to support the Network.

Eileen Wall noted that the ASGGN found it essential, in achieving their objectives, to have had the help of a post-doctorate to assist with writing the papers they had set as Network outputs.

The GA in collaboration with the GRA offers the possibility of being extended to include animal health mitigation strategies. The FAO agreed to keep the Network updated on the project launch and would ensure that the Network is given the chance to comment on the matrix issued by the GA. The GA is

also planning to expand into engaging with the areas of animal health and nutrition before moving into poverty reduction and equity.

The FACCE-JPI has previously launched research calls and the upcoming workshop in Madrid (May 2014) is an opportunity to scope the potential for a future call on animal health and GHG mitigation. The FACCE-JPI also indicated that they were looking into proposing an ERA-NET on GHG mitigation and will be working on the detail in the next few months.

A review of funding sources has been covered by the GRA Secretariat and a stocktake of funding opportunities is in the pipeline. A recommendation will be made to the GRA Secretariat to include animal health funding in their stocktake.

The discussions also covered the topic of learning from other Networks with 'pooling data' being identified as a key objective of other Networks.

Globally this is an important agenda and may be too much for the Network to address alone however if we work collaboratively with the FAO and FACCE-JPI we can achieve something tangible. The challenge of animal health status and GHG emissions intensity reductions requires an holistic and global approach.

Network Communications

The Network communicates through the Network Secretariat (Alice Willett and Adele Hulin), who can be reached through the Network email address (animalhealthnetwork@adas.co.uk) and the Twitter account (@AHGHGN). The Network features in the bi-annual 'UK Agri-Science and Innovation' newsletter and the quarterly LRG newsletter. There is not currently a Network website but a web presence was seen as being beneficial.

Future Network Workshops

Network workshops will be held annually, or potentially more regularly, within the three year lifespan that the Network Secretariat is funded (funding currently ends in June 2016). The workshops will primarily be used as a forum to discuss the progress of the Network. Agenda items to be included in the next workshop are:

1. Workshop report from the first workshop.
2. Final project report from AC0120.
3. Publication of the literature review on global GHG abatement potential from health intervention.
4. Update on progress with a scoping study to be led by Tim Robinson with support from willing Network participants into the areas of greatest benefit.

No decision was made as to the timing or location of the next workshop, however it is likely to be held within the margins of an existing conference. Conference recommendations were taken from the room, especially in relation to ideas for gaining further engagement from developing countries.

2.4 AOB

John Tayleur announced that he will be leaving Defra and thus his role as the UK Lead Co-ordinator of the Network will end shortly after this workshop. ADAS UK Ltd in consultation with Defra will consider how this role could be filled by an appropriate expert from the UK.

Thanks were extended to Brian Perry for his excellent facilitation of the discussion sessions, and to the Network Secretariat for organising the workshop.

APPENDIX 1: PARTICIPANTS LIST

Research Institute/Organisation	Title	Forename	Surname	Email Address	Country
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National Institute of research in forestry, agriculture and livestock	Dr	Sergio	Gomez Rosales	gomez.sergio@inifap.gob.mx	Mexico
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ADAS UK Ltd	Miss	Alice	Willett	animalhealthnetwork@adas.co.uk	UK

APPENDIX 2 Workshop Flyer

Animal Health & Greenhouse Gas Emissions Intensity Network Workshop



25th March 2014



What will we achieve at the Workshop?

- To get to know one another;
- To discuss existing research and generate ideas for future collaborative work;
 - To set the Network objectives and define tangible outputs;
- To scope regional animal health and GHG issues, and global opportunities; and,
- To explore funding sources, particularly for enabling participation and promotion.

Held in the margins of the Society for Veterinary Epidemiology & Preventive Medicine (SVEPM) Conference
(<http://www.svepm2014.com/>)

Dublin Castle Conference Centre, Dublin Castle, Dublin, Ireland, UK



Workshop Information

Agenda

The Workshop will run from 09:15 to 17:00 and details of the sessions are given below.

Time	Item	Chair, Presenters
09:15 – 09:40	Welcome and round table for introductions	John Tayleur & Tim Robinson
09:40 – 10:00	Introduction to the Network and GRA	John Tayleur
10:00 – 11:25	Short presentations on emerging research work 10 minute presentations with 5 minutes for questions	John Tayleur
10:05 – 10:20	Animal Health & GHG research	Tim Robinson (ILRI)
10:20 – 10:35	Background to FAO & GLEAM	Pierre Gerber (FAO)
10:35 – 10:50	Endemic cattle disease and GHG abatement potential	John Elliott (ADAS)
<i>10:50 – 11:10</i>	<i>Coffee</i>	
11:10 – 11:25	GHG emissions intensity and trypanosomiasis	Michael MacLeod (SRUC)
11:25 – 12:55	Panel discussion: Are animal health improvements going to have a significant impact of reducing GHG's emission intensities? Topics addressed may include: <ul style="list-style-type: none"> • What are the key issues, and where are the real opportunities? • How different are they between developed and developing countries? • What are the trade-offs between improving productivity and reducing GHG? • Who are the key players in research and development? 	Chair: Brian Perry Panellists: Eileen Wall, Pierre Gerber, John Goopy, Johanne Ellis-Iverson & Sergio Gómez Rosales
12:55 – 13:10	Poster Walk	
<i>13:10 – 14:00</i>	<i>Lunch</i>	
14:00 – 16:00	Discussion 2: Setting the Network objectives and work areas Topics addressed may include: <ul style="list-style-type: none"> • What is the Network's role in addressing the issues raised in Panel Discussion? • What objectives will address those issues? • What are the potential funding sources? 	Brian Perry
<i>16:00 – 16:30</i>	<i>Coffee</i>	
16:30 – 17.00	AOB, summary and close	John Tayleur & Tim Robinson

APPENDIX 3: SUGGESTED ORGANISATIONS FOR ENGAGEMENT

List of organisations for the Network to engage with. The list is not exhaustive and the Network Secretariat would be welcome recommendations for further organisations to engage with.

- African Union International Bureau for Animal Resources (AU-IBAR)
- Agricultural machinery manufacturers
- Animal Production and Health Commission for Asia (APHCAR)
- British Pig and Poultry Executive (BPEX)
- Copa-Coega
- Country specific production companies (i.e KenChick)
- DairyCo
- Department for International Development (DFID)
- English Beef and Lamb Executive (EBLEX)
- European technology platform on animal health
- GALVmed
- Indian Council of Agricultural Research (ICAR)
- Inter-American Institute for Cooperation on Agriculture (IICA)
- International Federation for Animal Health (IFAR)
- International Fund for Agricultural Development (IFAD)
- JBS
- Learn Network
- OneHealth
- Precision livestock technology providers
- Regional fund for agricultural technology (Latin America)
- Relevant organisations to bring in participation from Africa, Asia, Latin American and the Caribbean
- Star-IDAZ
- Veterinary Societies
- World Bank
- World Organisation for Animal Health (OIE)
- Zoetis