Enteric Fermentation Flagship: Working together towards low emissions livestock

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About the flagship

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Vision:

Countries are supported to account for and reduce enteric methane emissions within a context of sustainable development and food security.

Three components:

1. Development of solutions for reducing enteric methane emissions
2. Improved quantification of emissions at national to farm scales
3. Identification, testing and implementation of appropriate mitigation solutions in diverse situations

Four initial project proposals developed from 50+ ideas, priority was for projects that could extend an existing multi-partner collaboration and had an existing funding base

Proposal 1 – Profiling the rumen microbiome: breeding for productivity and environmental gains

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Who? NZ (lead), Denmark, Australia, Brazil, African countries, Uruguay (and potentially all GRA countries) – a project arising from concerted action by the LRG's Animal Selection, Genetics & Genomics Network

What? A method is under development for rapid low cost profiling rumen microbiomes in sheep in NZ and Australia to identify low CH4 emitting animals. This will be expanded by the inclusion of new partners and extended to other ruminants e.g. cattle, goats, Initially, additional profiling will be undertaken in dairy and beef systems in Australia, Brazil and across Africa. The project will expand from identifying animals with low CH4 to those better adapted to local circumstances. Methods developed will be shared with all GRA countries.

Why? Will yield a method to support genetic selection of animals that doesn't require expensive infrastructure and can be used in live animals at any stage of production. The method can then be used to identify and select low-emitting animals that are also better adapted to sustain periods of feed restriction and low quality forage.

How? Expansion of an existing GRA project funded by NZ, Denmark & Australia. Samples sought from other species and production systems for sequencing and profiling. Mix of in-kind contributions from countries and cash funding (for additional project coordination and recruitment and supervision of a postdoc).

Range of additional cash funding: USD150,000-350,000 per annum for up to 3 years.

Proposal 2 – Feed for Yield: quantifying the effect of nutrition on enteric methane

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Who? USA and Netherlands (lead), potentially involving all GRA countries → **links to LRG's Feed & Nutrition Network**

What? Major expansion of existing databases on feed/methane relationships to include new data representing production systems and environments around the world. Will enable more specific methane yield (Y_m) values to be developed for local feeds and production circumstances, which can then be used by participating countries to improve their national GHG inventories and demonstrate mitigation. Expansion will focus on tropical systems and systems relying on by-products for feed to address the biggest gaps in current data.

Why? Manipulating feed type and supply is one of the main ways of mitigating enteric methane. More comprehensive and globally representative data is urgently needed to increase the understanding of the relationship between enteric methane and feed, to develop nationally appropriate mitigation options, and to provide locally appropriate emission factors.

How? Expansion of ERAGAS project (FACCE_JPI –GRA GHG Nexus). In-kind contributions from countries to provide data. Cash funding for increase central project coordination and additional postdoctoral support for data collection and analysis and database maintenance.

Range of additional cash funding: USD350,000-750,000 per annum for up to 3 years.

Proposal 3 – RumenPredict+: linking genetics, diet and the rumen to predict environmental outcomes

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Who? UK (lead), potentially involving all GRA countries → **links to LRG's Rumen Microbial Genomics Network**

What? Use published data to develop a database that links genetics, diet and the rumen microbiome to environmental outputs. This exploitation of existing data will enable significant research gains in understanding how changes in the rumen microbiome alter rumen function and can reduce enteric methane emissions.

Why? Manipulating the microbes in the rumen is potentially a highly effective mitigation strategy. Global knowledge of the make-up and functioning of these microbial communities has increased substantially thanks to existing GRA collaborations such as the Global Rumen Census and the Hungate 1000. This project would build on past GRA projects by broadening the samples gathered to include a wider range of production environments, which in turn supports better forecasting of animal emissions and the most appropriate strategies to mitigate those.

How? Expansion of a newly funded ERA-GAS project (RumenPredict) submitted by the RMG. In-kind contribution of data from participating countries. Cash funding for increase in project coordination, further database development and postdoctoral support. Utilise the FACCE_JPI GHG Nexus agreement)

Range of additional cash funding: USD150,000-350,000 per annum for up to 3 years.

Proposal 4 – Forages For the Future: mitigating enteric methane from grazing livestock

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Who? Canada (lead), potentially involving all GRA countries → **links to LRG's Feed & Nutrition Network**

What? Examination of the practical and economic feasibility of the most promising feed-based solutions for reducing enteric methane in forage-based (grazing) systems. Initial action will be the creation of a database that compiles & summarises information obtained from GRA countries who have tested a range of mitigation approaches suitable for forage-fed ruminants. This will include novel local feeds, and novel feed additives and supplements

Why? Many feed-based mitigation strategies have been identified (e.g. lipid-containing supplements, feeding compounds, legume forages etc). However, these can be challenging to apply at the local level for grazing ruminants. Providing a critical evaluation of the efficacy of the various strategies will help inform countries' understanding of the options most appropriate to their production circumstances.

How? Creation of an online repository for research into the effect of different feed components and feed additives to inform mitigation strategies most appropriate for forage-based systems. In-kind contribution from individual countries of summarised reports. Cash funding for a postdoc to coordinate the project and undertake analysis.

Range of additional cash funding: USD100-200 per annum for up to 3 years.

Links with other flagships

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Any mitigation strategy for enteric fermentation will only become 'visible' in national GHG inventories or NAMAs if an advanced accounting methodology (Tier 2 or higher) is used.

The current Enteric Fermentation Flagship projects will not directly help improve accounting methodologies and inventories, but will seek to link with the ***Inventory Flagship*** to ensure climate benefits of improved feeding and genetics become visible for countries. For example by developing improved Ym values for use in national inventories & incorporation into IPCC Good Practice default values.

Changes in forages and use of supplementary feeds can have consequences for soil carbon. The Enteric Fermentation Flagship will seek to link with the ***Soil Carbon Flagship*** to enable a more comprehensive account of net GHG emission changes.