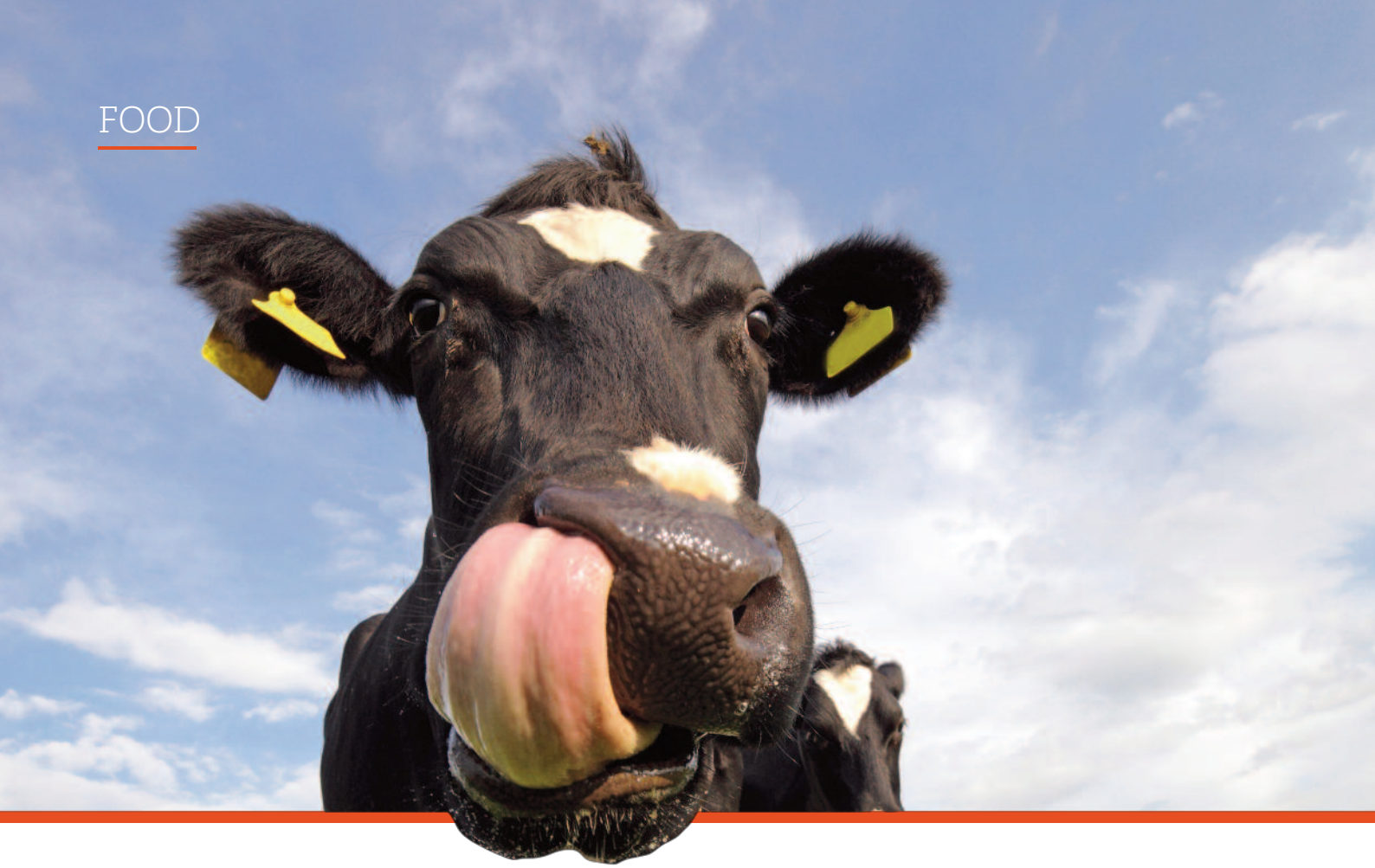

Taking the meth out of breath

New research from TEAGASC is exploring ways to reduce methane emissions from ruminants.

Methane (CH_4) production as a result of fermentation of feeds by ruminant organisms represents a significant contributor to greenhouse gas (GHG) emissions (**Figure 1**). Agriculture contributes approximately 6-7% of total GHG emissions and reducing these is a challenge, particularly as agricultural intensity is increasing globally. The European Council has recently agreed on a set of climate and energy targets for 2030 (40/27/27 package), with important implications for the EU agricultural sector. Agriculture must contribute to mitigation efforts, if the EU is to meet its long-term target of reducing GHG emissions in 2050 by 80-95% compared to 1990 levels.

The METHLAB project

Some animal dietary practices have shown promise to reduce methane emissions, including use of high-quality forages and dietary fat. On farm, lactic acid bacteria (LAB) are commonly used as direct feed microbials (DFMs)/probiotics and as silage inoculants. DFMs are products that contain live (viable) microorganisms and are used to modulate rumen function and induce beneficial health and productivity effects in ruminants. A limited number of LAB strains have been shown to affect ruminal fermentation, leading to downstream effects such as reduced methane production. However, the choice of strain(s) is key to the effectiveness and desired outcome of LAB application *in vivo*. In the METHLAB project, LAB will be targeted that directly inhibit methanogens, which are the methane-producing organisms in the rumen. LAB strains will be screened for the ability to reduce methane production *in vitro*, and selected strains will be tested in ruminants (cows and sheep) to confirm efficacy of methane reduction *in vivo*. Additionally, inhibitory compounds from LAB-termed bacteriocins may be a potential strategy to target the methanogens in the rumen when fed to ruminants. The process of methanogenesis consumes from 8-12% of the energy used in the rumen. Inhibition of this pathway could in fact lead to a surplus of energy available for the ruminant itself, leading to better quality meat and milk production. Furthermore, the wide use of LAB as probiotics in humans and as preservatives in the food industry means their application to ruminant production systems will face fewer regulatory hurdles. Outputs from this work will advance the knowledge transfer of LAB on-farm technologies to address the reduction of enteric methane emissions in ruminant production systems. A better understanding of LAB's use for reduction of methane in on-farm technologies will be achieved and this would accelerate the objective of reducing anthropogenic contributions towards climate change. A route to market is considered relatively straightforward as DFMs and silage inoculants have LAB as a main microbial ingredient and are already commercially available, accepted, and used on farms worldwide.

This proposal thus supports the development of a competitive, sustainable and profitable global agri-food sector.

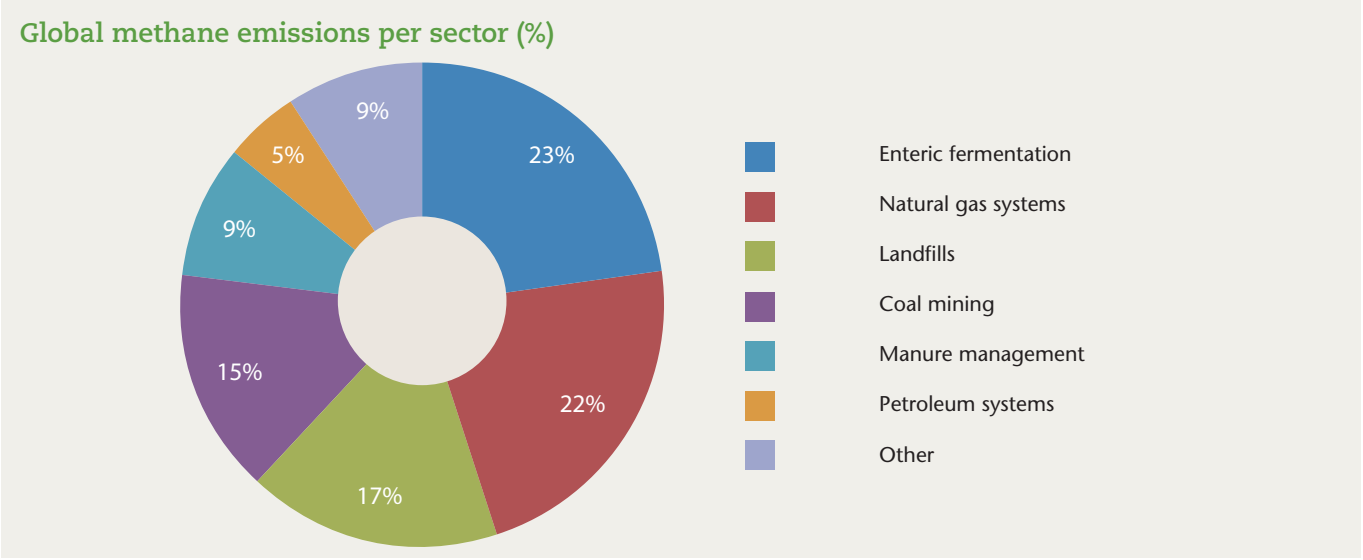

FIGURE 1: Global methane emissions per sector (%). Adapted from: http://www.energytomorrow.org/blog/2015/01/14/the-new-move-to-regulate-methane.

Multidisciplinary initiative

From both scientific and technological aspects, the integration and ambitious objectives of the project demand a truly multidisciplinary approach that involves life sciences, food technology/food bioengineering, culture production and nutrition. This consortium is co-ordinated by Teagasc. The partners in this proposal are all from the Global Research Alliance (GRA) member countries that share the goal of reducing methane emission intensity across ruminant classes in a manner that maintains agricultural production and sustains environmental integrity. METHLAB brings together five partners from across the EU and one New Zealand partner, forming a unique set of inter-sectoral expertise, knowledge, technologies and personnel in a new collaboration, meeting market needs for new innovative solutions to be incorporated into ruminant feedstuffs to create more sustainable, emission-efficient food production systems. The multidisciplinary consortium has been strategically designed to facilitate discovery and innovation but also rapid bench-to-market commercialisation outputs, e.g., new innovative microbial technologies, and animal nutrition products with new functionality.

The project represents a long-term, high-value application of microbiology, animal nutrition, and formulation/excipient research to meet a defined market need for generation of added value, high-quality animal nutrition products and the technology to deliver them.

The innovative technology platform that the project will deliver will provide long-term impact and benefits to the EU (and the world) through increased knowledge and research expertise in animal nutrition, microbiology and fermentation to stimulate a more sustainable, efficient and productive agri-food sector. Another benefit from reduced methane emissions in any country, particularly where ruminants contribute a large portion of GHG (such as Ireland and New Zealand) is that their governments are seen to be addressing methane emissions and as such, are demonstrating a commitment to maintain their international reputation by meeting climate change responsibilities. This action may influence future trade negotiations and alleviate barriers put in place that restrict the trading of products associated with high GHG emissions. It may also allow a premium to be placed on products originating from a low methane emission animal production system. If a methane mitigation strategy is able to improve digestive efficiency in the animal and capture some of the approximately 6-8% of the gross energy in the diet lost as methane and redirect into productivity gains, the economic benefits to the farmer could be large.

Funding

The METHLAB project is funded by FACCE ERA-GAS, an EU ERA-NET Cofund programme, whereby national money is pooled to fund transnational projects, and the European Commission also provides co-funding for the action. FACCE ERA-GAS is the ERA-NET Cofund for Monitoring and Mitigation of Greenhouse Gases from Agri- and Silvi-culture, and comprises funding agencies and project partners from 19 organisations across 13 European countries. Teagasc is the overall co-ordinator of the ERA-NET. METHLAB was one of 10 successful projects to be funded from 79 proposals from across Europe, the USA and New Zealand.

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