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Examining ways to reduce methane emissions from cattle

A new study initiated by JBS, in cooperation with the Animal Husbandry Institute of the Department of Agriculture and Supply of the state of São Paulo and Silvateam of Italy, is designed to see how tannins could reduce methane gas emissions from cattle.

With the global population set to reach an estimated 10 billion people by 2050, action on climate change with rising populations has pushed the livestock industry to improve their sustainability objectives in reducing greenhouse gas (GHG) emissions. Whilst there is an argument to say that livestock are the tip of the iceberg when it comes to GHGs, ruminants are nevertheless major contributors to the agricultural sector's emissions and, according to the FAO, account for almost 6% of the global anthropogenic GHG emissions.

Towards the end of last year, JBS, the world's second-largest food company, and the Animal Husbandry Institute of the Department of Agriculture and Supply of the state of São Paulo, formalised a partnership with plant-based extracts producer Silvateam. The aim of the collaboration will contribute to developing studies into the reduction of greenhouse gas emissions in the beef supply chain. One of the first studies will look at tannins, where they are known to reduce methane gas emissions by improving the efficiency of the fermentation process from the animal's diet.

With COP 26 last November highlighting the need to limit climate change, secure net-zero by mid-century and keep the target of 1.5°C within reach, JBS chief executive, Gilberto Tomazoni, mentioned the project during a debate on CNN Brasil at the time of the international climate conference.

Mr Tomazoni said there was hope that the project could lead to a 40% reduction in methane emissions. He added: "People say that if you want to save the environment you had to reduce your consumption of meat. But that's not necessary. People can continue to have the pleasure of eating meat. Science will deliver the solutions we need."

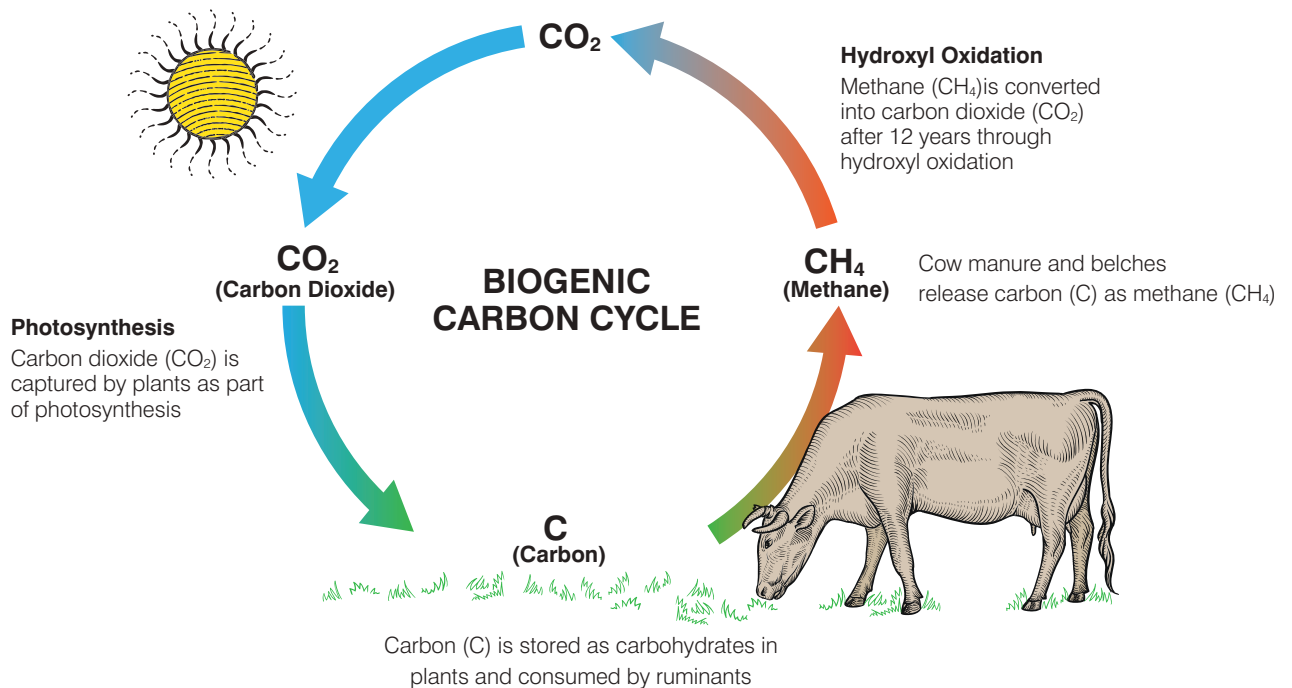
With global acceptance for the need to limit climate change, no countries have, as yet, set any legally binding targets with specific reference to livestock, preferring to keep flexibility in mind as to how to reach their targets. For instance, the UK's target of net zero by 2050, a binding commitment, sets no specific farming targets, only stating that by 2030, 75% of farmers in England will be engaging with low carbon practices. Scottish plans include reducing emissions from farming to 9% below 2018 levels by 2032 but



It's all a cycle

Greenhouse gases and their planet warming abilities are undeniable fact. What needs careful understanding is that not all GHGs are equal. Whilst the GWP100 standard is used to determine how greenhouse gases warm the planet, it does not take into consideration the timescale that the gases are “active”, nor does it specifically recognise the cyclical nature of them. Whilst

CO₂ is long lived in the atmosphere, methane lasts for around a decade and, being biogenic, is returned to the cycle as CO₂. However, unlike fossil carbon, biogenic carbon (from the breakdown of methane) is not continually adding to the system so, provided herd numbers stay static, in real terms, the overall emissions also stay static. In effect, the cattle are recycling the carbon over time.



again no specifics. The closest any European country has come is Denmark, passing a legally binding target to reduce climate emissions in the agricultural sector by a minimum of 55% by 2030 (as compared to 1990 levels). On the other side of the Atlantic, the US sees agricultural GHG's dwarfed by the sheer volume of fossil fuels that are adding to the nation's emissions. Compared to the global average of 14% “human induced” climate emissions, only 4% are attributable to cattle and other ruminants, with this dropping to just 2% when looking specifically at beef cattle. That said, the state of California has set a target to reduce emissions from the livestock sector by 40% (on 2013 levels) by 2030 – a target it is not currently on course to achieve.

As the statement by the JBS chief executive would suggest, Brazil has argued heavily against UN recommendations for climate change practices through reduced meat consumption, as too has Argentina. This should come as no surprise though, as they are two of the largest beef and animal feed producing nations.

Tannins do not just make leather

World Leather has published many articles in relation to vegetable tannins, the century old cornerstone of traditional leather making, but for three decades, Silvateam, well known for supplying tanneries with their raw materials, has developed a market in the agricultural sector. Utilising the same PEFC origins, a broad range of products, based on

tannins, saponins, polyphenols and pectin's, has been developed, specifically for its latest trials, Silvafeed BX.

This natural feed additive, derived from chestnut and quebracho tannins and saponins, is primarily used to improve the animal's gut health but also to increase the animal's productivity. By lessening the production of methane, a process that takes energy, various studies have shown that feed utilisation is increased. It is good news for farmers as this has a direct correlation to increased carcass weight.

Studies of ruminants' digestive systems, the rumen microbial ecosystem, are not totally understood but the methane inhibition afforded by tannins is most likely due to multiple factors, including the inhibition of methanogens and a decrease in H₂ production. For the saponins, these are known to be toxic to protozoa (present in the rumen) and studies have shown that they are symbiotically associated with methanogenic archaea, suggesting a link to methane reduction.

Worldwide studies

Initial work started on Silvafeed BX back in 2007, with a timeline covering participation in several international studies, looking at both dairy cows and beef cattle and the reduction in GHG's that tannins and saponins can achieve. By 2021 specific trials with the product were ongoing at various universities and institutions: an in vitro trial at the CSIC

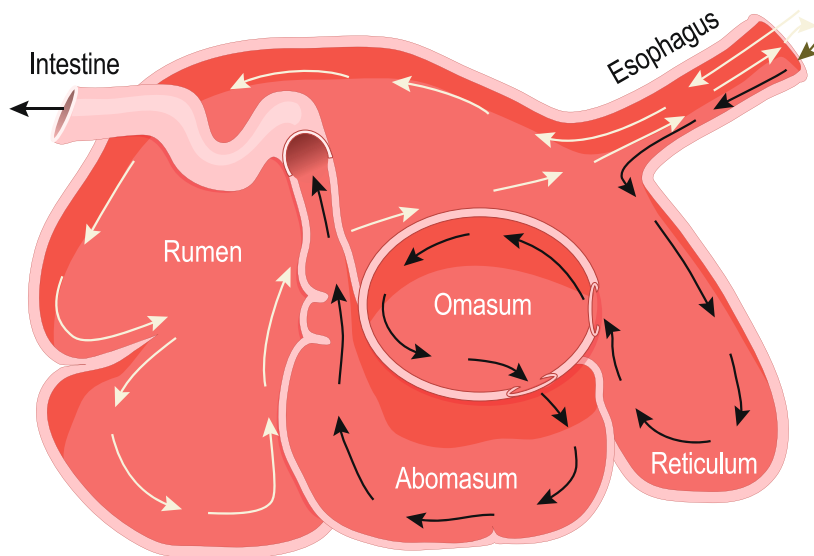


What is a ruminant

Other than cows, animals such as sheep, goats and even giraffes are classed as ruminants. In simple terms, these animals chew plant-based food and regurgitate it numerous times to digest it. More specifically, these are animals with stomachs made up of four separate chambers. The first, the rumen is where plants are initially broken down by a complex ecosystem of microorganisms such as bacteria, protozoa and fungi, to break down sugars, starch and cellulose. The second chamber, the reticulum, is where harder to digest material is stored and

allowed to regurgitate to be repeatedly chewed, physically breaking it down. The third chamber, called the omasum, is used to break down food even further and finally the fourth chamber, the abomasum, is where the nutrients are finally extracted from the food.

Through enteric fermentation, the action of the bacteria in the rumen and reticulum breaking down the complex carbohydrates of the plants into simple sugars, gases such as methane and carbon dioxide, are produced, the majority of which are released through belching but also through the manure.



The ruminant digestive system.
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(Spanish Research Council) of Granada, an in vivo trial at the University of Bologna in dairy cows, another in vivo trial at UC Davis in California in dairy cows, plus others in São Paulo, Georgia University, INTA Argentina and Colorado State University. For 2022, further trials are planned at the University of Bologna, an in vitro trial at Clemson University (South Carolina), and two in vivo trials at Colorado State University in beef cattle.

One of the most high profile proponents of animal agriculture and how it can actually play an important role in climate change, is Professor Frank Mitloehner of the University of California, Davis, one of the aforementioned institutions to have studied the feed additive. In previous statements, Professor Mitloehner has acknowledged that a 30% reduction in methane emissions from cattle would have a cooling effect, explaining that if cattle herd sizes remain constant, their methane emissions do not add to global warming as the methane they emit over a ten-year period would be equivalent to the methane that breaks down over that time. Reduce the methane cows emit over ten years and the amount that breaks down will be greater, decreasing the global warming effect of each herd. More recently, though, Professor Mitloehner pointed out that while the reduction in GHGs from agriculture is very much needed, they should not be seen as the silver bullet some would have us believe. Hyper focusing on animal agriculture emissions at the expense of reductions in CO2 may still leave us with a

warmer planet.

Having been granted a Carbon Trust validation in March 2021, it confirmed that "Based on results from laboratory and on farm testing against a valid baseline, Silvafeed can reduce methane emissions in ruminant livestock". According to veterinarian Marcelo Manella, who is also technical director of ruminants at Silvateam, owner of the Silvafeed brand, the market demand for carbon neutral accreditation is a reality. "We were one of the first additives in the country to have this certification, which proves Silvafeed's commitment to cooperate with agriculture, so that there is an improvement in productivity and, consequently, the reduction of environmental impact", he says. "Now, our goal is to become Net Zero by 2025."

Attempting to put a single figure on the methane reduction capabilities of the feed additive is almost impossible. Variability in breed, diet and dosage all play a part, but from all the laboratory tests and farm case studies, Silvateam, with their Silvafeed product, is confident about achieving up to 30% reductions. Studies have shown no known animal welfare risks or potential food safety risks. And with potential co-benefits from tannin/saponin-based feed additives such as improved protein supply plus a shift from urine to faecal excretion of nitrogen, it reduces the risk of N2O emissions, another highly potent GHG. Silvafeed could well provide a safer and more acceptable solution over other feed additives — not to mention genetically modified cows. 🌱