Ganadería y Clima

Reducing emissions intensity of methane through innovative nature based solutions in the cattle sector in Uruguay

CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

Ministerio de Ganadería, Agricultura y Pesca

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With support of the Global Environment Facility (GEF), Food and Agriculture Organization of the United Nations (FAO) and the Climate and Clean Air Coalition (CCAC), Uruguay through its Ministry of Agriculture is implementing a project which aims at fostering a climate smart cattle ranching. The National Agricultural Research Institute (INIA), the Faculty of Agronomy and farmer's organizations are also key partners of the project. The CCAC is funding the monitoring and reporting of the impact of improved management practices of grasslands and cattle on methane emissions from cattle.

Uruguay is a country with a population of 3.5 million people and 12 million cattle. Agriculture is a key part of Uruguay's economy, representing 70 per cent of all its exports. At the same time, the agriculture sector contributes to about 75 per cent of Uruguay's greenhouse gas emissions (GHG), of which 46 per cent are from enteric fermentation. Methane is by far the main GHG in the national inventory, and agriculture is responsible for 93 per cent of total emissions, being cattle responsible for 91 per cent of total methane emissions.

Uruguay's national agricultural policies have defined adaptation and mitigation in the beef and dairy cattle sector as main priorities. This is reflected in concrete targets set by the country's first Nationally Determined Contribution (NDC) to the Paris Agreement. The National Adaptation Plan prioritizes also the beef and dairy sectors, in harmony with the NDC targets. In the case of beef cattle, improved livestock and grassland management in natural grassland (in Spanish "*campo natural*") play a key role in promoting more resilient, less carbon intense and more productive agroecosystems, with benefits for farmers and the society as a whole. This is due to the fact that natural grasslands are the nutritional basis of the cattle and are the dominant land cover in the country.

The government has committed to address the challenges of the beef cattle sector through a holistic approach, which tackles productivity, sustainable land management, food security, economic competitiveness and climate change adaptation and mitigation. A set of practices is promoted for improved livestock management in natural grasslands, focused on sustainable increases in productivity and efficiency in a more inclusive way, representing a multiple-win scenario for farmers and a contribution to food security and to the achievement of the Sustainable Development Goals (SDGs) and to the NDC targets.

Uruguay's NDC commitments/goals in the AFOLU sector related to methane

Uruguay has set the following methane mitigation targets in the AFOLU sector:

- Reducing by 32 per cent methane per kilo of beef produced.
- Adopting good practices of natural grassland management and management of breeding herds in livestock production, including forage allocation, regenerative management and use of legumes.

- Using zero discharge technologies to rivers and streams and/or good practices of effluent treatment and/or recovery of nutrients and minimization of methane emissions in at least 40 per cent of dairy farms.
- Introduce intermittent irrigation technology with alternate wetting and drying (AWD) of soils in at least 10 per cent of the rice crop area (16 000 ha) by 2025 to reduce methane emissions and increase water use efficiency.

ProcessSince 2010 several policies and projects by the Ministry of Livestock, Agriculture and Fisheries of Uruguay (MGAP) have promoted sustainable intensification and climate-smart livestock production systems.

The approach of improved management of livestock in natural grasslands tackles the main barriers that hinder many small and medium sized farmers from adopting climate-smart practices and technologies. Such barriers include lack of awareness of climate change threats, lack of knowledge on the benefits of adopting climate-smart alternatives, and lack of adequate incentives and technical assistance to guide the transition to more productive and climate-smart production systems.

This approach needs a rethinking of the way researchers, extensionists and farmers relate. The traditional vision focused on linear approaches to finding solutions to complex systems has proven to be ineffective. An innovative and participatory approach known as "co-innovation" has been adopted in the implementation of climate smart agriculture pilot projects with good results at field level.

Co-innovation approach proposes that the sustainability of production cannot be resolved by means of simple adjustments in isolated components of the system, but rather requires a strategic redesign of the management of the farm, through a systemic, interdisciplinary and participatory approach.

The co-innovation approach is considered particularly important for projects that aim at the transformation of the production system to simultaneously cope with environmental, social and economic impacts. Co-innovation implies analyzing a production system and considering the family objectives to redesign it and move forward considering a set of objectives, with its intrinsic synergies and trade-offs. Thus, the participation of the whole management team of the farm acquires fundamental importance, since it promotes intentional behavioral changes arising from collective and individual learning and ensures relevance, applicability and adoption of the solutions. Consequently, this approach encourages women's participation not only because of a gender equity concern but also because many studies show that women are more willing to adopt changes when they perceive possible improvements in production and family quality of life, thus resulting in a dynamic force that favors farm innovations.

In many cases, low productivity is associated with an excess in stocking rates that results in overgrazing and low forage productivity. Therefore, a decrease in the number of animals may be required, resulting in less gross emissions. An increase in animal fertility, increased productivity and better diet quality significantly reduce the "breeding overhead" and avoids unnecessary GHG emissions.

The system change is based on the following principles:

- *Maintenance of appropriate forage allowance* through grazing intensity management over time. This enables improved grass growth through increased leaf area index and helps to synchronize livestock energy requirements with forage supply through the year.
- *Strategic allocation of feed:* allocation of forage as a function of body condition score to improve overall performance of the herd.
- *Improved fertility of cows* through strategic allocation of feed, concentration of mating period and early or temporary weaning.
- *Improved herd management*: maintenance of a greater productive/unproductive animal ratio through, for example, improving reproductive management, decreasing age at first calving, controlling mating and calving season, and the use of strategic supplementation.
- Establishment of shade/shelter tree plantations.
- Ensuring water access to animals in all paddocks.

Outcome

These actions lead to mitigation and restoration benefits in terms of:

- Reduction of emissions intensity of methane (and nitrous oxide): more efficient fodder uptake and improved digestibility, more efficient feed conversion, a reduction of non-productive animals.

- Carbon sequestration: reduction in herd size with less pressure on land, uptake in woody biomass, more inputs to the soil to build organic matter, development of deeper root systems, enhanced recovery periods may result in increased ecosystem carbon stocks.

- Land degradation: less disturbance and improved grazing increases plant productivity and structure, cycling of nutrients, prevents soil erosion, and leads to enhanced soil health and fertility.

Co-benefits beyond mitigation

Productivity
Cattle ranching in Uruguay is characterised by low productivity, particularly among small and medium sized family farms. The pastures and rangelands are overgrazed: high stocking rates combined with low grass height and low leaf area index lead to poor forage availability and quality. This results in low productivity at animal and herd level, especially related to reproductive performance and daily weight gain. For example, poor feed availability causes low pregnancy and birth rates. The national average weaning rate per mated cow is only 63 percent, meaning that there is a large number of economically unproductive cattle on pastures, so called 'breeding overhead'. Furthermore, the poor grazing and feeding conditions negatively affect animal growth rates. Despite the overall gains in productivity in the past decade and success with export markets, there is still ample room for improving productivity, especially among small and medium sized farms.

Adaptation
Uruguay´s livestock sector is very vulnerable to climate change, as it depends on the productivity of the rainfed natural grassland. Extreme weather events, including droughts, are expected to become more frequent and intense in the future, resulting in increased losses and damages. Unsustainable management of cattle production over large rangelands areas, in particular overgrazing, has led to ongoing land degradation.

Ecosystem services
Beef production in Uruguay is predominantly based on campo natural which is the dominant landscape in Uruguay. The campo natural in Uruguay is an ecosystem dominated by natural pastures, small shrubs and occasionally trees. It is characterized by variable soil structure and soil fertility, with subtropical climate, humid and hot in summer and mild in winter, and its vegetation is largely composed by native herbaceous grass species and legumes. The campo natural provides multiple ecosystem services, including food and water provision, hydric regulation, soil erosion control, and non-material benefits such as recreational and spiritual benefits of its landscapes. Most soils are high activity clays soils, which is important to build carbon. These services are irreplaceable if lost, so the approach should focus on conservation and restoration in cases where the provision of ecosystem services has decreased.

Biodiversity conservation
Uruguay's natural grasslands are rich in biodiversity, which is key for adaptation and resilience. Nevertheless, they have undergone systematic decline in biodiversity, mostly due to unsustainable grazing practices such as overgrazing. However, monitoring and experiments show that well managed grazed plots can maintain or restore biodiversity at various levels.

Implementation and long-term sustainability strategy

The long-term strategy stands on five pillars:

(1) Setting a platform to validate the co-innovation process, new technologies and practices, and assess the impacts of innovations for farmers. Currently 63 pilot farms have been selected and are working together with extensionists to catalyse a learning process and quantify and monitor the environmental, social and economic benefits and impacts of the adoption of the improved cattle and natural resources management at landscape level. The purpose is to improve farm general performance and sustainability and generate field-level information to calibrate and validate

models (e.g. the Global Livestock Environmental Assessment Model, GLEAM) and indicators that can then be applied to estimate the benefits during the upscaling of the proposals, as well as for the monitoring, reporting and verification (MRV) and monitoring and evaluation (M&E) of a livestock Nationally Appropriate Mitigation Action (NAMA) and the NDC targets.

(2) Offering support to necessary farm investments for the adoption of technologies and practices, such as fences, trees for shade and shelter and drinking water infrastructure for animals.
(3) Linking the pilot farms with the area of influence to raise awareness of the benefits of innovations and promote the adoption of good practices in at least 400 000 additional hectares.
(4) Removing barriers to the necessary upscaling of the proposal. The proposed technologies are of low cost but are knowledge intensive, and this represents a challenge for the national livestock extension institutions. The implementation of practices such as estimation forage availability and strategically allocating it throughout the year to different cattle categories will require technology transfer to and capacity building of farmers.
(5) Designing a national climate-smart livestock strategic plan involving all key actors and stakeholders.
(6) Formulating a national livestock NAMA with a strong MRV system to be able to quantify global environmental benefits.
(7) Implementing impact assessment to improve policy design.

Success factors and lessons learned

Co-benefits of "good practices" are key in climate smart strategies

Promoting good management practices of the Uruguayan natural grasslands is beneficial in terms of beef productivity, efficient use of natural resources and farmers 'income. But they are also important in terms of the rest of the relevant ecosystem services, including GHG regulation, soil regeneration, provision of clean water, nutrient recycling, and provision of genetic material, pollination, recreation, cultural, aesthetic and educational heritage. The temperate natural grasslands of Uruguay are part of the "Campos" biome, which have high biodiversity and are highly productive. These grasslands are scarce in the world and are being threatened by land use change. There is a need to restore value to natural grasslands and nature based solutions. Grasslands are able to produce great amount of non-edible biomass that can be transformed by ruminants to produce high quality protein and nutrients.

Successful climate-smart strategies need to identify economic, social and environmental co-benefits. The increase of farmers' income and its stability due to adaptation to climate change are key factors to be taken into account.

Participatory design is crucial

Participatory design of plans and policies, from the beginning, with relevant local and national stakeholders is essential. In particular, farmers' organizations at national and local levels are key partners. This is essential to raise awareness and build "ownership" by farmers.

Policies must be supported by science and based on farmers 'needs

Policies to mitigate climate change and build more resilient agroecosystems must be part of any policy portfolio and have to be supported by science and based on farmers 'needs. Mitigation of GHG is a complex process involving different sources and sinks of GHG. To make informed decisions and design policies, programs and projects, policymakers need information provided by science about the possible opportunities, practices and technologies that mitigate climate, while not affecting food security and giving a central place to farmers´ needs. The challenge for the academy is to provide this information and the challenge for the policymakers is to use this information collect and design policies that understand and take into consideration farmers´ needs.

A transparent and accurate reporting of the progress and achievements is essential to achieve its NDC targets. Uruguay is currently implementing its MRV and M&E systems to track progress in relation to mitigation and adaptation. In the case of mitigation, and in particular to methane, this entails improving activity data and using dynamic Tier 2 emission factors and parameters that are able to capture progress.

Key sources

Uruguay's first NDC :
https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Uruguay%20First/Uruguay_First%20Nationally%20Determined%20Contribution.pdf

Reference material for livestock production on natural grassland:
http://www.mgap.gub.uy/sites/default/files/multimedia/libro_campo_natural_final_en_baja_0.pdf

Principles to be promoted by the *Mesa de Campo Natural*:
http://www.mgap.gub.uy/sites/default/files/multimedia/aspectos_a_promover_mgcn.pdf

Principles of livestock production on natural grassland:
http://www.mgap.gub.uy/sites/default/files/multimedia/lineamientos_para_el_plan_estrategico_de_ganaderia_sobre_campo_natural-mgcna_2019.pdf