5 KEY TAKEAWAYS ON LIVESTOCK MITIGATION FROM THE 2023 IPCC REPORT ON CLIMATE CHANGE

KEY MESSAGES

Livestock production contributes significantly to global emissions. **Transformative shifts in production methods** are therefore essential to reduce emissions amid rising demand for livestock products.

Enhancing livestock production efficiency is vital for climate mitigation. Improving practices can cut emissions by up to 60%, balancing the need to meet growing demands for livestock-derived foods, while minimizing greenhouse gas emissions, building system resilience and optimizing existing agricultural land usage.

Restoring degraded lands and implementing enhanced pasture management can benefit both farmers' resilience and the environment's health, as well as increase carbon sequestration.

Efficient livestock management practices, including agroforestry and silvopastoral systems, can build system resilience, enhance net primary production, increase soil carbon storage and improve feed quality.

OVERVIEW

Livestock production is a substantial driver of greenhouse gas (GHG) emissions, estimated at 14.5% of total global emissions. As populations continue to grow, so will the demand for livestock products. In the absence of transformative shifts in production methods, this growth will result in a significant increase in emissions, posing potential risks to the environment, including biodiversity and water quality. Such ramifications could imperil the achievement of the world's environmental and climate goals.

This article highlights five key insights from the **Intergovernmental Panel (IPCC) on Climate Change AR6 Synthesis Report: Climate Change 2023**, focusing on mitigation strategies within livestock production. It provides constructive feedback and recommendations aligned with the **CGIAR Research Initiative on Livestock and Climate**'s action research, which encompasses reducing emissions through improved land grazing and livestock management, advocating for agroforestry and silvo-pastoral systems and raising livestock productivity sustainably alongside carbon sequestration practices.

▶ Banner photo: Traders in Ethiopia head to market with their cattle in the winter rain. Photo ILRI

TAKEAWAY 1: Improving the efficiency of livestock production is a crucial step in mitigating the climate crisis.

CGIAR response: Livestock accounts for most emissions from the agricultural sector. Developing countries are particularly affected, with 57% of these emissions coming from livestock production. The industry is projected to grow globally, with beef production expected to increase by 40% by 2050 (FAO, 2018). If production practices do not change, this growth will result in a significant increase in emissions that could have negative effects on the environment, including biodiversity and water quality. This could threaten the world's goals for the environment and climate (IPCC, 2022; CBD, 2022).

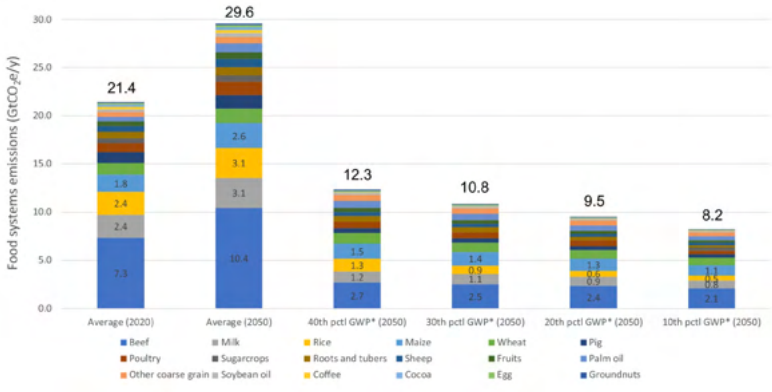
Drylands are particularly vulnerable to the impacts of climate change and desertification. These changes are expected to reduce crop and livestock productivity, modify plant species mix, reduce biodiversity and increase the risk of water stress, drought and habitat degradation for approximately 200 million people by 2050 if warming reaches 1.5°C.

By adopting best practices in livestock production, **livestock emissions could be reduced by up to 60%** – equivalent to a reduction of around 12% of global emissions.

Studies suggest that improved grazing land management could reduce emissions by between 1.4 and 11.8 billion tons of CO2 equivalent per year, (GtCO2-eq yr-1) while improved livestock management could achieve a reduction of 0.2 to 2.4 GtCO2-eq yr-1 (Conant et al. 2017; Herrero et al. 2016; Smith et al. 2008, 2014; FAO 2007). That's equal to emissions of 300 million cars per year!

These approaches include pasture management – such as the use of participatory rangeland management approaches, cultivation of improved forage varieties, rotational grazing and recovery of degraded land (Wang et al., 2019; Kell, 2011; Rao et al., 2001; Fisher et al., 2007) – as well as better animal management practices, including supplementary feeding and improved breeding and genetics (Li et al., 2022).

The introduction of agroforestry, silvopastoral and integration of crop and livestock systems can also enhance net primary production, increase soil carbon storage and improve feed quality and quantity (Costa Jr et al., 2022; Feliciano et al., 2018;; Fisher et al., 1996, 2007; Maia et al., 2009; Carvalho et al., 2009; Paulino et al., 2016).



Source: Costa Jr et al., 2022

These practices can also increase system resilience and feed conversion efficiency, playing a significant role in mitigating GHG emissions, especially CH4 (methane) emissions, which are a major contributor to livestock emissions (Costa Jr et al., 2021). A sustained annual decline of approximately 0.35% in CH4 emissions would be sufficient to prevent additional warming from CH4 emissions, equivalent to the impact of net-zero CO2 emissions.

Livestock-related options can also enhance the adaptive capacity of rural communities, particularly smallholders and pastoralists. There are significant synergies between adaptation and mitigation through sustainable land management approaches.

TAKEAWAY 2: Improved management of rangelands can generate multifold benefits. Highly productive pastures, also known as intensive pastures, cover only two percent of the world's land surface, whereas low productive (extensive) pastures cover 19 percent.

CGIAR response: Intensive pastures are characterized as areas with a livestock density greater than one animal per hectare. Meanwhile, the total agricultural land and herd size necessary for beef cattle ranching could be significantly reduced with the dissemination of improved systems, whereby only a fraction of the total area of agricultural land would be required by extensive systems while also raising the productivity of herds. By widely adopting these improved systems, we could potentially reduce a country's agricultural land area for beef production and cattle herd size by more than 100 million hectares and 70 million animal units (equivalent to around 100 million heads) by 2030, while still meeting projected beef production needs. These findings highlight the urgent need to scale up sustainable intensification of beef production systems to reduce emissions, meet food demands and spare land for other uses.

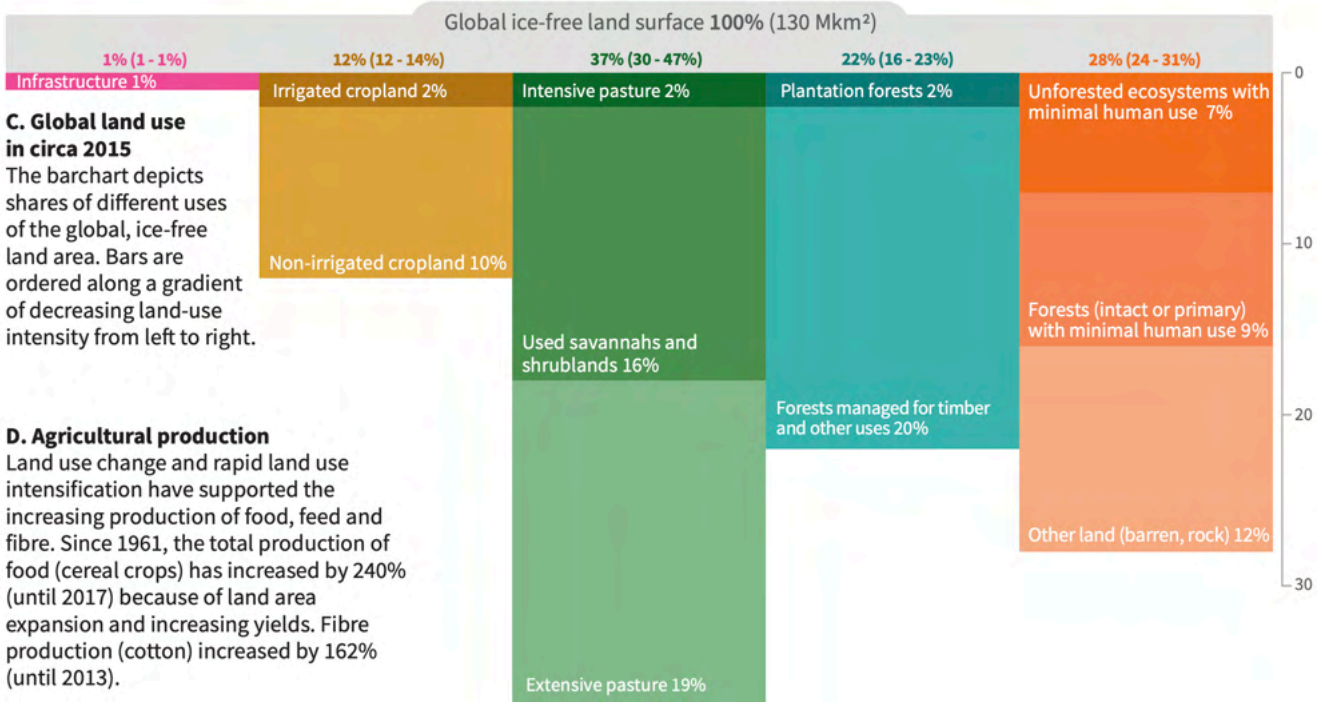
TAKEAWAY 3: While improved agricultural and livestock management can reduce emissions, reduced consumption of livestock products could promote further mitigation.

CGIAR response: Solutions must be developed to address the increasing demand for livestock-based foods while minimizing greenhouse gas emissions and optimizing agricultural land use. While the idea of balancing meat consumption across various income countries and substituting animal-based proteins with plant- or lab-based alternatives holds promise for reducing emissions from livestock (Costa Jr et al., 2022), this approach overlooks the disparities in food and nutrition security among these countries. Essential foods like meat, milk and eggs are especially crucial for the growth and development of undernourished populations. They provide vital nutrients necessary for overall health, such as protein, iron, zinc, vitamin B12 and other micronutrients.

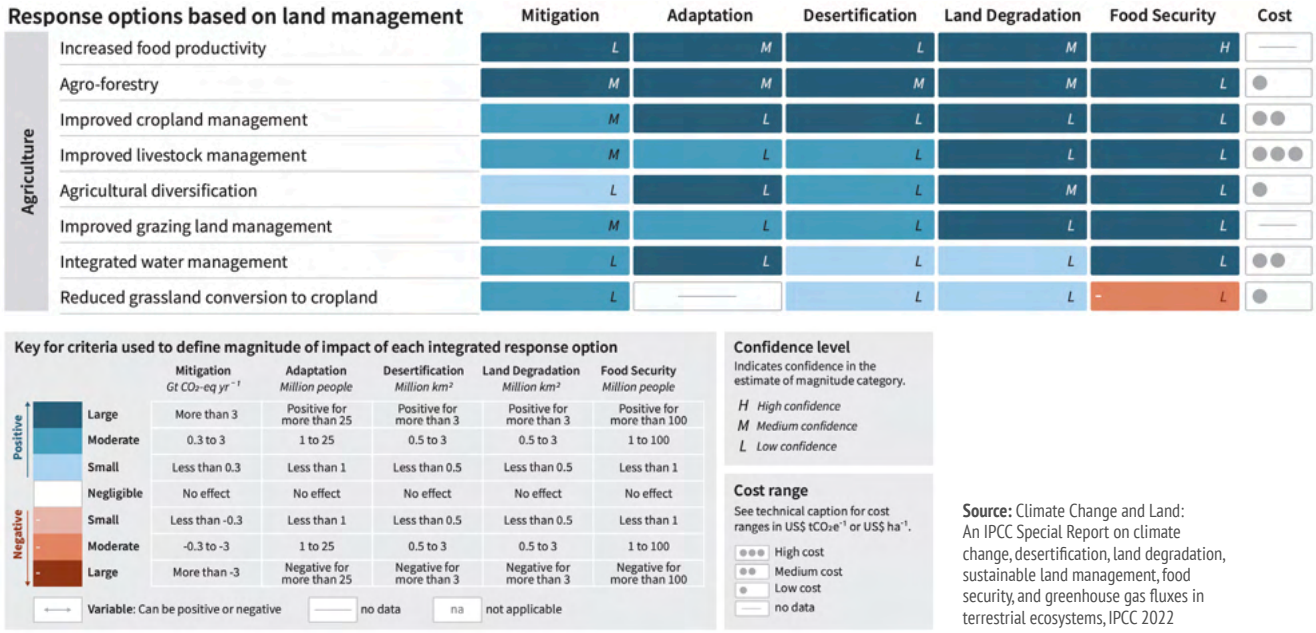
Additionally, this approach fails to account for the increasing demand for livestock-derived foods in low- and middle-income countries. Addressing this rising demand requires a two-pronged strategy: implementing low-emission practices to boost productivity while also reducing consumption of livestock-based protein by 10%–25% in high-income countries. This dual approach has the potential to result in a substantial emission decrease of 0.5–2.5 billion tons of CO2 equivalent per year by 2050 (Costa Jr et al., 2022a).

TAKEAWAY 4: Sustainable livestock production systems stand to benefit over 100 million people globally by improving food security and reducing desertification and land degradation across more than 300 million hectares of land.

CGIAR response: By improving livestock production systems, we have the capacity to alleviate land demand while creating multiple societal benefits. Numerous avenues exist to improve livestock production that do not entail additional land usage or raising livestock numbers, thereby creating a positive impact on sustainable development. In fact, many effective ways to counter desertification and land degradation – such as better rangeland management practices that include rotational grazing, agroforestry, manure management, as well as rehabilitation of degraded lands – are intricately linked with improved livestock production practices. Moreover, greater focus on reducing food waste and embracing more sustainable dietary choices can amplify the potential contribution of livestock systems to mitigating climate change impacts. (refer to table on page 4)



Source: Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, IPCC 2022



Source: Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, IPCC 2022

TAKEAWAY 5: In the fight against climate change, it is important to identify strategies that remove carbon from the atmosphere and store it within soils and trees.

CGIAR response: Simply reducing emissions is no longer enough. Restoring degraded pastures and other agricultural lands is one promising way to meet the Paris Agreement goal to limit global warming to 1.5 degrees Celsius. By planting improved forages in pastureland, for example, carbon can be sequestered in the soil at a rate of about 2 tons per hectare per year – equivalent to the emissions of about 2 cars per year. The United Nations Convention to Combat Desertification estimates that there are more than 2 billion hectares of degraded land in the world (twice the size of the United States), with 14% of that in Latin America. By restoring these lands, we can help increase the resilience of livestock farmers, combat climate change and improve the health of our planet. In a recent review, Bai and Cotrufo (2022 estimated that the achievable annual SOC sequestration potential in global grasslands is 2.3 to 7.3 billion tons of carbon dioxide equivalent per year for biodiversity restoration, 148 to 699 million metric tons carbon dioxide equivalent (MtCO2e) per year for improved grazing management and 147 MtCO2e for sown legumes in pasturelands. This potential corresponds to about 20% of the mitigation needed to achieve the 1.5ºC target temperature.

AUTHORS

Ciniro Costa Jr[1], Jacobo Arango[1], Todd Rosenstock[1], Mireille Ferrari[2] and Fiona Flintan[2]

[1]Alliance of Bioversity International and CIAT
[2]International Livestock Research Institute

CONTACT

Ciniro Costa Jr.
Alliance of Bioversity International and CIAT
Climate & food systems scientist
C.Costajr@cgiar.org

*This knowledge brief refers to the **Intergovernmental Panel on Climate Change AR6 Synthesis Report: Climate Change 2023** which builds on content from the three Working Groups Assessment reports: WG1 – The Physical Science Basis, WG2 – Impacts, Adaptation and Vulnerability, WG3 – Mitigation of Climate Change, and the three Special Reports: (1) Global Warming of 1.5°C, (2) Climate Change and Landd, (3) The Ocean and Cryosphere in a Changing Climate.*

The **CGIAR Research Initiative on Livestock and Climate** is designed to address the challenges that climate change poses to livestock production, providing livestock-keeping communities with the support they need without accelerating greenhouse gas emissions or degrading land, water, and biodiversity.