

The need for a prolonged and concerted investigation into GHG emissions, sequestration and associated methodologies of estimation and accounting.

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Reasons for communication: (1) Greenhouse Gas (GHG) emission and sequestration data of the livestock sector are inadequate for reliable calculation and, (2) the methodology used in calculation by authorities are limiting and is predicted to be detrimental to the future sustainability of the sector if not addressed.

Relevant UN bodies, functions and GHG reporting: The United Nations Framework Convention on Climate Change (UNFCCC) is the primary international treaty with the objective to stabilize GHG concentrations in the atmosphere to prevent dangerous interference with the climate system. It operates by dealing with mitigation, adaptation, finance, technology and capacity building. To that effect the UNFCCC relies on assessments from the Intergovernmental Panel on Climate Change (IPCC), which (a) is responsible for assessing the scientific basis of climate change, the impacts and future risks thereof, and the options for adaptation and mitigation; (b) provide information and directives in this context to governments; (c) provide key input into international climate change negotiations, and (d) is the official body to whom governments report their countries' decline in GHG emissions towards a particular target. [To limit global warming to 1.5°C, global GHG emissions must be reduced by 43-45% by 2030. South Africa need to reach a fixed GHG range of 350-420 MT CO₂e by 2030, the 2025 estimate being 400-510 MT CO₂e (the range results because of the amount of coal use for electricity generation). Net zero should be obtained in 2050].

Of importance to agriculture is the Land use, Land-use change and Forestry (LULUCF) GHG sector which falls under the UNFCCC covering carbon emissions and removals from managed lands (e.g. pastures), including forests, cropland, wetlands and settlements. LULUCF is crucial for reaching net-zero emissions, as it covers both emissions and biological sequestration (removals) of carbon.

Current GHG emission reporting: Despite recognition of GHG removal from the atmosphere by the LULUCF and recently of the storage of biogenic carbon through photosynthesis and other means by the Greenhouse Protocol: Land Sector and Removals Standard Version 1.0: Agriculture and CO₂ Removal Technologies, there has been no official reporting system for net emissions (the difference between GHG emissions and sequestration). The reasons for not recognising removals include UN and government reluctance and policies, poor understanding of the fate of methane in the

stratosphere, activism against livestock, and importantly from the perspective of this communication, **lack of reliable and quantitative research data to confidently proceed with calculation methodologies for net-emissions.**

Consequences: One of the measures of governments to enforce GHG reductions towards net-zero include introduction of taxes. The author already in 2017 in an Agri SA Report¹ warned against this possibility. A carbon tax on agriculture can be ill-afforded when economic sustainability is already vulnerable. In addition, emission reduction alone will not result in the reduction targets being realized, but fortunately agriculture, and the livestock sector in particular, has the potential to maximize removal of GHG and to embed carbon in the vegetation, soil and animal products. To that effect, SA research in the Dairy and the Wool Industry has resulted in respectively the DESTiny² and a wool production³ net-carbon model with considerable potential to enhance progress towards contributing to the objectives of the LULUCF and advancing towards a more fundamental correct and defensible accounting method of report to the IPCC. This should be a target for research in the livestock sector.

Shortcomings of current research and information required: The models have been developed with actually measured data and a considerable amount of literature data since much of the information required has not been researched. For the DESTiny model, the calculations apply solely to pasture-based dairy farms and not production systems based on total mixed rations (TMR). The wool model, which was developed from Australian data, requires much more local information, and nothing has as yet been done for the beef, goat, mohair and crop-livestock industries. This will require a huge effort in fundamental and applied research and training to understand and accumulate applicable data which can be used to populate the models necessary to eventually report to the IPCC. Although comprehensive, time is limiting towards 2030 and 2050, emphasizing the urgency.

Although a considerable amount of work has been done in South Africa which should be inventoried, research programmes need to be designed to limit enteric methane (animal and rumen genomics, rumen additives), soil carbon and microbial compositions, waste and manure emissions, production system data, ecosystem and biome differences, regenerative agriculture and conventional system differences, in addition to associative influences such as water, drought, disease and adaptability of stock to the diverse biomes of South Africa.

Institutional framework: Further down the line: (1) The institutional and legal framework of the relationship between South Africa and the UNFCCC and the IPCC in terms of responsibilities, liabilities and legalities when it comes to disputes with respect to measurement and reporting of GHG emissions will have to be clarified. (2) Calculations of both product and industry GHG footprints in consideration of ISO 14067*, the GHG

protocol, and various other documents regarding biogenesis to establish national targets that are scientifically defensible will have to be developed. This will need a specific methodology of calculation and reporting and in the national context, the design of a GHG estimation programme for the agriculture sector and individual industries.

References:

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2. Reinecke, R., J.N. Blignaut, H.H. Meissner & P.A. Swanepoel, 2025. DESTiny, an online farm-wide tool to estimate the net carbon emissions of pasture-based dairy farms in South Africa. *Front. Sustain. Food Syst.* 9:1491973. doi: [10.3389/fsufs.2025.1491973](https://doi.org/10.3389/fsufs.2025.1491973)
3. J. Blignaut, P. Swan & L. Blignaut, 2026. A biogenic life cycle approach towards estimating the carbon intensity of wool production: Evidence from six Australian case studies. *Agricultural Systems* <https://doi.org/10.1016/j.agry.2025.104631>.

**ISO 14067, 2018-08 edition is the International Standard which acknowledges biogenic carbon flows including to products and provides guidelines for quantification. However, as mentioned in the text, the procedures are not implemented or reported yet.*