REGIONAL SUPPORT TO NATIONAL LIVESTOCK GHG INVENTORIES IN SOUTHERN AFRICA: FOUR COUNTRIES MOVE TO TIER 2 GHG INVENTORY SYSTEM
Background

Ruminant livestock are responsible for 80% of agricultural greenhouse gas (GHG) emissions, with cattle contributing most of these emissions through enteric fermentation and manure management. The Southern African Development Community (SADC) countries recognize the need for adaptation to climate change and mitigation through reduction of GHG emissions, as evidenced by the targets to reduce emissions in their Nationally Determined Contributions (NDC). To better identify policies and measures that align national climate change adaptation and mitigation efforts and livestock development objectives, there is need for more advanced methods of compiling livestock GHG inventories.

Not all countries have been including livestock GHG mitigation in their NDCs. One key reason is that their national GHG inventories have been using the Tier 1 method to estimate GHG emissions. The Tier 1 method is based on multiplying livestock populations by a constant emission factor for each of dairy and non-dairy cattle (Figure 1). This approach does not consider that cattle may be of a different breed, production system, productivity, or consuming diets of different quality, among other factors. The Tier 1 method offers few opportunities to assess mitigation options, other than reducing herd size.

The Tier 2 method is considered more realistic in that, apart from livestock populations, it considers the breed of animals, herd categories (bulls, cows, heifers, growing animals or calves), production system, animal performance (daily weight gain, milk production, reproductive performance or work) and quality of feed as measured in terms of digestible energy content in determining emission factors (Figure 2).

Figure 1. Tier 1 method


Figure 1. Tier 2 method

Selection of Participating Countries

Botswana, Eswatini, Lesotho and Mozambique were selected to participate in a regional Tier 2 GHG inventory support project with financial support from the New Zealand Ministry of Foreign Affairs and Trade (MFAT) and Ministry for Primary Industries (MPI). The project was implemented by the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), with technical support from the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) and the University of Pretoria (UP).

The four countries were selected because they have similar cattle production systems (i.e., commercial ranching, emerging sector, communal sector) and a relatively high degree of a shared animal genetic base. In these countries, South African cattle genetics are dominant in the commercial beef and dairy sectors, with common local breeds dominating the communal sector. Against this background, there was high potential for these countries to develop Tier 2 cattle GHG inventories based on a systematic review of herd structure and animal performance data in Southern Africa, including South Africa, and a process that supported national agencies to compile Tier 2 inventories using both national and regional data. The project was implemented from November 2021 to April 2023 and featured various national and regional activities towards the development of national Tier 2 GHG inventories.
The GHG Inventory Compilation Process

Each country set up a team comprising a national expert or consultant, supported by technical personnel from relevant ministries or departments and other agencies responsible for collecting cattle activity data. Botswana chose to constitute a team of experts from national institutions rather than work with a consultant. The relevant agencies and/or ministries included climate change units responsible for compiling GHG inventories, ministries of environment and agriculture (livestock) and statistical agencies, commodity marketing agencies, and farmer organisations, among others.

The generic activities conducted at regional and national level were as follows:

i) Develop regional and national workplans;

ii) Provide iterative training and mentorship remotely (due to COVID-19 restrictions) on the Tier 2 method to regional and country teams;

iii) Conduct systematic review of data on cattle populations, herd structure, animal performance and manure management in each country for use in developing a regional database;

iv) Use secondary sources of data for cattle population from the base year until current and address data gaps;

v) Compile draft national cattle GHG inventories using IPCC (2006) guidelines and an excel GHG calculator;

vi) Convene a stakeholder workshop to validate the resulting Tier 2 GHG inventories and reports;

vii) Discuss national institutional arrangements and capacities for Tier 2 livestock GHG inventory management; and

viii) Convene a regional dissemination webinar to share experiences and key lessons on the regional Tier 2 GHG inventory compilation approach.

The compilation relied on existing national cattle data disaggregated by sub-categories, primarily available from official livestock data sources from either the livestock and/or veterinary departments of the ministries of agriculture or statistical agencies and FAOSTAT. Cattle population data gaps were addressed through interpolation and extrapolation of data from national statistics or FAOSTAT. Data on cattle performance and diets were based on research publications, grey literature, commodity marketing agencies, private producer organisations and expert judgement by various stakeholders, among other sources, and referenced against values from the regional database.

The Tier 2 GHG inventories

Each of the four national inventories provides estimates of GHG emissions by dairy cattle and other cattle (beef) from enteric fermentation (CH4), manure management (CH4 and N2O), and managed soils (N2O) due to deposit of dung and urine on pasture.

Institutional Arrangements to Manage and Improve GHG Inventories

In countries that included livestock in their NDCs, the GHG compilation was largely led by the ministry responsible for environment as the focal point for the United Nations Convention on Climate Change (UNFCC), with support of a sector expert or consultant. The agricultural sector agencies responsible for managing production and livestock population and related data were previously not involved, beyond provision of population data. One of the recommendations coming out of this regional support project was that the agencies responsible for livestock should play a major role in compiling the livestock GHG inventory and that the institutional arrangements should reflect this change (see Figure 3 for the recommended generic institutional arrangement).
Figure 3. Recommended institutional arrangement for compiling the GHG inventory

- Ministry of Environment
  - Task group specific to livestock
    - Key ministry departments
    - Other sector stakeholders
  - GHG Inventory teams
    - Receives data inputs into IPCC software
    - At least updated on Tier 2 process
  - National expert(s)
    - Collates & assesses data provided, writes report
    - Performs preliminary calculations
    - Able to provide support on an ongoing basis
- Ministry of Environment
  - Train so they know what data needed & why
  - Facilitate engagement of other stakeholders
  - Provide data
  - Learn how to manage inventory on ongoing basis
- Regional support to national livestock GHG inventories in Southern Africa
Experiences from National Teams

The experiences from the national teams varied by country but can be categorised into two: what went well and what could have been better.

**What went well?**

- Successful engagement of and leadership from the ministries of agriculture, especially the livestock departments, in the compilation of the GHG inventory.
- Continuous consultation among the livestock GHG inventory task team.
- Total commitment and support with data and expertise by the task team.
- Excellent coordination by FANRPAN and technical support by NZAGRC and UP throughout the project life.
- Experience sharing and support across participating countries in the region.

**What could have been better?**

- Local support towards the improvement/collection of missing data.
- The budget was inadequate for some countries that would have wanted to collect primary...
Lessons Learnt
The lessons learnt by different national teams are summarised below.

- The Tier 2 method demands much more detailed data, which, unfortunately, is not readily available and is not currently collected by most national agencies for various reasons, including lack of awareness, human resources capacity, shortage of equipment and lack of research.
- Most of the missing data at national level is also missing across the region.
- A decision should have been made earlier not to spend too much time looking for non-available missing data and instead, focus on gap filling efforts.
- There is greater success in teamwork and in letting the ministries mandated with livestock data take the lead in the data collection and compilation of the GHG inventory.
- Exchange of experience among countries with similar production systems and use of a regional database of cattle performance data was useful for countries with limited data.
- In general, countries need to improve availability of data on cattle performance, digestibility and composition of the diets, especially by supporting research by universities and research institutions.

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