National Agriculture Inventory Compilers' Meeting

17 January 2022, 2pm UTC

Inventories and NDC Network | GRA

Overview

On 17 January 2022, the Inventories and Nationally Determined Contributions (INDC) Network of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) hosted the first meeting of National Agriculture Sector Inventory Compilers virtually. Thirty-five countries were represented by their national agriculture inventory compiler.

The objectives of the meeting were to facilitate networking and information exchange, to discuss common issues faced in agriculture inventory compilation and to determine how the Network may best assist participants with these and inventory improvements.

To prepare for the meeting, the INDC Network collected survey responses from the agriculture inventory country representatives with questions on accounting, issues being faced, incorporation of the IPCC 2019 Refinement to the 2006 IPCC Guidelines and capacity.

<u>Attendees</u>: Argentina, Austria, Bangladesh, Benin, Bolivia, Canada, Colombia, Costa Rica, Czechia, Eswatini, Ethiopia, Finland, France, Germany, Ghana, Italy, Japan, Kenya, Morocco, Netherlands, New Zealand, Nicaragua, Niger, Norway, Peru, Republic Democratic of the Congo, Russia, Senegal, South Africa, St Lucia, Sweden, Switzerland, United Kingdom, UNFCCC Secretariat (observer), Uruguay and Viet Nam.

<u>**Apologies:**</u> Andorra, Brazil, Chile, Egypt, Guatemala, Kyrgyzstan, Latvia, Nigeria, Pakistan, Philippines, Suriname, Turkey, Uganda and Uzbekistan.

Key Outcomes

Network
1. There was a high level of international participation and engagement from Inventory Compilers. This meeting established contact across many countries that have not yet been connected with one another for agriculture inventory related issues. The INDC Network will continue to provide opportunities for multi-country engagement and knowledge sharing and facilitate sharing contact details amongst agriculture compilers.

Resources
2. Countries requested a resource documenting per country short summaries of accounting methods used, by accounting category (3A, 3Ba, 3Bb, 3C, 3D, 3E, 3F and 3G) if and where the country's accounting differs from IPCC Guidance.
3. Countries requested a resource or set of guiding principles on capturing agricultural mitigation strategies in national level inventories.
4. Many countries are also gap-filling prior to 2010 (but variable) due to lack of data. It is noted that it would be useful for compilers to have key literature summarized and available.

Discussion Summaries

There are differences in needs and circumstances of agricultural compilers globally and feedback for the INDC Network in the meeting reflected this. It was noted that Annex 1 compilers' needs tend to be very specific and technical where non-Annex 1 countries have more general capacity building needs. Despite these differences, compilers are universally focused on continuous inventory improvement which includes incorporations of the 2019 IPCC Refinement to the 2006 IPCC Guidelines, data problems and other inventory issues.

Therefore, under the umbrella of inventory improvements two discussion sessions across three general agriculture inventory topics were hosted:
  i)   livestock,
  ii)   agricultural soils, and
  iii)   open discussion forum and rice.

The political dimension of agriculture inventories as they inform decisions on national level agricultural emission mitigation strategies was also discussed during the meeting.

Political Dimension of Agriculture Inventories

Countries suggested the INDC Network consider developing a resource documenting per country short summaries of accounting methods used, by accounting category (3A, 3Ba, 3Bb, 3C, 3D, 3E, 3F and 3G) if and where the country's accounting differs from IPCC Guidance. The summaries would include details on including details on model choice, parameter choice, choice of emission factors and scientific basis for these decisions. This resource would inform compilers looking to make decisions about their own accounting methods, and the information does not exist in a central location for streamlined and efficient searching.

Countries also noted there is a policy guidance gap for a resource or set of guiding principles on capturing agricultural mitigation strategies in national level inventories, as the main evidence base to inform national decisions on reducing or preventing agricultural emissions. The resource would provide a general but repeatable framework for capturing and accounting for technical mitigations in the national inventory and enable the national inventory to form a basis to issue carbon credits. This resource like the previous resource request, does not exist in a central location.

General Suggestions for INDC Network

There are some existing platforms for exchanging expertise, but to our knowledge, these are not specific to agriculture inventory compilers. There is a broad and diverse range of research projects that exist among parties who attended the meeting. Specifically, the INDC Network could assist agriculture compilers by facilitating:

1. **Networking**
   - Under the UNFCCC review process, there is a Q&A forum where questions are posted by compilers to other reviewers. A similar forum or platform for inventory compilers would be useful (GHGMI have an experts' forum, but it comprises experts from all sectors and all forms of accounting i.e. not only national inventory reporting).
2. **Literature and research**
   - Summaries of key scientific literature to make it more accessible to inventory compilers who are time poor,
   - Coordination of efforts across multiple countries working together on topics where there is sufficient similarity between countries.
3. **Knowledge and expertise:**

- Sharing methodological approaches, tools, and methodologies to common topics among different countries.
- Knowledge exchange and learning from countries with more advanced inventories.
- Meetings for sharing technical experience would be useful, and/or special topic webinars, which could be facilitated using the INDC Network.

Existing Agriculture Inventory Networks

In general, there is interest in networking and considerable experience of it, more in some regions than in others. Given existing networks are relatively regional, the INDC Network could facilitate sharing of experiences and resources across regions, for example where a country in LAC may wish to develop their rice emission inventory and do not have the capacity that a country in Southeast Asia has through past research and inventory development efforts. Existing and more regional focused networks that were discussed are below.

Europe
- EU states have twice-yearly meetings of inventory compilers; many compilers serve as reviewers for other countries' inventories and thus contact and discuss with their counterparts in other countries. EU also provides capacity building to non-EU neighbouring states (e.g. Turkey, Macedonia, Montenegro etc.). Even so, some compilers feel contacts with other countries' compilers are not so frequent, partly because compilers in general are busy with their day-to-day tasks.
- A network of inventory compilers from Nordic countries (Denmark, Finland, Iceland, Norway and Sweden). They have similar climate zones but also many differences in their agricultural production systems. The network exchange experience by email, cross country visits etc. and sometimes ask other Nordic countries' compilers to informally verify some aspect of their work or take part in cooperative research on topics of mutual interest. Given common climate zones, Nordic countries are also exchanging with Canada on some issues, which is easier now that the exchange is done online.

LAC
- Latin America has a network of inventory compilers, but not every person involved in the inventory is represented in the network (limited to 1 representative per country). More agriculture inventory networking would be useful to discuss methodological issues.
- One Latin America initiative is [Red Latinoamericana de Inventarios Nacionales de Gases de Efecto Invernadero | Global Support Program – GSP (un-gsp.org)](un-gsp.org) with representatives of Argentina, Colombia, Cuba, Uruguay, Paraguay, Ecuador and Chile. Through this network, Colombia is providing support to Paraguay and other countries on Tier 2 for livestock emissions.

Africa
- The UN-GSP used to have such networking / capacity building support in West Africa, but it may have stopped at the end of a funded project. Germany has been supporting WASCAL (https://wascal.org/), which may be able to provide a useful platform for networking. Otherwise, there are some contacts between compilers in the region, and strong interest to work together where there are sufficient similarities between countries.

Asia
- In July 2021, Japan hosted the 18th annual Workshop on Greenhouse Gas Inventories in Asia (WGIA), that was not limited to the Agriculture Sector alone. Since 2003, as part of WGIA

outcomes, country to country mutual agriculture sector inventory learning exchanges have been supported between the following countries;

- o 2012 – Indonesia and Viet Nam,
- o 2013 – China and Myanmar,
- o 2014 – China and Mongolia,
- o 2015 – Indonesia and Laos,
- o 2019 – Cambodia and Philippines,
- o 2020 – China and Japan,
- o 2022 – Bhutan and Indonesia.

Oceania

- New Zealand and Australia are working with Fiji through some capacity building initiatives, but there is currently no formal agriculture inventory regional networking of New Zealand, Australia and Pacific Nations.

Livestock Discussion: Enteric Fermentation (3A), Manure Management (3Ba, CH₄ and 3Bb, N₂O)

Research & Capacity Needs:

There was a suggestion that Annex-1 countries have worked for a long time on inventories, and their needs tend to be very specific and technical, while non-Annex 1 countries have more general capacity building needs. Several specific needs/interests were expressed, outlined below.

Annex 1 Parties:

- It would be useful to have existing research on the dependence of enteric fermentation on feed types compiled and available for agriculture inventory compilers to consult.
- Developing specific EFs for animal housing and for manure storage as this relates to a Tier 3 model being developed in Europe based on a N flow model.

Non-Annex 1 Parties:

- Many countries have tier 2 inventories for cattle, but no existing research on Ym values.
- It was noted that in LAC countries there is a knowledge gap in N2O emission factors for calculating emissions from manure management. There is some existing research on pasture EFs, but little for swine or poultry.
- Colombia noted they have developed a model written in python for Tier 2 enteric fermentation and manure management [of cattle] and they are willing and interested to share their experience with this as well as the model.
- As indicated in the pre-meeting survey responses, country specific EFs are of high priority for most countries, particularly across the livestock reporting categories.
- Many countries are also gap-filling prior to 2010 (but variable) due to lack of data. It is noted that it would be useful for compilers to have key literature summarized and available.

Agricultural Soils Discussion (3D)

It was raised that for agricultural soils in particular, compilers would like to know how countries are disaggregating data for emission estimates (region, climate, soil type, topography, fertilizer types, environmental zones, crop types, area planted, season and related precipitation etc.). Many parties with T2 inventories are using IPCC default EF's with CS disaggregated data.

Existing Research and Knowledge Sharing

- The UK noted they have very high-resolution data (10km grid, including land use, fertilization type, soil type and climate type) and have developed empirical equation for estimation of direct N2O emissions from urea and ammonia-based fertilizers, with documentation for the inventory improvement process available online for other compilers who are interested.
- Switzerland would like to note they are exploring DayCENT for aspects of calculation emissions for agricultural soils and would like to know if any countries are already using DayCENT to account for emissions under 3D. Switzerland would be very open to share their experience and provide any support that is necessary where parties are exploring modulization of N2O emissions.
- Canada are exploring a new methodology that will describe relationships of agricultural soils in Canada including elevation shifts, soil moisture and other parameters such as fertilizer type, N source, Tillage factors, Soil texture, Cropping systems etc. This research is related to and informed by two studies;
  - i. Liang, C., MacDonald, D., Thiagarajan, A. *et al. Developing a country specific method for estimating nitrous oxide emissions from agricultural soils in Canada. Nutr Cycl Agroecosyst* **117,** 145–167 (2020). https://doi.org/10.1007/s10705-020-10058-w.
  - ii. Khagendra R. Baral, Susantha Jayasundara, Shannon E. Brown, Claudia Wagner-Riddle, *Long-term variability in N2O emissions and emission factors for corn and soybeans induced by weather and management at a cold climate site,* Science of The Total Environment, Volume 815, 2022, 152744, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2021.152744.
- Germany have conducted a metanalysis of all literature from the previous three decades and developed a T2 approach for estimating direct N2O. The data made it possible to distinguish between organic soils and mineral soils, to stratify between regional parameters (climate, soils) and was used to develop EF's at the district level which are now implemented in 3D inventory estimates. Doing this has resulted in lowering direct N2O emissions the previous estimate of emissions by 40% across the whole time series.
  - o Gokul Prasad Mathivanan, Max Eysholdt, Maximilian Zinnbauer, Claus Rösemann, Roland Fuß, *New N2O emission factors for crop residues and fertiliser inputs to agricultural soils in Germany,* Agriculture, Ecosystems & Environment, Volume 322, 2021, 107640, ISSN 0167-8809, https://doi.org/10.1016/j.agee.2021.107640.
- Germany are also working on at least a T2 method for estimating indirect N2O from nitrate leaching at runoff (i.e. FracLeach). using the regional N surplus as a control variable, including losses from denitrification during leaching.
- France is conducting research in the reduction of N2O emissions due to liming, depending on form of fertilizer.

Open Forum Discussion: Rice (3C), 2019 Refinement, N$_{OX}$ and NH$_3$

Implementation of 2019 Refinement

Implementing aspects of the 2019 Refinement is obviously not applicable where Annex 1 and non-Annex 1 parties already use CS EF's and methods but is of course applicable for example for more minor livestock categories that are not calculated at higher inventory tiers, or where refined IPCC default emission factors or methods are used with higher tier. Considering this, at least one third of respondents to the pre-meeting survey have implemented one or more aspects of the 2019 Refinement to their emission accounting.

Rice

Many countries are in the beginning of reporting rice in their inventories and are interested in exchanges with countries in more advanced stages.

- Eswatini are looking to include emission reporting for rice and noted the continued increase in rice production over the previous decades, especially in communal farmers. Eswatini is interested in an exchange with some countries that are experienced in accounting for rice emissions.
- Likewise, in Peru rice is the biggest crop producing 5% of national emissions. Peru have very little MRV data for emission calculation and have intentions to pilot measurements in 1000 rice fields, and would like to work with countries who have more advanced rice emission estimation and experience conducting and validating measurements.
- Viet Nam have research efforts focused on piloting Tier 3 emission estimation. Further they have seven field experiments and experience in estimating emissions in rice fields and upland crops, and developing EF's for rice for the national inventory (which has been adopted in the latest GHG inventories in which they estimate emissions at the T2 level). Use DNDC model to estimate GHG emissions (incorporating different climate and soil types). Vietnam have calibrated the model against field measurements for validation. Vietnam generated significant inventory data for rice using funding as part of AgResults, funded by WBO: effective incentive, measured 15,000 samples of GHG emissions (N2O and CH4).

N_{ox} and NH_3 emissions

- There is very little existing data on N_{ox} and NH_3 emissions, which are necessary for accurate estimation of indirect emissions from leaching. One European country has conducted a literature review.