

**IPCC EXPERT MEETING ON IPCC GUIDANCE ON ESTIMATING
EMISSIONS AND REMOVALS FROM LAND USES SUCH AS
AGRICULTURE AND FORESTRY**

13-15 MAY 2008, HELSINKI, FINLAND

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Introduction

The IPCC held an Expert Meeting on IPCC Guidance on Estimating Emissions and Removals from Land Uses such as Agriculture and Forestry in Helsinki, Finland 13th-15th May 2008. The meeting was co-hosted by Statistics Finland and supported by the Ministry of Environment, Finland Government to whom the IPCC wishes to express its gratitude.

The guidance on these sectors has evolved from the LUCF and Agriculture methodologies in the *Revised 1996 IPCC Guidelines*, through the Agriculture and LULUCF sectors in the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG2000)* and *Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF)* to the new guidance on a combined AFOLU sector in the *2006 IPCC Guidelines*. While these changes have led to improved accuracy and completeness of the estimates they have also been accompanied by increased complexity and greater data needs.

The aim of the meeting was to consider the existing guidance to determine if additional guidance or clarification could be given to assist inventory compilers making estimates of emissions and removals of greenhouse gases from any land use (e.g. agriculture, forestry) or any land use changes. Such assistance could include, amongst other things, improved or refined definitions, more clarity on input data and their acquisition and treatment or additional assistance for higher tier methods. The expected output of the meeting was a report on what may be needed and an outline of plans to fulfil these needs.

Nominated experts from 37 countries and 9 international organizations participated in the IPCC Expert Meeting on IPCC Guidance on Estimating Emissions and Removals from Land uses such as Agriculture and Forestry.

Following this introduction this report of the meeting contains 3 parts:

- PART 1. A summary of the issues agreed at the final plenary and actions that need to be taken.
- PART 2. The background papers and presentations that were made at the meeting.
- PART 3. The presentations made by country experts on their use of the IPCC guidelines and the state of inventories in the land use and agriculture areas.

PART 1 Conclusions: Issues and Actions

1 Meeting Overview

The meetings started with invited presentations (see Part 2 of this report):

- **“Evolution of IPCC Guidance on Agriculture and Land-use”** Nalin Srivastava (IPCC, NGGIP, TSU)
- **“LULUCF reporting: Experiences from reporting Parties and expert review”** Matthew Dudley, María J. Sanz, (UNFCCC)
- **“FAO global and regional datasets – potential use and limitations for GHG reporting”** Lars Gunnar Marklund, Caterina Batello (FAO)
- **“Use Of Satellite Remote Sensing in LULUCF Sector”** Frédéric Achard¹, Giacomo Grassi¹, Martin Herold², Maurizio Teobaldelli¹, Danilo Mollicone³ (GOFC-GOLD)
- **“Uncertainty Estimation And Management in the AFOLU Sector”** Suvi Monni, Giacomo Grassi, Adrian Leip (European Commission – Joint Research Centre, JRC)

Then followed a series of country presentations (see Part 3 of this report) discussing their use of the various IPCC guidelines for the agriculture and land use sectors:

- Benin
- Brazil
- Canada
- China
- Federated States of Micronesia
- Finland
- Japan
- New Zealand
- Russia
- UK
- USA

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These presentations identified a number of issues that were further discussed by the meeting in smaller groups. These include:

- ***Data Issues:***
 - There is a lack of or incomplete country activity data particularly on land use changes and the use of biomass for energy.
 - The use remote sampling was also raised with difficulties in interpretation and technical capacity. Also with remote sensing cloud cover is a problem in annual data as are seasonal changes.
 - The need for time series data can be problematic with the need for data for many years which is lacking (particularly the need for a 20 years history).
 - The correspondence of national and IPCC land classification and a mapping to 1996 GLs to compare data would be useful
 - Data collection – how to treat/process/store data
- ***Methodological Issues:***
 - Default methods may not include the latest information and defaults do not cover all situations. Specific methodological development may be needed in some areas due to new knowledge, e.g. Wetlands, Liming, N₂O from soils
 - The practical implementation of the guidance on uncertainty analysis in this sector gives many compilers difficulties.
 - Inter-annual variability which may swamp anthropogenic management effects. The meeting also discussed equivalence of models and forest inventory, particularly in the context of inter-annual variability due to natural disturbances, etc. The meeting noted that it depends on sampling regime and design of models, and that how to ensure comparability should be considered.
 - The definitions of managed land, land converted to agriculture and wetlands which change by season
 - How to demonstrate that pools are not sources, (specific requirements for reporting to Kiyoto Protocol)
- ***Inventory System***
 - The practical difficulties in some countries of implementing the inventory guidance includes local issues such as: lack of local capacity, poor data management, the need for capacity development/technology transfer, inability to sponsor research, and a need for external review inventories
- ***Other Needs***
 - There was a suggestion to develop simpler Tier 1 for agriculture
 - There were some specific activities identified that could help users. These are a help desk run by the NGGIP; Corrigenda (technical corrigenda is

published on the NGGIP web site); Software (this is under construction at present); and Templates for data collection

The meeting then discussed these points to decide the important issues that could be addressed by the IPCC's National Greenhouse Gas Inventory Programme.

2 Issues in the Use of the IPCC Agricultural and Land Use Guidance

There was a general consensus amongst the participants in the Expert Meeting on IPCC Guidance on Estimating Emissions and Removals from Land Uses such as Agriculture and Forestry, held in Helsinki, 13-15 May 2008 that the IPCC Guidelines are extremely useful in estimating and reporting national greenhouse gas emissions and removals from agriculture and land use sector. The meeting reiterated that the guidelines represent the best available, globally applicable, guidelines for the estimation of national greenhouse gas inventories. While the *GPG2000* and *GPG-LULUCF* are used by all the Annex I parties in reporting their national greenhouse gas emissions and removals to the UNFCCC, they are also being used by an increasing number of Non-Annex I parties.

Some users noted that the guidelines are complex and can be difficult to implement. Participants agreed on following ways to address these issues:

- Giving additional advice on the practical application of the guidelines
- Sharing and exchanging experiences
- Expanding the data and information distribution or sharing
- Incorporating new information and factors in the Emission Factors Database (EFDB)
- Collaboration with data generation organisations (e.g. FAO and satellite remote sensing organisations) for training and data collection.

The Expert Meeting identified five key areas where assistance could be given by the IPCC's TFI to inventory developers to assist them in using guidance on estimating emission and removals from land use and agriculture. These were then discussed by TFB 19, 16th May, where a practical plan was developed to act on these recommendations. Apart from a general suggestion that the TFI promote the guidelines further, the five issues are:

- **Data Issues.** In LULUCF sector data availability, especially activity data, is a problem for some parties. The data needs are complex and multi-year data are often needed. Obtaining, processing and classifying the data all have raised issues and more advice, descriptions of international datasets and sharing experiences would assist users.
- **Use of Managed Land Proxy.** Use of managed land as a proxy for anthropogenic emissions may increasingly raise interesting issues (e.g. wetlands, age distribution of forests, disturbances, possible biomass increases). While it is clear that estimating all C stocks will capture, management, disturbances and natural processes, and the guidance gives good details on how to estimate the carbon

stock changes, it is less clear if it is possible to apportion the total carbon stock change to individual drivers.

- **Uncertainties.** While the guidance in the GPG and 2006 Guidelines is appropriate, application of uncertainty guidance in practice is not easy in the LULUCF sector. Current guidance, whilst correct, is not practical enough for many. This is particularly due to the highly correlated data with correlations between land areas, emission categories and across time. It seems likely that the uncertainties reported by users of the guidelines are misleading as these correlations are often ignored. Additional assistance and experience sharing again would be useful and would help users move to the approach 2 methods.
- **Use of Tier 3 Models.** Many models are thought not to be in-transparent (opaque). They are difficult to assess, compare, validate and check they are consistent with the guidelines. While it may not be the role of the IPCC to assess or validate these models – this may be happening in other fora – a description of minimal information and validation checks would assist users of the models and of the final inventories.
- **Wetlands.** Current guidelines are not comprehensive and do not cover all emissions or how they vary. Improved and complete guidance is needed. However the meeting concluded that, due to on-going research, it would be at least 2-3 years before sufficient scientific information was available to be the basis of any guidance. Therefore this topic will not be discussed further in this document, although the TFI should consider this issue again in the future.

The meetings also discussed 3 ways of addressing these issues:

- **Expert Meetings** producing reports covering the issues and giving case studies, examples and practical advice.
- **EFDB**, both adding more data to the EFDB and extending the types of data and information held by it. The current plan to hold small meeting focused on a specific area to collect, approve and enter data was endorsed as one way to achieve this.
- **Web Presence**, adding to the information held on the NGGIP web site. While some of these enhancements are already under way (e.g. FAQ), other such as case studies will need to be developed.

The issues are discussed in more detail in the following sections.

2.1 Data Issues

The data needs in agriculture and land use are complex with the requirement of multi-year data at appropriate resolutions. The important data issues identified by the meeting participants were:

- **Data collection.** Some inventory compilers find it difficult to obtain all the necessary data in this sector. This problem covers both activity data and emission factors. Activity data includes such things as land areas by land cover/use type and information about livestock and the age distribution or history of tree stocks. Emission factors and other parameters are included in the guidelines; with the most up-to-date list in the 2006 GLs, however more country specific information would be useful and this data needs to be updated with more recent information.

- Use of existing international databases. While most international databases are often based on national data many inventories compilers find international data sets a more convenient and accessible source of data. Additional assistance and a description of what is available would be helpful.
- Inventory compilers have to deal with gaps in official data, e.g. informal sector, illegal activities etc. Some assistance and sharing of experiences and ways to deal with this would be very helpful. It was noted there is a little discussion of this in some of the other sectors.
- The reconciliation of national land use classes with the IPCC categories is a problem for several inventory compilers. While this is nationally specific the publication of case studies on how this has been done would be very useful.

It was proposed address these issues with an expert meeting on data issues. The meeting output will be in the form of a report covering the following:

- Elaboration of the Volume 1, Chapter 2 of the 2006 Guidelines dealing with data collection, suitable for use with *GPG-LULUCF* as well as *2006 Guidelines*;
- Case studies and illustrative examples to be published on the website;
- A list of international databases and advice on their use to be maintained on the website;
- Development of a checklist for expert judgment;
- Advice on filling gaps in the data due to informal sectors, illegal activities etc. publication on web site of case studies;
- Examples of templates from users reconciling national land use classes with the IPCC categories.

2.2 Use of managed land proxy

The use of managed land as a proxy for anthropogenic effects was adopted in the *GPG-LULUCF* and has been retained in the *2006 Guidelines*. However the participants felt that the use of managed land as a proxy for anthropogenic effects does have its shortcomings and that issues may arise in areas such as estimating emissions and removals from flooding land; how to deal with hypothetical situations like possible changes in bio-mass in natural forests and seasonal fluctuations in emissions and removals due to natural disturbances on managed lands.

The proposed solution to this issue was to have an expert meeting that will start with consideration of the causal understanding of these effects and find practical approaches to deal with them. The meeting output will be in the form of a meeting report that will assess the use of managed land as a proxy for anthropogenic effects in different contexts and identify specific cases where additional information can be given. It will also identify and evaluate other options for use as proxy for anthropogenic effects.

2.3 Use of Tier 3 Models

The IPCC Guidelines recommend a tiered approach to estimation of greenhouse gas emissions and removals from agriculture and land use, depending on data availability and national circumstances with increase in the level of detail in higher tier approaches. Tier 3 methods are higher order methods that involve models and inventory measurement systems with highly disaggregated activity data. Modelling approaches are being successfully used in several national inventories to increase the accuracy of estimates of emissions and removals from *key categories*.

There was a belief amongst the participants, however, that models are not generally transparent and therefore difficult to assess, compare, validate and check whether they are consistent with the guidelines.

A possible solution identified in this meeting was to have an expert meeting on modelling approaches that will focus on soil C and involve experience sharing amongst inventory developers in the use of modelling approaches. It will not however, involve detailed comparison of models. The meeting output will be in the form of a meeting report that will outline the various consistency checks required, ways to demonstrate transparency and general validation checks and guidance (such as demonstration of conservation of carbon and land areas).

2.4 Uncertainty

The application of uncertainty guidance in the agriculture and land use sector is not easy because of the highly correlated nature of the data. It was generally agreed by the meeting participants that the current guidance on the estimation of uncertainty as contained in the guidelines, whilst correct, is not practical enough for many inventory developers. Where the guidance is being followed it is often the case that the results are misleading as developers have not considered enough the correlations.

The solution identified in the Expert Meeting was to have two expert meetings on “Practical Application of IPCC guidance on uncertainty analysis to the LULUCF/AFOLU sectors”. The meeting outputs will be in the form of meeting reports on:

- ***Production of Case Studies and practical advice:*** focusing on common pitfalls and case studies, use of uncertainty ranges in *2006 Guidelines*, estimating and using errors in survey data, remote sensing data, extrapolated data, “old” data, “spatial” data, dealing with T3 model errors, model validation through measurements, empirical uncertainty assessments (“expert knowledge”), qualitative uncertainty assessment.
- ***Approach 1 to Approach 2:*** focusing on how to develop an uncertainty model in the AFOLU sector and how to deal with categories or estimates correlated through numbers, space or time. This would consider going beyond the simple Approach 1 error propagation approach to either Approach 2 or a hybrid Approach 1/2.

2.5 Wetlands

Wetlands present a challenge to inventory developers. It was concluded by the meeting participants that the current guidance as contained in the IPCC Guidelines are not comprehensive and do not cover all emissions and their potential variations. The 2006 Guidelines acknowledge this by including some information in appendices “as the basis for further methodological development”. However it is clear that the guidance is the best that can be achieved with the current state of knowledge of the processes and emissions involved. While it was agreed that more guidance will be needed at some stage, currently scientific investigations and consideration of these emissions is underway. Therefore, the IPCC will need to wait for at least 2-3 years for sufficient scientific knowledge to emerge in this field before it can realistically consider any further developments.

2.6 Other Activities

Emission Factor Database(EFDB):

The EFDB was felt to be an extremely useful resource for inventory developers in estimating the emissions and removals from agriculture and land use. There is a widespread need for more data covering more specific national circumstances beyond existing defaults. There is also a need to include more up-to-date information in the EFDB than available in the IPCC Guidelines as well as to keep the existing parameters and emission factors in tune with the latest scientific research. It was felt that there was an urgent need to enhance the population of EFDB. The participants supported the idea of having data collection meetings on specific topics that the TFI is planning to hold this year. Among others, the meeting noted that consideration of biomass expansion factors (BEFs) was of high priority, some participants being of the view that the default values for BEFs needed to be reviewed. The EFDB should also have links to international datasets, potentially useful models and calculation tools and other useful supporting information such as remote sensing.

Web presence

The participants felt that the web presence of the IPCC National Greenhouse Gas Inventory Programme (NGGIP) through its website (www.ipcc-nggip.iges.or.jp) was a very good way to communicate with and enhance the understanding of the guidelines amongst user groups such as inventory developers. At present, interaction of the IPCC NGGIP Technical Support Unit (TSU) with inventory community takes place through enquiries dealing with specific inventory issues that are answered by the TSU themselves or with the help of authors of the guidelines. Frequently Asked Questions (FAQs) dealing with commonly asked questions relating to inventory development are also going to be put on the website very shortly⁴. Other suggestions made by the participants in this regard were:

- Introduction of a web forum for posting inventory related questions and discussion threads;

⁴ 3 additional FAQ were suggested: Explanation of the definitions of land/vegetation classification; How to chose a transition period other than 20 years; and definitions of settlements and wetlands.

- Sharing illustrative examples and case studies on the website to help inventory developers.
- While direct capacity building and training is regarded as being beyond the remit of the IPCC the IPCC can produce training and other material for use by others. The IPCC also can suggest people who can contribute to training courses. All of this material should be hosted on the web site.

Publicity material in the form of brochures dealing with different aspects of NGGIP and a Primer meant to facilitate the understanding of the national greenhouse gas inventory development process and the use of the IPCC Guidelines are in preparation and will be posted on the web very shortly.

3 Possible way forward

As discussed earlier, the meeting participants identified the various important issues in the use of IPCC Guidelines in agriculture and LULUCF. It was agreed that the possible way forward is to have a series of expert meetings focusing on specific areas that require further elaboration. The meeting output will be in the form of meeting reports that will contain further elaboration and supporting materials. Accordingly, the following expert meetings/workshops were proposed in the Expert Meeting:

	Priority ⁵	Expert Meetings	EFDB	Web Presence
Data Issues	1	1	✓	✓
EFDB meetings		2/year	✓	✓
Use of Managed Land Proxy	2	1		
Uncertainties	2	2		✓
Use of Tier 3 Models	3	2		✓
Wetlands	3	2 ⁶		

It was noted that:

1. The wetlands meeting cannot take place for at least 2-3 years.

⁵ The priority ranking was recorded by the TSU on the basis of the discussions in the meeting and subsequently confirmed by the Task Force Bureau, many of whom also attended the expert meeting.

⁶ The meeting did not specifically discuss how many meetings would be needed but if formal IPCC guidance were to be produced then several meetings and review meetings would be needed.

2. Some of these suggestions overlap, particularly the data issues and uncertainties meeting. One meeting may be able to cover more than one topic.
3. The TFI should explore possibilities of a joint meeting with other interested parties (for example the data meeting would be of interest to data providers and the FAO has expressed an interest in a joint meeting on some of the data issues.)
4. The suggestion of a meeting on Tier 3 models may be more appropriately held by those parties who already use and develop such models.

The meeting strongly endorsed the ideas to extend and develop both the NGGIPO web site and the Emission Factor Database (EFDB).

Suggestions on the EFDB and web site are in line with existing developments and these should continue incorporating the elements described above.

PART 2 Invited Background Papers

1. **“Evolution of IPCC Guidance on Agriculture and Land-use”** Nalin Srivastava⁷ (IPCC, NGGIP, TSU)
2. **“LULUCF reporting: Experiences from reporting Parties and expert review”** Matthew Dudley, María J. Sanz, (UNFCCC)⁸
3. **“FAO global and regional datasets – potential use and limitations for GHG reporting”** Lars Gunnar Marklund, Caterina Batello (FAO)⁹
4. **“Use Of Satellite Remote Sensing in LULUCF Sector”** Frédéric Achard¹⁰, Giacomo Grassi⁹, Martin Herold¹¹, Maurizio Teobaldelli⁹, Danilo Mollicone¹² (GOFC-GOLD)
5. **“Uncertainty Estimation And Management in the AFOLU Sector”** Suvi Monni, Giacomo Grassi⁹, Adrian Leip⁹ (European Commission – Joint Research Centre, JRC)

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PART 3 Country Presentations

1. Benin
2. Brazil
3. Canada
4. Federated States of Micronesia
5. Finland
6. Japan
7. New Zealand
8. Russia
9. UK
10. USA