FAO datasets on land use, land use change, agriculture and forestry and their applicability for national greenhouse gas reporting

A background paper for the IPCC Expert meeting on
Guidance on Greenhouse Gas Inventories
of Land Uses such as Agriculture and Forestry.

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1 Background

One of the core functions of The Food and Agriculture Organization of the United Nations (FAO) is to collect and disseminate information related to the subject areas covered by the organization, among them natural resources, land use, agriculture and forestry. The organization collects country information through a handful of different reporting processes, and compiles it as global data sets, available in periodically published reports and on the FAO websites. FAO is considered as the main authoritative source of information on land use, agriculture and forestry at global and regional level, and data published by the organization is widely used for many different purposes.

This paper aims at giving an overview of FAO's global and regional datasets that may prove useful for compilers of national greenhouse gas (GHG) inventories. It also describes some of FAO's experience from the application of existing IPCC guidelines and gives some suggestions on how the FAO datasets can be used together with the IPCC guidelines for modeling emissions.

2 FAO datasets on land use, land use change, forestry and agriculture

2.1 FAOSTAT data on land use and land use changes

The global data set on land use maintained by FAO is published through the corporate statistics Website FAOSTAT (http://faostat.fao.org). It is updated annually, and contains a chronological time series since 1961. This dataset is a product of several independent reporting processes which use partially overlapping land use categories, and therefore the dataset is not totally consistent.

This land use dataset contains a large number of classes and subclasses of agriculture land, for which data are annually collected through a questionnaire sent to countries. It also contains data on forest area collected through the Global Forest Resources Assessment reporting process (see below for more detail). Data on forest area are available since 1990, and was originally reported for 1990, 2000 and 2005. Annual figures were obtained by linear interpolation between reporting years. Other land is calculated as the total land area minus agriculture area minus forest area.

2.2 Data sets on forestry

2.2.1 Global Forest Resources Assessment (FRA)

FAO has been collecting data about forest area and forest resources at 5 to 10 year intervals since 1946. The Global Forest Resources Assessments (FRA) are based on data that countries provide to FAO in response to a common questionnaire. FAO then compiles and analyses the information and presents the current status of the world's forest resources and their changes over time.

In the following is explained in more detail the process and available data from the latest assessment (FRA 2005) as well as what is expected from the recently initiated process for FRA 2010.

Beginning with FRA 2005, the reporting process builds on a network of officially nominated national correspondents that receive hands-on training through a series of workshops. In parallel, methods and reporting format were further developed to increase transparency so that all the reported figures can be traced back to original country data and its sources. Reported country data are thoroughly reviewed by the FRA secretariat to ensure consistent and well-documented country data. Before publishing, the data undergo a process of official validation by competent national authorities.

The methods for estimating biomass and carbon stocks in FRA 2005 were entirely built on the 2003 IPCC Good Practice Guidance, and for FRA 2010, countries are suggested to use the IPCC 2006 Guidelines whenever they lack country-specific data or conversion factors. FAO has participated in the development of the IPCC Guidelines and the UNFCCC secretariat form part of the FRA Advisory Group and Expert network.

2.2.2 Relevant data in FRA 2005 for GHG reporting

FRA 2005 collected information from more than 40 variables and for three points in time: 1990, 2000 and 2005. FRA 2005 data are available for viewing and download at www.fao.org/forestry/fra2005. A CD-ROM is also available for free upon request.

Data particularly relevant for GHG inventories are:

- Area of forest
- Area of other wooded land
- Area of other land with tree cover
- Growing stock
- Biomass stock
- Carbon stock
- Forest fires
- Wood removals

Area of forest is available for three points in time for all but one small country. Based on these figures, net changes in forest area have been calculated, as well as annual change rates. Note that net change of forest area is not the same as deforestation, as the net change is the

combined result of deforestation, afforestation and natural expansion of forest to land that was previously under other land use.

Data on growing stock, biomass stock and carbon stock are available from about 145 countries out of 229 countries and territories included in FRA 2005. However, non-reporting countries and territories are generally small countries with limited or no information. As regards carbon stock in litter and soil, the response rate is much lower.

2.2.3 Specific issues related to the FRA 2005 dataset

When using FRA data as input for the compilation of national GHG inventory reports, there are some specific issues that need to be considered

1. The definition of forest as used by FAO is not necessary exactly the same as used by a country when reporting to UNFCCC. Threshold values may vary (FAO uses 10% crown cover, 5 m tree height and a minimum size 0.5 hectares) and furthermore the FAO definition also contains a criterion on land use, thereby excluding all agricultural land and urban land that fulfill the requirements for forest in terms of crown cover, tree height and size. These areas are instead included in the category "other land with tree cover"; unfortunately the data for this category are weak, as many countries do not have this information.

2. Although FRA data contains a time series on stocks (biomass, carbon), the trend shown in these time series often only reflects the changes in forest area. The vast majority of countries do not have comparable time series data on stocks per hectare. This is an important limitation to be aware of.

2.2.4 FRA 2010 Global remote sensing survey

FAO has recently launched the next round of Global Forest Resources Assessment (FRA 2010). It contains a new component – a global remote sensing survey, based on 10x10 km sample plots from LANDSAT, at each latitude-longitude intersection. The total sample will be of more than 13000 sample plots. It is planned to compare images from 1975, 1990, 2000 and 2005, which will give very good data on land use change dynamics and trend statistics related to land cover and land use on global, regional and biome level. It is expected that data from this survey will be available in 2011.

2.2.5 FAO Support to National Forest Monitoring and Assessment

In many countries, forestry information is outdated, partial or subjective, and in most cases the precision and accuracy of the data are unknown. Upon request, FAO supports countries in their efforts to close this knowledge gap by implementing systematic field inventories and establishing comprehensive datasets on forests and trees outside forest. The national forest monitoring and assessment (NFMA) programme of FAO has been active since 2000 in a growing number of countries (see table below). The programme supports national forest monitoring assessments (NFMA) and integrated land use assessments (ILUA). The main objectives of the NMFA and ILUA include strengthening the ability of countries to update,

expand and manage their information base on forestry and land use to facilitate policy dialogue, preparation of forestry and land-use strategies, formulation of national forest programmes and national reporting to the UN Conventions (UNFCCC, CBD, UNCCD), UNFF and other processes and to the Global Forest Resources Assessment (FRA).

List of countries where direct FAO Support to National Forest Monitoring and Assessment is being provided

NFMA or ILUA completed	Bangladesh; Cameroon; Costa Rica; Guatemala; Honduras; Lebanon; Philippines
NFMA or ILUA in progress	Angola; Congo (Republic of); Kenya; Kyrgyzstan; Nicaragua; Zambia, Brazil, Uruguay

NFMAs typically cover not only forest resources on forest lands but also trees outside forests. They encompass a wide set of biophysical and socio-economic variables that can be transformed into harmonized information and knowledge on the social, economic and environmental benefits of forests and trees, their management, uses and users. The information relevant to the greenhouse gas reporting includes: areas of forest, other wooded land and other lands (detailed by forest and other land use types); data on forest fires; growing stocks in forest and outside forest; biomass and carbon stocks in forest and outside forest;. Methodologies for complementary soil carbon monitoring have also been developed.

Increasingly NFMA and ILUA are important for monitoring and reporting on deforestation and forest degradation under the REDD initiative and carbon accounting. Biomass and carbon stocks are derived from growing stock by employing biomass expansion factors/functions and carbon conversion factors respectively. The IPCC guidelines are followed when no local or national expansion/conversion factors/functions for biomass and carbon are available.

2.2.6 The planted forest database

Linked to FRA 2005, FAO made a thematic study on planted forests. A specific questionnaire was sent out to 61 countries that have the most areas of planted forests. The study has been published and the planted forest database is available on CD-ROM.

You can download the publication from the Planted Forest Web site at the following link: http://www.fao.org/forestry/webview/media?mediaId=12139&langId=1. The CD-ROM is available from FAO upon request to FO-publications@fao.org.

The planted forest database provides data on:

1. Area of forest plantations, productive and protective, by countries
2. Area of semi-natural forests (planted and/or regenerated through assisted natural regeneration), based on a sample of 61 countries that represents more than 94.5% of the total plantation area reported at year 2005
3. Area of planted semi-natural forests (productive and protective)
4. Total area of planted forest (productive and protective)
5. Planted forest area by species (only for countries that reported on questionnaire)
6. Growth parameters for reported tree species (only for countries that reported on questionnaire)

7. Age class distributions of planted forest by country, category and species (only for countries that reported on questionnaire)
8. Ownership of planted forests by country and category (only for countries that reported on questionnaire)
9. Area of planted forests for industrial and non-industrial purposes respectively

2.3 Data sets on agriculture and livestock

The following part of the paper will inform about FAO data sets that are specifically related to the agricultural sector (such as crops and cropping systems, livestock and manure, grassland and improved forages) that could be made available and further developed to meet the needs for GHG reporting.

The Agriculture Department (AG) and specifically Plant Production and Protection Division (AGP) and the Animal Production and Health Division (AGA) would be available to further bridge the gap and improve data collection at national level and sharpen estimates

2.3.1 Agricultural data in FAOSTAT

The current core of FAOSTAT contains a full matrix of integrated and compatible statistics coverage of 200 countries, 16 years, and more than 200 primary products and input items related to production, trade, resources, consumption and prices. FAOSTAT comes with complete global coverage, cross-domain integration, a fully-refined user-interface and increased data transparency. It serves the needs of users and allows them more time for analysis; still it may not meet all the specific needs of our diverse user groups. It is therefore necessary to jointly develop with IPCC recommendations and tools to convert the available information into information related to GHG inventories related to grasslands and cropland.

FAOSTAT aims not only to host the largest database on food and agriculture, but also to be a gateway to complementary databases.

Below are direct links to different agricultural datasets in FAOSTAT with some indications of their content:

i) crops (http://faostat.fao.org/site/567/default.aspx) :
   - Quantity produced
   - Producer price
   - Value at farm gate
   - Area harvested
   - Yield per hectare

ii) grasslands (http://faostat.fao.org/site/377/default.aspx) :
   - Temporary meadows and pastures-irrigated- non irrigated-fallow land
   - Permanent meadows and pastures-cultivated-irrigated-naturally grown

iii) Livestock, primary and processed
http://faostat.fao.org/site/569/DesktopDefault.aspx?PageID=569 :
- Milking animals-yield-production quantity
- Commodities such as buffalo meat, camel meat, chicken meat and so on....

iv) Livestock (http://faostat.fao.org/site/573/default.aspx) :
- Mules, camels, bees, ducks, geese, goats, etc.

v) Fertilizers (http://faostat.fao.org/site/575/DesktopDefault.aspx?PageID=575) :
- by subjects: Production-Import-Export-Non fertilizer use-Consumption
- by commodity: Nitrogen-Phosphate-Potash-Ammonia-NPK Complex, etc.

2.3.2 The FAO Statistical Yearbook

The FAO Statistical Yearbook is published annually and contains global statistics and data on a wide variety of variables, such as:

- Production of cereals and share in world
- Production of meat and share in world
- Production of fruits and vegetables and share in world
- Number of Animals
- Total fertilizer consumption and consumption of N, P2O5, K2O

The FAO Statistical Yearbook can be found at the following Web sites:
- (http://www.fao.org/statistics/yearbook/vol_1_2/index.asp) and with specific information on (http://faostat.fao.org/site/339/default.aspx)

2.3.3 Livestock sector

Below are some links to Web-sites maintained by FAO with information on the livestock sector:

http://www.fao.org/ag/againfo/resources/en/maps.html gives access to Geographic Information Systems (GIS), the Global Livestock Production and Health Atlas (GLiPHA) and the Gridded Livestock of the World (GLW). The latter can also be accessed directly at http://www.fao.org/ag/againfo/resources/en/glw/home.html where information is found about livestock densities, livestock production systems and livestock production info. The Gridded livestock of the world 2007 is found at http://www.fao.org/docrep/010/a1259e/a1259e00.htm.

FAO also maintains a Web-site for the “Information System for Pastoralism in the Sahel” which can be found at http://www.fao.org/ag/againfo/programmes/en/lead/sipsa/home.html

2.3.4 Fertilizer use

Statistics on fertilizer use is available at http://www.fao.org/ag/agl/fertistat/. There is also a set of 21 (so far) studies/publications on "*Fertilizer use by crop in …*". These studies are found at http://www.fao.org/ag/agl/fertistat/fst_pubs_en.htm. The information is organized by country, commodity and year, and it deals will all sources of fertilizers.

2.3.5 Integrated Plant Nutrition Information System (IPNIS)

IPNIS (http://www.fao.org/landandwater/agll/ipnis/index.asp) is a database and information system with the main objective to provide researchers, extension officers, decision-makers and other stakeholders working in the area of agricultural development with special emphasis to plant nutrients management with data on crop-wise plant nutrients use (organic and mineral fertilizers) and yields. This information is not only a prerequisite for providing farmers with appropriate advice on nutrient management, but also provides background information for policy and strategy formulations for improved plant nutrients use, demand forecasting, and formulation of agricultural production oriented field programmes. The database provides information at district level, irrigation, agro-ecological zone, soil types, NPK status, cropping systems, crop constraints, soil management practices, etc.

2.3.6 Global estimates of gaseous emissions of NH_3, NO and N_2O from agricultural land

The publication *"Global estimates of gaseous emissions of NH_3, NO and N_2O from agricultural land (2001)"* provides a comprehensive review of the literature about emissions of NH3, N2O and NO, and examines the regulating factors, measurement techniques and models. It draws these data together and generates global emission estimates that can serve as a basis for further addressing the issues of efficiency and environmental impact. The report is available at:
http://intranet.fao.org/offsiteframe.jsp?uu=http://www.fao.org/ag/AGP/Default.htm

2.4 Other related activities where FAO is key partner

In 1996, four United Nations bodies and an international scientific community created the **Global Terrestrial Observing System (GTOS)** (http://www.fao.org/gtos/). The specific aim of GTOS is to improve the quality and coverage of terrestrial data, to integrate it into a worldwide base and to facilitate its access by scientists, policy makers and the public. FAO hosts the GTOS secretariat and coordinates the programme implementation.

GTOS has several technical panels, of which one is the **Terrestrial Carbon Observations (TCO)** (http://www.fao.org/gtos/tco.html). The overarching goals of TCO are to better identify the potential end users and their requirements; organize and coordinate reliable data and information on carbon; and link the science community with potential users.

CarboAfrica (http://www.carboafrica.net) is a multi-partner project aiming at setting up GHG fluxes monitoring network of Africa, in order to quantify, understand and predict GHG emissions in Sub-Saharan Africa and its associated spatial and temporal variability. FAO and GTOS are both partners in the CarboAfrica project. Data will become gradually available on the CarboAfrica Web site, and a full dataset is expected to be available by March 2010.

3 Application of the IPCC guidelines for GHG reporting

Apart from collecting and disseminating data and information, FAO has actively participated in the development of the IPCC guidelines and has also applied the IPCC guidelines in different contexts. In this chapter, some experiences of applying the guidelines are presented as well as suggestions on how they could be applied to the available FAO datasets.

3.1 Experiences from carbon assessment in the Global Forest Resources Assessment

In FRA 2005, countries were provided with all the default values and conversion factor from the IPCC 2003 Good Practice Guidance. Out of the 145 countries that reported on biomass and carbon stocks, the vast majority used the GPG to convert their growing stock figures to biomass and carbon. Some particular issues were noted:

- The wide interval for the expansion factor that converts stem biomass to above-ground biomass made it difficult to advice countries where to set the expansion factor in particular cases. Most common approach was to apply the global average expansion factor.
- The factors were in a few cases used backwards, in order to estimate growing stock from biomass data.
- Despite some complexity, most countries managed to perform estimation using the 2003 GPG.

For FRA 2010, countries have been given the 2006 IPCC Guidelines to use for biomass and carbon estimation when no or limited national data and/or conversion factors are available. When putting together the guidelines on how to apply the 2006 Guidelines, several issues were observed:

- Although much effort have been made in order to improve quality and precision of the biomass and carbon estimates, the 2006 Guidelines are more complex and difficult to apply than the 2003 GPG
- The categories of inputs are different, e.g. in the table for root-shoot ratios there are a number of categories of domains and ecological zones, while in the table on biomass conversion and expansion factors, the entry point is by climatic zone and forest type. This kind of inconsistence adds confusion to the application of the guidelines.

- By promoting the use of biomass conversion and expansion factors (BCEF) instead of a separate conversion factor (density) to estimate stem biomass and then an expansion factor to estimate above-ground biomass, countries with good knowledge of their species distribution and the wood density of individual species may actually lose precision by not having a table with good expansion factors available.
- The table with BCEFs requires as input volume per hectare. However, it is not clear from the guidelines whether this refers to an average volume per hectare by country, or the volume per hectare at stand level. Furthermore, very few countries have data on volume per hectare for different forest types.
- The removal of default factors for dead wood makes it practically impossible for most countries to report on this fraction, and consequently it will be difficult to make global carbon estimates.
- It is no longer possible to go backwards and estimate growing stock from biomass.

3.2 Mapping emissions from cropland and grasslands using FAO data

IPCC guidelines can be used in conjunction with FAO datasets to derive maps of croplands and pasture emissions at a generalized level (per country calculation at a regional or global scale).

Also, maps are in development for selected countries to calculate emissions from croplands, referring to the chapter 5 of IPCC guidelines (biomass, above ground woody biomass, below-ground biomass, soil carbon, etc.).

The mapping of pasture it is more complex due to the fact that few statistical data are available for pasture land use (e.g. FAOSTAT has only five pasture crops and only estimates permanent pastures). The use of modeling or remote sensing data is therefore suggested for detecting the extent of pastures, although it does not seem possible to estimate in detail the large amount of pasture species at a global scale.

By using FAO datasets IPCC guidelines can be used to derive maps of croplands emissions at a detailed (i.e. sub-national level) or a more generalized level (per country calculation at a regional or global scale) both for cropland and pastures. Nevertheless, the objective is to establish a modeling framework where the scale independency is preserved, and the detail of the analysis can vary based on availability of input data.

A list of available FAO data at global and/or regional scale that could be used both in cropland that in grassland emission modeling approach is showed in the following table.

	Dataset description	Source
Cropland	Production Extent Yield Land use	http://faostat.fao.org/
Thermal regime	resolution 9 by 9 km at the equator	FAO IIASA GAEZ 2006 - *unpublished*
Suitability and occurrence of pasture	resolution 9 by 9 km at the equator	www.fao.org/geonetwork/srv/en/metadata.show?id=14167&currTab=simple www.fao.org/geonetwork/srv/en/metadata.show?id=14168&currTab=simple www.fao.org/geonetwork/srv/en/metadata.show?id=14068&currTab=simple
Net productivity for pasture and projected expansion of pasture	resolution 9 by 9 km at the equator	www.virtualcentre.org/en/library/key_pub/longshad/a0701e00.htm *internal data*
beta version of the Global Land Use Systems database 2008	resolution 9 by 9 km at the equator	www.fao.org/geonetwork/srv/en/metadata.show?id=31668&currTab=simple
Global Agro-Environmental Zoning (GAEZ)	resolution 9 by 9 km at the equator	www.iiasa.ac.at/Research/LUC/SAEZ/index.html
Length of growing period	resolution 9 by 9 km at the equator	FAO IIASA GAEZ 2006 - *unpublished*
Harmonized world soil database	resolution 1 by 1 km at the equator	FAO/IIASA/ISRIC/ISSCAS/JRC 2008 - *under publication*
Global land cover 2000	resolution 1 by 1 km at the equator	www.fao.org/geonetwork/srv/en/metadata.show?id=6531&currTab=simple
Global map of irrigated areas	resolution 9 by 9 km at the equator	www.fao.org/nr/water/aquastat/irrigationmap/index.stm
Land cover AFRICOVER	Aggregated version	www.africover.org/
Crop calendars GIEWS	Country level	www.fao.org/giews/
Corifa - Country rice facts	Country level	www.fao.org/waicent/faoinfo/agricult/agp/agpc/doc/riceinfo/Corifa.htm
FAO Rice information vol.3, 2002	Country level	ftp://ftp.fao.org/docrep/fao/005/Y4347E/y4347e00.pdf
Cropland sub-national statistics	Administrative level	www.fao.org/landandwater/agll/agromaps/interactive/index.jsp
Cropland sub-national statistics	Administrative level	www.fao.org/statistics/countrystat/
Plant management statistics (IPNIS)	Sub-national level	www.fao.org/ag/agl/agll/ipnis/

Fertilizers statistics	Country level	www.fao.org/ag/agl/fertistat/
Digital soil map of the world	1 : 5.000.000	www.fao.org/geonetwork/srv/en/metadata.show?id=14116&currTab=simple
SOTER Soil and terrain of Southern Africa	1 : 2.000.000	www.fao.org/geonetwork/srv/en/metadata.show?id=7389&currTab=simple

3.2.1 National emission scenarios

Using the national scale data available in FAO the following indicators at tier 1 can be calculated for cropland:

- above-ground biomass
- soil carbon
- methane from rice

Nevertheless, a set of modeling techniques aiming to simulate pasture extent need to be put in place because national scale data available in FAO would not be sufficient to calculate the following indicators for grasslands at tier 1.

In a following phase, results of this modeling can be used as a basis to calculate GHG emissions from pastures that can be used in global or regional scale calculations for the following list of indicators:

- above-ground biomass
- soil carbon
- non-CO2 emission for burning from pastures

3.2.2 Sub-National emission scenarios

Using the detailed sub-national scale data available in FAO and collaborating with selected countries, the following IPCC indicators for cropland remaining cropland at tier 1 or 2 can be calculated:

- above-ground biomass
- below-ground biomass
- soil carbon
- methane from rice

3.2.3 Examples of modeling for GHG reporting

Example for cropland remaining cropland at a national level, with comments about sub-national level possible expansion

Above-ground biomass

- from national statistics the area of cropland remaining cropland is calculated;
- from national statistics the biomass is calculated, by varying the coefficient for above-ground stock at harvest based on thermal climate and length of growing period map;
- the previous calculation produces the biomass status per year and can be used for trend analysis or for previsional modeling.

For selected countries sub-national calculation are possible with the aim of modeling emission due to different management practice. Modeling management effect can be a tool for decision makers establishing policies regarding land use and agricultural management. This step can be realized by using databases such as AgroMAPS, CountrySTAT national soil maps, Agro-environmental zone (AEZ) maps and IPNIS as baseline data and with s strict collaboration with countries.

Soil carbon from cropland remaining cropland

- the carbon stock of mineral and organic soil (separately) is calculated basing on thermal climate and length of growing period map and soil type;
- a certain set of management practices can be simulated and carbon stock variation is calculated for different scenarios.

As above, for selected countries sub-national calculation are possible with the aim of modeling emission due to different management practice.

Example for pasture remaining pasture at national level

Modeling areas of pasture remaining pasture

- from available global scale data, the productivity/distribution of pasture is calculated;
- suitability maps at a global scale are used to establish projection of pasture extent based on theoretical input levels and management practices (FAO/IIASA GAEZ)
- comparison and calibration with available FAOSTAT data;
- the projected pasture biomass is calculated which can be used as baseline data for following calculations of biomass and soil carbon.

Biomass from pasture remaining pasture

- the projected biomass can be varied by modifying hypothetical management techniques;
- the simulated biomass status in a certain moment with a certain management and can be used for trend analysis or for previsional modeling.

Soil carbon from pasture remaining pasture

- the carbon stock of mineral and organic soil (separately) is calculated basing on thermal climate, length of growing period map and soil type;
- a certain set of management practices can be simulated basing on the projected pasture extent and carbon stock variation is calculated for different scenarios.

3.2.4 Non-CO2 Emission from cropland and pastures

Methane emission from rice

Methane emission from rice can be calculated basing on IPCC guidelines and also basing on results obtained in the publication *"Global estimates of gaseous emissions of NH3, NO and N2O from agricultural land (2001)"*. One of the possible improvements of the publication is to simulate long term prevision on methane emission, following the steps listed below:

- from national statistics rice harvested areas is extracted;
- from Rice FACTS the cultivation period is extracted;
- irrigated area within croplands rice paddy areas is extracted;
- based on CORIFA actual land management practices on rice, management practices are simulated;
- based on bibliography methane emissions are calculated and comparison between management techniques is realised.

In case of sub-national calculation for selected countries, the level of detail of simulation can be increased by using AEZ, irrigated area, flooded areas and organic amendment.

Non-CO2 emission for burning from pastures

Non-CO2 emission from pastures could be analyzed using sub-national fire risk map in conjunction with land cover or land use maps. Fire risk maps are available from several sources and can be obtained from other UN agencies or international cooperation civil actors.

3.2.5 Land converted to other land uses (cropland or pastures)

To calculate land converted to cropland or land converted to pasture, the availability of selected "Land cover change maps" is required. FAO is producing several land cover change national maps. As an example, within the framework of the LADA project Land cover change maps of six countries are under development, Argentina, Senegal, China, South Africa, Cuba and Tunisia. Land cover change maps will be used in the future as baseline for emission calculation.

3.3 Livestock sector

The LEAD/FAO 2006 publication "Livestock's long shadows" assess the full impact of livestock sector on environmental problems, along with possible approach to mitigation. The study, realized at global scale for all land uses where livestock is present, analyses carbon emission on feed production, in livestock rearing, processing and refrigeration. Nitrogen emissions are also studied in feed-related fertilizers, in aquatic sources following chemical fertilizers use and in wasting of nitrogen in the production chain. Nitrogen emission from manure stored deposited or after application are also investigated.

For more information, see the full report at the following link: (http://virtualcentre.org/en/library/key_pub/longshad/a0701e/A0701E00.pdf)

4 Discussion

FAO through several of its technical departments (Agriculture, Forestry, Natural Resources) has several publicly available datasets with data at global regional and country level that can be of use for the compilation of national GHG inventory reports. Some data are available in on-line databases, others in printed and/or digital reports.

Some of the datasets form part of a continuous process where data are regularly updated, while others are the result of one-time data collections or at least the data are not regularly updated.

There are some ongoing projects that still have not produced any data, but where useful information are expected to become available within 2-3 years, such as the FRA global remote sensing survey and the CarboAfrica project.

Maps are currently being developed for selected countries to calculate emissions from croplands, referring to the chapter 5 of IPCC guidelines (biomass, above-ground woody biomass, below-ground biomass, soil carbon, methane from rice). By using FAO datasets, the IPCC guidelines can be used to derive maps of croplands and grassland emissions at a detailed (i.e. sub-national level) or a more generalized level (per country calculation at a regional or global scale).

Through its country presence, strong networks and already ongoing data collection and reporting processes, FAO has a unique opportunity to help providing more of the information the countries need for their GHG inventory reports. The collaboration with IPCC should therefore continue and be further strengthened in order to identify possible areas where FAO by adding some additional information in already ongoing reporting processes, could help the GHG inventory compilation process. FAO also wish to further strengthen the collaboration with UNFCCC and IPCC in the revision of guidelines for GHG reporting.

One of FAO's core functions is to disseminate information and is constantly working on facilitating access to available information. Any suggestions on how to improve the user interface and the access to information are most welcome.