# Workshop

# Land-use Related Choices under the Kyoto Protocol

## Obligations, Options and Methodologies for Defining "Forest"
## and
## Selecting Activities under Kyoto Protocol Article 3.4

## BOG: Cropland management, grazing land management, revegetation

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# The BOG Report

## 1. Introduction

The Breakout group (BOG) on Cropland Management (CM), Grazing land management (GM) and Revegetation (RV) met on 3 and 4 May at the meeting “Land-use Related Choices under the Kyoto Protocol, Selecting Activities under Kyoto Protocol Article 3.4” in Graz, Austria, 2-4 May, 2005.

This report summarises the outcome of discussions based on a series of questions related to CM, GM and RV posed in the workshop materials. The subjects are discussed under the following main sections:

- Technical implementation of accounting for CM, GM or RV
- Implications of election of CM, GM or RV
- Research / data needs

## 2. Technical implementation of accounting for CM, GM or RV

### *2.1 Greenhouse gas (GHG) implications resulting from adoption of CM, GM or RV*

If CM, GM, or RV are elected, 1990 data is also needed in addition to data for the commitment period (CP) due to the need for net-net accounting. In accounting for and reporting under article 3.1 (UNFCCC national greenhouse gas inventory reporting) and under article 3.4 for CM, GM or RV, there should be, as far as possible, consistency between 3.1 and 3.4 accounting. An example of this is to use the same data sources for N fertilizer used when calculating $N_2O$ emissions under article 3.1 as that used to calculate a soil C sink under article 3.4. The IPCC Good Practice Guidance (GPG) (2003) gives advice on consistency. Methods used to account and report under articles 3.1 and 3.4 might be the same, but are not necessarily so. Where the methods are different, consistency & transparency are needed. When providing data for decision makers, it is desirable to provide an assessment of the total GHG balance for given activities (and practices) to inform the potential election of a 3.4 activity. Regarding approaches to land area identification: method 1 (spatially referenced) and method 2 (spatially explicit), the approaches are described in GPG and reporting requirements in the Annex to the relevant decision taken at COP10. Choices are made according to country circumstances.

### *2.2 Measurements vs. other methods for accounting for CM, GM or RV*

As for other aspects of accounting methods and systems, choices are made according to country circumstances consistent with GPG. Documentation of the decisions taken with respect to choice of estimation system help to make the choices transparent. If models are selected, in line with GPG, models should be validated against measured data (see GPG and 2006GL). In general, lack of data at the national scale with which to validate models can delay the implementation of modelling based approaches. Table 2.2 presents the basis of the accounting systems of some countries and the reason a given method has been selected.

**Table 2.2** The basis of accounting systems used in selected countries, and the reasons for their selection

| Country | Basis / method | Reason |
|---|---|---|
| Canada | Model | Not feasible to use purely measurement based |
| Australia | Model / RS / measurements | Documented and published |
| Sweden | Model based SOC change in croplands and grasslands; measurement based in forest | Existing NFI, no inventory for cropland and grassland soils so modelled |
| UK | Spatially disaggregated LUC matrix, simple models, measurements | Historical growth of the system |
| Japan | Statistical data from administrative regions | To ensure that only human induced activities are included |
| USA | Models (DayCent [$N_2O$] & Century [SOC change]) | Good statistics to drive the models |
| Spain | Empirical / process-based models considered with measurements | Existing ICP level I and II data |

As seen from table 2.2, models are frequently used when large scale measurement data are not available, or are prohibitively expensive to collect. However, modelling is not simply a way to derive estimates where not available; modelling can improve the quality of national estimates. As mentioned above, model systems used for accounting for CM, GM and RV may be the same as those used for UNFCCC reporting, but are not necessarily so. When dealing rotational systems under CM, averaging mainly takes into account the status of such systems; rotational systems may require separate treatment within a stratified system. Within accounting systems, models can be used for a variety of purposes including the development of national emission factors (EFs) for tier 2 assessment, to develop context specific EFs based on differences in, for example soil type or climate, or can be used in a surface based grid / polygon approach (dynamic spatial application), or in some intermediate form.

### *2.3 Challenges in providing base-year estimates*

A significant challenge in providing base year estimates is that of time-series consistency. When reconstructing the past, data availability can be a problem. It is difficult to maintain the consistency of a time series when the methods used have changed. Though technologies have improved significantly since 1990, the instrumentation available in the past constrains what can be used in the present to maintain consistency. Some cross calibration (or reclassification) is possible. GPG allows for diverse approaches and solutions to this problem, but the challenge will always be present since new developments do not necessarily provide data comparable to that available from the past. Net-net accounting can facilitate establishing the relative change between the base year and the CP.

Another challenge is that activity survey data collected in 1990 was often collected for purposes other than for GHG accounting. For this reason, activity data may need to be analysed and transformed (using relevant drivers [e.g. livestock numbers and area applied to derive manure application rates] – see GPG) to derive the relevant activity data. CP activity data surveys can be tailored more closely to what is required. Extension service networks can be useful in interpreting and complementing the survey data.

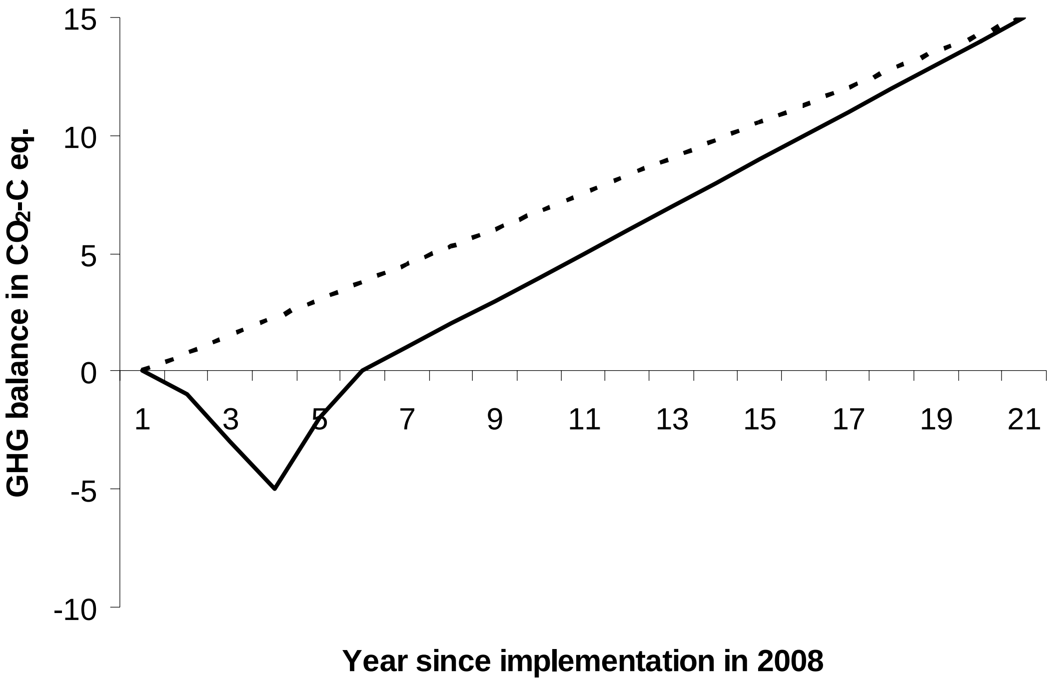
For some countries, the establishment of new political units (e.g. German reunification) can give rise to specific challenges associated with different data sources during the base year. Experience suggests that if reporting units correspond with appropriate administrative boundaries, deriving the best data is made easier. Some experience (e.g. Canada) suggests trends around the base year can help to establish the baseline, which helps to minimise anomalies in the individual year. The relevant text in the GPG clearly states that countries may make their own choices regarding whether to construct the base year using data from a single year or a composite of years (to derive a trend). This, of course depends on data availability and country circumstances, but should be consistent and avoid perverse interpretation.

### *2.4 Demonstrating that a pool is not a source*

Measurements can be used to demonstrate that a pool is not a source (e.g. SOC concentration measured in Sweden under its national forest inventory [NFI]). For suspected small sinks, economics may preclude measuring the sink, but well-validated models can be used to show that it will not be a source can be used (especially under projects). The choice of methods can determine whether a sink or a source is reported (due to temporal development of source / sink). For example, a short term source after revegetation that becomes a large sink after 20 years will have a different temporal profile under different methods (see Figure 2.4). Tier 1 / Tier 2 methods will show a time averaged sink over 20 years in each CP, whereas a Tier 3 method might show a source in CP1, before showing a sink in later CPs. However, Tier 3 method outputs can still be time averaged to show a sink in all CPs, equivalent to a Tier 1 or 2 method.

We note that paragraph 21 in the annex to decision 11/CP7 gives the choice of not accounting for pools that are not sources in the CP. In exercising this choice parties may wish to take into account the relativity of a given pool between the base year and the CP, i.e. it should not be a net source.

**Figure 2.4** How methods at different Tiers may show different temporal patterns of source / sink after implementation of a new practice. The solid line shows a Tier 3 method with yearly dynamics whereas the broken line shows a tier 1 or 2 method with a time averaged change over 20 years



*2.5 The efficiency of monitoring and reporting systems*

Measurement based systems can be cost efficient if they are already in place (e.g. NFI in Sweden). Building on existing systems (e.g. long term monitoring sites, models, inventories) helps to improve cost efficiency. Our experience is that sampling intensity needs to be adequate to detect relevant changes in land use, land cover and land management and associated carbon stock changes. If not used to generate the account, measurement systems can be used for verification, independent of sampling intensity.

## 3. Implications of election of CM, GM or RV

*3.1 Assessing likely outcomes of potential election of CM, GM or RV*

A cost benefit analysis and a risk analysis of electing CM, GM, RV is extremely useful in deciding whether or not to elect an article 3.4 activity. There are implications within broader policy context, for example opportunity costs, accounting costs, co-benefits (e.g. raising awareness among land managers) etc. Technical cooperation with other environmental conventions also needs to be considered (i.e. consideration within a multi-policy framework).

*3.2 Potential selection of CM, GM, RV – technical issues to be taken into account*

There is a risk presented to carbon stocks by long-term climate change, both to C pools themselves and to the driving management practices (e.g. if it becomes much drier / wetter practices may change). Further, catastrophic events (e.g. large fires during the CP) need to be accounted for when considering electing CM, GM, RV. The risk assessment should reflect uncertainty in the balance of each GHG since there is a greater uncertainty associated with some gases compared to others. A pending inventory recalculation can lead to risks associated with the election of CM, GM and RV.

A full GHG balance important (e.g. the fossil fuel savings of no till in Australia are larger that the soil C sequestered). Full chain / life cycle analysis would provide the best basis for comparison of practices and activities.

If CM or GM is elected, the boundaries between CM and GM can be difficult to distinguish. In constructing CM, GM, RV accounts, full C accounting may be used and provide flexibility should full C accounting be introduced in the future.

For some RV practices (e.g. natural regeneration on abandoned cropland remaining within the managed land), inventory data may not be available as the vegetation may fall outside country forest inventory systems. Furthermore, RV can occur on land under any other land use; a woody biomass plantation could be accounted for under CM, RV, GM, FM or AR. Different accounting rules will apply depending on where this is accounted for (e.g. 3.3 vs. 3.4, gross-net vs. net-net). For credible accounting, RV needs to be defined by a particular set of practices.

*3.3 Views on the perceived relative importance of CM, GM and RV in different countries.*

CM, GM and RV are perceived to have different importance in different countries, depending on the country circumstances. Table 3.3 shows which article 3.4 activities (CM, GM and RV) are considered important in different countries. The opinion was given by individuals from those countries and does not necessarily reflect the position of the government of that country.

**Table 3.3** Perception of the importance of CM, GM and RV in different countries

| Country | CM | GM | RV |
|---|---|---|---|
| Canada | Primary | Important only in that it cannot easily be distinguished from CM | Not important |
| UK | Together with GM | Together with CM | Not considered in detail |
| Spain | Complicated | Complicated | Possible. Intermediate to forest? |
| Italy | Still being discussed | Still being discussed | Still being discussed |
| Sweden | Less than forest | Less than forest | Regeneration will be considered under forest |
| Germany [1] | Limited importance | Limited importance | Limited importance |
| Japan [2] | Not important | Not important | RV for urban areas |
| France [3] | Possibly | Possibly | Not credible option |

[1] Expected credits from FM, CM & GM are less than 1% of German baseline emissions – decisions yet to be taken
[2] Data availability and cost of collecting new data will determine whether RV is elected.
[3] CM may be positive and desirable due to co-benefits.

*2.4 Trade-offs and synergies with other objectives, such as environmental or socio-economic considerations*

The key driving forces and potential incentives, besides carbon, why countries take certain decisions include considerations of socio-economics, wider environmental policy, politically-driven decisions, food quality improvements and public relations (education, corporate image, engagement).

There are a range of potential synergies and trade offs associated with practices constituting CM, GM and RV. The encouragement of organic farming is an example. Some studies suggest positive environmental effects and energy balance whilst other studies suggest trade offs among the greenhouse gases, with water and air quality issues and with respect to the total energy balance. It remains a contentious issue but demonstrates that a farm management regime presents potential synergies and as well as trade offs. Other practices have potential impacts on water and air quality. The encouragement of no-till in the USA and Canada has potential co-benefits and trade offs as does set-aside in Europe and the conservation reserve program (CRP) in the USA. The grassland biodiversity programme in Canada may deliver GHG benefits. Other examples include shelter-belts and cover crops for erosion protection, socio-economic policies to maintain farming income and prevent grassland conversion to cropland (under the Common Agricultural Policy; CAP), and integrated pest management.

There are opportunities to optimise synergies and reduce adverse effects and enhance sustainability and all countries are striving to do that by encouraging sustainable agriculture to deliver environmental and other benefits.

## 3. Data and Research needs

With respect to data needs, the following would greatly aid accounting for CM, GM and RV activities: National scale field measurements, better activity data (better surveys, engaging the land managers) and better coordination and connectivity.

Research in the following areas would yield extremely useful information for decision makers:

- environmental co-benefits and trade offs,
- full GHG balance accounting for each practice / mitigation option,
- thorough cost benefit analysis,
- thorough uncertainty analysis / risk analysis,
- assessing GHG balance for each practice on a full chain / full life cycle basis,
- assessment of the likely impacts of future environmental change on GHG balance,
- improving scaling techniques,
- more and better information on soils (a large uncertainty) and
- long-term, multi-factorial as long-term, multi-factorial assessments of sustainability.