Response to the request from the Methodologies Panel regarding dedicated plantations

Version 01.2[1]

1. The Methodologies Panel, at its fifty-fifth meeting, requested the A/R WG to provide advice regarding soil emissions resulting from production of biomass in dedicated plantations established in organic soils, in the context of the revision request AM_REV_0229 "Revision of AM0036, to include fuel switch to biomass from dedicated plantations" and the approved methodology ACM0017.

2. The Meth Panel requested the A/R WG to provide advice on the following specific issues:

(a) Whether the IPCC default values are appropriate for estimating the emissions for carbon soil losses from the cultivation of a plantation on organic soil as part of a CDM project activity, and if not, what would be a possible way of conservative application of these values at a project level, if any;

(b) What is the range of possible carbon emissions per hectare related to the conversion of an area covered by organic soil to plantations and how long the process may take;

(c) What monitoring procedure, if any, may be practical to conservatively quantify the emissions for carbon soil losses from the conversion of an area covered by organic soil to plantations and the cultivation of such a plantation, as appropriate;

(d) The appropriateness of the approach and the IPCC default values for soil carbon emissions in the case of a switch from degraded land to cultivated land in the context of ACM0017;

(e) Whether procedures could be provided: (i) to measure changes in soil carbon stocks as a result of such project activities; or (ii) to demonstrate that the soil carbon stock is not reduced during the crediting period.

3. The Methodologies Panel requested that while considering the above, the A/R WG should take into account the calculations performed for the emissions associated with the cultivation of five types of plants: fresh palm fruit bunches, cassava roots, jatropha nuts, soybeans, corn seed and sugar cane, using the ACM0017 approach.

Response from the A/R WG

4. The A/R WG agreed to provide the following response to the request from the Methodologies Panel for advice on issues related to production of biomass from dedicated plantations in organic soils:

(a) The IPCC default values of emission factors for drained organic soils in managed forests (i.e. forest land remaining forest) provided in Table 4.6 of the *2006 IPCC Guidelines (Volume 4)* have large uncertainty. In tropical climate, the range of values for this emission factor is 0.82 to 3.82 t C ha^{-1} yr^{-1} with a mean value of 1.36 t C ha^{-1} yr^{-1}. Thus in an individual project activity, the actual emissions could be up to 180% higher than the emissions estimated by using the IPCC default values of emission factors.

[1] This version was updated to correct the reference AM_REV_0238 (version 01.1) to AM_REV_0229 in paragraph 1.

The IPCC default values of emission factors for cultivated organic soils provided in Table 5.6 of the *2006 IPCC Guidelines (Volume 4)* also have a large uncertainty of 90%. In tropical climate, the mean value of the default factor is 20 t C ha^{-1} yr^{-1} with an uncertainty of 90% and hence use of the default value of the emission factor in an individual project activity could result in large underestimation of emissions.

Further, in case of cultivation of tree crops in drained organic soils (e.g. palm oil plantations), a default value of emission factor cannot be determined from the IPCC guidelines because the value of the emission factor would depend upon the depth of drainage and the area impacted by the drainage. If the drainage depth is small, then emissions from tree crops may be similar to the emissions from drained organic soils in managed forests, while deeper drainage for establishing perennial tree systems may result in emissions similar to the emissions from annual crop cultivation on organic soils.[2]

Use of the IPCC default values of emission factors for drainage and cultivation of organic soils is also likely to lead to underestimation of actual emissions because of the following reasons:

(i) The period over which the GHG emissions from drained organic soils will occur is likely to be longer than the period of accounting of these emissions under the project activity. Since emissions will continue either until the organic soil is depleted or the hydrology of the area is restored, and since this time period will most likely extend beyond the crediting period of the project activity, the accounting of emissions under the project activity will only be partial;

(ii) The project activity will not only release the C stock accumulated in organic soils, it may also prevent any future accumulation of C stock in those cases where the C stock in soils has not reached its maximum. Since the prevented accumulation of C stock is not taken into account in ACM0017 or AM0036, the accounting of emissions under a project activity will only be partial;

(iii) Apart from overshooting the temporal boundary of the project activity, the GHG emissions are also likely to overshoot the spatial boundary of the project activity. When an area of organic soils is drained and cultivated, the hydrology in areas outside the project boundary may be impacted. The impact may be direct, such as through infrastructure creation, or indirect, such as drainage of hydrologically connected areas. Since the GHG impact of drainage on the lands outside the project boundary is not taken into account in ACM0017 or AM0036, the accounting of emissions under a project activity will only be partial.

[2] IPCC 2006, Chapter 5.2.3.2

In view of the above uncertainties, the A/R WG is of the view that use of the default values of emission factors contained in Table 4.6 and Table 5.6 of the *2006 IPCC Guidelines (Volume 4)* under the methodologies ACM0017 and AM0036 is not likely to result in reliable and/or conservative estimation of GHG emissions from organic soil.

The A/R WG is of the view that to obtain a conservative estimate of the GHG impact of the drainage and/or cultivation of organic soils, a methodological tool would need to be developed;

(b) The A/R WG does not recommend that a simple range of emissions be proposed due to the complex potential impacts of drainage and uncertainty in the time span of the GHG emissions triggered by such drainage and cultivation;

(c) The A/R WG is of the view that a cost-effective monitoring procedure for quantifying GHG emissions from drainage and cultivation of organic soils would require considerable further work in view of the above uncertainties;

(d) The A/R WG is of the view that a switch from degraded lands to cultivated lands in the context of ACM0017 may result in significant GHG emissions from soils and an approach for estimating emissions using default values of emission factors will be inadequate for the following reasons:

(i) Degraded or degrading lands are identified in ACM0017 by using the "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities". However, it is not adequate to use this tool in association with the potential drainage of organic soils;

(ii) The *2006 IPCC Guidelines (Volume 4)* Table 6.2 categorizes grasslands as non-degraded, moderately degraded, and severely degraded according to the levels of degradation defined within the table itself. However, the definition of "degradation" in the "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" is not the same as in this table;

(iii) For the above reasons, the correlation between "degraded or degrading lands" as identified under the tool and possible GHG emissions from soils in such lands is not evident. Therefore, the approach used in ACM0017 for accounting of GHG emissions on the basis of classification of lands as degraded or degrading is likely to result in uncertainties of which the magnitude cannot be predicted;

(e) Procedures could be provided in case of mineral soils for estimating change in soil organic carbon (SOC) by applying the IPCC relative stock change factors where the pre-project land-use and post-project land-use correspond to one of the land-use categories for which the relative stock change factors are provided. However, the IPCC relative stock change factors are not applicable in case of organic soils and a conservative procedure in case of organic soils can only be considered after the abovementioned methodological work has been carried out.

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