Inputs on modalities and procedures for possible additional LULUCF activities under the CDM in response to the call for submissions per the decision of the SBSTA 39 on the agenda item 12(b), paragraph 3

Views submitted by the World Bank

1. Introduction

Management of land use activities with focus on long term sustainability is a priority to achieve multiple objectives - food security, mitigation of GHG emissions[1], adaptation to climate change, conservation of land and water resources, and maintenance of ecosystem services.

As a flexible market mechanism, the CDM facilitates flow of climate finance for mitigation activities. LULUCF activities are among the few opportunities available for developing countries to secure climate finance for mitigation actions under the UNFCCC. However, eligible land use activities under the CDM are currently limited to afforestation and reforestation (A/R)[2]; highlighting the limitations developing countries face in securing financial resources for LULUCF mitigation activities.

Inclusion of additional LULUCF activities under the CDM enables developing countries to strengthen institutional capacity, gain implementation experience, and develop monitoring and reporting systems necessary for subsequent scaling up of actions to address climate change in specific country contexts. In this regard, it is relevant for SBSTA to consider additional LULUCF activities with a view to making recommendations for their inclusion under the CDM.

In the above context, suggestions on inclusion of crop production, silvopastoral and rangeland management; wetland drainage and rewetting; and revegetation, as additional LULUCF activities under the CDM along with suggestions for revision of modalities and procedures of A/R activities (decision 5/CMP.1) to include additional LULUCF activities and their modalities and procedures.

2. Background

Considering the significance of land use, land use change and forestry (LULUCF) activities for food security, poverty reduction, and sustainable development, enabling developing countries to work towards achieving food security, while providing opportunities to address climate change mitigation and adaptation objectives is a priority.

Smith *et al* (2008)[3] estimate that about a quarter of global mitigation potential in agricultural land use for 2030 can be achieved at a carbon price below US$20/tCO2-eq, while also contributing to food

[1] LULUCF activities are estimated to contribute about 31% of global GHG emissions, with agriculture accounting for 14%; and deforestation and forest degradation accounting for 17% of the global GHG emissions.

[2] There are 52 registered A/R projects out of a total of 7435 registered CDM projects reflecting the miniscule proportion of LULUCF projects registered under the CDM.

[3] Smith, P., D. Martino, Z. Cai, D. Gwary, H.H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, R.J. Scholes, O. Sirotenko, M. Howden, T. McAllister, G. Pan, V. Romanenkov, U. Schneider, S. Towprayoon, M. Wattenbach, and

security and adaptation benefits. Most of the global mitigation potential related to LULUCF is in developing countries of Asia, Africa and Latin America. However, Smith et al (2007) note that only about 35% of technical mitigation is expected to be met by 2030 due to prohibitive financial, technical and socioeconomic and other barriers to implementation of mitigation measures highlighting that mitigation actions in most LULUCF activities are additional. In order to realize the mitigation potential, technical, policy and institutional aspects related to LULUCF activities need to be strengthened to overcome the barriers. The CDM incentive can contribute to alleviating some of these barriers.

In order to realize the mitigation potential in additional LULUCF activities under the CDM, there is a need to simplify methodologies and monitoring to promote cost effective mitigation. The methodologies developed under the CDM, voluntary standards[4], IPCC (2003) Good Practice Guidance for LULUCF, and IPCC (2006) AFOLU Guidelines provide technical basis for demonstrating mitigation actions in a range of LULUCF activities.

3. Suggestions for inclusion of additional LULUCF activities for inclusion under the CDM

The LULUCF activities highlight the feasibility of mitigation actions in broad range of land use categories. In this submission, a representative activity under each of the broad land use category is highlighted for inclusion under the CDM.

- Crop production (representing the KP land use category, cropland management)
- Silvopastoral and rangeland management (representing the KP land use category, grassland management
- Wetland drainage and rewetting (representing the KP land use category, wetland management)
- Revegetation (representing the KP land use category, revegetation)

Based on experience gained with the initial set of activities, more LULUCF activities can be identified for subsequent inclusion under the CDM.

Forest management[5] activities are not covered in this submission as discussions on enhancements of carbon stock are in progress under the REDD framework. The decisions under Warsaw framework for REDD+ (e.g. national forest monitoring systems, forests reference emission levels, measuring, reporting and verification, and the drivers of deforestation and forest degradation, and safeguards) at the COP19 may be relevant to some aspects of forest management. It is anticipated that SBSTA deliberations may focus these aspects in the context of CDM. Therefore, this submission does not cover forest management activities.

High density agroforestry, a system of combining trees, shrubs and crops of different heights on the same piece of land **(**e.g. multi-storey, poly-culture, fruit orchards, plantations, or multi-tier agroforestry) with crown cover greater than 30% confirm to the definition of forest as per the IPCC (2006) AFOLU guidelines. Aspects noted for forest management in relation to decisions under Warsaw framework on

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J.U. Smith, 2008: Greenhouse gas mitigation in agriculture. *Philosophical Transactions of the Royal Society, B: Biological Sciences,* 363 (1492), 789-813.

[4] For example, Verified Carbon Standard has methodologies and requirements approved for mitigation projects targeting afforestation, reforestation and revegetation, agricultural land management, improved forest management, avoided conversion of grasslands and shrub lands, and wetland restoration and conservation.

[5] Forest management activities in lands confirming to the definition of forest (based on area, crown cover, and tree height)

REDD+ may be pertinent to high density agroforestry systems. Therefore, this submission does not cover high density agroforestry systems.

Deliberations in regard to forest management and high density agroforestry systems in the SBSTA in the context of COP 19 Warsaw REDD+ framework decisions of are expected to provide clarity on the inclusion of these activities under the CDM.

A brief overview of the additional LULUCF land use categories proposed in this submission and their significance for GHG mitigation is presented below.

(i) Crop production

Crop production activities cover annual and perennial crops, and temporary fallows. Considering the importance of crop production to food security, climate change mitigation and adaptation contexts, it is relevant to consider the inclusion of crop production activities under the CDM. Adoption of improved crop production methods that enhance GHG removals by sinks and avoid or reduce GHG emissions is both a mitigation and adaptation priority.

Soil carbon sequestration has the most mitigation potential in croplands. Enhancing soil organic carbon status under crop production systems has been assessed as an activity with the greatest potential. The technical potential of carbon sequestration in soils of agro ecosystems is estimated at 1.2–3.1 billion tons C/yr. Increase in the soil organic carbon pool of 1 ton C/ha/yr is expected to enhance annual food production in developing countries by 24–32 million tons of food grains and 6–10 million tons of roots and tubers[6] highlighting the significance of soil carbon sequestration for achieving food security, climate change mitigation and resilience objectives.

technologies and management practices that enhance GHG removals by sinks in biomass and soils through residue management, tillage, cover crops, nutrient management, and other agronomic measures not only enhance GHG removals by sinks and crop productivity; but also facilitate efficient management of fossil fuel inputs in crop production translating in lower GHG emissions[7].

Crop production activities influence both GHG removals by sinks and emissions. Crop production is a major source of N_2O and CH_4 emissions[8]. Adoption of improved technologies and management practices enhances GHG removals by sinks and reduces N_2O and CH_4 emissions per unit of food produced.

Potential: It is estimated that global mitigation potential for 2030 of 1500-1600 $MtCO_2$-eq/year at carbon price of up to US$ 20/ tCO2-eq, with about 70% of mitigation potential in developing countries

[6] R.Lal (2011) Sequestering Carbon in Soils of Agro-ecosystems, *Food Policy*, 36, 533-539.

[7] Paustian, K., B.A. Babcock, J. Hatfield, R. Lal, B.A. McCarl, S. McLaughlin, A. Mosier, C. Rice, G.P. Robertson, N.J. Rosenberg, C. Rosenzweig, W.H. Schlesinger, and D. Zilberman, 2004: Agricultural Mitigation of Greenhouse Gases: Science and Policy Options. CAST (Council on Agricultural Science and Technology) Report, R141 2004, ISBN 1-887383-26-3, 120 pp.

[8] Smith P, Martina D, Cai Z, Gwary D, Janzen H, Kumar P, McCarl, Ogle S, O'Mara F, Rice C, Scholes B, Sirotenko O (2007a) Agriculture in Climate Change 2007: Mitigation. Contributions of Working Group III to the Fourth Assessment Report of the International Panel on Climate Change [Metz, Davidson O.R, Dave R, Meyer L.A (eds]), Cambridge University Press, Cambridge United Kingdom and New York, NY, USA.

attributable to soil carbon sequestration, and reduction in N_2O and CH_4 emissions. Mitigation benefits of improved crop production activities are significant. For example, reduced tillage reported to contribute 585 kg CO_2e/ha/year of prevented emissions; increase in residues and other organic inputs enhance the GHG removals by sinks of 607 kg CO_2/ha/year; and low emissions fertilizer formulations can reduce N_2O emissions by 20%, and nitrification inhibitors can further reduce 20% of N_20 emissions[9]. These data highlight the potential of suit of improved crop production technologies and practices in enhancing GHG removals by sinks and reducing emissions.

Methodologies and guidance: The methodologies and guidance available under the CDM[10], voluntary standards[11], IPCC (2006) AFOLU Guidelines[12], can be extended to crop production contexts. However, one of the constraints of existing methodologies under the CDM and the voluntary standards is that it is not economically viable to implement projects using methodologies that focus on standalone technologies and practices. Therefore, approval of consolidated methodologies/standardized baselines with simplified monitoring systems to cover both categories of GHG removals by sinks and GHG emissions can facilitate cost effective implementation of projects and programs of activities related to crop production.

(ii) Silvopastoral and rangeland management

Silvopastoral and rangeland management represent land use in which livestock economy has close linkages with grassland ecosystems in several countries of Africa, Asia and Latin America. These systems focus on integration of annual and perennial biomass, and/or livestock management through improvement of forage quality and/or management of frequency, seasonality, intensity, and rotation of grazing. Improved rangeland management contributes to livelihood improvements in addition to contributing to sustainable land use and climate change mitigation and adaptation.

Improved silvopastoral and rangeland management activities enhance GHG removals by sinks; enhance forage quality and animal nutrition through introduction of legumes translating in lower methane (CH_4) emissions from enteric fermentation. Reducing frequency or intensity of fires lowers CH_4 emissions and increases tree and shrub growth translating in increased net GHG removals by sinks in soil and biomass.

Potential: Silvopastoral and rangeland activities cover grassland ecosystems in Latin America, Africa and Asia, support extensive and intensive livestock systems and have major significance to enhancing soil

[9] Hiller J, Brentrup F, Wattenbach M, Walter C, Garcia T, Mila-il-Canals L, Smith P (2012) Which cropland greenhouse gas mitigation options give the greatest benefits in different world regions? Climate and soil-specific predictions from integrated empirical models, *Global Change Biology*, 18: 1880-1894.

[10] Examples of methodologies approved under the CDM for reduction of GHG emissions in crop production are AMS.III.A, AMS.III.AU, AMS.III.BE, and AMS.III.BF.

[11] Examples of methodologies approved under the Verified Carbon Standard are - VM0017 (Adoption of Sustainable Agricultural Land Management), VM0021 (Soil Carbon Quantification Methodology); and those approved under the American Carbon Registry include - Methodology for Quantifying Nitrous Oxide Emissions Reductions from Reduced Use of Nitrogen Fertilizer on Agricultural Crop; and N_2O Emission Reductions through Changes in Fertilizer Management.

[12] IPCC (2006) Guidelines for National Greenhouse Gas, Agriculture, Forestry and Other Land Use (Volume 4), Chapter 5.

carbon sequestration and reduction of methane emissions[13]. Socioeconomic and climate mitigation benefits of silvopastoral[14] and rangeland systems[15] have been widely documented.

Methodologies and guidance: Methodologies approved under voluntary standards[16] and IPCC (2006) AFOLU Guidelines for National Greenhouse Gas Inventories[17] can form technical inputs to the development of methodologies for mitigation activities in silvopastoral and rangeland systems under the CDM. The methodologies and guidance should cover GHG removals by sinks and emissions in an integrated manner so as promote cost effective mitigation and monitoring.

(iii) Wetland drainage and rewetting

Organic and wet soils contain high densities of carbon accumulated over a long period, and are crucial to maintaining the Earth's carbon balance. In addition to being carbon store, wetlands provide several ecosystem services such as water purification, hydrological buffering, groundwater replenishment, nutrient cycling, sediment retention, biodiversity, and recreation.

Drainage of wetlands is a human-induced lowering of water table exposing formerly saturated organic soil layers to oxidation and altering environmental factors such as temperature, reduction–oxidation potential, and decomposable organic matter resulting in GHG emissions.

Organic soils have been drained for agriculture, horticulture, plantation, peat extraction and other purposes. Draining of wetlands for crop production and plantations (e.g. oil palm) has been assessed as a major source of GHG emissions. Drained wetlands lower water table, aerate soil, and favor decomposition resulting in high CO_2 and N_2O fluxes. Uncontrolled wildfires and fires used for conversion of organic soils significantly contribute to GHG emissions. The surface fires consume vegetation and litter, while ground fires consume soil organic matter and deadwood as fuel, and persist for long periods, and penetrate to different soil depths in response to changing soil moisture and surface hydrology causing GHG emissions over a long period.

Taking into account the decision 5 /CMP.7, which states *significant pools and activities should not be excluded* from reporting and accounting, recognition of mitigation actions for wetland restoration assumes significance. Wetland drainage and rewetting has been approved for reporting and accounting in the GHG inventories of Annex I countries during the second commitment period of the Kyoto Protocol. The experience in Annex I countries can provide inputs to development of cost effective methodologies and monitoring under the CDM.

The restoration of previously drained wetlands by rewetting is a deliberate action to raise water table and re-establish water saturated conditions. Rewetting decreases CO_2 emissions from organic soils in

[13] FAO (2009) Grasslands: Enabling their potential to contribute to greenhouse gas mitigation, submission to the Intergovernmental Panel on Climate Change.

[14] Mannetje L 't, Amezquita M, Buurman P, Ibrahim M A, (2008) Carbon sequestration in tropical grassland ecosystems, Wageningen, The Netherlands, Wageningen Academic Publishers, 224pp.

[15] Lipper L, Dutilly-Diane C, McCarthy, N (2010) Supplying carbon sequestration from West African rangelands: Opportunities and barriers, Rangeland Ecology and Management, 63(1), 155-166.

[16] Examples of methodologies under voluntary standards include - Adoption of Sustainable Grassland Management through Management of Fire and Grazing, proposed under the Verified Carbon Standard; and Grazing Land and Livestoock Management proposed under the American Carbon Registry.

[17] IPCC (2006) Guidelines for National Greenhouse Gas, Agriculture, Forestry and Other Land Use (Volume 4), Chapter 6.

relation to the drained condition and enable recovery of carbon sink and reduction of N_2O emissions. Additionally, likelihood of fire occurrence in rewetted ecosystems is low translating in lower CH_4 emissions.

Potential: The largest mitigation potential per unit area is reported for activities involving restoration organic soils. Southeast Asia accounts for the largest extent of tropical peat lands accounting for about 10% of the global soil carbon stock. Rewetting of drained wetlands, preventing their conversion, and restoring native habitat helps to conserve critical ecosystems, prevent large potential future GHG emissions, and facilitate restoration of natural habitats[18].

Methodologies and guidance: Methodologies for wetland restoration and peat land rewetting in development under voluntary standards; and IPCC (2013) Wetland Supplement[19] can provide inputs development of methodologies and guidance for accounting of GHG emissions from wetlands under the CDM. Methodologies can also incorporate remote sensing methods for assessment, mapping of wetland area, biomass, and other characteristics of drained and rewetted wetlands facilitating cost effective monitoring.

(iv) Revegetation

Revegetation is a human induced activity to enhance carbon stocks of biomass that does not meet the definitions of afforestation and reforestation. It involves establishing new vegetation and/or enabling and augmenting existing vegetation. These activities include measures that restore carbon stock of degraded lands (e.g. saline, sodic, eroded soils etc.), settlements and other lands that are not categorized as afforestation/reforestation, forestland, cropland, and grassland.

Large areas of degraded lands subject to unsustainable use, erosion, organic matter depletion, salinization, and acidification, if not restored are expected to degrade further translating into large future GHG emissions. Revegation is a cost effective option to restore severely degraded lands through improving soil organic carbon and biomass.

Revegetation covers a range of activities that restore tree, shrub, and herb biomass in different land use categories such as urban spaces, mines, waste dumps, degraded lands (e.g. saline, sodic, eroded soils etc.), and other abandoned areas for establishing vegetation below the thresholds of forest. In addition to enhancement of carbon stocks, revegetation activities contribute to restoration of ecological processes, enhanced biodiversity, and amelioration of local environment. Revegetation activities are already eligible for Annex I countries under Article 3.4

Potential: Large areas of lands other than cropland, grassland, wetland and settlement that will not develop as forest because of limiting factors (e.g. climate, soil quality) and natural or anthropogenic disturbances offer significant opportunities for implementing revegetation activities. The ecosystem restoration co-benefits of revegetation activities can be significantly larger than GHG mitigation benefits.

[18] Smith P, Martina D, Cai Z, Gwary D (2007) Policy and technological constraints in the implementation of greenhouse gas mitigation options in agriculture, *Agriculture, Ecosystem and Environment* 118: 6-28.
[19] IPCC(2013) Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

Methodologies and guidance: Development of cost effective methodologies and monitoring are priorities for supporting revegetation activities. The elements of methodologies approved under the CDM, voluntary standards, and IPCC (2006) AFOLU guidelines can be suitably adopted in development of cost effective methodologies and monitoring for promoting revegetation activities.

2.0 Suggested revisions to the Decision 5/CMP.1 (modalities and procedures of A/R project activities under the CDM) (FCCC/KP/CMP/2005/8/Add.1) to include additional LULUCF activities

The decision 5/ CMP.1 covers the modalities and procedures of A/R project activities under the CDM (FCCC/KP/CMP/2005/8/Add.1). In order to facilitate the inclusion of additional LULUCF activities, modalities and procedures under the decision 5/ CMP.1 (modalities and procedures of A/R project activities under the CDM) and decision 6/CMP.1 (simplified modalities for small scale A/R project activities under the CDM) need to be revised to include the modalities and procedures relevant to additional LULUCF activities identified for inclusion under the CDM. In this context, modalities and procedures relevant to additional LULUCF activities at different stages of project cycle such as at validation and registration; monitoring; verification and certification; issuance of CERs; and coverage of relevant aspects relating to included LULUCF activities in the project design document and monitoring plan formats need to adopted.

A possible option is to have a common modalities and procedures for all LULUCF activities included under the CDM, along with annexes on modalities and procedures that are applicable to specific activities.

Along with the revision to the decision 5/CMP.1 and decision 6/CMP.1, consistency with decision 3/CMP.1 (modalities and procedures for CDM under the Article 12 of the Kyoto Protocol) need to be ensured to so that accounting of GHG removals by sinks and GHG emissions of LULUCF activities is consistent.

The suggestions made below with regard to modalities and procedures of additional LULUCF activities assumes the feasibility of developing common modalities and procedures for all LULUCF activities by suitably revising the modalities and procedures of A/R project activities under the CDM (decision 5/CMP.1)

2.1 Definitions of terms related to additional LULUCF activities

The terms relevant to additional LULUCF activities need to be included in the definitions of the Annex to the decision 5/CMP.1 (modalities and procedures of A/R project activities under the CDM).

2.2 Modalities and procedures for additional LULUCF activities at validation and registration

Paragraphs 10 to 24 and their sub-paragraphs in Section G of the modalities and procedures of A/R project activities (Decision 5/CMP.1) need to be suitably revised to include additional LULUCF activities and their validation requirements that a DOE is expected to review during validation.

2.3 Modalities and procedures for additional LULUCF activities during monitoring

Paragraphs 25 to 30 and their sub-paragraphs in Section H of the modalities and procedures of A/R project activities should be suitably revised to reflect the monitoring requirements of additional LULUCF activities.

2.4 Modalities and procedures for additional LULUCF activities at verification and certification

Paragraphs 31 to 35 and their sub-paragraphs in Section I of the modalities and procedures of A/R project activities should be suitably revised to reflect the verification and certification requirements of additional LULUCF activities.

2.5 Modalities and procedures for additional LULUCF activities on issuance of certified emission reductions

Paragraph 36, section J of the modalities and procedures of A/R project activities needs to be revised to include a sub-paragraph (c) on the issuance of (permanent) CERs for additional LULUCF activities that has implemented one or more alternative approaches listed in the paragraph 12(f) of the modalities and procedures.

2.6 Revisions to the Appendix B, Appendix C, and Appendix D of the Decision 5/CP.1

The information relating to appendix B (Project design document for afforestation and reforestation project activities under the clean development mechanism), appendix C (terms of reference for establishing baselines and monitoring methodologies for afforestation and reforestation project activities under the CDM) and appendix D (additional requirements for the registry to address afforestation and reforestation project activities under the CDM) of the decision 5/CMP.1 needs to be revised to include reference to additional LULUCF activities.

2.7 Consistency between the modalities and procedures of LULUCF activities and other activities under the CDM

With the inclusion of additional LULUCF activities, there is a need to ensure consistency between the revised decision 5/CMP.1 and revised decision 6/CMP.1 with the decision 3/CMP.1 (modalities and procedures for CDM under the Article 12 of the Kyoto Protocol) to ensure that accounting of GHG removals by sinks and GHG emissions of the LULUCF activities is consistent.

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