GRASSLANDS: ENABLING THEIR POTENTIAL TO CONTRIBUTE TO GREENHOUSE GAS MITIGATION

A submission by

The Food and Agriculture Organization of the United Nations[1]

Summary

Grasslands occupy about half of the emerged ice free world, make up approximately 70 percent of the world's agricultural area (FAO, 2005) and represent a major terrestrial carbon (C) stock which can be increased by appropriate management. The global technical mitigation potential by 2030 for grazing land management estimated by IPCC (2007) is high. Low cost mitigation options based on enhancing carbon sequestration in grasslands are available. These practices generate additional important co-benefits in the form of food security, biodiversity and water conservation, and improved resilience and thus adaptation to climate change. There are important methodological issues to be addressed (carbon monitoring, permanence, leakage) but increasing experience with LULUCF carbon monitoring and projections will provide valuable insight for resolving these. There are compelling reasons to consider grasslands as part of a holistic approach (all gases, all sources and sinks) to land use and land use change in the context of deliberations at COP15 in Copenhagen and beyond.

Background

Grasslands[2] and integrated grassland systems occupy about half of the emerged ice free world and approximately 70 percent of the world's agricultural area. Rangelands alone are the world largest land use type, and in 28 countries they represent more than 60 percent of total land area. In all farming systems of the world, critical links exist between semi-natural grasslands managed for multiple products, high potential agricultural zones, forests, calling for ecosystem and landscape approach. The livelihoods of almost one billion people depend on grasslands. Improved management of grasslands is key to food production and sustainable development in many countries. Poverty and economic marginalization often characterize the human populations managing grasslands; yet their interchange of goods and services with other agricultural and urban populations is substantial. If the future of agriculture is to build new understandings based on scientific and community-based knowledge systems, grasslands have much to offer as models of working with, not against, nature for human livelihoods.

This paper focuses on grasslands because this important land use system, and the considerable technical potential of its associated management practices to realize mitigation at relative low cost, should receive more consideration in the negotiations.

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[1] This document was prepared based on the outcome of a workshop held at FAO Rome 15 17 April 2009 which drew together 27 experts from around the world (see www.fao.org/agriculture/crops) and input from members of the Grasslands Carbon Working Group.

[2] Grasslands are land cover with herbaceous plants with less than 10 percent tree and shrub cover (UNESCO). In this paper, grasslands is used in its wider sense associating rangelands, grazing land, agro-silvo pastoral systems, cultivated pastures.

1. Grassland systems have a large mitigation potential

Agriculture accounts for roughly 14% of global GHGs or about 6.8 Gt of CO2 equivalent (e) per year (IPCC 2007). GHG emissions from land-use change, including deforestation in tropical areas, are around 17% of total GHG emissions. The forest sector accounts for 17.3 percent of total emissions, of which a substantial part is due to deforestation driven by agricultural conversion, including pasture and rangelands. Sustaining yields on the existing land base, whether under intensive pasture and agro-silvo pastoral systems production, or extensive grassland and rangeland management, is critical to mitigating greenhouse gas emissions from agriculture.

According to the IPCC (2007), the global *technical* mitigation potential of agriculture (excluding fossil fuel offsets from biomass-fuels) could be as high as 5.5-6 Gt CO_2 eq per year by 2030 of which approximately 1.5Gt CO_2 eq is from grazing land management, over 0.6 Gt CO_2 eq is from restoration of degraded land (that is directly linked to grassland and rangeland management), and more than 1.5Gt CO_2 eq is from cropland management (of which pasture management has an important share). Approximately 30 percent of this potential can be achieved in developed countries and 70 percent in developing countries.

Tennigkeit and Wilkes (2008) have already estimated that improved rangeland management has the biophysical potential to sequester 1.3 - 2Gt CO_2 eq worldwide to 2030.

Therefore grasslands (including grazing land management, plus a share of restoration of degraded lands, plus a share of cropland management) have a high potential to promote build up of C if appropriate management practices will be adopted.

Associated technologies to realise mitigation across much grassland are cost effective thus suggesting an attractive economic mitigation potential.

Grassland Management practices

A range of integrated grassland management interventions that can reduce GHG emissions and enhance C sequestration (by increasing C inputs to soil and above ground woody vegetation and/or reducing losses) were described by Smith et al. (2008). These include the introduction of new species and varieties, fire management, restoration of organic soils and degraded lands, extending the use of perennial crops, increasing tree cover in silvopastoral systems, managing grazing intensity and duration/periodicity, and improving pasture quality. Reducing the frequency and/or intensity of grassland fires will reduce greenhouse gas emissions and increase above and below ground carbon stock, but could reduce the value of the land for food and livestock production. The authors divided the world into four 'climatic types' and provided mean estimates of per area annual mitigation potentials for grassland management in each zone (tCO_2/ha/yr): cool-dry 0.11, cool-moist 0.81, warm-dry 0.11, warm-dry 0.81.

The IPCC (2000) suggested that with an international effort, it would have been possible to place 10 percent of the pasture land under improved pasture management by 2010. Existing barriers such as the lack of capital investment of pastoralists and small-farmers, the lack of adapted materials, and the lack of quantitative information on sequestration responses to management options in specific grazed ecosystems hamper such solutions. It should be considered that perhaps 5-10 percent of global grazing lands could be placed under C sequestration management by 2020. This could give between 2 and 8 percent of the above mentioned technical potential.

Most improved grassland management techniques also increase the resilience of the ecosystems and rural populations to climate change. Support and incentives for adaptation practices in grasslands should be given greater attention because one billion people depend on grasslands for their livelihood. The form and magnitude of the incentives for mitigation and adaptation measures in grasslands will be provided will greatly influence the level of adoption of improved management practices.

2. Potential to act now

Although there are methodological issues that need to be addressed, there is the base to act now.

Soil C sequestration is real and, in principle, its effects with respect to mitigation are measurable and verifiable. There is clearly a significant anthropogenic component with respect to both current levels of sequestration (and emissions) and actions to enhance mitigation. Cost- effective methodologies for measuring C sequestration in integrated grassland systems at global, regional, and national level are required. However, these are tractable problems and a number of pilot studies are already addressing them. A range of approaches at different scales has been employed in recent years to address the question of the extent of C sequestration in grasslands and the level of variation and uncertainty associated with it. Such work needs to be augmented and co-ordinated to gain experience and allow dissemination of best practices. There is a need to develop benchmark sites to check and compare to a baseline scenario the role of improved management on ecosystem C balance (including e.g. fire, grazing, and pasture cutting regimes).

Concerns with respect to the *permanence* of sequestration are real. These can best be addressed through a combination of long term (permanent) incentives to retain sequestered C in the ecosystem combined with capacity building towards management changes that in themselves have sustained benefits without long-term financial gains specifically linked to C sequestration.

Similarly, the question of *additionality* can be considered in the context of combining the development of simple and cost effective methodologies with modelling and mapping approaches.

The extent to which monitoring, reporting and verification (MRV) requirements are necessitated will depend in part on the funding mechanisms in place for enhancing mitigation.

Concerns about *leakage* point to the need to consider full GHG accounting from grasslands within a comprehensive framework of land use and land use change.

Sequestration in the context of GHG inventory for grasslands

The technical mitigation potential of grassland management is largely higher than methane emissions from ruminant animals or manure management emissions and can be implemented in all countries, both in heavily degraded areas and in areas which are only slightly degraded or well managed.

Nonetheless, benefits from enhanced C sequestration need to be addressed in the context of significant emissions of methane and nitrous oxide from ruminant livestock production and it is important that the effects of changing management practices is assessed in the context of reducing net GHG emissions. This requires whole managed ecosystem GHG inventories.

Multiple benefits

Grassland management practices that enhance soil C sequestration can also result in enhanced food production, greater biodiversity, improved water management both with respect to quantity (flood control) and quality (reduced pollution of waterway), restoration of degradation, and improved efficiency. However, evidence on this is limited and more studies and research are required in different agro-ecological zones to quantify such multiple benefits.

Amezquita et al (2008) reported that pasture improvement in selected tropical grassland ecosystems in addition to productivity and economic benefits, had a significant impact on soil C sequestration and C stock in established pastoral and silvopastoral systems. The recently concluded GEF-silvopastoral project in Nicaragua, Colombia and Costa Rica demonstrated that compensation of farmers for environmental services resulted in increased adoption of silvopastoral systems which enhanced carbon sequestration and biodiversity conservation in agricultural landscapes dominated with cattle. National institutions are currently implementing strategies for mainstreaming these experiences.

In addition to their mitigation potential, grasslands (including agro-silvo pastoral and rangeland systems) play a significant social and ecological role. If the issue is not correctly addressed, the consequences on food security, environmental degradation, and livelihoods could be dramatic.

3 Grasslands: What is the enabling policy and institutional environment?

An enabling policy framework should be developed in the near term with the aim of tapping the full mitigation potential from grasslands. The exclusion of grasslands and their large mitigation potential, does not serve the purpose of the Convention, the purpose of sustaining efficient food production, nor sustainable development and livelihood.

Five key areas should be considered to realize the full potential of mitigation and adaptation measures in grasslands: i) full GHG accounting; ii) measurements and monitoring; iii) training and capacity building; iv) policy measures in the environmental and agricultural sectors; v) financing options.

At national level it will, furthermore be necessary to build on the existing aggregation structure of farmers and pastoralists while mainstreaming mitigation in agricultural policies and vice-versa. The improved adoption of win-win management practices, that will result in sustainable production intensification and climate change mitigation, could be promoted through Farmers Field Schools' adult education schemes and through pastoral associations. An underlying constraint, both to carbon sequestration and to more general sustainable rangelands management, is the insecurity of tenure that most rangeland managers face.

Increased consideration should be given to grasslands in order to adopt measures that take into consideration all aspects including mitigation, adaptation, production, livelihood co-benefits and trade-offs.

4. Possible options for consideration by parties

Despite the many uncertainties concerning the management of grasslands for more effective contribution to GHG mitigation, there are strong reasons why it is timely to consider them in the context of the negotiations during COP15. Recognition of grasslands as a mitigation option would not only lead to expansion of land-based sequestration, but would facilitate empowerment of the almost one billion people dependent upon grasslands to enhance their livelihoods.

It has been demonstrated that, if appropriate management practices are adopted, grasslands have a great potential to contribute to GHG mitigation.

Parties may wish to consider a need to engage in starting pilot projects on the potential for C sequestration in grassland systems, cost effective measurement and monitoring of changes in soil C levels, and adapted management practices. The pilot projects would adopt a process of learning and adjusting, and would be focussed on developing countries. They would build on community work, and management practices associated with rural development would also be promoted. A global complete GHG assessment should be initiated and take into account emissions and reductions from nutrient applications, livestock management and grassland management.

A phased approach (as has been suggested with regard to REDD) should be established for grasslands as a component of an overall agriculture initiative to test MRV methodologies, incentives, and payment schemes. A smallholder and pastoral agriculture climate change readiness fund, linked to public-private trust funds should be considered to buy emission reductions from early action grassland mitigation projects from small farmers.

Integrating grasslands into the scope of LULUCF accounting, as well as into existing and new funding mechanisms, including any eventual mechanism linked to NAMAs should be considered.

It will be necessary to address technological and scientific information together with social and educational barriers associated with the efficient use and management of grassland systems at a landscape scale, while taking into consideration agroecological processes that provide flexibility and resilience.

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