Module 5: Mitigation of Climate Change in Afghanistan

Introduction

In Module 4 we learnt about the possible adaptation options in agriculture, forestry, water and soil management in Afghanistan. In this module, we will explore which sectors are the largest emitters of greenhouse gases (GHG) and the mitigation options.

Afghanistan's GHG emissions are extremely low at around 0.3 tonnes per capita as per data available for 2010, making Afghanistan one of the lowest emitters globally. This is likely to change with development and rapid urbanisation. The per capita energy consumption at present is low at an average of **120 kWh** per year. As the country develops this is expected to increase and the energy options the country may chose will determine the future emissions. The most significant sources of GHG at present are the **agriculture sector** (53%), followed by **land use change and forestry** (33%) and the energy sector (13%)[1]. Methane emissions arise primarily from the energy and agricultural sectors. These sectors therefore offer the greatest possibilities for mitigation (and adaptation) responses. National Emissions are set to grow given development and population growth.

Afghanistan is a member of the UNFCCC and drafted its Initial National Communication in 2013, in which it presents its potential actions towards mitigation and adaptation to climate change. The section below mainly focuses on agriculture and forestry. For more information on mitigation in the energy sector, please see the Alternative Energy Module and Module 6 on Nexus water-energy-food security.

At present, the Government does not have a detailed National Strategy on climate change mitigation. No detailed assessment of various mitigation opportunities is currently available. In the absence of reliable data, there are no models for assessment of mitigation options. Afghanistan's National Development Strategy promotes a low carbon energy sector development.

Agriculture's contributions to climate change

Figure 1 shows the largest emitters of GHGs in global agriculture – including cropping and livestock management. The biggest contributor is the enteric fermentation, the natural digestion of ruminants, which produces methane. Manure is another dominant emitter of GHG. Together with enteric fermentation, manure contributes to nearly two-thirds of the total emission from the agriculture sector. Paddy rice cultivation, the production and use of chemical fertilisers and the conversion of forests and other land to agriculture contribute substantially to GHG emissions.

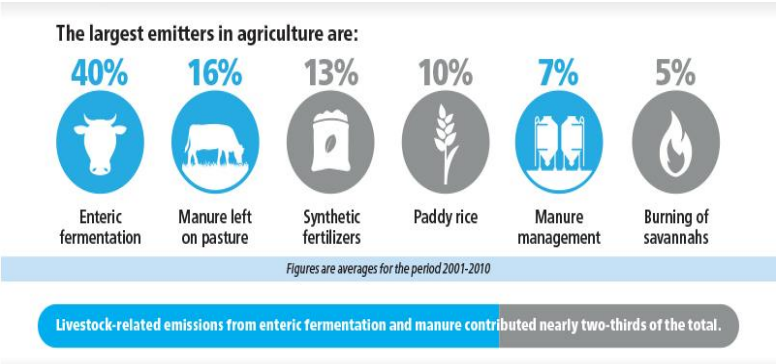

Figure 1: Largest emitters of GHGs in agriculture (FAO, 2014: Greenhouse Gas Emissions from Agriculture, Forestry and Other Land Use)

[1] National Environmental Protection Agency, Afghanistan, 2013: Afghanistan. Afghanistan initial national communication to the United Nations Framework Convention on Climate Change.

Greener pathways and carbon sinks

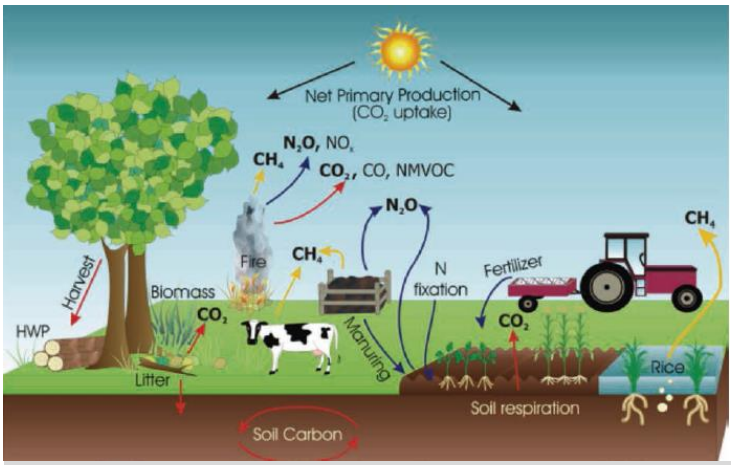

Figure 2: GHG emission sources/removals and processes in managed ecosystems (IPCC, 2006: 2006 IPCC Guidelines for National Greenhouse Gas Inventories)

With the development of the economy, greener pathways become more important for Afghanistan too. Growing population, urbanization, economic growth drive energy demand and consumption, resulting in increased GHG emissions. Adequate policies, incentives and cooperation regarding the development of mitigation policies and the implementation of efficient, carbon-neutral and renewable energy technologies are therefore needed. However, multiple other priorities, lack of access to national and international climate finance, challenges in governance and institutional arrangements may constrain the choice of energy sources.

Mitigation options are available in every major sector. Mitigation can be more cost-effective with an integrated approach that combines measures to reduce energy use and the carbon intensity of end-use sectors together with enhancement of carbon sinks in land-based sectors. The potentials for GHG removals in a managed ecosystem are shown in Figure 2.

Mitigation options in Afghanistan

Mitigation is possible in a broad range of sectors. In Afghanistan options in **agriculture, forestry and other land use (AFOLU)** involve reducing CO_2 emissions by reducing deforestation, forest degradation and forest fires; storing carbon in terrestrial systems (e.g. through afforestation); and providing bioenergy feedstocks. Options to reduce non-CO_2 emissions exist across all sectors, but most notably in agriculture, energy supply and industry. Table 1 summarizes the sequestration potential of the AFOLU sector by emissions reduction, sequestration, and substitution on the supply and demand sides.

The supply-side mitigation options can be reduction of GHG emissions per unit of land/ animal or per unit of product. The demand-side options can be changes in the demand for food, fibre and wood products and by reducing wastage in consumption of these products. Emissions from land-use change, land and livestock management can be reduced, terrestrial carbon stocks can be increased by sequestration in soils and biomass, and emissions from energy production can be reduced by the substitution of fossil fuels by biomass.

Box 1: definitions of AFOLU, afforestation and reforestation

Agriculture, Forestry and Other Land Use (AFOLU) is a term from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories describing a category of activities that contribute to anthropogenic greenhouse gas emissions.

Afforestation is the establishment of a forest or stand of trees in an area where there was no forest.

Reforestation is the re-establishment of forest cover, either naturally (by natural seeding, coppice, or root suckers) or artificially (by direct seeding or planting).

Afforestation and *reforestation* both refer to establishment of trees on land which is currently without trees.

Box 2: definitions of supply-side, demand-side, sequestration and substitution

Supply-side: the part of a country's economy that involves producing goods and supplying services.

Demand-side: the part of an economy relating to the consumption of goods and services.

Sequestration: is the process involved in carbon capture and the long-term storage of atmospheric carbon dioxide (CO2).

Substitution: the act, process, or result of replacing one thing for another.

Table 1: AFOLU sequestration potential (IPCC, 2014: Technical summary. Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change)

Supply-side improvements			Demand-side measures
Emissions/area or unit product (conserved, restored)			Animal/crop product consumption per capita
Emissions reduction: of methane (e.g. livestock management) and nitrous oxide (fertilizer and manure management) and prevention of emissions to the atmosphere by conserving existing carbon pools in soils or vegetation (reducing deforestation and forest degradation, fire prevention/control, agroforestry); reduced emissions intensity (GHG/unit product).	**Sequestration:** increasing the size of existing carbon pools, thereby extracting CO2 from the atmosphere (e.g. afforestation, reforestation, integrated systems, carbon sequestration in soils)	**Substitution:** of biological products for fossil fuels or energy-intensive products, thereby reducing CO2 emissions, e.g. biomass co-firing/CHP, biofuels , biomass-based stoves, and insulation products	**Demand-side measures:** Reducing losses and wastes of food, changes in human diets towards less emission-intensive products; use of long-lived wood products.

In **agriculture**, mitigation is possible by the reduction of GHG emission from croplands, rangelands and livestock. In **forestry**, mitigation involves reducing emissions from deforestation and forest degradation; conservation of forest carbon stocks; sustainable management of forests; and enhancement of forest carbon stocks. The **conservation of soil carbon** such as by reducing deforestation and increasing organic matter content, forms an important mitigation strategy. However, there are trade-off between development and mitigation goals, especially in the agriculture sector that forms the main source of livelihood in Afghanistan. Technical and socio-economic and market potentials also play and important role in the choice of options. Table 2 presents mitigation potential in some relevant sectors.

Table 2: Availability of technical mitigation options, barriers and opportunities (National Environmental Protection Agency, Afghanistan, 2013: Afghanistan. Afghanistan initial national communication to the United Nations Framework Convention on Climate Change)

Technical options	**Barriers**	**Opportunities**
Agriculture and Livestock		
Increasing carbon stock by cropland management. Reducing CH_4 emissions from better livestock management and rice production. Soil carbon sequestration and reducing N_2O emissions from animal wastes. Energy cropping to displace fossil fuels has good prospects if the costs can be made more competitive and the crops are produced sustainably. Improved waste management.	Lack of funding for Research & Development activities to conduct. Lack of national human and institutional capacity and information. Farm-level adoption constraints including lack of information and incentive.	Expansion of credit schemes, shifts in research priorities, development of institutional linkages across countries, trading in soil carbon, and integration of food, fibre, and energy products are ways to overcome the barriers. Measures to be linked with moves towards sustainable production methods. Energy cropping provides benefits of land use diversification where suitable land is currently underutilized for food and fibre production and water is readily available.

Land Use Change and Forestry		
There are three fundamental ways in which land use or management can mitigate atmospheric CO_2 increases: protection, sequestration, and substitution. These options show different temporal patterns; consequently, the choice of options and their potential effectiveness depend on the target time frame as well as on site productivity and disturbance history.	Lack of funding and of human and institutional capacity to monitor and verify. Population pressure and demand of more agriculture and pastures because of demand for food and meat. Minimal role for local communities and the private sector. Illegal trade of wood and wood products. Majority of rural people depending on fuel for cooking and heating on forest and rangeland. Afghanistan yet to become party to Kyoto Protocol.	Opportunities for reforestation and rehabilitation of degraded land with policies and incentives in the form of market payments for capturing and holding carbon as suggested in the Kyoto Protocol. Ratification of Kyoto Protocol and participation in REDD+. Opportunities to meet the Convention on Biological Diversity commitment. Poverty reduction opportunities through Community Based Natural Resources Management and benefit sharing.

Agricultural, livestock and agroforestry practices

Agriculture and rural development are priority sectors of Afghanistan's National Development Strategy to achieve the goal of poverty reduction. Consequently, the government is giving highest priority in the rehabilitation and construction of irrigation infrastructure. There will be a significant rise in the irrigated land. As the semi arid and arid areas become less suitable for agriculture there will also be an increase in the livestock population in the coming years. As agriculture is the major contributor to GHG of Afghanistan, these changes will also lead to an increase in emissions in the coming years.

The mitigation options in agriculture and livestock sectors, presented in Table 2 above, are the most cost-effective options for Afghanistan. Indeed, **cropland management** and **improved waste management** are conservation agriculture practices that increase carbon stock. Moreover, **better livestock management** through **improved grazing management** practices help to reduce CH_4 emissions, increase soil carbon sequestration and reduce N_2O emissions from animal wastes.

Box 3: Importance of rangelands

Healthy rangelands function as a water buffer, in particular due to their vegetative cover, which increases water infiltration, soil organic matter and nutrient cycling and protects the soil from erosion. This allows rangelands to absorb water and slowly release it thorough the year.

Rangelands are also "the most important carbon sinks", and good management can build resilience to climate change.

These **low-cost vegetative** and **agronomical soil** and **water conservation measures** (cf. Vegetative & Agronomic SWC Measures) strongly contribute to restoration of organic soils and enhance the productivity of the land. If successfully applied and maintained by the community, these measures lead to better management of land resources (soil, water and vegetation), enhance soil carbon sink through sequestration, and "have the potential to reduce land degradation and simultaneously address concerns such as water scarcity, land use conflicts and climate change" [2]. These mitigation options are perceived as co-benefits from adaptation practices (cf. Module 4).

It is important to note that GHG mitigation activities in agriculture have co-benefits for and offer synergies with other policy objectives such as food and energy security, rural development and poverty alleviation goals. Moreover, interdependencies exist between adaptation and mitigation at the sectoral level and there are benefits from considering adaptation and mitigation in concert. The world will need to both mitigate and adapt to climate change if it is to effectively avoid harmful climate impacts.

Soil and water management

[2] WOCAT, 2007: where the land is greener – case studies and analysis of soil and water conservation initiatives worldwide

There is a consensus that mismanagement, especially overgrazing (cf. Grazing Management) and conversion to rain-fed wheat production in Afghanistan is causing deterioration of rangelands resulting in extensive desertification and decreasing productivity [3]. If the current trend of deforestation and degradation of rangelands continues, it will have direct impact on the livelihoods of millions of people and pose a challenge to the achievement of poverty reduction in Afghanistan. The **National Priority Programmes** prioritise **conservation of forests and rangelands**. As part of these measures, 15% of the existing degraded forests and rangeland areas will be regenerated, covering approximately 195,000 hectares of forest land and 4.5 million hectares of rangelands[4] and directly participating to carbon sequestration.

Box 4: Causes of land degradation in Afghanistan

Overgrazing, either by a large number of livestock heads or through excessive grazing (for too long). Occurs primarily near villages in the valleys, where the stock is left to graze continuously by sedentary villagers, and in areas where nomadic communities' use of traditional routes is blocked.

Excessive harvesting of wood and shrubs for firewood, usually through the uprooting of bushes by local communities for subsistence (and/or by commercial operators).

Change in land use through the conversion of rangelands into rain-fed cropland. In semi-arid areas, ploughing of rangelands and conversion to rain-fed farming contributes significantly to soil erosion, in particular on sloping grounds.

Climate change tends to increase the effects of land degradation due to an increase in extreme events such as droughts and floods.

Indirect drivers such as poverty, power relations, governance structures, war and conflict, etc.

The mitigation potential of **AFOLU** is highly dependent on broader factors related to land-use policy and patterns. The many possible uses of land can compete or work in synergy. The main barriers to mitigation are institutional (lack of tenure and poor governance), accessibility to financing mechanisms, availability of land and water, and poverty. On the other hand, AFOLU mitigation options can promote innovation, and many technological supply-side mitigation options also increase agricultural and silvicultural efficiency, and can reduce climate vulnerability by improving resilience. Building capacities at National Environmental Protection Agency, key sectoral ministries and in the private sector for the assessment of mitigation potential of different activities is important towards overcoming these constraints.

Box 5: REDD+ and CDM definition

Reducing emissions from deforestation and forest degradation (**REDD**) is a mechanism that has been under negotiation at the UNFCCC since 2005, with the objective of mitigating climate change through reducing net emissions of GHG through conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

Clean Development Mechanism (**CDM**) is one of the Flexible Mechanisms defined in the Kyoto Protocol that provides for emissions reduction projects which generate Certified Emission Reduction units (CERs) which may be traded in emissions trading schemes.

[3] National Environmental Protection Agency, Afghanistan, 2009: Afghanistan. National capacity needs self-assessment for global environmental management (NCSA) and national adaptation programme of action for climate change (NAPA). Final joint report

[4] Environmental Protection Agency, Afghanistan, 2013: Afghanistan. Afghanistan initial national communication to the United Nations Framework Convention on Climate Change.

Box 6: mitigation potentials in other sectors in Afghanistan

The following sectors also emit GHGs:

- **Energy** (energy & transformation industries, manufacturing industries and construction, transport, commercial, institutional and residential (fossil))
- **Industrial processes** (mineral products, chemical industry, metal production)
- **Waste** (solid waste on land, waste water handling, human sewage).

The mitigation potentials can be tapped by replacement of traditional brick kilns, improved energy efficiency in Small and Medium Enterprises (SMEs), landfill sites development for methane recovery, wastewater collection, technology transfer for sound waste management, etc.

Source: National Environmental Protection Agency, Afghanistan, 2013: Afghanistan. Afghanistan initial national communication to the United Nations Framework Convention on Climate Change.

Concluding remark

Policies governing practices in all sectors need to take into account both mitigation and adaptation needs and look for possible co-benefits, contributing to development while reducing climate vulnerability. Longer-term measures often require adjustments in policies and regulations which can lead to transformation in various sectors. Afghanistan has the potential to tap such co-benefits, at a relatively low cost, from the agriculture and forestry sectors thereby contributing to a global good as also selling such environmental services.

Author(s): Patricia Gorin and Nicole Clot, April 2016

This publication has been made possible through financial support of Swiss Agency for Development and Cooperation SDC. The content, however, is the sole responsibility of HELVETAS Swiss Intercooperation.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Federal Department of Foreign Affairs FDFA
Swiss Agency for Development and Cooperation SDC

Further readings

- IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: http://www.ipcc.ch/report/ar5/wg2/
- IPCC, 2014: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: http://www.ipcc.ch/report/ar5/wg3/
- FAO, 2013: Climate-smart Agriculture Sourcebook, FAO.

  Available at: http://www.fao.org/docrep/018/i3325e/i3325e.pdf
- Savage M., Dougherty B., Hamza M., Butterfield R., Bharwan S., 2009: Socio-Economic Impacts of Climate Change in Afghanistan. A Report to the Department for International Development.

  Available at:

  https://www.weadapt.org/sites/weadapt.org/files/legacy-new/placemarks/files/5345354491559sei-dfid-afghanistan-report-1-.pdf
- National Environmental Protection Agency, Afghanistan, 2013: Afghanistan. Afghanistan initial national communication to the United Nations Framework Convention on Climate Change. Available at: http://unfccc.int/resource/docs/natc/afgnc1.pdf
- Islamic Republic of Afghanistan, 2015: Report on the Intended Nationally Determined Contribution (INDC). Submission to the United Nations Framework Convention on Climate Change. Available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Afghanistan/1/INDC_AFG_Paper_En_20150927_.docx%20FINAL.pdf