Biochar in Namibia:
opportunities to convert bush encroachment into carbon offsets

A summary policy brief

Background

Considerable proportions of Namibia's natural rangelands are encroached by invader bush. This phenomenon, called bush encroachment, is recognised as a form of land degradation. It reduces the livestock carrying capacity of rangelands, leads to a loss of biodiversity, reduces the penetration of rainwater into the soil and thereby reduces the recharge of underground water resources, and indirectly causes a decline of jobs and business opportunities in rural Namibia. Yet, the bush resource sequesters significant amounts of carbon dioxide, which renders Namibia a net carbon sink.

Most farmers consider bush encroachment undesirable. Yet, bush is vital for the country's browsers, which constitute a significant source of income for the tourism industry, game farmers and conservancies. The bush resource also offers business opportunities for fire wood producers and the charcoal industry, and holds significant additional expansion potentials. In addition, new but as yet undeveloped opportunities lie in the creation of carbon sequestering and offset projects in the country's agricultural and forestry sectors, as well as bush encroached farmlands.

Under the Kyoto Protocol, Namibia is a non-Annex I country, which implies that it does not have greenhouse gas reduction commitments. It can, however, actively participate in and derive benefits from the trade in certified emission reduction certificates for carbon-saving and/or carbon-sequestering activities. Namibia's various land uses could offer new prospects for additional revenues from carbon credits: while many farmers equate bush to an expensive nuisance factor that needs to be eradicated, projects using bush and its derivative products could potentially earn carbon credits, and thereby introduce new economic value chains. However, under the Protocol carbon sinks are only available for afforestation, reforestation, and land-use changes in areas that have been deforested before 1990. New opportunities in LULUCF sectors may arise in the post-2012 period, especially those that permit the use of agricultural soils as carbon sinks, and those that target forest-like areas such as Namibia's bush-encroached lands

Biochar:
charcoal created by the burning (at high temperatures) of organic material such as woody vegetation. This charcoal is a stable solid, rich in carbon content that can lock carbon in the soil.

Namibia's rural areas do not offer many formal job opportunities. This is despite the fact that almost one-half of the country's population depends on subsistence farming and associated activities. Innovative projects are needed to create jobs and additional economic activities using the country's many natural resources without undermining the environmental sustainability of the land. Here, the production of biochar could one day offer perspectives for local job creation, while creating new opportunities for value addition from invader bush and rangeland rehabilitation.

Presently, carbon sequestering and associated trading mechanisms from improved rangeland and soil management practices, including the use of biochar, are being discussed at a variety of international forums. However, numerous research and procedural gaps remain before carbon revenues from biochar can be generated. The promise that Namibia's bush encroachment can be turned into biofuels and biochar, while also earning carbon credits, is a proposition that deserves prominent attention, targeted support and ongoing research and development.

There is no Namibian policy or guideline that incentivises or regulates the development of carbon offsets or carbon sequestering through rangeland management. While baseline and methodological guidance is available for select project types in the field of agriculture and forestry through the Clean Development Mechanism, none is as yet available for biochar. It is expected that an

Major issues

Bush encroachment affects some 26 million hectares of farm- and rangeland in Namibia, and is responsible for an annual loss in agricultural output estimated to exceed N$ 700 million. It has a direct impact on the livelihoods of both communal and commercial farmers and their employees, and amongst other factors, is responsible for the reduction of the total number of livestock in Namibia from 2.5 million in 1958, to some 800,000 in 2001.

internationally binding post-2012 carbon trade agreement will be developed within the coming months, and ratified at Copenhagen in December 2009. It is likely that additional mechanisms from the formal and informal trade in carbon from the land-use, land-use change and forestry sectors will be agreed upon in the coming months. Biochar may be included in such future arrangements too.

Namibia is well-advised to develop the required institutional capacities, and actively participate in international negotiations, to benefit from the many as yet undeveloped opportunities that its bush resource offers, both as a carbon offset and a source of future carbon revenues.

Effective use of invader bush could:

- rehabilitate encroached rangelands by improving the yield of non-bushy biomass, and in this way increase the per hectare return of activities that depend on the availability of cellulosic biomass
- create jobs in areas that have shown declining job numbers in the past years
- introduce new economic opportunities and associated investments in rural areas
- enhance the uptake of water and associated recharge of the groundwater resources
- reinvigorate opportunity-poor rural areas by introducing both low-technology and possibly high-tech enterprises, and
- re-establish and strengthen biodiversity, and increase value addition from and through it.

Land use, land-use change and forestry (LULUCF) is defined by the UN Climate Change Secretariat as 'A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities.' LULUCF has impacts on the global carbon cycle and as such these activities could add or remove carbon dioxide from the atmosphere, contributing to climate change.

Carbon sinks in the LULUCF sectors however, remain controversial. Concerns include

- the permanence of the carbon sequestered in soils and forests
- how Certified Emission Reductions earned from LULUCF activities will drive additional deforestation and increase Greenhouse Gas emissions from land use changes
- what the impacts of large-scale afforestation and reforestation are, including the social and food security repercussions of such activities
- how biodiversity will be affected by soil carbon sequestration incentives, and
- how soil and soil-enhancing carbon sinks can be effectively monitored over time.

The current interest in biochar is based on the following features:

- that it is produced during biomass conversion processes which release volatile substances in the form of biofuels, such as oils and gases (depending on the temperature and speed of the process), and heat (which has an economic value)
- that the biofuels produced in this way can displace conventional fossil fuels
- that the biomass conversion process also results in a solid substance containing considerable carbon residues, i.e. biochar, that is firmly embedded into the organic biomass matrix, which is said to prevent the rapid disintegration and release of carbon dioxide into the atmosphere when buried in the soil
- that biochar has soil-enhancing properties and its addition to soils can reduce the requirements for fertilizers and water, which in turn improves arable land and agricultural yields

LULUCF opportunities in Namibia

At present the UNFCCC lists methodologies afforestation and reforestation and for agriculture. Within these methodologies the following topics could be of interest for the development of LULUCF opportunities in Namibia:

- restoration of degraded lands through afforestation/reforestation
- afforestation/reforestation with trees supported by shrubs on degraded land
- afforestation/reforestation on degraded land for sustainable wood production
- methane recovery in animal manure management systems
- methane recovery in agricultural activities at household/small farm level, and
- GHG emission reductions from manure management systems.

Any post-2012 carbon trade arrangements will to a significant degree determine the scope and potential of LULUCF-related certificate trading activities. It is therefore essential that Namibia actively participates at the forthcoming COP in Copenhagen, and that officials from both MTI and MET keep up to date with the latest

issues and developments. An often-cited excuse, namely that the required human resources are unavailable, should not prevent Namibia from participation. It should be recognised that some private-sector capacity exists that could and should be called upon to support Government in framing and communicating the most important climate change and carbon issues presently under discussion.

The following preliminary issues require further investigations:

- sustainable land use criteria for bush-encroached areas in Namibia
- cost-benefit analyses of the various LULUCF options, with a focus on those areas that have established baseline procedures and methodologies
- field trials to investigate the recommended dose, longevity and method of application of biochar, and associated costs and benefits under Namibia's climatic conditions

- quantification of benefits of value chains related to the biochar production process
- opportunities for synergies in the production of biochar, especially from related sectors and existing or new agricultural and/or forestry products
- business models for private-sector and institutional biochar production
- local, regional and international market opportunities for Namibian-produced biochar
- biochar production chains, using existing agricultural and/or forestry practices
- value-adding processes that could benefit from biochar production in Namibia
- institutional support mechanisms to establish and sustain a biochar sector in Namibia
- technology requirements for the establishment of a biochar sector
- human resource requirements to initiate and sustain a biochar market in Namibia.

Policy Recommendations

1. **Strengthen institutional capacity**
   Local institutions dealing with carbon projects, including the future CDM office at the Ministry of Trade and Industry and the existing DNA office at the Ministry of Environment and Tourism, need to be adequately staffed and resourced to be able to deal with the rapidly developing opportunities as well as the associated risks introduced through international carbon trade.
2. **Prepare and train Namibian negotiators attending international forums**
   It is essential that Namibian representatives and negotiators attending COP and related UN climate meetings are knowledgeable about the issues at stake, and can effectively communicate Namibia's position and preferences. The required preparation and training of such representatives requires a commitment of resources.

3. Enhance feedback from international forums

Improved feedback mechanisms are require to spread the insights gained from attendance at international forums through improved communications between Government ministries on the one hand, and Government and the multitude of private sector stakeholders through regular press releases, websites and other publications.

4. Involve private-sector specialists and stakeholders

Local specialists and specialist organisations can significantly contribute to existing and new Government functions if provided with a mandate to do so through short-term appointments and contracts. Greater involvement of private-sector specialists also broadens the national pool of expertise, and is often more cost-effective than training existing Government employees.

5. Support research and specialist studies

Specialist studies need to be commissioned to identify the most viable options for Namibia's future participation in LULUCF-related carbon trade activities. In addition, further research is required to assess the viability and sustainability of different bush utilisation methods, including the large-scale production and use of biochar. Identifying a dedicated national bush-promotion champion, for example the Ministry of Agriculture, Water and Forestry, or the MET, would support the goal-oriented identification of sustainable bush utilisation measures. It is advisable that private-sector specialists are recruited to participate in this important national debate and associated research activities.

6: Devise a bush utilisation and beneficiation framework

Specific LULUCF-related targets should be cross-sectorally assessed to draw up a *Namibian bush utilisation and beneficiation framework*, which identifies and quantifies the business and carbon reducing /sequestering opportunities, as well as the carbon offset opportunities in the country's LULUCF sectors.

7: Provide seed funds to stimulate carbon project development

Seed funds are required to scope, investigate, identify and draft Project Identification Notes and Project Development Documents, which are to be submitted to the CDM Executive Board for Namibia's participation in future carbon-related trade activities.

8: Assess costs and benefits of charcoal use in Namibia

The potential of charcoal production and the use of biochar need to be further assessed. Charcoal production strengths and viability need to be investigated and further research in biochar and its role as soil additive needs to be conducted.

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