REDD+ in Miombo woodlands of Southern Africa

Background

The region of the Southern African Development Community (SADC) is home to 375 million hectares of forest and forest-like formations. Dry forests account for the largest share of SADC's forests and are present in almost all 15 SADC countries. According to FAO, annual net forest loss in the region amounts up to 0.46% per year (2005-2012), resulting in high biomass losses and carbon emissions. Although the extent of forest cover change and the drivers of deforestation vary between different countries, forest cover change is mainly driven by agricultural expansion, energy production and logging activities. It is estimated that SADC is responsible for half of biomass carbon losses in Africa due to deforestation.

Against this background, there is a high potential for the SADC countries to participate in the financing mechanism REDD+, which is currently being developed at the international level to reward developing countries for avoided deforestation and forest degradation (DD).

Countries aiming for REDD+ participation have to meet a number of requirements including the development of monitoring systems to measure, report and verify changes in forest cover and related carbon emissions (MRV systems). However, most SADC countries have limited resources to develop and maintain those systems.

From 2011 to 2015 the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH worked together with the SADC Secretariat on a project to develop MRV systems. The testing of MRV systems was carried out at pilot sites that represented forest ecosystems typical for the region.

The technical development and implementation has been developed by the consulting consortium GAF/DFS, in close cooperation with the national forest directorates and other relevant national institutions.

This brochure outlines some characteristics of the dry forest type "Miombo" with a focus on biomass, forest cover changes and related emissions at the project's test site for Miombo. Prior to the project there have been few studies that looked at those different characteristics of Miombo forest in an integrated way (Kamelarczyk, 2009).

However, those studies combined different data sets that have been collected independently from each other and differed in terms of applied methods. The estimates from the project are a good baseline for further

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REDD+ inventories, because of the methodological consistency of the project.

Miombo

Miombo woodlands are dominated by the genera *Brachystegia, Julbernardia* and *Isoberlinia*. They are composed of a single storey of 10 to 20 meter high trees, a discontinuous understorey of broadleafed shrubs and a continuous layer of grasses. This structure of the woodlands results to some extent from frequent wildfires. If wildfires were completely excluded, the Miombo would soon grow into a forest with a closed canopy.

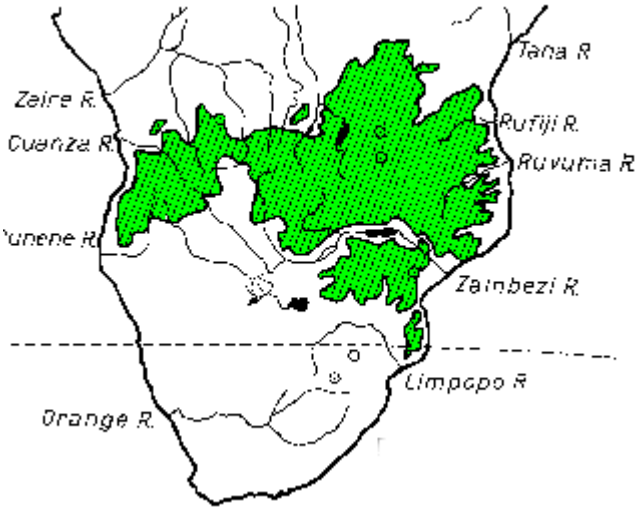
Many of the dominant trees lose their leaves only for a short period in the late dry season. In drier areas the Miombo may be fully deciduous while in moister areas it may be evergreen (Campbell et al., 1996).

Distribution: Miombo woodlands cover an area of 1.21 million km² (Frost, 1996). They extend from Tanzania and southern DRC in the north to Zimbabwe in the south and from Angola in the west to Mozambique in the east.

Usage: People living in the Miombo traditionally grow sorghum, millet, maize and pulses, either under shifting agriculture, or, in drier regions, in connection with rearing livestock.

Townsmen in the region depend on charcoal from Miombo trees for energy.

In comparison to other woodland savannas of the region, population densities are still relatively low, though increasing. To feed the growing population, short-duration croplands will expand into the woodlands. It is estimated that half a million hectare of woodland are cleared annually in the region.



Distribution of Miombo in Southern Africa (Campbell et al., 1996).

REDD+ MRV design

The MRV includes a forest inventory to determine biomass and so called Emission Factors (EFs) and satellite image interpretation to assess areal changes of the forest. Emissions released between 2000 and 2010/13 have been calculated by multiplying EFs with the area changes.

The project determined only gross emissions, which means that the carbon balance of the land replacing the forest, such as cropland, grassland and settlement, was ignored. Nevertheless, gross emissions resulting from deforestation are reported for each land use change category separately. The project achieved its objective to develop a MRV system that meets globally agreed upon criteria for reporting under REDD+.

Pilot site results

The test site spans from the eastern province of Zambia to the central parts of Malawi. It has been selected to represent the nature of forest

ecosystems that are not restricted by national borders. The test site includes non-protected and protected areas. Its entire size comprises 26,000 km², with a forest cover percentage of 59%.

The biomass inventory took place in 2014 and gives the following results for above ground biomass (AGB): 30.98 tons per hectare (to/ha). Disproportionally higher amounts of biomass are contained in the trees with small diameters (DBH) than in the other trees. The probable reason is that trees with bigger diameters have been exploited.

The inventory determined biomass separately for an intact forest strata (40.05 to/ha) and a non-intact forest strata (25.25 to/ha) that had been defined on the basis of satellite image interpretation. The non-intact forest is an indicator for areas where degradation occurs. The two strata differed significantly with regard to biomass. These inventory results approve the successful estimation of forest degradation by satellite imagery.

Overall 222 different tree species were found. Tree species that typically dominate Miombo woodlands have the largest share of biomass. Brachystegia species contain with 12.4 to/ha more than a third of all tree species biomass (37.4%). Julbernardia species are providing the second highest biomass weight per hectare with 3.9 to/ha (12.6%). Approximately 63 species store more than 95% of the biomass.

As could have been expected, forests were less degraded in protected areas than in non-protected areas. However, two exceptions

Intact Miombo woodland at the pilot site in Eastern Zambia/Western Malawi. Picture: U. Flender.

exist: Healthy forest is growing in the non-protected areas of the western part of the pilot site in Eastern Zambia, and in Malawi degraded forest was found in two forest reserves.

Carbon emissions resulting from deforestation at the test site are as follows:
Between 2000 and 2010 each year 6,141 ha of forest were converted into cropland, releasing 327,848 tonnes of CO_2/year. 8,5136 tonnes CO_2/year resulted from the annual transformation of 1,595 ha of forest into grassland. Clearing 5 ha of forest for settlements each year was responsible for 240 tonnes CO_2/year.

Degradation occurred on 12,765 ha/year, causing 325,576 tonnes of CO_2 emissions each year.

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Pilot site results for the period 2000 – 2010

Conversion	Annual Change	Carbon Content	Emissions
Forest Land (FL) – Crop Land	**6, 141 ha/year**	**14.56 t C/ha**	**-327, 847.52 t CO_2/year**
FL – Grass Land	**1, 5947 ha/year**	**14.56 t C/ha**	**-85, 135.72 t CO_2/year**
FL – Settlement	**4.5 ha/year**	**14.56 t C/ha**	**-240.24 t CO_2/year**
FL – Land remaining Forest (Degradation)	**12, 765 ha/year**	**6.96 t C/ha**	**-325, 762.8 t CO_2/year**

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