NATIONAL FOREST INVENTORY 2018

Report Brief

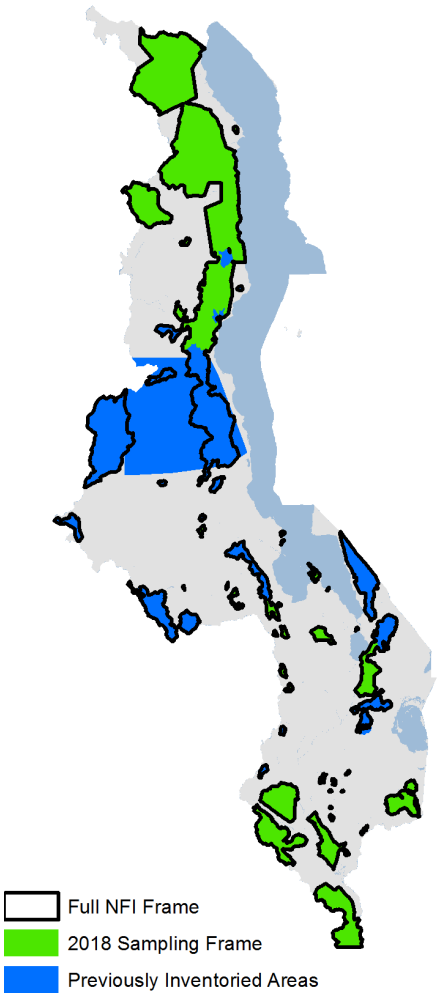
Malawi's 2018 National Forest Inventory

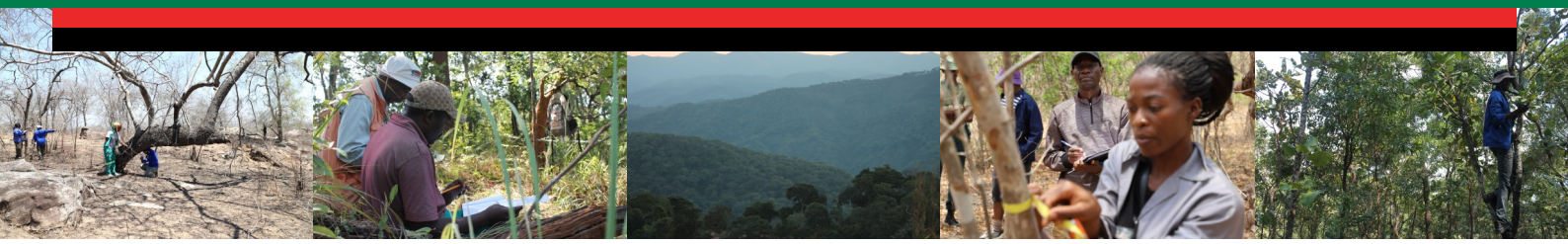
To help establish the essential building blocks for sustainable forest management USAID/Malawi supported the Government of Malawi (GoM) and Malawian academic institutions to conduct Malawi's first-ever National Forest Inventory (NFI) in 2018. The NFI was designed to consolidate and build directly on site-based forest inventories previously conducted in Malawi. This complementary and comprehensive NFI effort was done to build national capacity to monitor forest resources, to advance Malawi's Reducing Emissions from Deforestation and Forest Degradation (REDD+) readiness, and to provide the fundamental information needed to estimate and report carbon stocks and fluxes to the United Nations Framework Convention on Climate Change (UNFCCC). Furthermore, the NFI 2018 was done to formalize the science-based approaches necessary to formulate targeted interventions and to support funding solicitations from potential donors to address deforestation and forest degradation.

During the NFI, thirty full-time inventory team members orienteered to randomly-sampled inventory plots from within the 2018 Sampling Frame (see map) that met Malawi's definition of a forest adopted by the Department of Forestry in 2017. Once at the plot, inventory teams recorded measurements on canopy cover, tree height, tree diameter at breast height (DBH), species, deadwood, soil and litter. These data were aggregated with data from four previous, localized forest inventories and used to calculate the estimates of forest biomass and carbon stocks in Malawi. These Malawi-specific estimates of forest stocks can be used to inform management of the country's forest resources and to develop emission factors for use in national greenhouse gas accounting. In addition, the NFI provides a representative data set on the ecological condition and biodiversity distribution of the country's forests nationwide.

The completion of the NFI 2018 is a major milestone in the Government of Malawi's efforts to achieve REDD+ readiness and to inform forest management for a more sustainable and climate-change resilient future for Malawi. After 2018, the NFI will become a permanent function of the Department of Forestry (DoF) and will routinely serve as an authoritative source of information on Malawi's forests.

This report brief summarizes the key findings of the NFI 2018. For more details on the NFI 2018, including the NFI sampling methodology, aggregated forest inventories and forest carbon stock and biomass calculations, please refer to the full NFI 2018 report.





Key Findings of the NFI 2018

Malawi's Average Total Biomass Stock is 45.9 ± 3.9 Tons of Carbon per Hectare

The national weighted average total biomass stock of Malawi is 97.7 ± 8.3 t biomass ha^{-1} (Aboveground and belowground biomass (AGB+BGB)), equivalent to 45.9 ± 3.9 t C ha^{-1}, with an uncertainty of 8.5%. The Malawi REDD+ Program has reported this figure to the UNFCCC.

Forest Stocks in Malawi are Similar to Those in Zambia and Tanzania

The nation's forest stock results (45.9 ± 3.9 t C ha^{-1}, with an uncertainty of 8.5%) are similar to neighbouring countries' forest stocks: Zambia (41.2 t C ha^{-1}, with an uncertainty of 7%) and Tanzania (33.6 to 12.3 t C ha^{-1}, with an uncertainty that varies from 1% to 7.5%). These similar forest stock results suggest high quality data collection and results illustrative of miombo woodland landscapes.

Forest Biomass Stocks are Higher in the Northern Region and Have Less Uncertainty

In Malawi, the Northern Region's forests have higher biomass density than Southern Region forests on a per-hectare basis. Furthermore, data on Northern Region forest stocks present less variability or uncertainty. This result was expected due to the higher prevalence of forests on customary land in the Northern Region and due to the North's lower human population.

Canopy Cover is Not Indicative of Forest Biomass

The forest plots inventoried in the 2018 NFI were stratified according to canopy density (100%, 75%, 50%, and 25%) by assessing Google Earth imagery. Each stratum had significantly different biomass stock (p-value < 0.001), which decreases steadily with canopy coverage. While the relationship (i.e. the linear regression) is significant (p-value < 0.001), canopy coverage only explains 30% of the biomass variability.

Malawi's Forests are Mostly Comprised of Fourteen Tree Species

The inventory team identified 217 species of trees during the 2018 NFI, but the forest areas inventoried were dominated by a much smaller subset of fourteen species. Of the 217 species, 114 were recorded with five or fewer specimens. Instead, over 50% of the total biomass estimated from the sample was attributed to just fourteen species. Five species: *Julbernardia globiflora*, *Uapaca kirkiana*, *Colophospermum mopane*, *Brachystegia bussei*, and *Brachystegia spiciformis* make up more than 25% of the total tree biomass in Malawi.

Biomass Stocks are Higher within Protected Areas

A comparison between NFI 2018 forest plots located within protected areas (Forest Reserves, National Parks, Game Reserves, etc.) and forest plots found in customary lands revealed that forest stocks were higher within protected areas.

Malawi's Forests Have Little Deadwood Biomass

Deadwood, both lying and standing, was a rather small portion of the carbon pool in the NFI 2018 (0.064 ± 0.039 t C ha^{-1}) and had high uncertainty (61%). A lack of deadwood in Malawi is possibly related to the country's high charcoal and firewood demand due to more than 96% of households using these wood fuels as their primary fuel for household cooking and heating.

Most of the Trees in Malawi's Forests are Small with 5 to 15cm Diameters

NFI 2018 data found that 82.6% of trees in the country's forests are small trees (i.e. trees with DBH of 5-15 cm). Medium (15-30 cm DBH) and large (DBH over 30 cm in the 20-m nest) trees represent 14.2% and 3.2% of the total forest inventoried in 2018, respectively.

According to NFI 2018 data, the national weighted average total biomass stock of Malawi's forests is
97.7 ± 8.3 tons of biomass per hectare or
45.9 ± 3.9 tons of carbon per hectare, with an uncertainty of **8.5%**.

How to Use NFI 2018 Data

Carbon stock values estimated from the NFI 2018 analysis have been used to develop emission factors for national greenhouse gas (GHG) emission estimates for national and project-scale monitoring and planning activities, including National Communications to the UNFCCC and Monitoring, Reporting and Verification data for REDD+. Furthermore, the NFI analysis provides information on non-carbon dimensions of forest conditions in Malawi, such as species richness, that are of interest to a broad range of potential users and management objectives for natural forests. All data can be isolated and applied to a specific region, district or forest area of Malawi and can be, therefore, used to develop a 2018 baseline for forest landscape restoration or biodiversity conservation programs. The analysis and data of the NFI 2018 are available at the Department of Forestry Headquarters in Lilongwe.

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