SWFLG Briefing Note 15

Biodiversity Assessment
Sheko Forest
South West Ethiopia

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Summary

The Wild Coffee Conservation by Participatory Forest Management (WCC-PFM) Project (2010-2016) is testing an innovative approach to *in situ* conservation of wild *Coffea arabica* using Participatory Forest Management (PFM) with the aim of maintaining the forest and its biodiversity in Sheko district, southwest Ethiopia, including the Amora Gedel and Kontir Birhan forests.

An assessment of woody species was conducted to assess the impact of the PFM approach to maintaining the biodiversity of the forest. Data was collected from 82 plots in 2015 which overlapped with an equivalent study undertaken in 2010. Woody species density was found to have increased over this time period in all diameter classes in the natural forest, as had the number of species found, demonstrating a positive contribution by PFM to the maintenance of biodiversity and the conservation of the wild *Coffea arabica* gene pool in the natural forest. In contrast, there has been a decline in biodiversity in the coffee forest where selective management practices have manipulated the forest to favour coffee.

Differentiating between forest management types

The surveys undertaken differentiated between two types of forest management. One type is considered to be lightly managed at present i.e. to have limited human interference. This is sometimes referred to as **natural forest**. The other type is considered to be intensively managed, i.e. to have frequent human interference. This is referred to as **coffee forest** in reference to the primary crop grown and managed there.

Methodology

A total of 82 plots each 100meter by 20 meters were used to collect the data. In addition to these random plots, a number of purposive plots were identified along transect lines through two forest blocks, Kontir Birhan and Amora Gedel. The distance between consecutive plots on each transect line was 200 meters. The nested plot technique was used to collect the data. In the 100 by 20 meter plots, Diameter at Stump Height (DSH) of all woody species > 10 cm was measured; in a nested 20 by 20 meter plot, all woody species with DSH < 10 cm were identified and counted.

The number of sample plots for the inventory area was calculated following the method used by the Woody Biomass Inventory and Strategic Planning Project (WBISPP, 2000) and the start point of the transects were identified randomly. Plots covered the natural forest and coffee forest. The assessment was undertaken at the beginning of the project in 2010 and towards the end of the project in late 2015.

Results

Coffee forest

In the coffee forest there has been an increase in woody species in the lower diameter (<10cm) class (Figure 1); though not statistically significant, it may be due to planting of more coffee plants. This is supported by the comparison of density of *Coffea arabica* between the two inventory periods; during this time an average of an additional 600 coffee plants/hectare was observed.

There has been a decline in woody species >10cm, which includes relatively mature trees; this is statistically significant and may be attributed to the death of over matured trees and/or selective cutting to open the canopy as coffee bushes need only partial shade (60%) for maximum yield.

These changes are borne out when coffee forest woody species diameter is mapped; the drop between the diameter class two and three is very sharp and does not depict the normal inverted J shape (Figure 2.). This is consistent with manipulation to favour coffee plants.
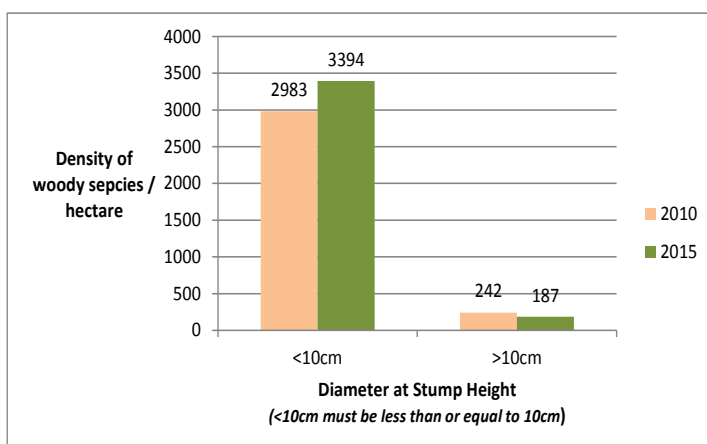

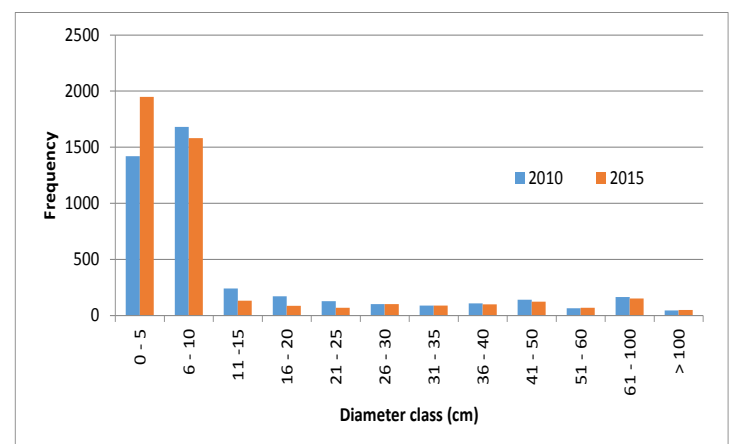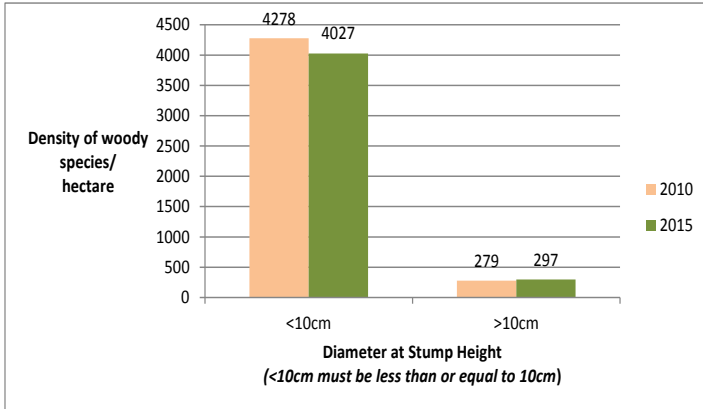**Figure 1.** *Density of woody species in coffee forest, Sheko 2010 and 2015*

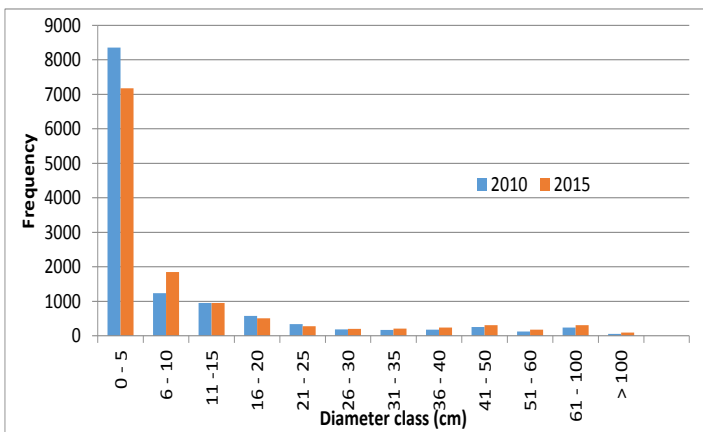**Figure 2.** *Diameter distribution of woody species in coffee forest, in Sheko 2010 and 2015*

Natural Forest

In the natural forest the density of woody species shows a small but not statistically significant decline of 5.8% between 2010-2015 of woody species <10cm diameter; with the >10cm group increasing by 6.4% over the same period (Figure 3).

The diameter of woody species in the natural forest showed a similar structure for both inventory years. This is charactarised by higher number of individuals in the lower diameter classes and is very close to an inverted J shape that characterises healthy size structure of a forest.

Figure 3. *Density of woody species in natural forest, in Sheko 2010 and 2015*

Figure 4. *Diameter distribution of woody species in natural forest in Sheko, 2010 and 2015*

The slightly lower number of individuals in the first diameter class compared to the second class when 2010 is considered alongside 2015 (Figure 4) may be due to transition (through growth) from the first to the second class over the five years between inventory periods. The remaining diameter classes show a stable number of individuals.

The Shannon Diversity Index (Table 1) was used to compare the diversity of species recorded across both forest land use types and inventory periods. Analysis shows a decline in species richness and evenness in the coffee forest. However in the natural forest diversity in all aspects (Shannon Diversity Index richness and evenness) was maintained across the two inventory periods.

Table 1. Diversity of woody species in Sheko forest, Ethiopia		2010	2015
Shannon diversity	Coffee Forest	1.99 (0.04)	1.33 (0.03)
	Natural Forest	2.85 (0.00)	2.97 (0.01)
Shannon evenness	Coffee Forest	0.43	0.34
	Natural Forest	0.62	0.63
Species richness	Coffee Forest	106	65
	Natural Forest	100	107

Conclusions

Results indicate that the coffee forest is declining in biodiversity due to a reduction in the number of woody species at all diameter classes and a reduction in diversity. However, results show that in the natural forest the density of woody species is being maintained along all diameter classes and diversity is stable.

The maintenance of woody species biodiversity in the natural forest, unlike the decline in the coffee forest, shows the role played by PFM in preserving the biodiversity through sustainable management of the forest. Without the PFM, part of the natural forest would have gradually been intruded and changed into coffee forest, with a concomitant loss of biodiversity.

Community PFM member assessing forest

South West Forests and Landscapes Grouping

SWFLG is an informal grouping of organisations which are interested in the development of an ecologically sound and socio-economically sensitive approach to the management of the south west landscapes of Ethiopia. The members of the grouping to date are: University of Huddersfield (UK), Ethio-Wetlands & Natural Resources Association and Sustainable Livelihood Action/Wetland Action EEIG (the Netherlands). They have been partners in projects funded by the EU and several other international donors since 1996 and have built up specific expertise in the areas outlined above.

The grouping currently has two projects in this area besides the recently completed NTFP-PFM Project. These are:

Wild Coffee Conservation by Participatory Forest Management Project (WCC-PFM) led by the University of Huddersfield with contributions from EWNRA and SLA and funding from the European Union, the Horn of Africa Regional Environment Centre and Network and the UK Government Darwin Initiative.

REDD+ Participatory Forest Management in South West Ethiopia (REPAFMA-SW Ethiopia) led by Ethio-Wetlands and Natural Resources Association in association with the Development Fund of Norway with contributions from SLA and UoH, and funding from NORAD.

WCC-PFM Project Summary

The "Wild Coffee Conservation by Participatory Forest Management" (WCC-PFM) Project seeks to test and fine-tune PFM so that it can contribute to *in situ* conservation of wild coffee in the forests in southwest Ethiopia. At present the project is working in parts of Southern Nations, Nationalities and People's Regional State (SNNPRS).

The focus of this approach to *in situ* conservation is the engagement of the communities so that they own and lead the process of PFM and forest management plan development and implementation. The plans include different forest management practices - development, protection and utilisation, including activities to ensure *in situ* conservation. The PFM process is driven by the way in which rights can be devolved to communities and forest-based enterprises developed which help forests become an attractive land use for communities, competing against other land uses and so "pay their way".

Further details can be found at:
http://wetlandsandforests.hud.ac.uk/forests.html

All SWFLG Briefing Notes can be found at:
http://wetlandsandforests.hud.ac.uk/wcc_publications.html

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Project Funding Agencies

European Union, Environment Budget

Horn of Africa Regional Environment Centre and Network

Darwin Initiative of the UK Government

Project Partners

The University of Huddersfield

Ethio-Wetlands and Natural Resources Association.

Sustainable Livelihood Action

Ethiopian Institute of Biodiversity

Southern Nations, Nationalities & Peoples Regional State, Bureau of Agriculture