Institution: University of Huddersfield

Unit of Assessment: UoA5 – Biological Sciences

Title of case study: Empowering communities to maintain biodiversity, protect wild coffee and stimulate sustainable forest use in southwest Ethiopia

Period when the underpinning research was undertaken: 2010 - 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Byongjun (Phil) Hwang	Reader in Geography Senior Lecturer in Geography	2020–present 2018–2020
Adrian Wood	Professor of Sustainability Lecturer – Professor of Geography	1986–present
Julia Meaton	Reader in Sustainability	1995–present
Matt Snell	Research Projects Manager	2015 – present

Period when the claimed impact occurred: 2013 – 2020

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact

The sustainability of 151,000 hectares of tropical montane forest in Sheko and two adjoining districts in southwest Ethiopia is under threat impacting environmentally as well as economically on the wellbeing of those who live there. Research by the University of Huddersfield (UoH) has developed innovative mapping which has been embedded within a community forest management (CFM) process through training for 61 forest management groups (FMGs). 176,000 people have begun actively managing the forest and have protected its integrity. CFM has been shown to maintain biodiversity and enhance carbon storage as well as preserving wild coffee in the natural forest. In another district in southwest Ethiopia, Gera, a new satellite method has also been developed and applied to assess the extent of the degradation that has been occurring where farmers have manipulated the natural forest to create “coffee forest”. This loss of biodiversity and regenerative capacity of the tree canopy in coffee forest is now on the agenda of government staff in Gera District and the research community as the country seeks to develop increased value from coffee grown in the forest and to do so sustainably.

2. Underpinning research

Rationale for the research

Historical sources suggest that high forests in Ethiopia once covered ca. 35% of the nation’s land area. Satellite records show that coverage of natural high forests had declined to 6.08% in late 1970s and then to 2.36% in 2000, losing ca. 0.2% per year. Now, the last of Ethiopia’s natural high forests can be found only in remote parts of the southeast or southwest highlands. This has significantly reduced Ethiopia’s ability to maintain its forest area, support its ecosystem services and meet its international commitments to forest carbon storage [3.1]. Forest loss also jeopardises the survival of wild coffee that has been preserved for thousands of years in these ancient forests where it evolved and was first domesticated [3.2]. The remaining high forests in the southwest, a globally significant biodiversity hotspot, continue to suffer from deforestation and degradation through forest clearing for cereal cropping and timber extraction or through forest modification for coffee production, creating “coffee forest” which threatens the regenerative ability of the forest canopy [3.3, 3.1].

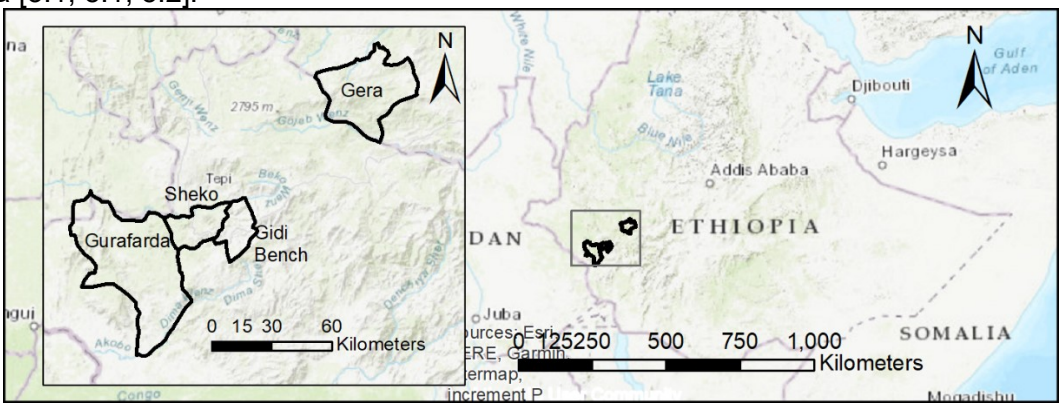
Research Team and Approach

Hwang joined UoH in 2018 and applied his mapping expertise to established work on forest protection which Wood started in 2003. This work has received major grants from the EU, the

UK's Darwin Initiative and others which fund twelve Ethiopian field staff who, along with UoH staff, have developed and applied a highly devolved form of Community Forest Management (CFM) [3.1]. Meaton joined in 2012 and works on forest product contributions to livelihoods [3.4, 3.5]. Snell has supported this since 2015. The research is undertaken in collaboration with an Ethiopian NGO – Ethio-Wetlands and Natural Resources Association (EWNRA), the government of the Southern Regional State and Jimma University. An inter-disciplinary and participatory action research approach is applied, with co-development and field testing of innovations [3.1, 3.2, 3.3]. This work has been funded primarily by the EU Delegation to Ethiopia (£5.8m) and the UK government's Darwin Initiative (£594k).

CFM and Map-Supported Agreements for Active Forest Management

UoH's devolved approach to CFM [3.1] shows the importance of community-based management in forest maintenance [3.6]. The approach requires agreements to be signed between the government and community FMGs [3.1]. The agreements signed between 2014 and 2020 in Sheko and two adjoining districts include geo-referenced land use maps created by communities trained to use handheld GPS units and staff using a computer-based Geographic Information System (GIS) [3.2]. These form the basis of CFM plans, reviewed annually by government to ensure forest protection, regeneration and sustainable utilisation practices are being followed. In this REF period the CFM involved 61 communities managing a forest area of 151,000 ha with a total population of over 176,000 people in these three districts of the Southern Region of Ethiopia [3.1, 5.1, 5.2].



Map of the study area showing Sheko and two adjoining districts (Gurafarda & Gidi Bench), and Gera district in southwest Ethiopia.

Natural Forest – Maintaining Biodiversity, Carbon Stocks and Wild Coffee

Communities are trained in the maintenance of the forest and its biodiversity, especially the wild coffee stands in the natural forest. FMGs and communities were empowered to conduct *in-situ* biodiversity surveys and develop regular monitoring of their forest areas. Independent consultants, specialising in analysis of satellite imagery and undertaking biodiversity and carbon surveys, were engaged to assess the impacts between 2010 and 2015 of these community actions in Sheko District in southwest Ethiopia [3.1].

A part of the CFM agreements requires that the communities not only maintain the forest handed over to them, but also protect the stands of wild coffee found within it due to their genetic importance. To evaluate the effectiveness of the CFM in preserving wild coffee, we utilised ground surveys at 30 sites in 2015 and 2019 to assess the retention of wild coffee in selected CFM forest areas. Satellite imagery was used to evaluate the site-specific forest conditions. The results from this research showed an overall preservation of wild coffee in Sheko District [3.2].

Coffee Forest – Assessing 'hidden' Degradation and Active Regeneration Potential

In some parts of the forests in southwest Ethiopia, natural forest has been thinned and coffee bushes planted as a shrub layer, creating "coffee forest". We utilised satellite imagery and *in-situ* photography and biodiversity surveys to assess the extent and level of the degradation within this created coffee forest in another district, Gera [3.3]. Our research revealed a significant degradation over 32 years from 1987 to 2019 within this coffee forest due to intensive management practices such as undergrowth clearing, canopy tree cutting and coffee planting

[3.3]. This research shows there is a real danger of complete loss of the regeneration capability of forest in such areas if intensive management is not adjusted [3.3].

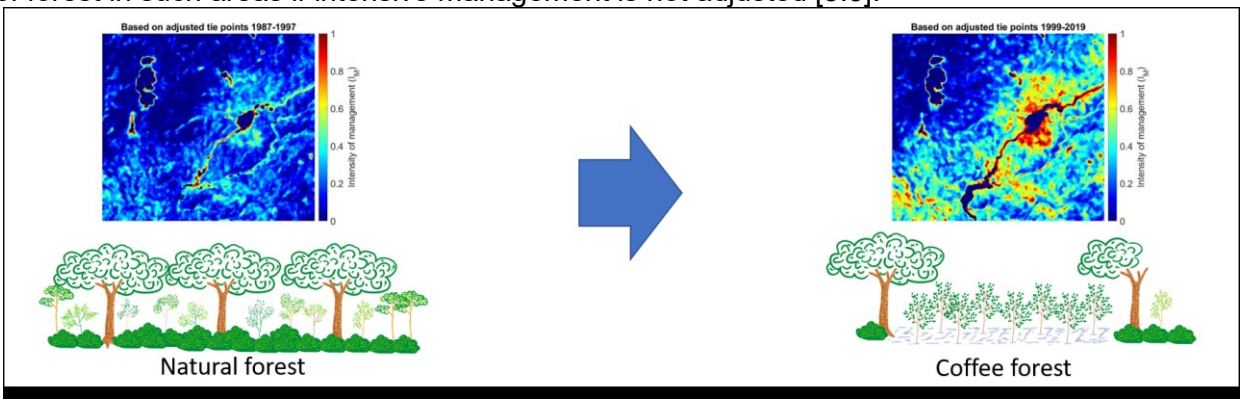


Illustration of the conversion of natural forest into intensively managed "coffee forest". On satellite-derived images, red colour indicates intensive management, while blue colour low level of management and natural forest.

3. References to the research

The research described here was both Internally and externally reviewed and published in high-quality international journals.

3.1. **Wood, A.P**., Tolera, M., **Snell, M**., O'Hara, P. & Hailu, A. (2019) Community forest management (CFM) in south-west Ethiopia: Maintaining forests, biodiversity and carbon stocks to support wild coffee conservation. Global Environmental Change, Vol. 59, November, https://doi.org/10.1016/j.gloenvcha.2019.101980

3.2. **Hwang, B**., **Wood, A**., **Snell, M.,** Fantaye, D., Belayneh, E. and Mekuria, B. (2020) Monitoring wild coffee using ground survey and satellite observation in community-managed forest in Sheko, south-west Ethiopia. Sustainability, 12, 9409, https://doi.org/10.3390/su12229409

3.3. **Hwang, B**., Hundera, K., Mekuria, B., **Wood, A**., and Asfaw, A. (2020) Intensified Management of Coffee Forest in Southwest Ethiopia Detected by Landsat Imagery. Forests, 11, 422, https://doi.org/10.3390/f11040422

3.4. Lowore, J., **Meaton, J**. and **Wood, A.** (2018) African forest honey: an overlooked NTFP with potential to support livelihoods and forests Environmental Management, 62: 15-28,. https://doi.org/10.1007/s00267-018-1015-8

3.5. **Meaton, J.**, Biniyam Abebe, & **Wood, A.P.** (2015) Forest spice development: the use of value chain analysis to identify opportunities for the sustainable development of Ethiopian cardamom (korerima). Sustainable Development, 23, 1-15, https://doi.org/10.1002/sd.1563

3.6. Sutcliffe, J.P., **Wood, A.** and **Meaton, J**. (2012) Competitive forests – making forests sustainable in south-west Ethiopia, International Journal of Sustainable Development and World Ecology, 19:6, 471-481, https://doi.org/10.1080/13504509.2012.740510

Grants 1/2/3, 2003-07, 2007-14, 2010-16, European Union, totalling £5.8M.
Grants 4/5, 2012-2015, 2018-2021, Darwin Initiative, totalling £594K.

4. Details of the impact

The research to address the threats to the forests in parts of southwest Ethiopia has had impacts that can be summarised under three headings: 1. CFM Agreements, Empowered Communities and Active Forest Management; 2. Natural Forest – Maintaining Biodiversity, Carbon Stocks and Wild Coffee; 3. Coffee Forest – Exposing 'hidden' Degradation and Raising Concern for Forest Regeneration.

1. CFM Agreements, Empowered Communities and Active Forest Management

Provision of GIS training and map production for farmers and government empowered 61 communities to sign government approved CFM agreements since 2014 [5.1] and take responsibility for forest management. Forest Management Groups (FMGs) now undertake a range of activities, including patrolling and protecting the forests from clearance, facilitating forest regeneration and sustainably harvesting forest products from the 151,000 ha they manage [5.1, 5.2]. One EU observer notes this devolved forest management, as he observed between 2014 and 2016, had led to a shift from ineffective state conservation into *"active management and protection of the natural forest by communities"* [5.3].

These FMGs, with government agreements, defend their rights and prosecute illegal settlers infringing their forest [5.2, 5.4]. This has led to better government support for the FMGs, and for the CFM approach which is now included in the 2012 Regional and 2018 Federal forest legislation [5.4]. Head of the Public Prosecutor Office in Bench Sheko Zone stated *"..community management of the forest is now the normal arrangement in our area…With their agreements on forest management with the government, the FMGs are actively applying their rights, prosecuting illegal settlers in the forest…"* [5.4].

Having clear rights to use the forest allows communities to develop their economic activities. These are important for diversifying livelihoods and improving resilience in the face of climatic and politico-economic uncertainties. Activities include a range of non-timber forest products, such as forest honey produced using traditional hives, spice collection, and the harvesting of forest fruits and seed, including coffee [5.1, 3.4, 3.5]. Such activities contribute more than 60% of the cash income of forest fringe communities and are critical for many households' survival strategies. Between 2018 and 2020 such income has improved by 25% [5.5].

2. Natural Forest – Maintaining Biodiversity, Carbon Stocks and Wild Coffee

An independent comparative assessment of change in CFM and neighbouring non-CFM forest showed a positive impact of CFM in the 28,000 ha of forest in one District (Sheko) between 2010 and 2015 [5.6, 3.1]. The assessment with 82 plots along two transects totalling 25 km, across the forest in Sheko District, showed that the biodiversity and carbon stocks of the CFM forests were maintained during this REF period [5.6, 3.1]. This confirms the effectiveness of the CFM in maintaining biodiversity and carbon storage in this district. In the community managed natural forest, biodiversity (richness, evenness and diversity of woody species) was maintained [3.1]. Forest loss in the CFM areas was reduced to 0.18% per annum, whereas in non-CFM areas forest loss was at 2.6% [3.1]. For the same period carbon stock in the CFM forests increased by 23%, while it declined by 12% in the non-PFM forest [5.6]. This is important for the direct generation of income for rural communities and for the REDD+ carbon credit programme (https://redd.unfccc.int/) being trialled in Ethiopia [5.5, 5.6] and to the national Climate Resilient Green Economy policy. The wider contribution to stabilising global climate is of global importance.

Research also shows that CFM is effective at maintaining the wild coffee mother trees and saplings thereby conserving the globally important wild coffee gene pool [3.2]. The results from this research confirms the effectiveness of the CFM in preserving wild coffee in the natural forest of 8 communities in Sheko District [3.2, 3.6]. Communities report that the CFM arrangements motivate them to ensure that the forest maintained the stands of wild coffee. One of the community's FMGs in Sheko District testifies *"Projects implemented to date include wild coffee conservation and capacity building project, community conservation of wild coffee. Through these projects we have got awareness of forest management..."* [5.7].

3. Coffee Forest – Exposing 'hidden' Degradation and Raising Concern for Forest Regeneration

In the non-CFM coffee forest areas in another district, Gera, also in southwest Ethiopia, UoH research shows that biodiversity has been significantly compromised due to thinning the tree canopy and clearing undergrowth [3.3]. It also confirms that intensive management in the coffee forest has led to an over-mature tree canopy with no replacement sapling trees, significantly affecting forest regeneration for years to come [3.3]. This research, disseminated through

workshops in 2019, engaged government officials and Ethiopian university researchers to better understand the national importance of the issue given the development policies and plans for expansion of the forest coffee value chain.

Awwal Jihad Ahimad, Head, Office of Gera District Environment, Forest and Climate Change office, testifies that *"The workshop was intense and equipped the officials with GIS capability for further demarcation of coffee forest. Understanding the degree of the degradation of coffee forest has led to discussions with farmers on this delicate issue and trying to find ways to ensure the forest can regenerate as well as producing coffee. The impact…is widespread… estimated 75,516 ha of coffee forest in Gera, supporting 10,556 households (coffee farmers)"* [5.8].

Shabu Jemal, a former government official in Gera District, and now a lecturer at Wollega University, has witnessed that, "*It is now recognised that the degradation in coffee forest is very important for the forest regeneration in the region. It has been long questioned whether coffee forest and its degradation can be detected from satellite imagery. The research by UoH has made a very important step to monitor the coffee forest degradation, and certainly helps us develop studies on these coffee forests.*" [5.9].

There are wider policy implications arising from this work. Production of coffee in natural forest has often been considered beneficial as it deters communities from converting forest into crop fields. As Dr Abduke stated, "*Coffee provides Ethiopia with its most important agricultural commodity, contributing around one quarter of its export earning"* [5.10], coffee production in "coffee forest" is of critical importance. However, Ethiopia's global commitments such as the United Nations Framework Convention on Climate Change (UNFCCC) demands assurance of conservation of forest integrity and regenerative ability [5.10]. Our research has created the awareness that *"expanding forest coffee impacts (on) long-term forest regeneration, which in the long term can undermine this type of coffee production"* [5.10].

5. Sources to corroborate the impact

Note: Items 5.1, 5.2, 5.4 & 5.8 use the Ethiopian Calendar which is seven years behind UK.

5.1 Begashaw Kassa Bekele, Head, Coop Development Office, Bench Sheko Zone. (FMG communities = gots (Table1, Col 5) = 61, population in CFM forest management areas = 176k)

5.2 Wubitu Gemta Yatskoms, Head, Environment Protection, Forest Climate Change Protection Office, Bench Sheko Zone. (PFM/CFM forest = 102k + 49k = 151k ha)

5.3 Friedrich Mahler, Rural Development Advisor, EU Delegation, Lusaka, formerly in Addis Ababa. (Assessment of impacts of Wild Coffee Conservation Project, 2010-2016)

5.4 Sultan Zoit Dekagus, Gurafarda Woreda, Attorney Office, Bench Sheko Zone. (Prosecuting illegal settlers, development of Communal Land Certificates (CLCs)

5.5 Dr Mulugeta Lemenih, Country Rep for UNIQUE (German Land Use company) and periodic adviser to Ministry of Environment, Forests and Climate Change. (CLCs, economic impacts of CFM & forest enterprises, policy influence and contribution to CRGE policy)

5.6 Dr Motuma Tolera Feyissa, Dean, Wondo Genet Forestry College, Hawassa University. (Independent Team Leader on biodiversity and carbon impacts of CFM work in Sheko)

5.7 Sheko Woreda, Participatory Forest Management Association. (Translated to English by Kassahun Adelo, Ethio Wetlands & Natural Resource Association, Mizan Aman.) Community conservation of wild coffee and engagement in natural forest management and enterprises)

5.8 Awwal Jihad Ahimad, Head, Gera Woreda, Environment, Forest & Climate Change Authority. (Extent of coffee forest, recognition from UoH work of forest regeneration issue)

5.9 Shabu Jemal, Lecturer, Wollega University, ex Gera Woreda, Environment, Forest & Climate Change Office. (New ability from UoH work to monitor coffee forest degradation)

5.10 Dr Muktar Aduke, Managing Director, MA Water Works Consultancy, Contractor to Canadian Embassy for Field Support Services. (Importance of current forest coffee development strategy and need to address its impact on regeneration of forest canopy)