

Impact case study (REF3)

Institution: University of Oxford		
Unit of Assessment: 14 – Geography and Environmental Studies		
Title of case study: Building Resilience to Climate Change with Cocoa Farmers in Ghana		
Period when the underpinning research was undertaken: 2014-2018		
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:
Mark Hirons	Research Fellow/Lecturer	2014 to present
Yadvinder Malhi	Professor of Ecosystem Science	2004 to present
Constance McDermott	Associate Professor and Senior Research Fellow	2009 to present
Period when the claimed impact occurred: 2017- Dec 2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact (indicative maximum 100 words)		
<p>Climate-smart approaches to cocoa farming seek to reduce its contribution to deforestation and greenhouse gas emissions while making the sector and farmers' income less vulnerable to climate change. Research led by Malhi and co-produced with multiple partners has contributed to the development of Ghana's national strategies to reduce deforestation and support climate-smart practices, and their implementation in the Kakum region in southern Ghana. It has helped to generate private sector funding (over USD330,000) for training 5,365 farmers and community members as well as an extensive climate-smart cocoa monitoring and evaluation programme.</p>		
2. Underpinning research (indicative maximum 500 words)		
<p>Ghana is the world's second-largest producer of cocoa and responsible for around 25% of global production. Accounting for 21.5% of the country's GDP in 2014, cocoa is the main source of income for 800,000 farmers, more than half of whom are small holders cultivating up to 2 hectares. Ghana's cocoa production and climate change are closely interconnected. Cocoa farming contributes to deforestation and greenhouse gas emissions, while extended droughts, more intense heat and wetter wet seasons are already affecting cocoa yield. Projected climate changes may render many of the 5,900,000ha devoted to cocoa farming unviable under current production methods. This is why 'climate-smart' cocoa approaches are necessary. These seek to protect forests and reduce farmers' poverty by increasing cocoa yields.</p> <p>Building on Malhi's long-standing collaboration with the Nature Conservation Research Centre (NCRC) and other in-country partners [R1], the underpinning research has analysed the social and ecological dimensions of cocoa production and how these are affected by climate change. The research – the ECOLIMITS project and a follow-up project on the effects of 2015/16 El Niño events – took place in the Kakum region in Ghana's Central Region. Consisting of more than 212,868ha of land and home to some 60,000 cocoa farmers, the Kakum region is characterised by high biodiversity levels and cocoa production that generates relatively low yields but enhances deforestation. The research was co-designed by academic and non-governmental partners. It was both interdisciplinary and mixed-method [R2, R3, R4], which has been key to the realisation of the changes described in Section 4.</p> <p>The research has adopted a 'biocultural framework' [R5]. This transcends the nature vs culture dualism that pervades (Western) mainstream science and integrates the 'social' and the 'ecological' into a holistic socioecological approach centred on the landscape and cocoa production as the outcomes of simultaneously human social and biophysical processes as integrative elements. Thus, R4 identifies multiple socioecological factors – e.g. fertiliser use and dispersion across farms of rotting plant biomass – that increase farmers' cocoa harvests. Using a socioecological landscape approach, R2 shows that high canopy levels owing to the</p>		

Impact case study (REF3)

presence of shade trees increase CO₂ absorption capacity and mitigate deforestation's adverse environmental effects. The importance of the governance of trees on cocoa farms and of access to communal lands to poverty and ability to cope with climate change among cocoa farmers is demonstrated in **R3** and **R5**, respectively.

Farmer poverty has been conceptualised as broader than income deprivation. It has multiple dimensions (e.g. basic needs, health, education, food security, asset ownership) and is differentiated within farming communities according to gender, age and ethnicity [**R6**]. Nonetheless, the finding that reduced cocoa yields following the 2015 El Niño drought translated primarily into cash income and food shortages [**R5**] highlights that improving farmers' income must be at the heart of climate-smart cocoa strategies. Intensive (fertiliser and pesticide use) and ecological (dispersing biomass across farms) farming techniques can significantly increase yields but generate minimal income gains for the poorest farmer once the costs for chemical inputs are taken into account [**R4**]. Modelling has shown that, by increasing incomes, optimal farming techniques improve school attendance and access to adequate amounts of food in particular [**R6**].

3. References to the research (indicative maximum of six references)

- R1:** Malhi, Y., Adu-Bredu, S., Asare, R. A., Lewis, S. L. and Mayaux, P. (2013) African rainforests: past, present and future. *Philosophical Transactions of the Royal Society B: Biological Sciences* 368(1625): 20120312. DOI: 10.1098/rstb.2012.0312. [output type: D]
- R2:** Morel, A., Adu Sasu, M., Adu-Bredu, S., Quaye, M., Moore, C., Asare, R.A., Mason, J., Hirons, M., McDermott, C.L., Robinson, E.J.Z., Boyd, E., Norris, K. and Malhi, Y. (2019) Carbon dynamics, net primary productivity and human-appropriated net primary productivity across a forest-cocoa farm landscape in West Africa. *Global Change Biology* 25(8): 2661-2667. DOI: 10.1111/gcb.14661. [output type: D]
- R3:** Hirons, M., McDermott, C., Asare, R., Morel, A., Robinson, E., Mason, J., Boyd, E., Malhi, Y. and Norris, K. (2018) Illegality and inequity in Ghana's cocoa-forest landscape: How formalization can undermine farmers control and benefits from trees on their farms. *Land Use Policy* 76: 405-413. DOI: 10.1016/j.landusepol.2018.02.014. [output type: D]
- R4:** Morel, A., Hirons, M., Adu Sasu, M., Quaye, M., Asare, RA., Mason, J., Adu-Bredu, S., Boyd, E., McDermott, CL., Robinson, E.J.Z., Straser, R., Malhi, Y., Norris, K. (2019) The ecological limits of poverty alleviation in an African forest-agriculture landscape. *Frontiers in Sustainable Food Systems* 3: 57. DOI: 10.3389/fsufs.2019.00057. [output type: D]
- R5:** Hirons, M., Boyd, E., McDermott, C., Asare, R., Morel, A., Mason, J., Malhi, Y. and Norris, K. (2018) Understanding climate resilience in Ghanaian cocoa communities – Advancing a biocultural perspective. *Journal of Rural Studies* 63: 120-129. DOI: 10.1016/j.jrurstud.2018.08.010. [output type: D]
- R6:** Hirons, M., Robinson, E., McDermott, C., Morel, A., Asare, R., Boyd, E., Gonfa, T., Gole, T.W., Malhi, Y., Mason, J. and Norris, K. (2018) Understanding poverty in cash-crop agroforestry systems: evidence from Ghana and Ethiopia. *Ecological Economics* 154: 31-41. DOI: 10.1016/j.ecolecon.2018.07.021. [output type: D]

Funding: PI: Malhi, Co-I: McDermott: ECOLIMITS: Exploring the ecosystem limits to poverty alleviation in African forest-agriculture landscapes (GBP630,110; 2013-2016 DFID, ESRC and NERC); PI: Malhi, Socio-ecological response and resilience to El Nino shocks: The case of coffee and cocoa agroforestry landscapes in Africa (GBP394,775; 2016-2018 DFID and NERC).

4. Details of the impact (indicative maximum 750 words).

A) Enhancing Ghana's national strategies to reduce deforestation and support climate-smart practices

A key goal of the ECOLIMITS project was – in the words of research partner organisation the NCRC – to offer “understandable and adoptable recommendations to influence [Ghana's]

national strategies to reduce deforestation and support climate-smart policies and practices” [E1]. NCRC are a leading not-for-profit organisation focused on using conservation initiatives to promote awareness and protection of the natural, cultural and historic diversity of Ghana (and the West Africa region). Their recent primary focus is how climate change and biodiversity affects the region, with a view to supporting capacity building and mentoring of communities and peer-organisations. As an in-country partner with established networks, they were uniquely placed to mobilise the research findings among key stakeholder organisations. With the Oxford team led by Malhi, the NCRC organised a workshop in October 2017 with 22 decision-makers from the most relevant government agencies, including Ghana’s Forestry Commission and Cocoa Board, and representatives of 14 global cocoa/chocolate companies (including The Hershey Company) and other cocoa organisations active in Ghana [E1, E2a]. The NCRC Director of Programmes and Research outlines in a letter that the first key message shared at this workshop, (reflecting the findings of R4) was that:

“cocoa yields are statistically higher when the cocoa is cultivated close to [intact] forest (something that had never been documented before), when farms have pollinator habitats (rotting biomass), and when farmers actively manager their soils (e.g. by applying fertilisers), but that cocoa incomes cannot “solve” all of the issues driving poverty and thus require support and governance” [E1].

The Director confirms that the research presented at these workshops “came to directly influence Ghana’s definition of climate-smart cocoa, including on-farm practices and the adoption of cocoa-forest landscape approaches” [E1].

The data and insights provided by ECOLIMITS also strengthened existing relationships between NCRC, the Forestry Commission and the Cocoa Board, supporting NCRC’s involvement in their policy initiatives, including the Ghana Cocoa Forest REDD+ Programme (GCFRP) [E1, see also E3]. REDD+ is a UN programme that seeks to reduce greenhouse gas emissions from deforestation and forest degradation in developing countries through sustainable forest management and other practices, and GCFRP is the world’s first commodity-based emission reductions programme. It is focused on significantly increasing cocoa farmers’ yields by making cocoa production more sustainable through a ‘climate-smart cocoa’ approach. The Executive Director of the Forestry Commission testifies to the value of the ECOLIMITS research to the GCFRP, via the collaboration with NCRC [E4]:

“the Nature Conversation Research Centre (NCRC) is also a partner to the Forest Commission (FC) ... specifically on the development and implementation of the Ghana Cocoa Forest REDD+ Program (GCFRP) which is being implemented under the World Bank’s Carbon Fund and has benefitted immensely from the outputs of the ECOLIMITS research project”.

B) Development of the Kakum landscape as a Hotspot Intervention Area (HIA)

A significant challenge for the GCFRP was how to advance the implementation of smart cocoa farming. The NCRC’s use of the ECOLIMITS research in Kakum ensured that the findings played an important role in shaping development and implementation of the GCFRP’s Hotspot Intervention Areas (HIAs). It also provided compelling evidence to funders, which has led to further funding and benefits to cocoa farming communities.

The GCFRP is an area-based approach to policy, concentrating interventions in particular regions. The Forestry Commission’s Executive Director has endorsed that “the findings from the [ECOLIMITS] project have been used in the development of the GCFRP implementation mechanism and in the delineation of the Hotspots Intervention Areas (HIA) for the program implementation” [E4]. The Head of Sustainable Sourcing at The Hershey Company (the largest chocolate maker in the USA) confirms that the NCRC’s knowledge of the Kakum landscape and the ECOLIMITS project were “instrumental in the development of Kakum as a Hotspot Intervention Area (HIA)” [E5]. The GCFRP website recognises the importance of the research to the management of the Kakum HIA, acknowledging “Central Zone A HIA [Kakum] as being ‘led by NCRC with [cocoa companies] Touton, PBC, Oxford Univ. and [conservation union] IUCN-NL” [E6].

Subsequently, the ECOLIMITS findings helped NCRC to broker funding in late 2018 [E1] from The Hershey Company [see E5] and ECOM (a global commodity trading and processing company with an office in Ghana) to implement the GCFRP in the Kakum region with approx. 60,000 cocoa farmers. [Text removed for publication] [E2a] has enabled:

1. The rollout of climate-smart cocoa production: farmers and community leaders have been the key beneficiaries of an extensive training programme in smart cocoa production run by ECOM, the Ghana Cocoa Board and NCRC. In 2019, 2,416 farmers were trained in climate smart cocoa and agroforestry, compared with 2,431 in 2020 (4,847 in total) [E2b].
2. The development of landscape-level community-based governance structures to further enhance climate resilience and reduce poverty among cocoa farmers [R3, R5]: a further 507 individuals (347 men and 160 women) received training in 2019-2020 on different aspects of governance, such as roles and responsibilities of executives of different decision-making bodies and agencies, and constitutions and by-laws [E2b].

For The Hershey Company, the NCRC orchestrated project in Kakum “is a key investment as we pursue climate-smart cocoa in Ghana, and one of our most important projects globally” [E5, see also E7]. This is why, in September 2020, they confirmed that they were about to sign that month a “second three-year agreement to enable another phase of multi-stakeholder collaboration to enhance up-take of climate-smart cocoa farming practices, support the continued development of community-based landscape governance, reduce deforestation and loss of shade trees in the landscape, foster livelihood diversification through new botanical value chains, and enable comprehensive landscape monitoring” [E5].

C) Shaping a climate-smart Monitoring and Evaluation (M&E) scheme

There is broad consensus that monitoring is essential to understanding the impacts of the GCFRP interventions in HIA landscapes but “the reality is that monitoring at a landscape-scale is not simple” [E8]. This is because available data are often too narrow in scope and unrepresentative of all cocoa farmers. NCRC has therefore sought to develop an externally funded M&E scheme with a holistic socioecological approach for the Kakum landscape. According to its Director of Programs and Research, the “ECOLIMITS research experience also directly influenced NCRC’s ability to sign an agreement in 2019, with the Lindt Cocoa Foundation to develop a monitoring and evaluation system for cocoa landscapes that focuses on [the] socioeconomic, ecological, farmer wellbeing, and productivity pillars” [E1] of GCFRP interventions. The Managing Director of Lindt Cocoa Foundation confirms that “[b]ecause of NCRC’s socio-ecological knowledge of the landscape, their expertise in designing and implementing research, and their strong relationship with the local communities as a result of the ECOLIMITS project, the Lindt Cocoa Foundation decided to fund the 3-year project to design and test an M&E system in the Kakum Landscape” [E9]. [Text removed for publication] [E2a].

[Text removed for publication] [E10]. Original data from the ECOLIMITS project are used as baseline measurement on three indicators: canopy cover and shade trees [see R2] under the ecosystem health theme, and multi-dimensional poverty [see R6] under the well-being and social inclusion theme. In late 2020, NCRC also started to train 11 staff members in the Kakum region who will undertake the socioecological landscape monitoring [E2b].

The M&E scheme has been picked up by Partnership for Forests, a programme that is funded by the UK’s FCDO and BEIS and that catalyses multi-stakeholder collaboration around, and investment in, sustainable forests and land use. In a document published in September 2020, they offer a toolkit for holistic landscape approaches to cocoa management across West Africa that also considers monitoring [E8]. The document presents the Lindt Foundation-funded Kakum landscape M&E scheme as the only operational landscape approach to monitoring, proposing it as a standard for other regions and actors seeking to pursue smart cocoa strategies. The document also credits ECOLIMITS and El Niño follow-up projects as key “systems” [Figure 14, page 43] feeding into the M&E scheme.

5. Sources to corroborate the impact (indicative maximum of 10 references)

- E1:** Letter: Director of Programs and Research, Nature Conservation Research Centre (NCRC) on effects of ECOLIMITS projects.
- E2:** Emails: Director of Programs and Research, NCRC, Email **2A** on workshop and funding, **2B** on training.
- E3:** Letter: Deputy Chief Executive, Ghana Cocoa Board
- E4:** Letter: Chief Executive Officer, Ghana Forestry Commission.
- E5:** Letter: Head of Sustainable Sourcing, The Hershey Company.
- E6:** Website: Ghana Cocoa Forest REDD+ Programme – List of HIAs
- E7:** Annual Report, Ghana - The Hershey Company (2019)
- E8:** Document: Partnerships for Forests (2020) Learning About Cocoa Landscape Approaches, Document and Toolbox.
- E9:** Letter: Managing Director, Lindt Cocoa Foundation: Testimony for Climate Smart Monitoring and Evaluation Scheme.
- E10:** Document: NCRC (2020) Monitoring & Evaluation System for Cocoa CREMAs in HIA Landscapes in Ghana: Guidebook to M&E Methods.