Innovate UK

Climate-Smart Agriculture Partnership Scoping Projects

November 2024

Introduction

This brochure showcases the winning project applications of the Climate-Smart Agriculture Partnership funding competition

This pilot programme will build collaborations and enable knowledge sharing between the UK, Brazil and Africa (Ghana and Nigeria) to develop technologies and practices that promote climate-smart agriculture in Ghana and Nigeria.

What are Scoping Projects?
Scoping Projects will build trilateral networks between the UK, Brazil, Ghana and Nigeria and identify opportunities for collaboration and knowledge sharing to promote climate-smart agriculture for sustainable food production systems in Ghana and Nigeria. The aim of a Scoping Project is to scope and document a range of potential solutions to climate-smart agriculture and sustainable food production system challenges within a broad topic area. A Scoping Project is not your typical research project looking at one solution to a single agricultural problem.

Scoping Projects will deliver a range of network building activities and workshops between the UK, Brazil, Ghana and Nigeria between December 2024 and January 2025. They will support in providing a pipeline of potential innovations and solutions that are either ready to implement or which could take advantage of future research and development funding. The project leads, from UK universities or research technology organisations, will catalyse knowledge sharing and facilitate networking activities for stakeholders from the UK, Brazil, Ghana and Nigeria projects to get involved with.

These projects are the first set of activities to identify opportunities for trilateral partnerships, as such the topic areas they cover are not representative of the potential scope of the whole programme. Future funding competitions through the Climate-Smart Agriculture Partnership will fund individual trilateral innovation projects and will be announced in 2025.

What will Scoping Projects do?
Scoping Projects will:

1. Deliver planned networking activities to bring together stakeholders in the UK, Brazil, Ghana and Nigeria to:
- Build a diverse network of stakeholders across the UK, Brazil, Ghana and Nigeria to develop productive research and innovation partnerships and relationships.
- Facilitate the development of consortia for future collaborative projects.

2. Produce a public facing report to:
- Identify and outline challenges, barriers and technology gaps associated with a specific topic area in both Ghana and Nigeria.
- Explore and assess the relevant research, innovations, technologies and practices in the UK, Brazil, Ghana and Nigeria to identify expertise and knowledge in the specific topic area.
- Identify opportunities to collaboratively transfer, develop, commercialise, adopt and scale-out technologies and practices to promote climate-smart agriculture in Ghana and Nigeria.

How to get involved in the activities being delivered by a Scoping Project
Email agripartnership@iukbc.org.uk if you are keen to speak about a particular project.

A trilateral network for agroforestry and integrated regenerative landscape management to support climate resilient development and food security

Project leads: Lindsay Stringer, Professor in Environment and Development, and Director of York Environmental Sustainability Institute, University of York & Tim Pagella, Senior Lecturer in Forestry, Bangor University

Agroforestry is a sustainable land use approach which deliberately integrates trees and woody shrubs with crops and animals for environmental, economic and social benefits. With globally impressive results across a range of contexts, including Nigeria and Ghana, agroforestry is a highly promising climate-smart technology in addressing the intertwined challenges of food security, climate change, land degradation and poverty.

Northern regions of Nigeria and Ghana in particular are experiencing unpredictable rainy seasons, higher temperatures, dry spells and recurring droughts. The rapidly changing climate, coupled with rising unsustainable land use practices such as logging and excessive chemical usage, is contributing to significant land degradation and desertification. These challenges are exacerbating conflict as well as the marginalisation of vulnerable groups such as women, hindering the advancement of the SDGs and ultimately the climate resilient development (CRD) pathways that climate-smart agricultural practices such as agroforestry seek to achieve. CRD advocates for actions that simultaneously address greenhouse gas emissions, climate change adaptation and the SDGs, with emphasis on four enablers: ecosystem stewardship, equity and justice, inclusivity and diversity of knowledge. For agroforestry to advance CRD, the four enablers must be at the centre in designing any agroforestry technologies, ensuring social issues such as gender inequalities are addressed, and diverse knowledge and perspectives are considered when developing and scaling these technologies. Such efforts are crucial given that women's rights are afforded such low recognition in many sub-Saharan African countries (including Nigeria and Ghana), often due to socio-cultural and religious factors.

The common agroforestry practices promoted to farmers in both regions include Farmer Managed Natural Regeneration (FMNR), Alley cropping and Taungya systems, and the use of Multi-purpose Trees (MPTs) on crop land. Many of these practices are also used in parts of Brazil. Given the importance of matching the 'Right Trees to the Right Place' (RTRP), it is important to understand the suitability of the trees for the two regions. In this project we use the four CRD enablers as a framework for bringing together diverse stakeholders across the four partner countries (UK, Brazil, Ghana and Nigeria), helping inform the design and scaling of the agroforestry technologies to be advanced in these regions. Through stakeholder analysis and engagement, online workshops, interviews and desk-based literature review, we aim to identify opportunities for trilateral collaboration and knowledge sharing to promote agroforestry as a technology for CSA, supporting sustainable food production systems in Ghana and Nigeria.

Climate-smart cowpea for Africa

Project lead: Stephen Rolfe, Professor in Plant and Microbial Biology, University of Sheffield

This project aims to improve cowpea (Vigna unguiculata) for pest resilience and soil fertility in Ghana, Nigeria, and Brazil, three countries where the crop plays a significant role in food security, livelihoods, and agricultural sustainability. Cowpea is a critical grain legume that contributes to nutrition, livestock feed, and income generation across its value chain. Its high protein content, nitrogen-fixation ability, and adaptability to different environmental conditions make it an essential crop for marginal soils and areas with low rainfall, common in regions such as West Africa (including Nigeria and Ghana) and Brazil's semi-arid zones.

Despite the importance of cowpea to African farmers, the actual yield achieved in the field often falls short of the potential yield by 60% or more. This yield gap arises from the impact of pests and diseases, and also the lack of critical soil nutrients. As a legume, cowpea can enter symbiotic relationships with soil bacteria allowing them to fix atmospheric nitrogen, but Nigerian researchers also identified a lack of soil phosphorus (P) as a critical limitation.

Studies in Sheffield have shown that Nigerian soils in cowpea growing areas are almost devoid of P in any form, therefore soil P amendments are essential, at least in the short term. Whilst synthetic fertilisers can fill this gap, their use is unsustainable due to high economic costs and environmental impacts. Nigeria has extensive reserves of Sokoto rock phosphate, but the P in this mineral is in a form that cannot be used by plants.

Therefore, this project aims to improve P nutrition by developing cowpea varieties that are able to take up and utilise P efficiently and, crucially, enter symbioses with soil microbes that allow them to access the P in Sokoto rock phosphate. In the longer term, a shift in agricultural practice is needed to build soil fertility in a sustainable manner, whilst improving yields and farmer income. This can be achieved using co-designed projects building on local and international expertise. By understanding the shared problems facing cowpea farmers in Brazil, Nigeria and Ghana, new varieties of cowpea can be produced by plant breeders with improved disease resistance, nutrient use and nutrient acquisition. Interactions with soil microbes are required to build long-term soil fertility and plant stress resilience, and the adoption of sustainable agricultural practices that are essential to bridge the yield gap in an economically and environmentally sustainable manner.

Development of a UK, Ghana, Nigeria and Brazil network on cocoa improvement

Project lead: Paul Hadley, Director, Centre for Horticulture and Lead, Cocoa Group, University of Reading

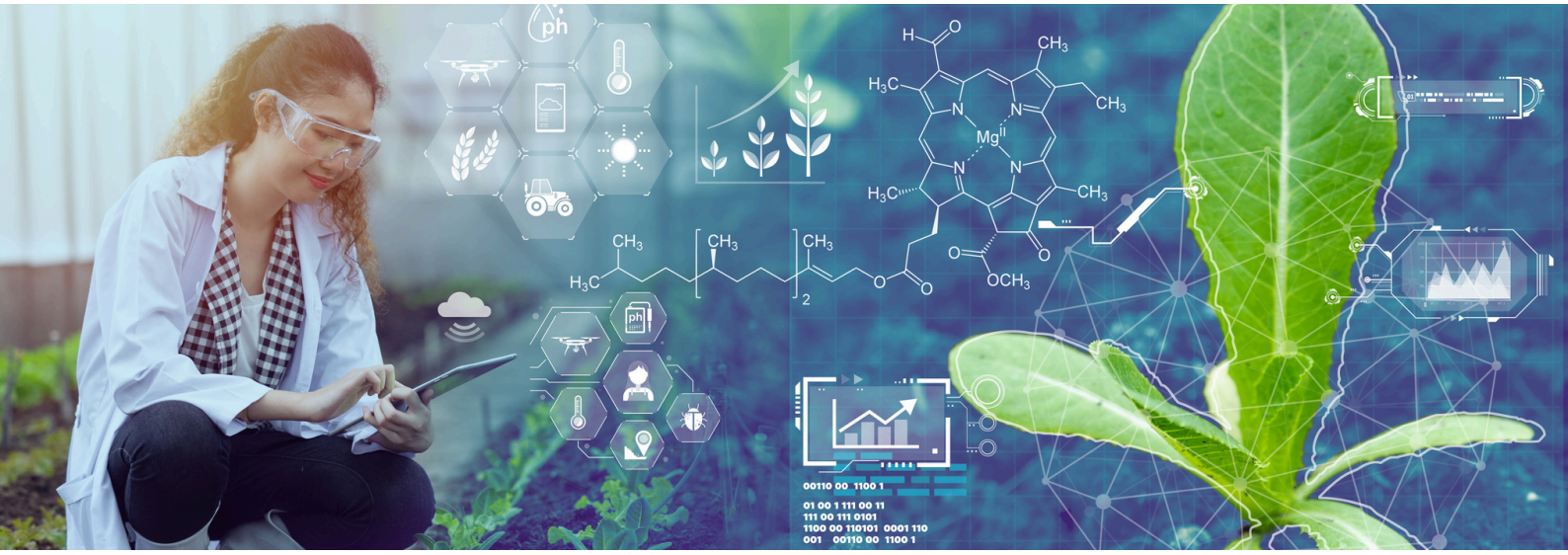
Cocoa is grown throughout the humid tropics, supporting an estimated 5-6 million smallholder farmers and providing an essential ingredient to the chocolate and confectionery industry worldwide, and specifically in the UK. Over 70% of the world's supply of cocoa is supplied from West Africa but yields from this region have recently declined sharply, whilst in Brazil yields are approximately half of those achieved in the 1980's due to the effects of Witches' Broom Disease.

In West Africa, four factors are considered to account for recent yield declines: the impact of climate change, increasing age of tree stocks due to a lack of investment in new plantings, poor farming practices, including poor soil management, and increased incidence of pests and diseases, possibly due to the negative impacts of climate change. Future cocoa production can be improved in the short term by changing farming practices and in the medium /long term by the replacement of tree stocks with genotypes with more resilience to climate extremes.

The University of Reading (UoR) is recognised as a centre of excellence for cocoa research with a programme that has spanned over 40 years. Ongoing research led by UoR in collaboration with the Cocoa Research Institute of Ghana (CRIG), Kwame Nkrumah University of Science and Technology (KNUST) and other key stakeholders in Ghana has shown that organic amendments and surface mulches improve cocoa establishment and yield. These research findings are being translated into practical field solutions to deliver more sustainable farming systems through a NERC Knowledge Exchange Fellowship at UoR. Physiological studies, also at UoR, funded by Cocoa Research UK, have led to the development of a methodology to identify climate resilient cocoa genotypes with increased water use efficiency and sensitivity to high temperature stress amongst accessions held in the International Cocoa Quarantine Collection, also held at UoR. Material previously identified at UoR has been incorporated into breeding trials and selections from these trials have the prospect of providing a major step towards a new generation of climate adapted genotypes. The development of climate resilient planting material that could replace current climate sensitive trees in cocoa producing countries would be a step-change in the resilience of cocoa to climate change.

The aim of this project is to develop and expand existing networks, currently maintained through knowledge exchange between UoR and key institutions and stakeholders in Ghana, to two other key cocoa producing countries, namely Nigeria and Brazil.

Digital Agri-Tech Africa-Brazil Ecosystem Engagement (DATA-BEE)



Project lead: James Kayam, International Business Development Manager, UK Agri-Tech Centre

Our market-led approach will target the broad areas of opportunity for farmers and agribusinesses dealing with the global challenges of climate change, maintaining and growing agricultural productivity within sustainable production systems. We will use this opportunity to qualify market demand and gaps through online, and where possible, in-market engagement. These will be supported by our existing UK and international farmer and innovation networks, alongside the UK Department for Business and Trade (DBT) and the Science and Innovation Network (SIN) within the Foreign Commonwealth and Development Office (FCDO).

Our goal in this scoping project is to understand specific agricultural and technology challenges in both Nigeria and Ghana through market engagement, identify a range of solutions and providers, which can bridge between Brazilian and Nigerian/Ghanaian agricultural systems to help address climate-related challenges. We will support these providers to develop credible business models for Nigerian and Ghanaian markets. These will be documented in our final report, allowing us to pinpoint the most compelling opportunities for development, bridging gaps, and growing future collaboration, co-operation and knowledge exchange between UK, Brazil, Ghana and Nigeria.

The UK Agri-Tech Centre (UKATC) is uniquely positioned to support innovation and accelerate the development of climate-smart agriculture solutions including those from the UK and Brazil, and their adoption in Ghana and Nigeria. As the largest agri-tech centre in the UK, our strength lies in our ability to remove roadblocks, enabling businesses to innovate and scale quickly. We are close to the market, with staff, facilities, and expertise that empower companies to drive sustainable, net-zero food production.

Our approach will focus on listening to and understanding the common climate challenges faced by small- and large-scale farmers in these key markets, as well as current solutions, practices and mitigations. We will work closely with farmer organisations and innovation support networks in Ghana, Nigeria, and Brazil to identify shared common themes that can be addressed through enhanced digital agriculture and precision farming interventions. This will allow us to identify and prioritise where digital agriculture and precision farming solutions are appropriate, and support the development of credible routes to market. This will support a framework for collaborative global development with UK businesses and research institutions, helping to build a sustainable digital future. By leveraging our expertise, we aim to provide farmers with practical, scalable solutions that can be readily adopted, to help them achieve climate-smart, sustainable production while promoting profitability and best practices through sharing knowledge.

Enhancing Cassava Productivity in Africa: Connecting the dots for sustainable agriculture and higher yields in Ghana and Nigeria with microbial biological solutions

Project lead: Georgos Zangos, Market Strategy Manager, CPI

This project aims to build an international collaboration between partners in the UK, Brazil, Ghana, and Nigeria to enhance cassava productivity in West Africa. Nigeria is the world's largest producer of cassava, accounting for about 20% of global production, however, its average yield of 8.75 tons per hectare (t/ha) is lower than the global average of 11.08 t/ha and lags compared to high-yielding regions such as Brazil and South America, where yields can reach up to 50 t/ha. Ghana, though performing better with a national average of 22.97 t/ha, also faces difficulties with significant gaps in productivity, particularly among smallholder farmers, whose average yields often fall between 10-15 t/ha. The challenges in both countries include low-yielding cassava varieties, poor soil fertility, pest pressure from diseases like Phytophthora and Mirids, and limited access to chemical pesticides. Brazilian cassava farms, on the other hand, have leveraged the latest advancements in agricultural practices to boost yields, especially in the southern regions where yields average over 18 t/ha. These solutions have proven effective in improving soil health, reducing pest infestations, and enhancing crop resilience.

This project will aim to transfer both the Brazilian expertise in sustainable agricultural technologies, focusing on microbial biopesticides, bio-stimulants, and biofertilizers, along with the strong UK knowledge on developing microbial agricultural bio-inputs, in order to help Ghanaian and Nigerian farmers improve cassava yields in a sustainable way. The initiative will foster knowledge exchange through collaborative workshops. It will also explore opportunities for improved agronomic practices to increase productivity, particularly for smallholder farmers who form the backbone of cassava production in these countries. By networking researchers, and private organisations across the UK, Brazil, Ghana, and Nigeria, the project will aim to identify locally adaptable solutions that improve soil fertility, reduce crop losses from pests and diseases, and ultimately increase cassava yields in West Africa. This will not only strengthen food security but also enhance the economic potential of cassava as a vital cash crop, benefiting millions of smallholder farmers and their communities.

Exploring how a blended approach of ecology, culture and technology can help translate nature-based solutions for pest-control into crop farming for African subsistence farming communities

Project lead: Seirian Sumner, Professor of Behavioural Ecology, UCL

Global food supplies are not sufficient to sustain our growing human populations. Crop pest management is of paramount concern: arthropod pests cause losses of 18–26% annual crop yield worldwide, at an economic cost of US$ 470 billion. The current use of chemicals to control pests is unsustainable for human health, biodiversity, and climate change. The impact is especially acute in low/middle-income countries (LMICs) like Nigeria and Ghana, where population growth and poverty are substantial, and 80% of farming is subsistence-level. These countries are being left behind as sophisticated methods of pest control, being used in countries like the UK and Brazil, are currently unviable for LMIC farmers. Unregulated pesticides are often used; as well as risks to biodiversity, these chemicals drive inequality as field spraying is typically done by women, without protection, who then suffer detrimental health impacts from exposure.

There is an urgent need for innovations in sustainable pest control methods that are accessible and culturally appropriate for subsistence farmers in LMICs, safe for biodiversity and human health and that afford resilience to local communities coping with climate change. Natural enemies are insects that naturally predate arthropod pests. Africa is host to a huge biodiversity of natural enemies, especially parasitoids and hunting arthropods which are known to be effective regulators of crop pests. Brazil's crop production has a strong industry-led infrastructure in the production of natural enemies for pest control; the UK has strong government-led initiatives in the use of ecological practices to encourage natural enemies and pollinators in crop farming. How can these approaches be translated into African subsistence farming, in a way that can be maintained by communities, and which accounts for diverse cultural and knowledge-bases? Climate-smart agriculture (CSA) projects in Africa have been effective in improving farmer knowledge of biodiversity, and promoting diversity of natural enemies. However, consideration of diversity in local culture and knowledge is essential to translate a blended form of sustainable pest control that capitalises on the very best that nature and technology have to offer.

We will build a network of agriculturalists, sociologists, ecologists, policy-makers, industrial partners and farmers across the four countries to explore challenges and innovations in pest control and scope out how to translate innovations into small-scale, subsistence farming in Africa in an ecological and culturally appropriate manner. We strive for a climate-smart solution which promotes self-sufficient approaches to pest control; safety for biodiversity and humans; and resilient to climate-change.

Identifying priority areas and aligned innovations for sustainable goat production in Africa

Project leads: Holly Vickery, Lecturer in Animal Behaviour and Welfare, Harper Adams University & Zoe Barker, Lecturer in Animal Sciences, University of Reading

Goats are renowned for their productivity (short gestation periods with multiple kids per birth) and versatility (tolerance to a range of farming systems, environments and diets). Goats are of significant global importance, with a global population of 1.1 billion in 2022 – a ten-year increase of 20.4%. Africa holds the largest share of the global herd (44.2%) where goats are more common than cattle and sheep (goat population: 506 million, sheep: 419 million, cattle: 381 million). The average annual population growth of ruminant species in Africa is highest in goats, and they represent an essential source of milk, meat and fibre for many communities. Goats are colloquially referred to as the 'poor man's cow' yet are more efficient meat and milk producers than cattle and thrive in wider environmental conditions, making them a more climate-resilient species choice. Per kilogram of milk produced cattle require 1.78kg dry matter, 5.73 litres water, and output 7.25 kg CO2 versus 1.43kg, 2.73l and 6.70kg CO2 for goats.

Furthermore, compared to cows, goat milk has superior nutritional qualities. Of the United Nations, 17 sustainable development goals goats play a particularly important role in the sustainability of food and nutrition, economics, and the environment. Goats' ability to support food security is especially important in areas of vulnerability including Sub-Saharan Africa. Despite their global importance and potential to aid climate-smart agriculture, the lower economic value of goats, and their relatively lower importance to Western agriculture, means they are under-researched and their full potential for sustainable agricultural systems is poorly understood. Agriculture across West Africa is typically subsistence based low-input systems with inadequate technology which results in low outputs per unit of land or animal. Research on agricultural technology transitions highlights low uptake as problematic to attempted improvements. Potential benefits of technology cannot be realised unless they are adopted, which relies on them being feasible for use in systems they are designed for. Implementing on-farm change relies on research application, therefore, to have an impact, it is essential that research is targeted and feasible for use, which can be improved by implementing co-design principles.

This project aims to contribute towards the sustainable development of African goat production, by co-creating with regional stakeholders a list of prioritised key challenges and utilising networks in the UK and Brazil to identify possible solutions aligned to practical application.

Scoping Climate-Smart Livestock Systems in Africa (SciCLiSA)

Project lead: Dominic Moran, Professor of Agricultural and Resource Economics, University of Edinburgh

Building on UK work on agricultural emissions mitigation (for the Committee on Climate Change), further collaborative research in Brazil (with EMBRAPA) identified the scope of system mitigation measures that have enabled the livestock sector to make a significant contribution to both UK carbon budgets and Brazil's Nationally Determined Contribution.

This scoping project will now seek to extend this learning to partners in Ghana and Nigeria; specifically considering how these measures (a combination of productivity, animal performance and grassland management) can be applied to systems in both countries. The scoping exercise will work with in-country partners in a process to evaluate technical (mitigation) potentials for measures to be applied on key production systems, and will also consider the ways that mitigation benefits can be made resilient to climate change (i.e. are adapted or climate-smart). A further objective is to explore the emerging dynamic of related agricultural emissions credits in both Brazil and Africa and the opportunities for private sector partners to capitalise on offsets and insets from agricultural mitigation measures.

As such this application overlaps the category of climate finance. This project will:

- Establish a four country network linking researchers and industry stakeholders in from the UK, Brazil, Nigeria and Ghana, with a common aim to develop climate-smart livestock systems;
- Develop a series of online meetings and expert (Delphi) surveys of network members to collect responses around the following objectives;
- To scope livestock production systems in Nigeria and Ghana and associated technical interventions for emissions mitigation
- Understand the climate resilience of mitigation measures (e.g. climate-smart) systems;
- To estimate technical mitigation potential from mitigation measures;
- To scope the development of reliable emissions credits based on livestock system mitigation;
- To explore with private sector partners the potential for credits to be marketed as certifiable offsets and insets;
- To develop a longer-term collaboration around specific data and modelling gaps revealed by this scoping study.

Silvopasture for climate resilient livestock systems

Project leads: Will Simonson, Principal Researcher, Agroforestry, Organic Research Centre & Maria Paula Escobar-Tello, Senior Lecturer, Bristol Veterinary School, University of Bristol

Countries such as Nigeria and Ghana are being impacted by climate change. The period of “dangerous humid heat” that engulfed western Africa in February 2024 was made 10 times more likely by climate change. Other impacts include intensive and erratic rainfall, droughts and floods. Coupled with land degradation resulting from overgrazing and deforestation, climate change will expose farming and pastoralist communities to intense pressure and vulnerability, with severe social and economic consequences including poverty and hunger.

Silvopasture is a climatesmart agricultural approach proven to mitigate these expected impacts and build resilience in farming communities. Silvopasture combines livestock with trees and forages, improving productivity, diversification, animal wellbeing and ecosystem services. For example, the trees create vital shade and shelter during heat waves, whilst also providing nutritionally and medicinally important browse, and potentially new marketable by-products for the farmers, whilst soil health is improved and carbon sequestered. Coupled with conservation and regeneration agreements, silvopasture can harmonise intensified production with environmental sustainability. Silvopasture is well practised in some parts of Latin America, the Caribbean and Europe, but less so in Africa, with experts noting the region’s high potential for adopting silvopasture and the lack of sufficient evidence to support this process. Literature on policy mobilities highlights the risks of policy and knowledge transfers that lack awareness of the impact of context on how knowledge and policies are adopted. This project aims to create a network of researchers, innovators, commercial partners and policy experts within the farming and food chain sector in the UK, Brazil, Ghana and Nigeria to:

1. Identify climate change impacts and risks to livestock farming in Ghana and Nigeria and the potential of silvopasture as an adaptation approach.
2. Identify how lessons learnt from the current practice of silvopasture in Brazil and the UK could contribute to adaptation in the African livestock sector.
3. Establish the foundations of an action and research plan that allows stakeholders in Ghana and Nigeria to:
    i) Innovate silvopasture systems that are biophysically and socially suitable for their contexts, and
    ii) design programmes to increase their uptake to help livestock farmers adapt to the challenges of climate change and improve their livelihoods.

The project will identify and interview key stakeholders in each of the participating countries, hold an online workshop to carry out knowledge exchange to meet the above-stated objectives and produce a report that will summarise key findings.

Soil health for productivity and climate resilience

Project lead: William Blake, Director of the Sustainable Earth Institute, University of Plymouth

Soil health' across its interconnected physical, chemical and biological dimensions underpins the fundamental objectives of climate-smart agriculture (CSA) and sustainable land-water systems. For example, healthy soil with nutrients balanced to crop types increases agricultural productivity supporting profitable agribusiness for food but also national GDP, e.g. cocoa in Ghana. Equally, a soil that is healthy in structure and stability is resilient to hydrological extremes of drought and flood, supporting adaptation and building resilience to climate change, noting short periods of intense rainfall are reportedly twice as likely in Nigeria due to climate change.

Building soil organic matter through a change in agricultural practice underpins fundamental CSA health dimensions bringing co-benefit of carbon sequestration, and reducing/removing greenhouse gas emissions. Evidencing co-benefits of CSA practice to deliver soil health remains, however, a challenge, in part due to costly and time-consuming traditional soil assessment tools but also due to conflicting sectoral perspectives on soil health priorities (e.g. 'carbon for soils or soils for carbon' debate). Addressing the soil health assessment challenge supports both grassroots decision making and co-design of policy – policy that is adaptable to local socio-economic, environmental and climate change factors delivering toward the Food and Agricultural Organisation (FAO) action point of expanding evidence bases for CSA across crops, land types and farming systems. To meet this challenge, we aim to develop an interdisciplinary/cross-sectoral network that capably fuses farmer-led, laboratory and sensor technology assessment tools with indigenous knowledge to create a new holistic approach to soil health assessment. It will enable equitable transition to CSA with wider benefits for downstream water security and aquatic ecosystem services.

We have a proven track record working in partnership with communities, the agricultural sector and the tech industry, between the UK and the global south, to deliver holistic evidence that supports soil nutrient and water management. New ways of working have been tested and proven in East Africa, Latin America and the UK to meet CSA goals i.e. 'supporting enabling policy frameworks' e.g. new community agri-byelaws, 'strengthening national and local institutions' e.g. empowering extension workers with evidence of positive change, 'enhancing funding, and financing options' e.g. new data generation citizen science livelihood concepts supporting green entrepreneurship, and 'implementing CSA practices at field level' e.g. demonstration plots for engagement and peer-to-peer learning. Building on new links in Nigeria and Ghana established through the UNESCO Intergovernmental Hydrological programme, we are ready to make a major contribution to the ambitions of this call.

SusNet Cacao (Sustainability Network for Cocoa)

Project leads: Sarah Arnold, Senior Specialist - Applied Entomology Researcher, NIAB (National Institute of Agricultural Botany) & Andreanna Welch, Associate Professor, Department of Biosciences, Durham University

Cocoa (produced from Theobroma cacao) is growing in global demand but the crop experiences low, unreliable yields in many parts of the world. As a long-lived tree, it is vulnerable to climate challenges within its lifetime, particularly as it is commonly grown in monocultures with poor resilience to fluctuating conditions. Additional issues in agriculture and markets, such as pests and diseases, poor agronomic practices, and changing expectations (environmental/ethical) by buyers/consumers, jeopardise future production and the livelihoods of those involved in growing and processing it.

Agroforestry may provide solutions to these issues, as it delivers multiple ecosystem services and buffers against climate impacts, but there is also considerable scope to modernize agronomic practice and learn from other global fruit-production systems. This project aims to identify best practices and opportunities for sustainable cocoa production and processing in Brazil (e.g. cabruca, hand pollination), Ghana, and Nigeria, with the aim to introduce new technologies for research, monitoring and plantation management that best suit each environment. This includes both research tools (e.g. eDNA monitoring) and agri-tech to support farmers and production. A sustainable vision of future cocoa would a) maintain or increase yields without increasing the land footprint b) be robust against climate changes c) support biodiversity while still managing pests and associated diseases d) be equitable for workers in the industry. Better connections between industry/researchers in the three countries will enable innovations in sustainable cocoa production to be shared more widely.

This network will identify the biggest problems facing cocoa production in Ghana (2nd largest cocoa producer), Nigeria (5th largest) and Brazil (6th largest), spanning countries where cocoa is likely native and also introduced. Building on links established in a current UK-Ghana partnership (including researchers, farmers, and the cocoa industry), we will develop a new multilateral network including Brazil and Nigeria. We will employ fact-finding visits, online meetings, focused interviews and online tools to identify the research and innovation priorities for a range of different individuals involved in the cocoa industry, from production on farms through to retail of chocolate in shops. This will bring together a consortium of researchers, farmer groups, and industry organisations ready to carry out research and innovation to ensure future sustainability and climate-resilience in cocoa. We will produce a report about our findings, to shape the funding priorities for this sector in the future, and also communications materials to spark discussion about cocoa among wider society.

Sustainable Oil Palm Options (SOPO)

Project lead: Julia Drewer, Group Leader Biosphere-Atmosphere Exchange and Effects, UK Centre for Ecology and Hydrology

Oil palm (OP) is one of the most valuable crops grown in humid tropic regions, leading the global vegetable fat market and providing biofuel. The global market size projection is $74 billion (CAGR of 5.1%) by 2024 reaching $100 billion by 2030 (Data sourced from Market Research Future). OP cultivation is vital to global food security and provides jobs and income to millions of farmers, but large-scale conversion of dense and diverse rainforests into large OP monocultures has also caused substantial environmental degradation due to widescale deforestation and the application of chemical fertilisers and pesticides.

Maximising efficiencies, stability and sustainability of production is essential to improving food security and societal benefits as well as mitigating the environmental burden of OP farming is predominantly cultivated in Southeast Asia (SEA, over 80% of global production), where it is an introduced species and commonly grown in large-scale industrial plantations. West Africa, OP's native home, has been identified as a future production hotspot. OP has been grown commercially in Africa since at least the eighteenth century. Nigeria dominated the African OP industry throughout most of the twentieth century and by 2012, the top-producing countries were Nigeria, and Ghana. The long-term success of increasing OP production in Africa relies on both the economic and environmental sustainability of agricultural management, which can be achieved by combining learning from different regions. Brazil is currently the 10th largest OP producer in the world and serves as a role model in the expansion of sustainable OP production.

UKCEH has worked extensively in SEA over several decades regarding efficient, climate-smart sustainable farming practices with reduced GHG emissions in both industrial and smallholder OP cropping systems. Thus, there is a wealth of knowledge in different regions which should be combined to apply to decision making frameworks prior to the expansion of activities in Africa. At this early stage in the large-scale development of the oil palm industry in Africa, there is a great and timely opportunity to adapt lessons learnt from SEA and Brazil to Ghana and Nigeria to co-develop and promote potential solutions to sustainable OP cropping in West Africa.

The proposed project will bring together researchers, agricultural experts, industry leaders and a diverse variety of stakeholders from Brazil, Ghana, Nigeria and the UK. The expected outcome will be a network of practitioners enabling knowledge exchange and learning to develop and test practical and implementable solutions for a sustainable, climate-smart African oil palm production industry.

Contact us

To discuss this brochure further, please contact:
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